

ABSTRACT**PEDIATRIC****O-1 | Transcatheter Closure of PDA Compared to Surgical Ligation in Premature Neonates: Clinical Outcomes and Cost Comparison**

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Background: Surgical and transcatheter closure of patent ductus arteriosus (PDA) are both effective strategies in premature neonates but the clinical outcomes and the economic impact of these therapeutic modalities is unknown.

Methods: A retrospective study of premature infants weighing <2.5kg who underwent surgical PDA ligation (between 2008-2014) or transcatheter PDA closure (2014-2019) at a large regional hospital. Total and department-specific inpatient costs during the index hospitalization were estimated from the Pediatric Health Information System, adjusted for inflation to 2019 dollars, and log transformed to meet the normality assumption. Complications were defined as untoward events requiring further interventions or causing death. Analyses included t-tests and chi square tests for continuous and categorical variables, respectively. Because this hospital is a referral center, all analyses were stratified by those patients who *Transferred back* to the referring facility following index procedure versus *In-House* patients who stayed in the NICU until hospital discharge or mortality.

Results: The study cohort included 167 patients who underwent surgical PDA ligation and 107 who had transcatheter PDA closure. Among *Transfer* patients, baseline demographic and clinical characteristics were similar between the two groups. In the *In-House* category however, median weight at procedure was significantly lower in the surgical group compared to the transcatheter group [960 gm (range 560-2480) versus 1190 gm (640-2500), respectively, $p < 0.001$]. The mean total inflation adjusted 2019 cost was similar between the

surgical and transcatheter groups for both *Transfer* (\$40,384 versus \$34,419, $p=0.29$) and *In-House* (\$400,670 versus \$374,701, $p=0.15$) patients. The surgical group had higher lab and pharmacy costs, while transcatheter procedures had higher imaging cost. The overall complication rate was significantly higher in the surgical compared to the transcatheter group {43/167 (25.7%); 8/107 (7.5%), respectively, $p < 0.001$ }.

Conclusions: Given the high complication rates associated with surgical PDA ligation, transcatheter appears to be a safer and cost-equivalent alternative for this extremely vulnerable population.

Disclosures: H. Agrawal *Nothing to disclose.*

O-2 | Percutaneous Axillary Artery Access Facilitates Complex Cardiac Procedures in Children

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Background: Children with complex congenital heart disease/other lesions often require alternative arterial access. Axillary artery access may facilitate these complex procedures. We aimed to assess the efficacy and safety of the use of percutaneous axillary artery access in children undergoing cardiac catheterization procedures.

Methods: Medical records of children in whom percutaneous axillary artery access was attempted between 12/2014-12/2019 at Texas Children's Hospital were reviewed. Percutaneous axillary artery access was performed with the use of ultrasound and fluoroscopy, to avoid arterial compromise/damage to the brachial plexus.

Results: respectively. Procedures performed included ductus arteriosus interventions (n=15), coarctation of aorta interventions (n=2), left pulmonary artery recanalization through modified Blalock Taussig (mBT) shunt (n=2), occluded mBT shunt recanalization (n=1), aortopulmonary collateral embolization (n=1), ventricular septal defect creation and stenting (n=1), Impella device placement (Abiomed, Danvers, MA) (n=1), renal artery stent placement (n=1), superior mesenteric artery and celiac artery angiography (n=1), and coronary angiography (n=1). No acute complications were encountered. Follow up ultrasound was obtained after 14/26 procedures. Axillary access related complications occurred in 5/26 (19%) procedures. These

included axillary artery thrombosis (n=3) that were all treated medically with full resolution and pseudoaneurysm formation (n=2, one requiring ultrasound injection of thrombin and the other spontaneously resolved). At a median follow up of 23.3 (0.25-57) months, there was no clinical documentation of arterial compromise or nerve injury.

Conclusions: Percutaneous axillary artery access facilitates complex interventions in children. Operators should be aware of the relevant anatomy, and potential complications (in addition to their management) of this procedure, particularly thrombosis and pseudoaneurysm formation.

Disclosures: B. Mohammad Nijres *Nothing to disclose.*

O-3 | Advanced CT Imaging Aids Neonatal PDA Stenting for Ductal-Dependent Pulmonary Blood Flow With Reduction in Overall Procedural Morbidity

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Background: Patent ductus arteriosus (PDA) stenting allows neonates with critical congenital heart disease to maintain a stable post-natal circulation. Advanced CT imaging can aid in pre-procedural planning. We aim to review outcome variables between patients who did and did not undergo advanced CT imaging prior to PDA stenting.

Methods: Retrospective chart review of PDA stenting outcomes at our institution from 2014 to 2019. We specifically compared the

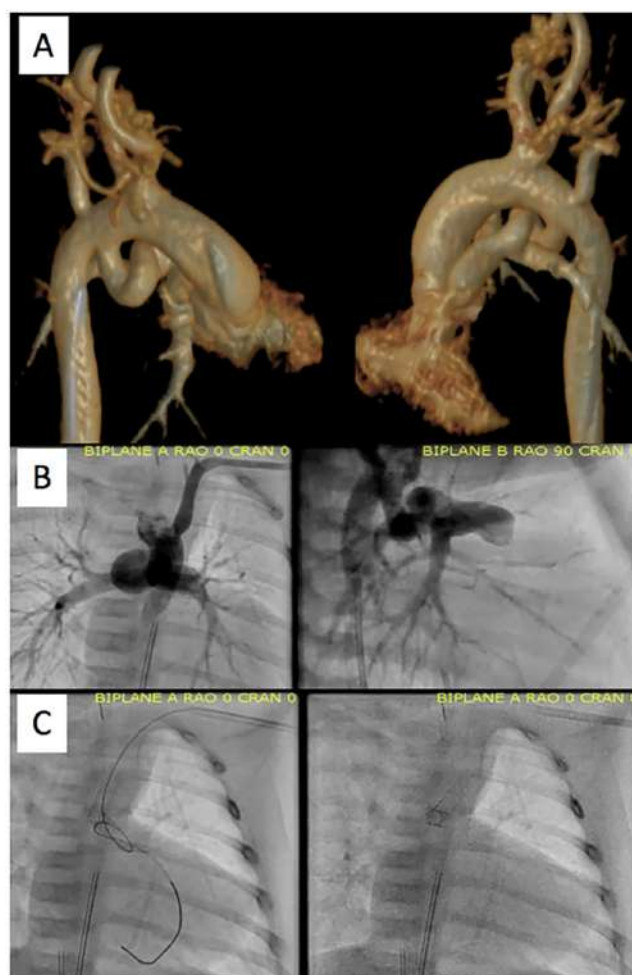


Figure 1: Neonatal PDA Stenting Approach and Procedure: 1 day old patient with TOF/severe PV stenosis. **A)** Pre-Procedural CT Heart reconstruction showing a "Corkscrew" PDA. **B)** Patient was approached via left axillary artery. **C)** Successful delivery of a 3.5mm x 23mm Vision Multilink stent.

Neonatal PDA Stenting (2014-2019)				
n = 74 (n = 3 not amenable (4%))				
Procedural Complications	n = 5 (7%)			
Procedural Mortality	n = 0			
Long Term Mortality	n = 14 (19.4%)			

	Overall, n = 71	No CT, n = 43 (61%)	CT, n = 28 (39%)	
Age at Cath (days)	19.86	24.57	13.5	p = 0.08
Weight at Cath (kg)	3.28	3.36	3.16	p = 0.19

	Overall (avg.)	No CT patients (avg.)	CT patients (avg.)	
CT Radiation (mGy.cm)	-	-	20.46	-
Fluoro Radiation (mGy.m2)	295.89	255.15	205.05	p = 0.28

	Overall (avg.)	No CT patients (avg.)	CT patients (avg.)	
Number of Access Sites	1.46	1.6	1.3	p = 0.04
Sheath Time (min)	115.99	125.07	100.08	p = 0.06
Fluoro Time (min)	32.73	37.53	25.35	p = 0.1
Contrast (ml/kg)	7.15	7.85	6.08	p = 0.03

Table 1: Demographic and procedural data comparing the two groups of PDA stented patients with and without pre-procedural cardiac CT imaging.

number of access sites, procedural time, fluoroscopy time, and contrast needed between the cohorts.

Results: A total of 71 patients underwent successful PDA stenting with 28 (39%) obtaining pre-procedural advanced CT imaging. A comparison of the two groups is outlined in **Table 1**. A case example of the process is summarized in **Figure 1**.

Conclusions: Pre-procedural advanced CT imaging aids interventional planning for neonatal PDA stenting which results in a statistically significant reduction in number of access sites and contrast exposure. A trend toward reduction in procedural and fluoroscopic time is noted.

Disclosures: V. V. Dimas: *Abbott (St. Jude): Consulting; Medtronic: Consulting;* A. W. Nugent: *PECA Inc: Consulting;* S. Reddy: *B Braun Interventional: Consulting;* Y. Arar *Nothing to disclose.* E. V. Mittelstaedt *Nothing to disclose.* T. M. Zellers *Nothing to disclose.* C. E. Herbert *Nothing to disclose.*

O-4 | Effect of Intravenous Calcium Administration During Transcatheter PDA Closure in ELBW Infants

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Background: Surgical ligation of the patent ductus arteriosus (PDA) in extremely low birth weight (ELBW) infants has been replaced by transcatheter PDA closure (TCPC) at our institution. Observational studies have shown a decrease in the rate of post-ligation syndrome (PLS) from 40% to less than 4% with TCPC. However, a transient decrease in left ventricular ejection fraction (EF) immediately following TCPC has been observed. In this study, we describe the change in EF immediately following TCPC, its clinical significance, and estimate whether procedural intravenous administration of Calcium Chloride (CaCl) can prevent this decrease in EF following TCPC.

Methods: Since 2019, our institution has administered a bolus of intravenous CaCl (10 mg/kg) at the end of each TCPC procedure for all ELBW infants. A retrospective review of ELBW infants that underwent TCPC between Jan 2019-Dec 2019 was performed and compared to ELBW infants who underwent TCPC prior to this period (Jan 2015-Dec 2018). All patients had a transthoracic echocardiogram (TTE) during TCPC and 4-6 hours post-TCPC. Those who had >20% reduction in EF had a repeat TTE at 24-hours post-TCPC.

Results: A total of 111 ELBW infants underwent TCPC between Jan 2015-Dec 2019 at our institution, with 40 patients having received

CaCl. Recent patients underwent TCPC at an earlier age (21 ± 9.1 vs. 29 ± 11.7 days; $P=0.025$). The procedure success rate was higher and adverse event rate lower in 2019 compared to before. The % decrease in EF before 2019 compared to procedures performed in 2019 was 8.2 ± 7.7 % vs. 4.9 ± 8.5 % ($P=0.087$) respectively, which did not reach statistical significance. However, significantly more patients had a > 20% decrease in EF (9.8% vs. 5%; $P=0.011$) and PLS (5.6% vs. 2.5%; $P<0.01$) when CaCl was not administered.

Conclusions: TCPC in ELBW is feasible (98% success rate) with low incidence of serious adverse events (3.6%). The incidence of PLS is low (4.5%) and can be further lowered by administering CaCl. Though decreased EF cannot be totally prevented by CaCl, the incidence of significantly decreased EF can be prevented by its use. Therefore, the use of CaCl during TCPC in ELBW infants may have a role in improving acute outcomes following the procedure.

Disclosures: B. R. Waller III: *Abbott (St. Jude): Principal Investigator for a Research Study;* W.L. Gore and Associates, Inc.: *Principal Investigator for a Research Study;* S. K. Sathanandam: *Abbott (St. Jude): Advisory Board/Board Member, Consulting, Principal Investigator for a Research Study and Speaker Bureau;* N. C. Taylor *Nothing to disclose.* R. Philip *Nothing to disclose.* E. Harvey *Nothing to disclose.* G. Dupuis *Nothing to disclose.* N. Stecchi *Nothing to disclose.*

O-5 | Utility of Post-Procedural Carotid Ultrasound Surveillance in Infants Undergoing Patent Ductus Arteriosus Stenting via Carotid Artery Access

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Background: Common carotid artery (CCA) access has been used as a more direct route to the patent ductus arteriosus (PDA) for stenting procedures. Traditionally, surgical carotid artery cutdown (CAC) has been utilized. Recent literature suggests that percutaneous carotid access (PCA) may be a safe and effective alternative. However, access complications can be life threatening if not detected early. The aim of this study is to evaluate the utility of post-procedural carotid ultrasound (US) surveillance in patients (pts) undergoing PDA stenting.

Methods: A retrospective chart review of all infants undergoing PDA stenting via CCA access from September 2013 through December 2019 at our center was performed.

Results: 33 pts underwent PDA stenting via CCA. PCA was utilized in 22 pts (66.6%). Median age was 7 days (range: 1 - 105 days) with median weight of 3 kg (range: 2 - 5.2 kg). Carotid US was performed

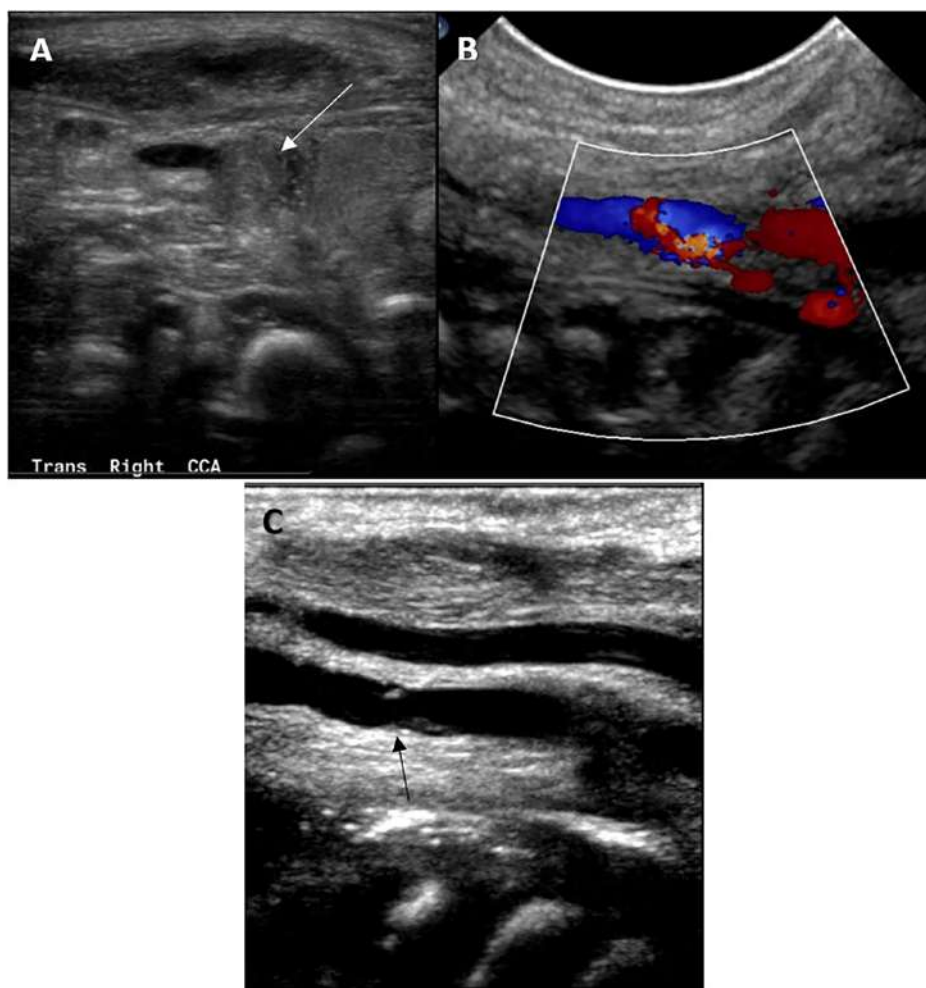


Figure 1: Examples of abnormalities on post-procedural carotid ultrasound images. **A)** Right common carotid artery occlusive thrombus. **B)** Focal area of common carotid artery stenosis. **C)** Subtle intimal injury.

post procedure in 21/22 PCA pts and 6/11 pts with CAC. 25/27 were performed within 24 hours.

Prior to implementing routine US, one PCA pt was readmitted with a large pseudoaneurysm requiring urgent surgical repair. 17/21 pts with PCA had a normal US. One asymptomatic pt had an occlusive thrombus on US that was managed with heparin infusion and aspirin. Follow up US 6 months later showed non-occlusive thrombus. Other US abnormalities included subtle evidence of intimal injury (n=1) and focal stenosis (n=1) which were monitored (Figure 1).

5 pts (83%) with CAC had a normal US. One pt with CAC had a focal area of CCA stenosis which was monitored.

Conclusions: PCA is a safe alternative to CAC. Post-procedural carotid US surveillance aids in early identification of access complications.

Disclosures: S. Reddy: *B Braun Interventional: Consulting*; V. V. Dimas: *Abbott (St. Jude): Consulting*; *Medtronic: Consulting*; E. V. Mittelstaedt: *Nothing to disclose*. Y. Arar: *Nothing to disclose*. C. E. Herbert: *Nothing to disclose*. T. M. Zellers: *Nothing to disclose*.

O-6 | Fate of the Left Pulmonary Artery and Thoracic Aorta After Transcatheter Patent Ductus Arteriosus Closure in Extremely Low Birthweight Infants

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Background: Transcatheter patent ductus arteriosus closure (TCPC) is an emerging treatment for extremely low birthweight (ELBW) infants. Left pulmonary artery (LPA) and descending aorta (DAO) obstruction are described device-related complications, however data on long term outcomes is lacking.

Methods: A retrospective analysis of ELBW infants who underwent successful TCPC from 05/2013-12/2018 was performed. 2-D echocardiography and Doppler imaging was obtained before, during, 24 hrs post-procedure, and in long-term follow-up with a focus on LPA and DAO stenosis.

Results: A total of 45 ELBW neonates underwent successful TCPC at a median procedural weight of 1150 g (755 - 2510 g). Thirty two infants (71%) underwent TCPC with an AVPII and 12 (27%) with the Piccolo device. One patient, who had a pre-procedural diagnosis of coarctation of the aorta, required aortic stent placement 3 days after TCPC. One patient, who had a concerning LPA flow pattern immediately after device implant, developed early progressive LPA stenosis requiring stent placement 3 months post-procedure. Both had Doppler velocities > 2.5 m/sec on post-procedure echocardiogram, the highest recorded values for LPA and DAO in our cohort. In the remaining infants, including 6 (13%) who had increased post-procedure Doppler velocities (ranging 2.0 - 2.4 m/sec), none developed LPA or DAO obstruction, and all had progressive improvement and normalization of flow velocities over time (median last follow-up 26.1 mo (0.5 - 75 mo).

Conclusions: TCPC can be performed safely in ELBW infants with a low incidence of LPA and DAO obstruction. Patients who develop significant LPA or DAO obstruction present early and may be successfully treated with stent therapy. In the absence of significant progressive vascular obstruction in the early post-procedure period, mild increases in LPA and DAO flow velocities < 2.5 m/sec improve spontaneously and normalize in long-term follow-up.

Disclosures: R. Garg: *Abbott (St. Jude): Consulting and Principal Investigator for a Research Study*; E. M. Zahn: *Abbott (St. Jude): Consulting and Principal Investigator for a Research Study*; D. Markush *Nothing to disclose*. S. Gupta *Nothing to disclose*. J. C. Tsing *Nothing to disclose*. N. C. Berndsen *Nothing to disclose*. G. Radville *Nothing to disclose*. M. Almeida-Jones *Nothing to disclose*.

O-7 | Transcatheter PDA Occlusion in VLBW Infants: Development of an Intra-Procedural and Transportation Safety Protocol For Homeostasis

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Background: PDA occlusion in the VLBW infants is safe & effective but requires meticulous care to maintain homeostasis during transportation between the NICU and the cath lab for successful outcomes.

Methods: A prospective QI project monitored PDA occlusions in VLBW infants (5/2018-12/2019). A multi-disciplinary team (interventionist, neonatologist, anesthesiologist, cath lab staff & bedside nurse) was formed for pre- & post-procedure discussions. A transportation & intraprocedural protocol and checklist were developed to optimize

Adverse events	N	New preventive measure	Comments
Hypothermia (35°C)	5	- Minimize transport time - Plug in transport isolette during cath (maintain battery power) - Increase ambient temperature in cath lab - IV fluid warmers - Fluid warmers - Plastic wraps to retain body heat and insensible fluid loss - Add heat lamp - Use only pediatric size forced air warmer - Add backup chemical warmer - Remove ultrasound gel after echo imaging - Use esophageal temp probes	No additional hypothermic events observed in the last 11 pts
Hyperglycemia Hypoglycemia	4 1	- Close monitoring of glucose infusion rate and blood glucose levels during procedure - Use only NS flush and bolus glucose if needed - Detailed history of glucose levels and responses to treatment - Continue TPN (if used in NICU)	No glucose disturbances in last 20 pts
Atelectasis	2	- Include bedside nurse during pre procedure discussion to obtain history of suctioning requirements and optimal infant position - Early fluoroscopic evaluation of ETTW - Additional use of transcutaneous CO2 monitor - Use of cerebral and renal NIRS monitors	Having NICU staff present in cath lab for very small or fragile patients and those on an oscillator
Wire perforation of liver capsule	1	Fluoroscopy guided advancement of wire in IVC	No additional perforation or bleeding events in last 19 pts.

temperature, glucose and ventilation homeostasis. Further refinements for the checklist & incremental process improvements were made after each case. Patient profile, cath lab data & early outcomes were analyzed.

Results: 30 VLBW infants (median BW: 714.5 gm; range:460-1120) underwent PDA occlusion. Median age & weight at time of procedure was 26.5 days (14-49) and 1080 gm (625-2000) respectively. Successful occlusion was achieved in 29 (96.7%). In 1 pt, the device embolized into the LPA and was retrieved without incident. Preventable adverse events (13) and a checklist of preventive measures are listed in table 1. Twelve preventable adverse events (AEs) occurred among the first 19 pts, resulting in process improvements for subsequent cases. For the latter 11 cases, only 1 AEs occurred (RUL atelectasis).

Conclusions: Transcatheter PDA occlusion in VLBW infants can be performed successfully. While maintenance of homeostasis in this high-risk group is challenging, a vigilant multidisciplinary approach utilizing a standard protocol and checklist can mitigate AEs. Further studies to confirm efficacy and safety are warranted.

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PEDIATRIC

I-1 | Angiographic Anatomy of Major Aortopulmonary Collaterals and Association With Surgical Outcomes

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	Total MAPCAs (n=1063)	MAPCA Type			
		Single supply (n=566, 53%)	Isolated supply to central NPA (n=81, 8%)	Dual supply to central NPA (n=385, 36%)	Mixed Supply (n=31, 3%)
Descending Thoracic Aorta	863 (81%)	488 (86%)	70 (86%)	277 (72%)	28 (90%)
Right Subclavian	74 (7%)	31 (6%)	3 (4%)	40 (10%)	0 (0%)
Left Subclavian	71 (7%)	35 (6%)	2 (3%)	31 (8%)	3 (10%)
Coronary Artery	15 (1%)	0 (0%)	6 (7%)	9 (2%)	0 (0%)
Transverse Arch	16 (2%)	11 (2%)	0 (0%)	5 (1%)	0 (0%)
Abdominal Aorta	24 (2%)	1 (<1%)	0 (0%)	23 (6%)	0 (0%)
Lung Segments Supplied	7 (3, 15.5)	3 (1, 5)	8 (7, 11)	18 (14, 18)	15 (14, 17)

	Total Patients (n=276)	Patient Group			
		Absent central NPA (n=45)	Incompletely arborizing NPA (n=147)	Normally arborizing NPA (n=48)	Unilateral PDA or "hemi- truncus", (n=36)
Female sex	141 (51%)	20 (44%)	74 (50%)	27 (35%)	20 (56%)
Age (years)	0.33 ± 0.27	0.39 ± 0.25	0.36 ± 0.25	0.24 ± 0.34	0.29 ± 0.24
Weight (kg)	5.3 ± 1.8	5.6 ± 1.8	5.3 ± 1.8	4.9 ± 2.1	4.9 ± 1.8
22q11 deletion	107/228 (47%)	25/40 (63%)	58/122 (48%)	16/36 (44%)	8/30 (27%)
Alagille syndrome	7 (23%)	1 (2%)	5 (3%)	1 (2%)	0 (0%)
Intrapericardial NPAs present	217 (79%)	0 (0%)	147 (100%)	48 (100%)	22 (61%)
Right aortic arch	129 (47%)	21 (47%)	69 (47%)	26 (54%)	13 (36%)
Pulmonary stenosis	33 (12%)	0 (0%)	5 (3%)	23 (48%)	5 (14%)
Qp:Qs	1.8 ± 1.1	2.0 ± 1.3	1.7 ± 1.1	1.5 ± 0.9	2.2 ± 1.3
Number of MAPCAs	3.9 ± 1.4	3.7 ± 0.9	4.0 ± 1.2	4.4 ± 2.0	2.6 ± 1.2
Any Subclavian MAPCAs	105 (38%)	10 (22%)	57 (39%)	28 (58%)	10 (28%)
Any Abdominal MAPCAs	20 (7%)	0 (0%)	2 (14%)	15 (31%)	3 (8%)
Any Coronary MAPCAs	15 (5%)	0 (0%)	5 (3%)	4 (8%)	6 (17%)
Any Transverse Arch MAPCAs	15 (5%)	3 (7%)	9 (6%)	2 (4%)	1 (3%)
Nakata Index (mm ² /m ²)	52 (13, 94)	0 (0, 0)	52 (22, 93)	62 (39, 86)	121 (76, 161)
MAPCA Index (mm ² /m ²)	73 (30, 129)	154 (119, 217)	50 (83, 126)	0 (0, 28)	35 (20, 63)
TNPAI (mm ² /m ²)	142 (94, 192)	154 (119, 217)	156 (106, 198)	74 (45, 113)	171 (119, 226)
First Surgery					
Complete Repair	182 (65.9%)	34 (75.6%)	106 (72.1%)	20 (41.7%)	22 (61.1%)
Aortopulmonary Window	36 (13.0%)	0 (0%)	11 (7.5%)	25 (52.1%)	0 (0%)
Unifocalization to shunt	40 (14.5%)	9 (20%)	26 (17.7%)	3 (6.3%)	2 (6.5%)
Unilateral palliation	18 (6.5%)	2 (4.4%)	4 (2.7%)	0 (0%)	12 (33.3%)
Current status					
Single stage complete repair	182 (65.9%)	34 (75.6%)	106 (72.1%)	20 (41.7%)	22 (61.1%)
Multi-stage complete repair	70 (25.4%)	8 (17.8%)	25 (17.0%)	26 (54.2%)	12 (33.3%)
Unrepaired or lost to followup	23 (8.3%)	3 (6.7%)	15 (10.2%)	2 (4.2%)	2 (5.6%)
RV:Ao at complete repair	0.34 ± 0.09	0.33 ± 0.11	0.35 ± 0.10	0.34 ± 0.09	0.34 ± 0.08

Data presented as number (%), mean ± standard deviation, and median (quartile 1, quartile 3). MAPCA=major aortopulmonary collateral artery. NPA=native pulmonary artery. PDA=patent ductus arteriosus. Qp:Qs=ratio of pulmonary to systemic blood flow. TNPAI=total neopulmonary artery index (sum of the cross sectional area of NPAs and MAPCAs). RV=Right ventricular pressure. Ao=Aortic pressure.

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Background: Due to the practical challenges of defining the variability of the pulmonary circulation in patients with pulmonary atresia and major aortopulmonary collaterals (MAPCAs), the surgical literature on this condition has focused on relatively basic anatomic characteristics. It is difficult to study these patients without taking into account the variation in sources and anatomic aspects of pulmonary blood flow. In this study we detailed the native pulmonary artery (NPA) and MAPCA anatomy in a large group of infants and assessed relationships between these variables and surgical outcomes.

Methods: All infants with a complete preoperative anatomic catheterization at our institution from 2001 to 2019 were included. We reviewed angiograms for anatomic characteristics of all MAPCAs and NPAs, including supply to each bronchopulmonary segment, size and course of MAPCAs, and the location of MAPCA to NPA connections. Patients were classified into different groups based either on MAPCA or NPA anatomy and associations with surgical outcomes were studied.

Results: We described the anatomy of 1,063 MAPCAs in 276 infants (Table). We found no association between the number, origin, course, stenosis pattern, or segmental supply of MAPCAs and early surgical outcomes. There were no NPA arborization patterns clearly associated with worse outcomes. Lower combined cross-sectional area of MAPCAs and NPAs was associated with unsuitability for complete repair in infancy.

Conclusions: We detail the highly variable anatomy of 276 MAPCA patients, and confirmed our empirical impression that good surgical outcomes can be achieved for essentially any anatomic variation.

Disclosures: D. B. McElhinney: *Medtronic: Consulting and Proctor*; G. T. Adamson *Nothing to disclose*. J. A. Feinstein *Nothing to disclose*. L. F.

Peng *Nothing to disclose*. F. L. Hanley *Nothing to disclose*. S. B. Perry *Nothing to disclose*.

I-2 | Angioplasty of resistant lesions using the Conquest 40 balloon

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Background: Stent angioplasty in pediatric patients with congenital heart disease (CHD) has traditionally been limited by maximal expansion characteristics of implanted stents. Transcatheter longitudinal intentional stent fracture (ISF) using ultra high pressure (UHP) balloons is a safe and effective approach to treat iatrogenic vascular stenosis. Recent advances in stent technology, paired with ISF has renewed interest in addressing small vessel stenosis by stent placement. However, lesions with older stents may be resistant to ISF with conventional UHP balloons, limiting further percutaneous therapies. The Conquest 40 PTA dilation catheter has the highest available rated burst pressure (up to 40 atm) at diameters 4-12 mm and may allow fracturing of resistant stents.

Methods: Retrospective single-center case series of experience using the Conquest 40 PTA dilatation catheter (Bard) in children <18 years old with CHD between 2018 - 2019.

Results: Three patients (5 lesions) underwent stent dilation with Conquest 40 balloons (Table 1). Lesions included 2 coronary stents (1 napkin-ring), 2 Palmaz Blue stents and 1 Formula 418 stent. All patients had previously undergone failed UHP angioplasty with standard Conquest balloons. ISF was successful in all coronary and Palmaz Blue stents. Complications included 1 intimal dissection and 1 contained aneurysm both treated with covered CP stents (CCPS).

Patient	Age (yrs)	Wt (Kg)	Anatomy	Vessel	Initial stent	Lesion	Conquest 40 size	Angioplasty pressure (atm)	ISF attempted/successful	Subsequent interventions
1	9	23	Pulmonary atresia/VSD S/p unifocalization, residual VSD	dRPA	Liberte 4.5 x 12 mm	Napkin-ring deformity	9 x 20 mm	36	Y / Y	-
				pRPA	Palmaz Blue 5 x 18 mm (x2)	Neo-intimal and iatrogenic stenosis	10 x 20 mm 12 x 20 mm	36 34	Y / Y	Immediate CCPS for intimal dissection
				pLPA	Palmaz Blue 7 x 15 mm	Neo-intimal and iatrogenic stenosis	10 x 20 mm 12 x 20 mm	36 36	Y / Y	Immediate CCPS for small aneurysm
2	9	30	Pulmonary atresia/VSD s/p unifocalization	RLL PA	Multi-link Vision 4 x 8 mm	Iatrogenic stenosis	8 x 20 mm 9 x 20 mm	34 40	Y / Y	-
3	3.5	16	DILV, pulmonary atresia, hypoplastic LV s/p right Glenn, central shunt to LPA	RSVC	Formula 418 7 x 20 mm	Neo-intimal stenosis	7 x 20 mm	30	N / N	-

Conclusions: To our knowledge, this is the first description of ISF of a napkin-ring deformed coronary stent or Palmaz Blue stent using the Conquest 40 balloon. The Conquest 40 may be the transcatheter solution for ISF in historically 'unbreakable' stents.

Disclosures: N. Arora *Nothing to disclose.*

I-3 | Transcatheter Recanalization of Atretic Pulmonary Veins in Children

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Background: Pulmonary vein stenosis (PVS) is a progressive disease associated with a high rate of mortality in children. When PVS develops into atresia (PVA) the risk of mortality increases. We report on a successful method for recanalization (ReCAN) of atretic pulmonary veins (PV) in children with PVS.

Methods: We reviewed all catheters performed in children with PVS at our institution from 2008-2019. PVS was classified angiographically from Grade 0 (no PVS) to Grade 3 (PVA). All patients undergoing attempted ReCAN of PVA were reviewed and procedural success rate and patency rate were noted. ReCAN success was defined as patency of affected vein without surgical intervention. Failure was defined as need for surgical repair or re-development of atresia post ReCAN.

Results: Among 112 patients with PVS, 37 patients had 58 veins with PVA during the study period. Median time of PVS diagnosis to PVA was 0.89 months (IQR 0-14.6). Of the 58 atretic veins, 30 PVA underwent attempted ReCAN, and in 27/30 (90%) the procedure was successful. At time of ReCAN, 4/27 (15%) PVs had an existing stent in place and underwent angioplasty, while in 16/27 (59%) a drug-eluting stent was placed, and 7/27 (26%) underwent angioplasty without stent placement. Of 27 acutely-successful ReCAN PVs, 22 (81.5%) had late success with a median of 3 transcatheter reinterventions (range 0 to 8). Recurrence of PVS $\geq$ Grade 2 occurred in 12 patients at a median of 200 days (IQR 103-494). In 3 veins, PVA recurred in a PV that had acute ReCAN success. Among these, 2/3 had successful second ReCAN. Among the 37 patients with PVA, 4 patients died, with 3 of those

deaths directly related to PVS. Six patients have had resolution of PVS, 1 patient was lost to follow-up, and 26 patients receive ongoing surveillance.

Conclusions: Transcatheter ReCAN of PVA can result in successful re-establishment of flow to affected PVs in the majority of cases. Although recurrence of PVS is common, patency can be maintained via re-intervention. Even in cases where PVA recurs after acute ReCAN success, second ReCAN may be possible. Long-term studies are needed to determine if ReCAN of PVA significantly alters the mortality associated with PVA.

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I-4 | Outcomes following balloon pulmonary valvuloplasty in symptomatic neonates with tetralogy of Fallot - Results from the Congenital Catheterization Research Collaborative

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Table 1. Patient characteristics and outcomes

Variable	Total N=47 ^a	CR>30 days w/o RI N=27	CR <30 days and/or RI N=20	P-value
Male, n (%)	27 (57)	13 (48)	14 (70)	0.134
Weight at initial intervention, kg	2.9 (2.4, 3.4)	3.1 (2.6, 3.5)	2.7 (2.3, 3.2)	0.088
Age at initial interventions, days	7.0 (4.0, 14.0)	7.0 (4.0, 16.0)	6.0 (3.5, 10.0)	0.316
PV annulus diameter, mm (n=45)	4.5 (4.0, 5.1)	4.75 (4.0, 5.3)	4.3 (3.5, 4.9)	0.087
PV annulus size, mm (n=44)*	4.8 (4.0, 5.5)	5.0 (4.6, 5.5)	4.3 (3.5, 5.2)	0.045
Minimum MPA diameter, mm (n=36)	3.9 (3.2, 4.8)	3.8 (3.2, 4.8)	4.4 (3.5, 5.0)	0.493
Minimum infundibular diameter, mm (n=36)	3.7 (2.4, 4.4)	3.7 (3.0, 5.2)	2.4 (3.0, 4.0)	0.027
Length of infundibulum, mm (n=36)	8.0 (7.05, 8.9)	7.9 (6.0, 9.7)	8.0 (7.3, 8.5)	0.731
Balloon-Annulus ratio (n = 41)	1.28 (1.16, 1.36)	1.28 (1.13, 1.35)	1.30 (1.17, 1.62)	0.328
Survival to CR, n (%)	44 (94)	27 (100)	17 (85)	
Death before CR, n (%)	2 (4)			
Alive w/o CR, n (%)	1 (2)			
RI, n (%)	17 (36)			
Time to CR (days)	151 (106, 210)			

All measurements by angiography unless otherwise noted

*Measurements at time of initial echocardiogram

^aTotal number 47 unless otherwise noted

Data presented as median (interquartile range)

CR=complete repair, RI=reintervention before CR, PV=pulmonary valve, MPA=main pulmonary artery, w/o=without

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Background: Symptomatic neonates with tetralogy of Fallot (sTOF) can undergo surgical or transcatheter palliation to relieve cyanosis and delay the need for complete repair. Balloon pulmonary valvuloplasty (BPV) is an established treatment for pulmonary valve stenosis; however, its effectiveness in palliating sTOF has not been well investigated.

Methods: Neonates with sTOF undergoing BPV between 2005-2017 were reviewed within the 9 center Congenital Catheterization Research Collaborative. Primary outcome was complete repair (CR) >30 days after BPV without interval reintervention (RI).

Results: During the study period, 327 neonates with sTOF underwent palliation, of whom 47 underwent BPV. Demographics are shown in Table 1. Oxygen saturations improved from 85% to 92% ($p < 0.001$). There was one episode of cardiac tamponade secondary to cardiac perforation without any procedural mortality. 62% of patients underwent CR >30 days post BPV without RI. Median time to CR was 151 days (106, 210). A valve sparing repair was performed in 14% of the patients. RI prior to CR occurred in 17 pts (36%) and included surgical shunt (n=7), outflow tract stenting (n=6), ductal stenting (n=2), and surgical outflow patch (n=2). RI or CR < 30 days from BPV was more likely with smaller infundibular diastolic diameter ($p = 0.027$). An infundibular diastolic diameter < 3.5 mm demonstrated 77% sensitivity and 60% specificity to detect early CR or RI.

Conclusions: BPV can be an effective palliative therapy in select neonates with sTOF to delay CR. Smaller diastolic infundibular diameter is a predictor of RI or early CR. Patient selection is key when considering BPV for initial palliation in sTOF.

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LLC: Principal Investigator for a Research Study; A. C. Glatz Nothing to disclose. J. D. Zampi Nothing to disclose. G. T. Nicholson Nothing to disclose. J. Meadows Nothing to disclose. B. H. Goldstein Nothing to disclose. C. J. Petit Nothing to disclose. H. Bauser-Heaton Nothing to disclose. M. Kelleman Nothing to disclose. C. McCracken Nothing to disclose. P. J. Chai Nothing to disclose. J. C. Romano Nothing to disclose. S. Maskatia Nothing to disclose. L. Eilers Nothing to disclose. K. M. Hock Nothing to disclose. S. J. Healan Nothing to disclose. J. Smith Nothing to disclose. I. B. Asztalos Nothing to disclose. A. A. Kamsheh Nothing to disclose. R. A. Ligon Jr. Nothing to disclose. S. Juma Nothing to disclose. J. E. Raulston Nothing to disclose. H. Q. Khan Nothing to disclose. J. Pettus Nothing to disclose. A. L. Pajk Nothing to disclose.

I-5 | Hemodynamic Findings Associated with Composite Failure After Bidirectional Cavopulmonary Anastomosis

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Background: Successful bidirectional superior cavopulmonary anastomosis (SCPA) depends on favorable preoperative hemodynamics.

Methods: We retrospectively reviewed all patients who underwent SCPA at Nicklaus Children's Hospital from January 2006 to December 2019. Pre-operative data and post-operative course were reviewed.

Composite failure was defined as operative death, transplant, anastomosis takedown and/or addition of aortopulmonary shunt.

Results: 203 patients were identified. We excluded 8 patients without pre-operative data. 120/195 (62%) were males. Median age was 166 days with median weight of 6.2 Kg. 19 (9.7%) patients underwent PA banding as part of their initial palliation. Fourteen (7.1%) patients had bilateral SCPA and 7 (3.6%) patients had Kawashima type SCPA. 112 (57.4%) patients had single right ventricle, 57 (29.2%) patients had single left ventricle and 26 (13.3%) patients had biventricular morphology that could not be divided. During inter-stage period, 51 patients (26.2%) had at least one additional cardiac catheterization, 62.7% required percutaneous interventions. Median mean pulmonary artery pressure (mPAP) was 14 mmHg with median transpulmonary gradient (TPG) of 7 mmHg. Median single ventricle end-diastolic pressure (SVEDp) was 9 mmHg. Median SVC saturation was 51% with median systemic saturation of 78%. 28 (14.3%) patients underwent an intervention during pre-SCPA catheterization; the most common intervention was aortic arch angioplasty in 20 patients, followed by PA balloon and/or stent angioplasty in 13 patients. Eight (4.1%) patients meet criteria for composite failure. In univariate analysis; only SVEDp (OR 1.28, $p = 0.05$) and SVC saturation (OR 0.87, $p = 0.01$) were associated with composite failure. In addition, higher weight (OR 0.48, $p < 0.01$) and higher weight for age Z-score (OR:0.5, $p = 0.02$) at time of SCPA and history of PA banding (OR 6.42, $p = 0.02$) were also correlated with composite failure.

Conclusions: High SVEDp, low SVC saturations and history of PA banding were associated with poor outcomes after SCPA. However, mPAP, TPG and systemic saturation were not. Higher weight at time SCPA was associated with favorable outcome.

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I-6 | Diagnostic Utility of Intravascular Ultrasound in Elucidating the Mechanism of Obstruction in Pediatric Pulmonary Vein Stenosis

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Background: Intravascular ultrasound (IVUS) has been shown to adequately visualize the wall of adult pulmonary veins, delineate the mechanism of obstruction in systemic veins and is considered superior to venography in adult peripheral venous pathology. The use of IVUS in pediatric patients with known or suspected intraluminal pulmonary vein stenosis (PVS) has not been reported.

Methods: Retrospective, single center, cohort analysis of all patients who underwent IVUS of pulmonary veins from August 2016 to

October 2019. Adequate visualization was defined as ability to see entire vein lumen and wall architecture well enough to make measurements.

Results: IVUS was performed on 54 pulmonary veins in 37 pediatric patients with known or suspected PVS (median age = 1.7 years [0.2 - 17.6], median wt. = 8.5 kg [2.9 - 43.2]). All veins accepted the IVUS catheter (0.014" [n = 13] or 0.018" [n = 41]), with adequate visualization in 85% (46/54) of imaged veins, and improvement in diagnostic imaging in the more recent era of the cohort (96%; 23/24). In 29 veins with angiographic PVS requiring transcatheter intervention (15 with biopsy proven intraluminal PVS), IVUS demonstrated concentric, homogeneous medial/intimal thickening in 27 (93%); two veins had ostial luminal narrowing without wall thickening. In veins with suspected PVS (n = 17), IVUS findings included ostial luminal narrowing without wall thickening at a previous surgical site [6], vein distortion/compression with non-circular lumen (6), unobstructed stent with (3) or without (1) growing distal vasculature and unobstructed (thin walled/circular lumen) vein with increased flow as documented by nuclear lung perfusion scan (1). There were no IVUS related adverse events.

Conclusions: IVUS can be used safely in pediatric patients with known or suspected PVS and can reliably demonstrate vein lumen and wall architecture. IVUS can help differentiate anatomical obstruction (distortion/compression) or surgical scar from intrinsic pulmonary vein disease. Although further study is necessary, this differentiation could have significant implications for management and prognosis in this patient population.

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I-7 | Success and Outcomes Following Transcatheter Recanalization in the Setting of Late Presentation in Isolated Pulmonary Artery of Ductal Origin

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Background: Isolated pulmonary artery of ductal origin (IPADO) is often diagnosed after complete closure of the arterial duct (PDA) as the presentation is occult. Treatment options for late IPADO are usually limited to surgical systemic-to-pulmonary arterial shunt (BTS) or surgical repair with pulmonary artery (PA) reimplantation (ReIMP). We describe a novel approach using chronic total occlusion (CTO) wires

to recanalize (ReCAN) the PDA in infants and children with late IPADO.

Methods: Patients with late IPADO who presented to our institution between 2012-19 were reviewed. Patients with PDA patency at time of intervention attempt were excluded. We reviewed all attempts at ReCAN, with a primary endpoint of successful PDA ReCAN.

Results: During the study period, 11 pts with late IPADO were identified at a median age 3 months (range 6 days to 7 years old). 4 pts were >12 months old at presentation. Percutaneous carotid access was used in 4 pts, and femoral access in 7 pts. ReCAN of the PDA using CTO wires, with PDA stenting, was successful in 10 (91%) pts. Procedural time was median 107min (range 47-360), and fluoro time was median 23min (range 6-294) for all attempted ReCAN cases. There were no procedural complications, although PDA dissection occurred in 3 pts – in all 3 cases PDA stenting effectively sealed the dissection flap. Four pts developed reperfusion injury within 6 hours of PDA stenting with one developing pulmonary hemorrhage. Contralateral pulmonary hypertension (PH) developed in 5 pts, requiring medical therapy in 4 and early ReIMP in 1. Among the 10 successful IPADO ReCAN pts, 2 underwent reintervention to re-stent (n = 1) or dilate (n = 1) the PDA. At last follow-up 8 have undergone ReIMP, with one pt awaiting surgery and one death following non-IPADO-related surgery. The interval between successful ReCAN and ReIMP ranged from 31 to 459 days, median 173. No pts are receiving medical PH therapy following ReIMP.

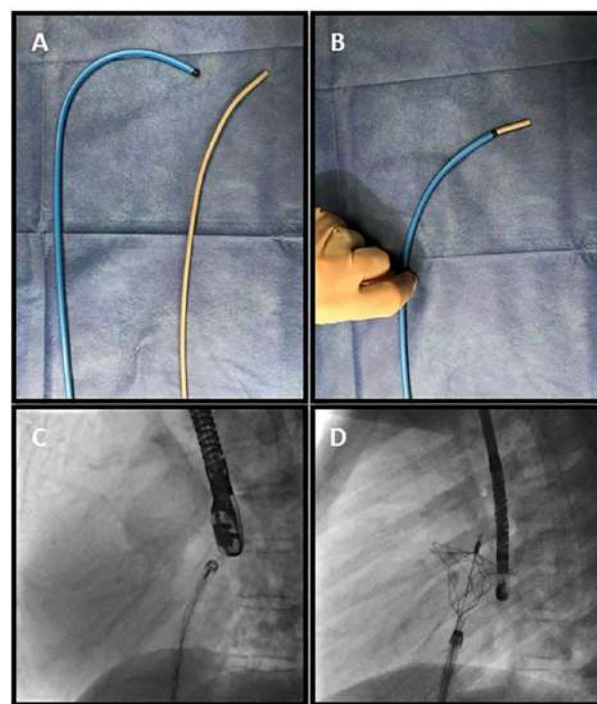
Conclusions: Catheter-based rescue of late IPADO is an effective method to re-establish perfusion in late IPADO. ReCAN carries risk of reperfusion injury to the isolated lung early post-ReCAN, and there is a high rate of contralateral PH.

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I-8 | Mullins™ Sheath Facilitated Delivery of Gore Cardioform ASD Occluder Devices for Closure of Large or Challenging Secundum Atrial Septal Defects

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Background: The Gore Cardioform ASD Occluder (W. L. Gore and Associates, Flagstaff, AZ) has recently been approved for closure of secundum ASDs, however it may be challenging to align the device



parallel to the atrial septum in large secundum ASDs and those with challenging anatomy.

Methods: A retrospective study was conducted to study the use of a Mullins™ sheath to facilitate Gore Cardioform ASD Occluder delivery for secundum ASD closure in the cardiac catheterization laboratory from 6/2017 - 12/2019 at Texas Children's Hospital/Baylor College of Medicine (Houston, TX). The distal curvature of the Mullins™ sheath was used to align the device parallel to the atrial septum during device deployment (Figure).

Results: Out of 98 patients who underwent an attempt at ASD closure using the Gore Cardioform ASD Occluder, a Mullins™ sheath was used in 52 patients, median age 8 (IQR 4,13.2) years and median weight 27.6 (IQR 18, 51.6) kg. The procedure was successful in 46/52 (88%) patients with median procedure and fluoroscopy times of 88 (IQR 68, 123) minutes and 18.1 (IQR 13.7, 33.3) minutes respectively. The Mullins™ sheath was primarily used to deliver large devices with 38/46 (83%) size 32 mm or greater. An attempt using more than one device occurred in 11 patients and there were 2 adverse events (atrial fibrillation requiring cardioversion). At a median follow up of 43 (IQR 1,374) days, no patient had more than a mild residual shunt.

Conclusions: The Mullins™ sheath facilitated delivery of the Gore Cardioform ASD Occluder device may be a useful technique for closure of large secundum ASDs or secundum ASDs with challenging anatomy.

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I-9 | Safety and Efficiency of Three Dimensional Rotational Angiography (3DRA) use in Single Ventricle Patients in the Interstage

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Background: Three-dimensional rotational angiography (3DRA) has been shown to add additional information in congenital heart disease catheterizations, compared to conventional angiography (CA) alone, but little is published about 3DRA use in the single ventricle interstage. In particular, the safety of 3DRA use in interstage patients who have undergone the Hybrid stage I palliation has not been evaluated.

Methods: Interstage patients who underwent catheterization between January 2010 and October 2018 were identified, and catheterizations utilizing 3DRA were matched by cardiac diagnosis 1:2 with those using CA alone. All 3DRA cases were included. Variables regarding safety (radiation and contrast exposure, and procedural complications), and efficiency (case and room time) were recorded.

Results: Twenty-nine cases utilized 3DRA were compared to 53 CA cases. Procedural variables were compared between both groups (Table 1). Though contrast volume was significantly higher in the 3DRA group, there was no difference in rates of AKI (6.7% 3DRA vs. 9.7% CA; $p = 0.99$, Fischer's exact test). There were no complications from 3DRA use, and no significant difference in procedural complication rates between groups (10.7% 3DRA vs. 26.9% CA; $p = 0.99$).

The majority of complications were arrhythmias limited to the catheterization, with two arrests (CA) and no deaths.

Conclusions: Use of 3DRA in interstage patients is safe with no significant increase in complication rates or radiation dose compared to CA procedures. Further study is needed to understand how to optimize this image modality for patient care.

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I-10 | Simultaneous Deployment of Landing Stents Over a Melody Valve

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Background: Melody valves implanted within another stent are much less likely to sustain a Melody stent fracture (MSF). Pre-stenting the right ventricular outflow tract (RVOT) followed by placement of the Melody valve within the same procedure is the current standard

Table 1. Comparison of Procedural Variables Between 3DRA and CA

Procedural Variable	ALL (N=82)	3D Only (N=29)	CA Only (N=53)	p-value
Fluoroscopy time (min)	36.5 (25, 63)	34 (27, 45)	38 (25, 65)	0.577
Fluoroscopy dose (mGy/kg)	31.5 (19.3, 59)	31.35 (21.3, 56.3)	31.5 (17.7, 61.8)	0.8116
Dose Area Product (DAP) (cGy/cm ²)	809 (473, 1628)	711 (542, 1305)	892 (407, 1911)	0.9081
Total contrast (ml)	21.25 (15, 34.5)	29 (20, 36)	19.5 (13, 27)	0.0029
Weight-adjusted contrast total (ml/kg)	4.39 (3.1, 6.25)	6.04 (4.4, 8.75)	3.75 (2.8, 5.01)	0.0006
Room time (min)	200 (173, 265)	198.5 (177, 240.5)	207 (171, 265)	0.8857
Catheterization case time (min)	125 (98, 177)	126 (107, 177)	119 (83, 177)	0.1443

Data is reported as median value (interquartile range), and p-values are calculated via Mann-Whitney U test.

Table 1. Comparison of Key Clinical Variables

	Simultaneous Stenting Group (n = 32)	Separate Stenting Group (n = 21)	p-value ($\alpha = 0.05$)
Patient Age (Mean, Years)	21.1	18.9	0.52
Patient Weight (Mean, kg)	56.3	56.5	0.99
Procedure Time: (Mean, min)	199	207	0.70
Fluoroscopy Time: (Mean, min)	36	42	0.49
Dose Area Product: (Mean, cGy*m2)	5383	13385	0.02
Complications (Number)	3	2	1.0

practice; however, separating these steps can lead to difficulties maintaining the position of the landing stent during subsequent Melody deployment, particularly in native RVOT. Furthermore, separating the steps might theoretically increase procedure time and radiation dose. We theorized that combining the deployment of the pre-stent (s) and the Melody valve into one step would reduce positioning complications, decrease procedure time, and reduce radiation exposure.

Methods: We performed simultaneous landing stent(s) and Melody valve deployment on a total of 32 patients at 3 tertiary institutions between 2018 and 2019. 21 patients who underwent Melody valve placement in the usual manner during a similar time frame served as a comparison group. We used the Student's T-test and Fisher's Exact Test to compare key clinical variables between the groups.

Results: There was no difference between the age, weight, total procedure time, fluoroscopy time, and complication rate between the two groups. There was a statistically significant decrease in the Dose Area Product (DAP) radiation for the simultaneous stenting group (Table 1).

Conclusions: In a small cohort, the simultaneous deployment of landing stent(s) with the Melody valve did not lead to an increased complication rate. Procedure and fluoroscopy times were similar, but DAP radiation was decreased in the simultaneous stenting group.

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I-11 | Balloon Atrial Septostomy May Unmask RV Dependent Coronary Circulation Patients with PA/IVS

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Background: The strongest predictors of mortality in PA/IVS are tricuspid annulus z-score <-2 and presence of RV dependent coronary circulation (coronary sinusoids associated with stenosis resulting in RV dependent myocardial perfusion). Many patients with PA/IVS require intervention in the newborn period. Here we report newborn interventions in patients with PA/IVS and their relationships to ultimate surgical anatomy and mortality.

Methods: Retrospective study, conducted at a pediatric cardiac center from 1988-2018 of patients with PA/IVS.

Results: Eighty-eight patients with PA/IVS were identified; median follow up was 8 years. The median gestational age was 39 weeks, 47% (n=42) had coronary sinusoids. Most managed surgically in the newborn period (73%), either BT or central shunt, ended up with single ventricle physiology (n=54/65). A quarter of the shunted group also had transcatheter interventions; 12 preceding BAS, 5 RF pulmonary valve perforation and valvuloplasty. Twenty-four patients had only transcatheter interventions, the most common was PDA stenting (n=17/24). A minority had isolated BAS (n=5/24) or BAS with PDA stenting (n=2/24). Of newborns managed exclusively with transcatheter interventions, 58% (n=14) had ultimate biventricular physiology.

Overall mortality was 10%, 8 of the 9 deaths occurred before 18 months. Of early deaths, 7 had BAS and 6/7 had sinusoids. Early mortality for patients who required BAS was 36% (7/19), compared to 1.4% (1/70) for infants who did not require a BAS (p=0.000). The presence of sinusoids was not an independent predictor of mortality (HR 0.89, p=0.87).

Conclusions: Infants with PA/IVS who required BAS in the newborn period had significantly higher mortality. The majority of deaths occurred in patients who required BAS and also had sinusoids. This suggests elevated mortality may be related to reduction in RV preload caused by BAS which unmasks RV dependent coronary circulation. For infants with PA/IVS and sinusoids, care should be taken to identify RV dependent coronary circulation prior to performing BAS.

Disclosures: J. W. Moore: Transmural Systems: Advisory Board/Board Member; N. L. Herrick Nothing to disclose. A. Courelli Nothing to disclose. N. Dreger Nothing to disclose. J. Lee Nothing to disclose. K. Ratnayaka Nothing to disclose. H. El-Said Nothing to disclose.

I-12 | Femoral vein patency following PDA occlusion in VLBW infants: Intermediate term follow up

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Background: Transcatheter PDA occlusion in the very low birth weight (VLBW) infant is safe and effective. The procedure requires a

relatively large sheath for femoral vein (FV) access. To date, there is no data available on the FV patency following this procedure.

Methods: We reviewed the pt profile and results of our cohort of VLBW pts who underwent transcatheter PDA occlusion in the cath lab from 5/2018 to 12/2019. Vascular ultrasound studies of the FV were performed utilizing 2D, color and pulse Doppler in conjunction with the follow up echocardiogram. Vessel patency, compressibility and diameter size were reported.

Results: Overall, 30 VLBW patients (median BW: 714.5; range:460-1120 gm) underwent ductal occlusion via a 3.3-4 Fr femoral venous sheath. Median age and weight at time of procedure was 26.5 days (range: 14-49 days) and 1080 gm (range: 625-2000 gm) respectively. Twenty-nine infants had successful occlusion with no residual shunting. One was referred for surgical ligation after the device embolized into the left pulmonary artery upon release and was retrieved without incident. Major complications occurred in one additional infant (wire perforation in the liver capsule requiring transfusion with no other sequelae). One expired 5 months post ductal occlusion due to complications unrelated to the procedure. To date, vascular ultrasound was performed in 15 patients (median days post procedure: 184 days; range: 45-419 days). Fifteen studies are pending (6 scheduled, 6 to be scheduled (from outside referrals), 2 rescheduled (due to lack of patient cooperation), 1 expired). 14/15 FVs were widely patent and compressible with mean diameter of $2.8 \text{ mm} \pm 0.06$. One study showed mild-moderate flow obstruction at the proximal superficial femoral vein. This patient required placement of a tunneled femoral venous central line after removal of the sheath for continue central vascular access for TPN.

Conclusions: Transcatheter PDA occlusion in the VLBW infants is safe and effective. At intermediate-term follow up, femoral veins remain patent after access with sheath sizes up to 4 Fr. In the absence of need for additional long-term central line access at the same site, femoral vein patency following PDA occlusion is 100%.

Disclosures: F. F. Ing: Abbott (St. Jude): Consulting and Speaker Bureau; C. Brecek Nothing to disclose. D. Schmidt Nothing to disclose. J. Yeh Nothing to disclose. E. Rivera Nothing to disclose.

I-13 | Long-term Outcomes of Coarctation Stent Implantation in Infants with Biventricular Anatomy

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Background: Recurrent coarctation in infants following surgical repair remains a challenging problem. Stent implantation is an alternative to repeat surgical intervention when balloon angioplasty alone does not

provide adequate relief of aortic obstruction. However, little is known about the longer-term outcomes in these patients.

Methods: We performed a retrospective chart review of all infants with biventricular anatomy who underwent coarctation stent placement between 04/2004 and 07/2019. Outcomes of interest included change in aortic lumen diameter, peak gradient, number of re-interventions, time to re-intervention, and adverse events (AEs).

Results were analyzed using Student's t test and Kaplan-Meier curves as appropriate.

Results: We identified 16 patients age 0.31 ± 0.27 yr and weight 4.72 ± 2.01 kg. Follow up interval was 7.96 ± 5.21 yr. Eight (50%) received a coronary stent. Seven (44%) patients underwent procedure due to ventricular dysfunction. Three (19%) patients had a native coarctation, 1 (6%) had a prior balloon angioplasty, and 12 (75%) had prior surgical repair. Coarctation diameter increased from 2.03 ± 0.85 mm to 5.57 ± 6.60 mmHg ($p < 0.01$) and gradient decreased from 33.14 ± 20.71 mmHg to 5.57 ± 6.60 mmHg ($p < 0.01$). Thirteen (82%) patients required at least one re-intervention, with an average of 1.64 ± 3.07 years from the index procedure. Overall, there were 30 re-interventions in 13 patients (17 balloon angioplasty, 4 additional stent placements, 9 surgeries). There was no mortality due to the procedure. There was one patient who had a serious adverse effect, an aortic tear requiring a covered stent. On follow up, 3 (19%) had hypertension and 10 (63%) were on anti-hypertensive medications.

Conclusions: Stent treatment of recurrent coarctation in infants is feasible with an acceptable risk profile. Repeat interventions to dilate the stent further are quite common, as expected. Planned surgical revision occurred in half of these patients when older and larger with good result. The development of bioabsorbable stent technology will benefit this population greatly reducing the high rate of reintervention.

Disclosures: B. H. Morray: Abbott (St. Jude): Proctor; Medtronic: Consulting; T. K. Jones: Abbott (St. Jude): Consulting; Edwards Lifesciences: Consulting; Medtronic: Consulting; W.L. Gore and Associates, Inc.: Consulting; J. D. Kurtz Nothing to disclose. A. E. Rubio Nothing to disclose. T. A. Johnston Nothing to disclose.

I-14 | Single Tertiary Center Experience with Use of GORE CARDIOFORM ASD Occluder for Transcatheter Atrial Septal Defect Closure: with focus on Deficient Rims

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Medicine, Texas Children's Hospital, United States; Gary E. Stapleton, Baylor College of Medicine, Texas Children's Hospital, United States; Srinath T. Gowda, Baylor College of Medicine, Texas Children's Hospital, United States

Background: We describe a single tertiary center experience with Gore Cardioform atrial septal defect (ASD) Occluder (GCO) for secundum ASD closure with focus on deficient rims.

Methods: Retrospective review of all patients with secundum ASD, evaluated in the catheterization lab by TEE for transcatheter occlusion at Texas Children's Hospital from Jan 2017 to Dec 2019. TEE planes at 35, 0 & 90 degrees were used to evaluate anterosuperior (AS), posteroinferior (PI), superior (S), inferior (I), anterioinferior (AI) and posterosuperior (PS) rims, respectively. ASD size > 20mm was considered large. Rims measuring <5 mm were defined as deficient. Primary outcome was successful device deployment and stable position by echocardiogram prior to discharge. The unsuccessful group included; patients with failed attempt to place GCO and patients not attempted to close after TEE evaluation due to deficient rims.

Results: A total of 124 patients were included with median weight 36(8-141kg), mean age 11.4 (1-60 years) and mean ASD diameter 14.6 (5-28mm). ASD closure was attempted in 105, and not attempted in 19 (15%). Among attempted closure, 93 (89%) were successful, 9 were unsuccessful (9%) due to deficient rims, closure was deferred in 3; PHTN 1, arrhythmia 1 and tiny multiple defects 1. 106 of 124 (86%) had one or more deficient rims as follows: 85 (68%) AS, 31 (25%) PI, 15 (12%) AI, 25 (20%) PS, 20 (16%) S, and 27 (22%) I. Deficient PI, I, PS rims & ASD >20mm were associated with procedure failure ($p<0.001$ in all). On multivariate analysis deficient PI and I rims were associated with failure ($p=0.007$ and $p=0.008$). Multiple deficient rims reduced procedural success (OR 0.38, 95% CI, 0.25-0.56); a combination of a deficient PI and S rim had highest risk for failure ($P<0.05$). There was 1 device embolization, 6 transient arrhythmias and 1 vascular complication.

Conclusions: Transcatheter closure of ASDs with deficient rims is effective and feasible using GCO. Large ASD with deficient PI and I rims are associated with procedural failure. Comprehensive evaluation of these rims and risk stratification are warranted prior to consideration for the use of GCO.

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I-15 | Dilatable Pulmonary Artery Banding Palliation in Congenital Heart Disease

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Background: Surgical pulmonary artery banding (PAB) has a wide spectrum of published uses and techniques, but has been limited in practice because of later requirement for surgical PAB removal. Limited data exists regarding methods to create a dilatable PAB that is adjustable via transcatheter interventions, and later outcomes. The aim of this study is to describe our experience creating a reliably dilatable PAB in small patients with congenital heart disease (CHD).

Methods: A retrospective chart review of all CHD cases performed at our institution of PAB placement with a single strip of GoreTex membrane and serial hemoclips to allow for transcatheter balloon dilation (TCBD). We sought to outline anatomical variants palliated and patient outcomes.

Results: Sixteen patients underwent dilatable PAB placement, placed somewhat tighter than conventional bands because of ability to enlarge them over time. Median age was 52 days (range 4-215) and weight 3.12 kg (1.65-5.8). The median Doppler velocity at PAB was 3.28 m/s (1.91-4.0). Seven (44%) of the patients were premature, 11 (69%) had VSD(s) with pulmonary over-circulation, 4 (25%) atrioventricular septal defects, and 4 (25%) single ventricle physiology.

Subsequent to the index procedure, 5 patients have undergone intra-cardiac complete repair at a median of 74 days (range 46-987). Six patients remain well palliated with no additional intervention, and 4 single ventricles are awaiting their next palliation. One patient died secondary to NEC (presumed unrelated to PAB) and pericardiocentesis was required in 1 patient early post-op. Five patients underwent TCBD of the PAB without complication - 3 had 1 TCBD, 1 had 2 TCBD, and another had 3 TCBD. The median change in saturation was 15% (range 6-22%) and PAB diameter was 1.7mm (1.1-5.2mm). Median time from PAB to most recent outpatient follow up was 668 days (35-1774 days).

Conclusions: Our institution has standardized a PAB technique that allows for transcatheter incremental increases in pulmonary blood flow over time to compensate for growth. This methodology has proven safe and effective enough to supplant other techniques of limiting pulmonary blood flow in most patients - allowing for interval growth or even serving as the definitive palliation.

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I-16 | Early Outcomes of PDA Management in VLBW Infants: Transcatheter Closure vs. Surgical Ligation

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Background: Transcatheter PDA closure (TPC) in VLBW infants is safe & effective. There is little data comparing early outcomes of surgical ductal ligation (SDL) to TPC.

Methods: The outcomes of all VLBW infants who underwent TPC (5/18-8/19) were compared to those who underwent SDL (4/11-6/18). SDL pts were matched for gestational age at birth & wt at time of procedure. Data collected included procedural success, complications, pulmonary severity score (PSS), wt gain, duration of inotrope use & intubation, and hospital stay. Qualitative pre & post procedure CXR findings were compared.

Results: Pt profile & hospital course data is shown in table 1. In the TPC group complete data was available for 14 pts. 5 were transferred

back to referring hospital post TPC. 1 remained hospitalized. Complete data exists for all 20 SDL pts.

In the TPC group, 12/20 (60%), CXR reported improvement in pulmonary edema (PE) on post-cath day 1 while 2/20 (10%) showed worsening lung fields. In the surgical group, 5/20 (25%) reported improvement while 10/20 (50%) reported worsening on POD 1.

Conclusions: Compared to SDL, TPC is equally safe & effective. There was no statistical difference in the post procedure PSS between the 2 groups but it trended favorably towards the TPC group in the 1st wk post procedure. While the SDL group showed higher wt gain immediately post-op (due to edema), the wt gain was better in the TPC group by the 2nd week. Mean duration of inotropic use, intubation & hospital stay was similar, but the number of SDL pts who required inotropic support was almost 2X that of the TPC group. CXRs tend to show earlier improvement of PE in the TPC group while those in the surgical group may worsen initially.

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	TPC	Surgical Ligation	p
Median birth weight in grams (range)	704 (460-1035)	760 (495-1340)	
Median gestational age at birth in weeks (range)	25 (23-28)	25 (23-28)	
Median procedural weight in grams (range)	1065 (670-2000)	1105 (655-1730)	
Median age at procedure in days (range)	27 (17-60)	32.5 (10-65)	
Procedural Success	20/20 (100%)	20/20 (100%)	
Major Complications	0/20	0/20	
Non Procedure Related Mortality	1/20 (Post-Cath Day 138)	1/20 (Post-Op Day 65)	
Average Pulmonary Severity Score (PSS) Pre-OP Day 1	0.784 (n=20)	0.768 (n=20)	0.87
PSS Post-Op Day 1	0.905 (n=20)	1.099 (n=20)	0.17
PSS Post-Op Day 3	0.805 (n=19)	1.026 (n=20)	0.16
PSS Post-Op Day 7	0.716 (n=18)	0.712 (n=20)	0.97
PSS Post-Op Day 14	0.645 (n=16)	0.57 (n=20)	0.49
PSS Post-Op Day 21	0.611 (n=16)	0.529 (n=20)	0.46
Average Weight gain Post-Op Day 7 (grams)	101 (n=18)	129 (n=20)	0.53
Weight gain Post-Op Day 14	253 (n=16)	228 (n=20)	0.6
Weight gain Post-Op Day 21	419 (n=16)	389 (n=20)	0.61
Number of patients requiring inotropes	5/20 (25%)	9/20 (45%)	0.18
Average Duration of Inotropes (days)	0.8	1.05	0.73
Average Days to Extubation	11.93 (n=15)	11.25 (n=20)	0.86
Average Hospital stay (days)	115 (n=14)	113 (n=19)	0.82
First post procedure CXR showing less pulmonary edema	12/20 (60%)	5/20 (25%)	
First post procedure CXR showing worse pulmonary edema	2/20 (10%)	10/20 (50%)	

I-17 | Safety of cardiac catheterization in pediatric patients on systemic anticoagulation

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Background: Therapeutic anticoagulation is usually held prior to cardiac catheterization (CC) in adults. In children, data regarding the safety of CC while on anticoagulation are lacking. We report our outcomes in a cohort of pediatric patients undergoing CC while on therapeutic anticoagulation.

Methods: A retrospective chart review was performed of patients who underwent CC while on therapeutic anticoagulation from 10/2017-10/2019. Special attention was made to assess sheath size, hemostasis times, interventions performed, and complications. Data are provided as median [range] or mean $\pm$ SD.

Results: 60 CCs were performed in 46 patients (age: 6.6 [0.2-18.9] yrs). The patient was on warfarin in 29 cases, heparin in 21, enoxaparin in 7, fondaparinux in 2, and warfarin and heparin in 1. Anticoagulation was necessary for a mechanical valve in 15 cases and ECMO in 11. In patients treated with warfarin the INR was 2.5 ± 0.8 . In patients treated with heparin the anti Xa level was 0.52 ± 0.19 . The opening ACT was 190 ± 36 sec. Ultrasound was used for a component of vascular access in 43 cases (71.7%). Arterial and venous sheaths were placed in 39 cases (65%). In 3 cases only arterial access was obtained, and in 18 cases only venous access was obtained. The venous sheath size was greater than 7 Fr in 15 cases. For arterial access a 3.3 Fr sheath was used in 4 cases, 4 Fr in 24, 5 Fr in 13, and 7 Fr in 1. Additional anticoagulation was given in 40 cases (heparin n=35, bivalirudin n=5). An intervention was performed in 48 cases (80%) and included angioplasty (30), stent implantation (16), vascular embolization (15), transeptal puncture (7), transjugular liver biopsy (5), atrial septostomy (5), thrombectomy (2), endomyocardial biopsy (2), fenestration occlusion (1), and valvuloplasty (1). Time to hemostasis was 19 [range: 7-76, IQR: 14-26] min. Access site bleeding on POD #0, access site bleeding on POD #1, non-occlusive femoral artery thrombus, sheath dislodgement, and a small hematoma were experienced in 1 patient each.

Conclusions: CC can be performed safely in pediatric patients receiving anticoagulation therapy. Ultrasound can be used for safe vascular access. Larger venous and arterial sheaths can be used, and interventions can be performed with low complication rates.

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I-18 | Use of New Amplatzer Trevisio Delivery Cable for Closure of Atrial and Ventricular Shunts

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Background: The aim of this study was to describe the initial experience using the new Amplatzer Trevisio delivery cable in closure of atrial and ventricular septal defects. Additionally, bench testing was performed to compare the Trevisio and standard Amplatzer delivery cables.

Methods: Retrospective review of all patients in whom the Trevisio cable was used at a single institution between September 2019 and November 2019. Bench testing of both cables was performed to compare straight-line pushability and device shift after release.

Results: Two atrial septal defects (ASD), one patent foramen ovale (PFO), and two ventricular septal defects (VSD) were successfully closed with Amplatzer occlusion devices utilizing the Trevisio cable. One VSD occlusion and one ASD occlusion were successful after inability to close the shunt via alternative modalities due to anatomic complexity. Clinical review with the standard cable demonstrated a shift in the angle of the device of 15° by transesophageal echocardiography (TEE) and 12.3° by fluoroscopy, while the Trevisio cable demonstrated a shift of 2.4° by TEE and fluoroscopy. Bench testing demonstrated no difference in the ability to push between both cables despite the more flexible tip of the Trevisio cable. Fluoroscopic testing with a 3D model demonstrated improved device position predictability with the Trevisio cable.

Conclusions: The Amplatzer Trevisio delivery cable offers reduction in device tension and device reorientation without sacrificing device pushability when compared to the traditional delivery cable for deployment of the Amplatzer series of devices.

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I-19 | Outcomes After Lymphatic Intervention for Hepatopulmonary Connections

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Background: Percutaneous lymphatic interventions have been successful in eliminating abnormal connections from the thoracic duct with retrograde pulmonary perfusion in patients with plastic bronchitis (PB) and chylothorax (CTX). We applied the same approach for

abnormal lymphatic connections from the liver with pulmonary perfusion.

Methods: This is a single center, retrospective review including all patients who underwent lymphatic imaging and were found to have hepatopulmonary (HP) connections from 1/2016-3/2019.

Results: HP connections were identified in 14 patients with history of CTX (10/14) or PB (5/14) who underwent lymphatic imaging at median age 9.8 years (0.5-17 years). 4 patients had prior lymphatic procedures but continued CTX/PB. 9 patients (64%) had congenital heart disease, including 7 (50%) with Fontan circulation. 10 (71%) patients underwent lymphatic intervention for HP connections. Embolization of abnormal channels was performed with lipiodol (1/10) or TruFill glue (9/10). All targeted channels were successfully embolized. 1 patient had a 2nd embolization for additional HP connections. 3 patients had additional nonHP lymphatic interventions.

Post-procedure complications included transient hypotension requiring dopamine (1/10), blood transfusion for anemia (2/10), and hemo-peritoneum in a patient on ECMO with multisystem organ failure prior to intervention; care was withdrawn the next day. Glue embolization occurred in 3 patients, resulting in a stroke in 1. There was no intraprocedural mortality. 1 additional patient died after transfer back to his facility.

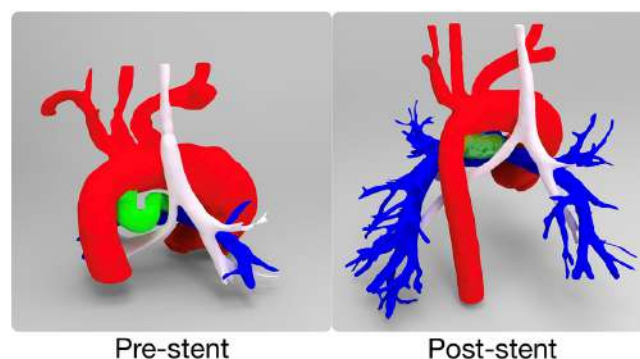
Excluding fatalities, all patients had resolution or decrease in cast production and no CTX reaccumulation at median follow-up 93.5 days (7 days-3.6 years). 2 patients transferred to home ICUs and the other 6 had median ICU stay 1.5 days (1-3 days) and median hospital stay 17.5 days (6-63 days).

Conclusions: HP connections are a rare cause of CTX/PB and lymphatic intervention for these connections is effective with improvement or resolution of symptoms in all surviving patients, without significant complications in the majority of patients. If central lymphatic imaging does not show abnormalities in CTX/PB patients, liver imaging should be performed.

Disclosures: C. E. Tomasulo *Nothing to disclose*. Y. Dori *Nothing to disclose*. C. L. Smith *Nothing to disclose*.

I-20 | Bronchial Compression relieved by PDA stenting

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Ratnayaka, Rady Children's Hospital, University of California San Diego, United States; John W. Moore, Rady Children's Hospital, University of California San Diego, United States; Howaida El-Said, University of California (San Diego) Program, United States

Background: PDA stenting is evolving as an alternative to BT shunt for infants with ductal dependent lesions. Given the anatomical relation, PDA has the potential of compressing the bronchus. We report the prevalence of PDA mediated bronchial compression and assess the effect of subsequent stenting.

Methods: Review of patients who received PDA stent for duct dependent pulmonary flow between January 2011 and February 2019.

Results: In our institution from January 2017 we exclusively utilize PDA stenting for ductal dependent pulmonary blood flow. Forty-three PDAs were stented in 41 patients (2 patients had bilateral PDAs). 15/43 underwent imaging of the chest prior to stenting. Bronchial compression[3 left and 2 right] was found in 5/15 (33% incidence rate in those imaged). The degree of compression was directly related to the size of the PDA (range:4-6.6mm) and to the PDA tortuosity type, with 5/5 cases of the documented bronchial compression happening in patients with PDA tortuosity score type 2 or 3. None of pts exhibited post procedure clinical evidence of bronchial compression. 3pts (4 PDAs) had imaging post stent placement that documented significant improvement of the bronchial compression. The improvement was related to the change in size, the loss of tortuosity and the lateralization of the PDA post stenting.

Conclusions: Bronchial compression secondary to PDA is influenced by PDA size and type. Our study suggests that preexisting bronchial compression does not preclude PDA stenting on the contrary, stenting can relief pre-existing bronchial compression. Further larger studies are needed to confirm this effect.

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ADULT CONGENITAL

I-21 | A Systematic Approach to Pulmonary Valve Replacement in the Current Era

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Background: Transcatheter pulmonary valve replacement (PVR) requires a suitable landing zone. Since 2017, we have offered off-pump hybrid PVR as the preferred approach to standard surgical PVR when transcatheter PVR was not possible. The aim is to review our institutional approach to PVR and outcomes.

Methods: We reviewed all cases since February 2017 in which PVR was indicated. All pts underwent cardiac MRI, transcatheter right ventricular outflow tract (RVOT) balloon sizing and coronary compression (CC) testing. Hybrid PVR entailed off-pump right ventricular plication (RVP) with subsequent transcatheter PVR in the same procedure. We present our results of this systematic approach, aimed at minimizing the use of cardiopulmonary bypass.

Results: PVR was indicated in 55 pts. Transcatheter PVR was attempted in 38, 8 had surgical PVR, and 11 had a hybrid procedure. Mean age at PVR was 29.1 years and the most common diagnosis was tetralogy of Fallot (n=36). Transcatheter PVR was successful in 36/38, with 2 converted to surgical PVR for stent/valve migration. Surgical valve implantation on cardiopulmonary bypass was needed for positive CC (n=3), stent/valve migration (n=2), patient size limitations (n=2) or patient preference (n=1).

Mean implanted valve size was 25.1mm for transcatheter PVR, 24.7mm for surgical PVR, and 26.8mm for hybrid PVR. The hybrid group had a mean RVOT size of 34.2mm by balloon sizing pre-plication. Length of stay following procedure was 0.8 days for transcatheter PVR, 3.5 days for surgical, and 1.4 days for hybrid (p<0.01). Mean follow-up period was 2.1 years. No patient had greater than mild insufficiency and the mean peak gradient across the RVOT was 16 mmHg. There have been no episodes of endocarditis and no valve re-interventions to date. One hybrid patient has since deceased (11 months post-index procedure) for multiple reasons, but including coronary artery insult with unclear relation to RVP.

Conclusions: Transcatheter PVR may be accomplished in the majority of patients with RVOT dysfunction. In patients with an unsuitably large outflow, utilizing a hybrid off-pump right ventricular plication with subsequent transcatheter PVR is effective and avoids the effects of cardiopulmonary bypass.

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I-22 | Transesophageal Echocardiographic Guidance for Assessing Aortic Compression during PA Stenting in a Patient After an Arterial Switch Operation

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Background: Branch pulmonary artery (PA) stenosis can be an important long-term sequela after an arterial switch operation (ASO) and LeCompte maneuver, with incidence ranging from 3.8-28%. Compared to typical PA stenting procedures, draping of the PAs on either side of the aorta, proximity to the re-implanted coronary arteries, and retrosternal position significantly increases complexity and risks for PA stenting after an ASO.

Methods: A 24-year-old patient presented with long segment RPA and adjacent retrosternal main PA stenosis. After his initial ASO as an infant, progressive dilation of the aortic root necessitated a valve sparing aortic root replacement with a 32 mm Dacron graft. Right PA stenosis was not responsive to balloon angioplasty (BA) and prior stenting (recurrence of PA stenosis from anteroposterior stent collapse). After multidisciplinary discussion, PA stenting with a covered stent followed by placement of one or more reinforcing bare metal stents was planned. Prior to stenting, stenosis compliance and coronary compression testing was performed during BA. The stenosis was compliant. During concomitant aortography, there was no coronary compression, however the degree of aortic root compression was not clearly defined. As an alternative to 3D rotational angiography (RA), we chose transesophageal echocardiographic (TEE) guidance to assess aortic compression.

Results: TEE in 90-110° view provided excellent visualization of the entire length of the ascending aorta. During balloon sizing with a single balloon, severe compression (>50%) of the ascending aorta was clearly defined. A similar degree of aortic compression was also seen after repositioning the balloon and with double balloon technique. The degree of compression was a contraindication to stenting.

Conclusions: While 3DRA can provide excellent 3D guidance during interventional procedures, limitations include ionizing radiation, IV contrast burden, and need for equipment clearance during image

acquisition. In contrast, TEE guidance routinely used for guiding interventional procedures, is universally available, and provides conclusive actionable dynamic real-time 2D and 3D imaging. It can be repeated and avoids important limitations of 3DRA.

Disclosures: A. A. Divekar *Nothing to disclose*. D. J. Miller *Nothing to disclose*.

I-23 | Is Stroke Worse Than Atrial Fibrillation? A Network Meta-Analysis on Patent Foramen Ovale

Leonardo Varotto, San Bortolo hospital, Italy; Bregolin G. Bregolin, San Bortolo hospital, Italy; Carlo Bonanno, San Bortolo hospital, Italy

Background: We did a network meta-analysis (NMA) by comparing devices for PFO closures, so as to evaluate safety and efficacy of transcatheter PFO closure in the prevention of neurological events, in patients (pts) with cryptogenic stroke when compared with medical therapy (MT), and to assess the risk of atrial fibrillation (AF) in the same pts.

Methods: We searched PUBMED database and identified randomized-controlled trials (RCTs) from 2012 till end 2018. We performed a NMA, used pooled odds ratios (ORs). Analyses were done in NetMetaXL1.6 and WinBUGS1.4. Number-needed-to-treat (NNT) and number-needed-to-harm (NNH) were derived by applying the estimated ORs. The Likelihood of being Helped or Harmed (LHH) was evaluated to estimate the risk-effectiveness balance.

Results: We identified 6 RCTs enrolling 3560 pts (mean age 45.4 to 46.2 years) with cryptogenic stroke and PFO. Pts allocated to PFO closure were less subject to a stroke than pts allocated to MT. From NMA, the ORs for any device vs MT were 0.41 with Fixed-effects and 0.22 with Random-effects model. We cannot conclude that one device is better than the others to reduce strokes recurrences, but our NMA proves that PFO closure induces a number of AF episodes significantly higher than MT (Risk Ratio=4.9), also in new episodes of AF defined as serious (RR=4.04). The NNT preventing one stroke was 38 (Fixed-effects) and 29 (Random-effects), while the NNH causing one case of new-onset AF was 26 (Fixed-effects) and 25 (Random-effects). The LHH was 0.68 and 0.86 respectively, and showed that the number of strokes saved is less than that of AF added. If we calculate this parameter considering only the serious AF, the number of strokes saved is twice higher than that of serious AF induced by the PFO closure (LHH was 2.1 and 2.02 respectively).

Conclusions: Our NMA provides evidence in favor of PFO closure with all the devices used in young pts with cryptogenic stroke. We can presently conclude that these devices are better than MT, but increase the risk of AF by over 4/5 times, with serious or unserious AF. We cannot state that one device is better than the rest to reduce AF episodes in the follow up. Considering serious AFs, pts have more advantages in being treated than in not being, since LHH is ≥ 2 .

Disclosures: L. Varotto *Nothing to disclose*. B. G. Bregolin *Nothing to disclose*. C. Bonanno *Nothing to disclose*.

ACUTE CORONARY SYNDROMES & MI

I-26 | Does the mode of treatment alter the duration of complete heart block in acute inferior wall myocardial infarction?

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Background: Acute inferior wall myocardial infarction with complete heart block has a high mortality. Whether patients treated with primary angioplasty (PCI) would have a shorter period of complete heart block and better outcome than those treated by other methods was the question.

Methods: Consecutive patients with acute inferior wall myocardial infarction and complete heart block or second degree heart block over a 1 year period were included in the study. Out of 225 patients with acute inferior wall myocardial infarction, 123 had high degrees of atrioventricular block. The duration of heart block, the demographic variables, the door to balloon time for PCI and the total ischemic period from the onset of chest pain, mode of reperfusion, the use of temporary pacemaker implantation were noted. Biomarkers like NGAL (in 28 patients) were estimated.

Results: Of 123 patients, 10 were in Killip class 4 with cardiogenic shock. 47 patients were treated with intravenous streptokinase. The mean duration of heart block in this group was 56.1 $\pm$ 54.7 hours. (Group A). 51 patients were treated with primary angioplasty and the mean duration of the heart block was 44.4 $\pm$ 51 hours (B). Those who presented later than 12 hours were treated with intravenous heparin. The mean duration of heart block in this group was 103 $\pm$ 71 hours (n=25, Group C) p value B vs C $p < 0.001$. A longer duration of heart block was found in those more than 45 years, blood urea above 40 mg/dl and those with an elevated jugular venous pulse.

A total of 40/123 (34.9%) patients died in the hospital and 3/120 (2.5%) on followup. The variables significantly associated with death were: Systemic hypertension, ($p < 0.0001$) Killip class, ($p < 0.0001$) total ischemic period after the onset of chest pain ($p < 0.0001$). In the primary angioplasty group a lower door to balloon time was associated with less death. ($p < 0.002$) A total of 67 (54.47%) patients had temporary pacemaker implantation with 3 lead perforations.

Conclusions: In the primary angioplasty era, the mortality complete heart block with acute inferior wall MI still remains high (34.9%) The duration of heart block was the least in this group.

Disclosures: P. N. Gupta *Nothing to disclose*. V. A. *Nothing to disclose*. S. Vishwanathan *Nothing to disclose*. A. G. Koshy *Nothing to disclose*. V. V. Radhakrishnan VV *Nothing to disclose*.

I-27 | Smokers Paradox in Myocardial Infarction is Short-Lived: Analysis of Thirty-Day Readmissions from the Nationwide Readmission Database

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Background: A paradoxical association between smoking status and improved outcomes during initial (or index) hospitalization for ST elevation myocardial infarction (STEMI) has been described. This association is known as "smoker's paradox". Follow-up data on whether the improved outcomes in smokers persists post-discharge is lacking. We aim to describe the incidence of 30-day readmissions and outcomes in smokers compared to non-smokers after index admission for STEMI.

Methods: A descriptive, secondary analysis of the Nationwide Readmissions Database was conducted for years 2016-2017. Admissions for STEMI were selected based on pertinent ICD-10 codes. Multivariate cox-regression analysis was performed, and findings were adjusted for patient demographics, comorbidities and intervention performed on index admission.

Results: Among the 284,247 patients admitted with primary diagnosis of STEMI, 25.58% were smokers. Patients who smoked were younger (56±10 vs 65±12 years) and had lower comorbidities (mean Elixhauser score 5.7±7 vs 6.8±7) compared to non-smokers. The adjusted risk of 30-day readmission for any cause was not different between the two groups [HR 0.97, CI (0.93-1.01), p=0.12]. The most common cause of readmission for smokers was STEMI (28.2%) and for non-smokers was decompensated heart failure (30.3%).

The adjusted risk of 30-day readmission for STEMI [HR 1.21, CI(1.06-1.37), p=0.004] and in-stent restenosis [HR 1.34, CI(1.03-1.74), p=0.03] was higher in smokers. Similarly, risk of cardiogenic shock during readmission was higher in smokers [HR 1.22, CI(1.01-1.48), p=0.04]. Smokers had higher risk of requiring percutaneous coronary intervention (PCI) on readmission [HR 1.12, CI(1.002-1.25), p=0.04]. The risk of coronary artery bypass [HR 0.97, CI(0.79-1.18), p=0.76] and mortality [HR 1.17, CI(0.95-1.44), p=0.13] during readmission was similar between the two groups.

Conclusions: Smokers have higher risk of 30-day readmission for STEMI and in-stent stenosis compared to non-smokers. The risk of cardiogenic shock and PCI during readmission was also higher. The perceived benefit of the 'smoker's paradox' is short-lived with smokers having worse outcomes upon follow-up.

Disclosures: P. Acharya *Nothing to disclose*. J. Fritzlen *Nothing to disclose*. R. Weidling *Nothing to disclose*. S. S. Taduru *Nothing to disclose*. S. Ranka *Nothing to disclose*. Z. Shah *Nothing to disclose*. K. Gupta *Nothing to disclose*.

I-28 | Impact of Intraprocedural Stent Thrombosis on Outcomes of Percutaneous Coronary Intervention: A Meta-Analysis

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Background: Intraprocedural stent thrombosis (IPST), defined as the development of occlusive or nonocclusive new thrombus in or adjacent to a recently implanted stent before completion of PCI. IPST even though a rare entity, yet is associated with worse prognosis amongst all intraprocedural thrombotic events. Data regarding impact of IPST is scarce and needs further investigation.

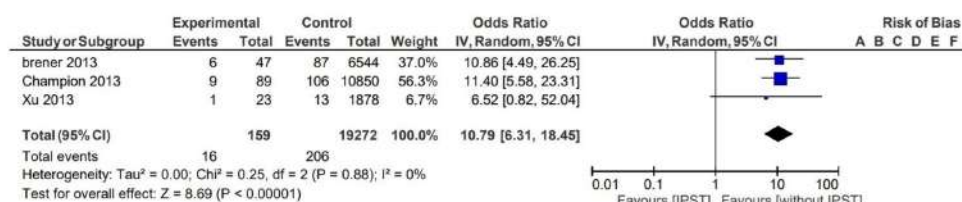
Methods: We performed literature search of all published full-length articles that studied and compared data on patients with IPST and with no IPST during PCI. We calculated odds ratios via the random effects model for 30 day and 1 year outcomes.

Results: Our literature search yielded 3 studies (1 retrospective, 2 observational post-hoc analysis) relevant to the meta-analysis. Total 19272 patients were included. IPST occurred in 159 patients (0.8%). At 30 days, IPST was associated with statistically significant higher all-cause mortality (OR 10.79, 95% CI [6.31, 18.45] p<0.00001), MI (OR 4.82, 95% CI [2.39, 9.73] p<0.0001), target vessel revascularization (TVR) (OR 6.70, 95% CI [3.38, 13.29] p<0.00001), definite stent thrombosis (OR 10.44, 95% CI [5.87, 18.58] p<0.00001), definite or probable stent thrombosis (OR 9.28), 95% CI [5.54, 15.56] p<0.00001 and death or MI or TVR (OR 7.20), 95% CI [4.10, 12.64] p<0.00001, than those without IPST. At one year, results remained statistically significant for higher mortality (OR 4.27, 95% CI [1.92, 9.49] p = 0.0004) and death or MI or TVR (OR 2.91, 95% CI [1.58, 5.36] p = 0.0006) in patients with IPST.

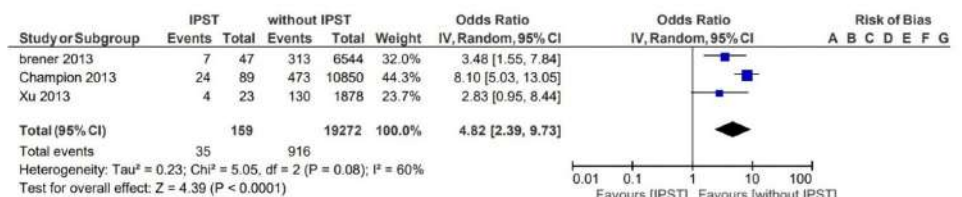
Conclusions: IPST even though is a rare occurrence, is associated with more adverse ischemic events, including higher mortality at 30 days and 1 year.

Disclosures: A. Aggarwal *Nothing to disclose*. A. Jain *Nothing to disclose*. V. Kohli *Nothing to disclose*. N. Beriwal *Nothing to disclose*. T. Mir *Nothing to disclose*.

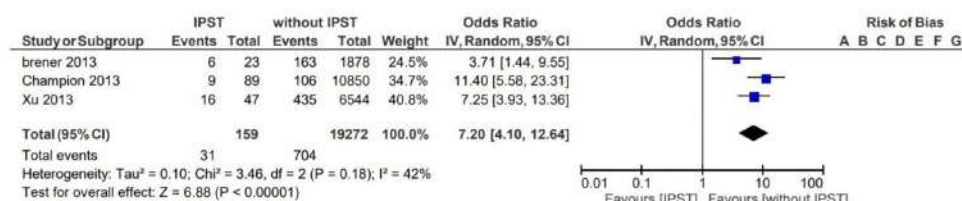
1.1 Mortality



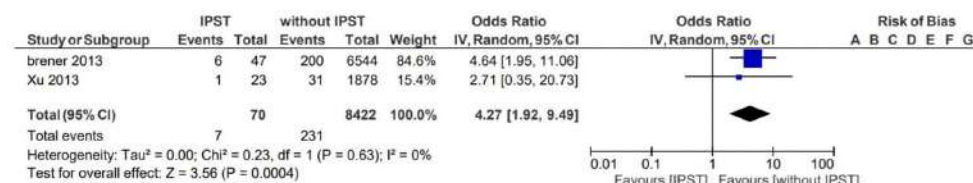
1.2 Acute MI



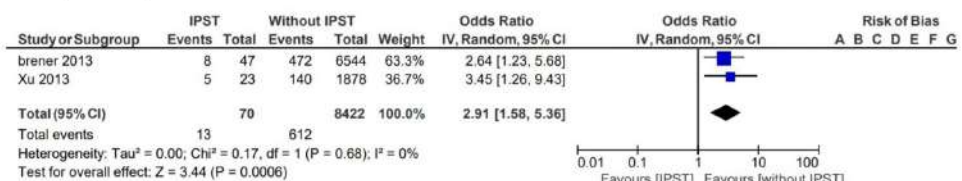
1.3 Death or MI or TVR



1.7 One year mortality



1.8 One year Mortality or MI or TVR



I-29 | Cost impact of Percutaneous Coronary Intervention and its Association with Angina Class

Mansoor Ahmad, UICOMP, United States; Minchul Kim, UICOMP, United States; Nathan A Neilson, UICOMP, United States; Chirag Divecha, UICOMP, United States; Michael Y Tye, UICOMP, United States; Marco Barzallo, OSF Cardiovascular Institute, United States; Sudhir Mungee, OSF Cardiovascular Institute, United States

Background: Cost impact of percutaneous coronary intervention (PCI) and its distribution over angina class is poorly understood.

Methods: We performed a retrospective analysis on 7388 patients who underwent angiogram at our facility during January 2015 to December 2017. Patients were identified from local CathPCI registry. Readmission and death data were extracted from chart review. Cost data were provided by the finance department. We excluded patients

with incomplete records and those who required coronary artery bypass graft. Patients were divided in two groups based on PCI requirement. Cost analysis was done based on Canadian Cardiovascular Society (CCS) Angina Class. Adjusted linear and logistic regression were used for clinical outcomes. Primary outcomes were 30-day readmission and death. Secondary outcome was admission cost.

Results: After exclusion, final sample size was 6403. Average age was 65.6 years (SD: 12.5; Male: 63.8%). 2444 required PCI (38%; $p < 0.001$). PCI group had comparatively younger patients (62.5 years; SD: 12.3, $p < 0.001$) with significantly lower BMI (30.6 vs 31.1, $p = 0.015$). PCI rate increased significantly with increasing Angina Class. PCI group had significantly lower odds for 30-day readmission (OR: 0.63; CI: 0.45-0.89; $p = 0.009$) and 30-day mortality (OR: 0.60; CI: 0.41-0.89; $p = 0.011$).

Odds of PCI increase with increasing Angina Class at presentation (Table-1). Cost was significantly high in PCI group for all CCS classes (Table-2).

Table 1: Outcome = PCI (n=6403)

Covariates	Odds Ratio	P value	95% CI	
Angina Class (Ref: No symptoms)				
CCS I	1.27	0.268	0.83	1.93
CCS II	2.19	<0.001	1.51	3.18
CCS III	2.76	<0.001	1.91	3.99
CCS IV	2.98	<0.001	2.07	4.28
Constant	0.03	<0.001	0.01	0.06

(Logistic regression)

Table 2: Cost

Angina Class	PCI	No PCI	Difference	95% CI		P value
No symptoms	\$19,548	\$14,078	\$5,470	-\$3,142	\$14,082	0.213
CCS I	\$10,936	\$5,322	\$5,614	\$505	\$10,722	0.031
CCS II	\$8,927	\$4,127	\$4,800	\$3,080	\$6,520	<0.001
CCS III	\$10,158	\$4,925	\$5,234	\$3,746	\$6,722	<0.001
CCS IV	\$14,318	\$9,537	\$4,781	\$3,711	\$5,852	<0.001
All	\$12,753	\$8,022	\$4,731	\$3,699	\$5,763	<0.001

(Generalized linear model with log link and gamma distribution)

Conclusions: A higher angina class at presentation is associated with greater odds of receiving PCI. Despite significantly higher cost, PCI patients had better 30 readmission and mortality.

Disclosures: S. Mungee: *Edwards Lifesciences: Advisory Board/Board Member and Speaker Bureau*; M. Ahmad *Nothing to disclose*. M. Kim *Nothing to disclose*. N. A. Neilson *Nothing to disclose*. C. Divecha *Nothing to disclose*. M. Y. Tye *Nothing to disclose*. M. Barzallo *Nothing to disclose*.

I-30 | Early vs delayed coronary angiography is patients with out of hospital cardiac arrest without ST elevation: a meta-analysis and systemic review

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K. Chan, University Of Missouri Health Care, United States; Poorna R Karuparthi, University of Missouri Columbia, United States; Kul Aggarwal, University of Missouri, United States

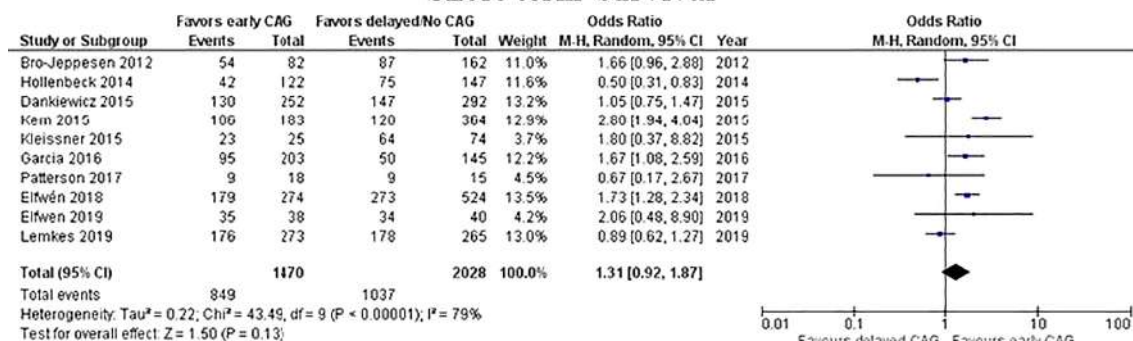
Background: Role of early coronary angiography (CAG) remains uncertain among patients with out of hospital cardiac arrest (OHCA) without ST segment elevation myocardial infarction (STEMI). A meta-analysis of the published studies was performed to assess the impact of early vs delayed CAG in OHCA patients without STEMI.

Methods: Multiple databases were searched for published literature pertaining to CAG in OHCA patients. Primary end points of the study included short term survival (upto 90 days) and in hospital good neurological survival/recovery (defined as cerebral performance category score 1 or 2). Secondary end points were long term survival (upto 3 years) and neurological recovery at follow up. A random effect model was utilized for analyzing the pooled data.

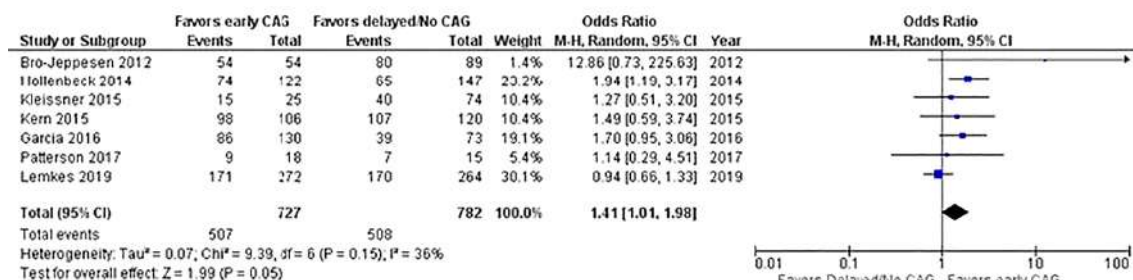
Results: A total of 10 studies were identified (7 observational studies and 3 randomized controlled trials) with total 2,028 patients. Use of early CAG was associated with improved long term survival [pooled OR: 1.94, CI: 1.28-2.94] and good neurological survival/recovery at hospital discharge [OR: 1.41, CI: 1.01-1.98]. Early CAG did not impact short term survival based on presenting rhythm. Early CAG was not associated with statistically significant short term survival [OR: 1.31; CI: 0.92-1.87] or good neurological recovery on follow up [OR: 1.36, CI: 0.99-1.85](figure).

Conclusions: Results of this meta-analysis show that early CAG in OHCA patients without STEMI are associated with good long-term survival and in hospital neurological survival but does not show short

Short-term survival



In-hospital good neurological survival



term survival benefit. Further randomized studies are needed to identify patients that will benefit from an early CAG strategy.

Disclosures: B. Bhardwaj *Nothing to disclose*. A. S. Al-Taweel *Nothing to disclose*. A. Kumar *Nothing to disclose*. A. K. Chan *Nothing to disclose*. P. R. Karuparthi *Nothing to disclose*. K. Aggarwal *Nothing to disclose*.

I-31 | Adequacy of ED-Initiated Anticoagulation in Patients with Acute ST-Elevation Myocardial Infarction Undergoing Primary PCI

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Background: Unfractionated heparin (UFH) is the most common anticoagulant used in patients with ST-elevation myocardial infarction (STEMI) undergoing primary percutaneous intervention (PCI). The ACC/AHA STEMI Guideline recommends an activated clotting time (ACT) goal of 250-300 secs when the use of glycoprotein IIb/IIIa receptor antagonist is not planned. The aim of our study was to assess the adequacy of UFH-anticoagulation initiated in the emergency department (ED) in patients with acute STEMI undergoing primary PCI.

Methods: Data were collected from medical records of all patients diagnosed with STEMI in the ED of a single center in South Texas from 2014 through 2018. Patients were included if they received an UFH bolus in the ED and if an ACT was measured immediately after obtaining arterial access in the catheterization laboratory. Those that received additional boluses of UFH before the first ACT was measured were excluded. The ACT levels were measured using a Hemochron device.

Results: Of 147 patients with STEMI, 76 met our inclusion criteria. The time between the initial UFH bolus and initial ACT level was 42.5 ± 16.8 min. After receiving the UFH bolus in the ED, the mean initial ACT of this group was 173.8 ± 50.4 secs, and the peak was 235 ± 82.5 secs. The ACT was similar in those receiving 50-69 U/kg compared with 70-89 U/kg (169.1 ± 33.2 secs vs 175.7 ± 61.2 secs; $p = 0.58$). The mean ACT of patients who received a UFH bolus followed by infusion was 170.6 ± 47.1 secs, compared with 189.2 ± 71.9 secs in those who received UFH bolus without infusion ($p = 0.3$). The mean UFH bolus was $6,139.5 \pm 1,343.9$ U (69.6 ± 7.1 U/kg) and the mean UFH infusion was $1,143$

± 305.7 U/kg/h (12.4 ± 2.5 U/kg). Median door-to-balloon time was 66.5 minutes. There were 8 cases of shock and 1 death. There were no major bleeding events or in-hospital reinfarctions.

Conclusions: In our study, most of the patients failed to reach initial therapeutic anticoagulation after receiving UFH in the ED. However, it seems that this observation was not associated with major adverse outcomes since there was only one death, 8 cases of shock and no cases of in-hospital reinfarction.

Disclosures: C. D. Avalos *Nothing to disclose*. C. Gutierrez *Nothing to disclose*. J. Cha *Nothing to disclose*. J. Castano *Nothing to disclose*. C. Aude *Nothing to disclose*. Y. W. Aude *Nothing to disclose*.

I-32 | Coronary Artery Spatial Distribution on Cancer Survivors Who Have Received Radiotherapy

Victor Becerra, University Of Miami - Miller School Of Medicine/ Jackson Memorial Hospital, United States; Neal Olarte, University Of Miami - Miller School Of Medicine/ Jackson Memorial Hospital, United States; Cesar E Mendoza, University Of Miami - Miller School Of Medicine/ Jackson Memorial Hospital, United States

Background: A significant cause for morbidity in cancer survivors with prior radiation exposure is radiation-associated cardiovascular disease (RACD) that manifests even in the absence of cardiovascular risk factors. The coronary anatomy in this setting has not previously been well-described. Here we report the coronary anatomy of patients with prior exposure to chest radiotherapy at a single tertiary referral center.

Methods: Cases were included prospectively between January 2010 and August 2018 who were admitted for elective coronary angiography. Culprit lesions were read by a single observer. A Scale Master II was used to measure with planimetry the distance to the culprit lesion and its length. The distance to the stenosis was measure from the ostium of the left or the right coronary artery (RCA) to the end of the culprit lesion.

Results: Mean age of diagnosis was 55.7 ± 9 years with a mean time between radiotherapy and disease presentation of 37.9 ± 2.5 years. The mean number of cardiovascular risk factors was 1.2, with equal prevalence of hypertension and hyperlipidemia. The mean number of coronary vessels involved was 2.2. Table 1 describes the anatomical characteristics of the coronary lesions.

Conclusions: Obstructive lesions in the left main coronary artery (LM) and left anterior descending artery (LAD) occurred more frequently than the other epicardial vessels. RCA lesions were longer and closer to the ostium, which may be clinically significant for target vessel revascularization. With increasing cancer survivorship, interventional cardiologists will encounter RACD with greater frequency. Foreknowledge of coronary anatomy in these patients may make planning for intervention easier and expected complications and follow-up more predictable.

	N		% Obstruction	Length (mm)	Distance (mm)
Left main	10	Mean ±SD	67±20.5	10.2±1.1	5.3±5.4
		Median	70	10	4
		Q1-Q3	50-82.5	10-10.5	0-10.5
		Min-Max	20-90	8-12	0-13
RCA	9	Mean ±SD	55±21.9	14.6 ± 2.9	16.1 ± 6.3
		Median	50	15	14
		Q1-Q3	30-75	12-16.5	10-21
		Min-Max	30-90	10-21	10-29
LAD	17	Mean ±SD	62.1±21.4	12.7±2.8	22± 6.1
		Median	70	15	22
		Q1-Q3	50-80	12-16.5	15.5-28.5
		Min-Max	20-95	10-20	14-31
LCx	8	Mean ±SD	43.8±14.9	12.9±2.3	24.6±8.7
		Median	50	14	23.5
		Q1-Q3	30-50	10-15	16.5-33.8
		Min-Max	20-70	10-15	13-38

Disclosures: V. Becerra *Nothing to disclose.* N. Olarte *Nothing to disclose.* C. E. Mendoza *Nothing to disclose.*

I-33 | Acute Coronary Syndrome In Patients With Prior CABG: Clinical, Angiographic Profiles & Management Practices

Fathima Aaysha Cader, Ibrahim Cardiac Hospital and Research Institute, Dhaka, Bangladesh, Bangladesh; Maksumul Haq, Ibrahim Cardiac Hospital and Research Institute, Dhaka, Bangladesh, Bangladesh; Saidur Rahman Khan, Ibrahim Cardiac Hospital and Research Institute, Dhaka, Bangladesh, Bangladesh

Background: Acute coronary syndrome (ACS) among post-CABG patients is not uncommonly encountered in current clinical practice. This study aimed to investigate the clinical, angiographic profiles and management strategies among post-CABG patients presenting with ACS at a tertiary care cardiac centre.

Methods: This retrospective observational study included all ACS patients with prior CABG presenting to our institute and undergoing coronary angiography from February 2015 to October 2019. Data were collected from hospital and catheterization laboratory database and statistically analysed.

Results: From a total of 591 post-CABG cases that underwent angiography, 223 (37.7%) presented with ACS. Mean age was 62.15 ± 8.28 years. 90.6% of the patients were male. 61.9% presented with NSTEMI,

followed by unstable angina (32.7%) and STEMI (5.4%). Most males presented with NSTEMI (63.9%). Most females presented with unstable angina (52.4%). 79.9% were hypertensive, 48.9% dyslipidaemic, 70% diabetic and 49.8% were smokers. Troponin I was elevated in 143 (64.1%). Mean left ventricular ejection fraction was 48.31±9.48 %. Graft vessel disease (GVD) was identified as culprit in 60.2% of cases and native artery in 24.8%. Among those with GVD, 129 (58.1%) had venous graft lesions, 12 (5.4%) had arterial graft lesions and 15 (6.8%) had both arterial and venous graft disease. 64.1% underwent angiography by left radial approach, followed by right radial (24.2%), right femoral (11.2%) and left ulnar (0.4%). As for management strategy, 66.7% were recommended revascularization by PCI, 31.1% were treated with optimal medical therapy and 5 2.3% were referred for re-do CABG. In total, 41.9% of patients underwent PCI, of which 82.8% were ad hoc and 17.2% were elective procedures during index admission. Target vessel for PCI was a native coronary artery in 53.8% and a bypass graft in 37.6%. In 8.6%, PCI was performed to both a native coronary and a graft.

Conclusions: NSTEMI was the most common ACS presentation in post-CABG patients. Women presented more frequently with unstable angina. Venous grafts were the predominant culprit vessel. PCI remains the most frequently utilized strategy for revascularization, with native artery PCI taking precedence over grafts.

Disclosures: F. A. Cader *Nothing to disclose.* M. Haq *Nothing to disclose.* S. R. Khan *Nothing to disclose.*

I-34 | Reducing Contrast-Induced Acute Kidney Injury in a Cardiac Catheterization Laboratory: A Quality Improvement Initiative

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Background: Contrast-induced acute kidney injury (CI-AKI) occurs in 3-19% of patients undergoing cardiac catheterization and is associated with adverse clinical outcomes, elevated mortality rates, prolonged hospitalization, and increased healthcare costs. Patients with chronic kidney disease are at high risk for CI-AKI. We describe the development and results of an ongoing quality improvement initiative implemented at a hospital cardiac catheterization laboratory.

Methods: The initiative involved nurse education, a patient care protocol, and regular interdisciplinary review of real-time outcome data. The protocol included a maximum contrast media volume (CMV) threshold based on patient baseline kidney function, periprocedural hydration, and use of a medical device to monitor and minimize CMV for high-risk patients.

Results: From January 2018 through March 2019, 1956 patients underwent coronary angiography procedures performed by 10 physicians. The 1956 procedures included 1123 (57%) diagnostic cases and 833 (43%) percutaneous coronary intervention (PCI) cases. The full CI-AKI reduction protocol was followed in 1789 (91%) cases. After

implementation of the protocol, the incidence of CI-AKI among patients undergoing PCI during the first quarter of 2019 declined to a risk-adjusted rate of 4.98%. Initial outcomes 9 months after implementation of the protocol demonstrated a 43% relative reduction in the rolling 4-quarter CI-AKI rate among PCI cases and a 30% relative reduction in the quarterly CI-AKI rate among diagnostic cases compared with comparable rates from the prior year.

Conclusions: These findings highlight the effectiveness of a systematic quality improvement program in reducing the incidence of CI-AKI among patients undergoing PCI or diagnostic coronary angiography.

Disclosures: A. Cameron *Nothing to disclose*. T. J. Espinosa *Nothing to disclose*.

I-35 | Cost ineffective mortality reductions for lung cancer with PCI: Propensity score and machine learning supported nationally representative case-control analysis of 30 million+ hospitalizations

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Background: There are no nationally representative studies of mortality and cost effectiveness for percutaneous coronary interventions (PCI) and lung cancer even considering the high global burden of the co-prevalence diseases of this cancer and coronary artery disease.

Methods: Backward propagation neural network machine learning supported and propensity score adjusted multivariable regression was conducted for the above outcomes in this case-control study of the 2016 National Inpatient Sample. Age, race, income, geographic region,

cancer metastases, mortality risk, the likelihood of undergoing PCI (in addition to length of stay [LOS] for cost), and the complex survey design were adjusted for in regression models to produce nationally representative estimates. The Centers for Disease Control and Prevention (CDC) method for cost effectiveness ratio (CER) analysis was performed.

Results: Of the 30,195,722 hospitalized patients meeting criteria, 1.88% had lung cancer (the 3rd most prevalent primary malignancy) of whom 1.94% underwent PCI including 0.82% with metastases. In propensity score adjusted regression among all patients, the interaction of PCI and lung cancer (versus not having PCI) significantly reduced mortality (OR 0.64, 95%CI 0.53-0.78; $p < 0.001$; likelihood: -0.87%) while increasing LOS (Beta 0.88 days, 95%CI 0.64-1.11; $p < 0.001$) and total cost (Beta \$37,769.87, 95%CI 34,491.53-41,048.22; $p < 0.001$). Among lung cancer patients, mortality was significantly reduced by PCI (OR 0.68, 95%CI 0.56-0.83; $p < 0.001$) and being in the 4th versus 1st income quartile (OR 0.90, 95%CI 0.83-0.97; $p = 0.004$) and Mid Atlantic, East North Central, Mountain, and Pacific regions (all $p < 0.05$) compared to New England. PCI non-significantly reduced mortality for metastatic patients (OR 0.77, 95%CI 0.54-1.10; $p = 0.148$). 71 extra lung cancer patients' lives were saved with PCI for a net national cost of \$4.82 billion million for a CER of \$67.93 million per averted death.

Conclusions: This novel nationally representative study suggests PCI reduces inpatient mortality for lung cancer patients despite high costs, while having geographic disparities in outcomes.

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I-36 | Predictive Value of Triiodothyronine in Long-term Outcomes of Left main and/or three-vessel Disease in Patients with Acute Myocardial Infarction

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Table 1 Baseline characteristics

	Low T3 group (n = 196)	High T3 group (n = 604)	P value
Age, yrs	63.63 ± 10.41	56.11 ± 10.67	<0.001
Male, n(%)	141 (71.9)	523 (86.6)	<0.001
BMI, kg/m ²	26.06 ± 2.83	25.95 ± 3.26	0.669
SBP, mmHg	122.03 ± 18.03	123.58 ± 17.18	0.325
LVEF, %	58.00(50.00, 62.00)	60.00(55.00, 63.93)	0.001
CK-MB, ng/ml	14.00 (9.00, 63.50)	11.00(8.00, 15.00)	<0.001
eGFR, ml/min/1.73m ²	80.83 (66.43, 95.16)	96.11 (85.52, 104.10)	<0.001
TSH, µU/ml	1.27 (0.71, 2.76)	1.72 (1.08, 2.52)	0.006
T4, µg/ml	7.42 ± 1.82	9.21 ± 1.94	<0.001
FT4, ng/dl	1.08 ± 0.21	1.18 ± 0.18	<0.001
T3, ng/ml	0.73 (0.64, 0.78)	1.06 (0.95, 1.20)	<0.001
FT3, pg/ml	2.34 (2.05, 2.67)	2.89 (2.64, 3.14)	<0.001
Clinical history, n(%)			
Diabetes mellitus	74 (37.8)	185 (30.6)	0.064
Hypertension	141 (71.9)	364 (60.3)	0.003
Dyslipidaemia	130 (66.3)	366 (60.6)	0.151
Current smoker	107 (54.6)	415 (68.7)	<0.001
Previous MI	20 (10.2)	52 (8.6)	0.498
Previous PCI	70 (35.7)	118 (19.5)	<0.001
Previous CABG	12 (6.1)	13 (2.2)	0.009
Clinical presentation, n(%)			
STEMI	147 (75.0)	430 (71.2)	0.302
NSTEMI	49 (25.0)	174 (28.8)	0.302
Killip class ≤ II	24 (12.2)	33 (5.5)	0.001
Angiographic and procedural characteristics			
SYNTAX score	18.05 ± 9.60	15.77 ± 8.27	0.001
Left main	8 (4.1)	16 (2.6)	0.335
Total occlusion	81 (41.3)	387 (63.9)	0.174
primary PCI	79 (40.3)	98 (16.2)	<0.001
Staged PCI	39 (19.9)	139 (23.0)	0.362
stent implantation	171 (87.2)	569 (94.2)	0.001
IABP use	20 (10.2)	14 (2.3)	<0.001
Complete revascularization	52 (27.5)	196 (32.9)	0.166
Medical administration			
Aspirin	192 (98.0)	597 (98.8)	0.357
Clopidogrel	193 (98.5)	597 (98.8)	0.684
Statins	182 (92.9)	581 (96.2)	0.053
beta-blockers	174 (88.8)	560 (92.7)	0.082
ACEI/ARB	129 (65.8)	436 (72.2)	0.089

Data are presented as n (%), mean ± Standard deviation or median (interquartile range). Complete revascularization was defined as residual SYNTAX score = 0. T3, triiodothyronine; BMI, body mass index; SBP, systolic blood pressure; HR, heart rate; LVEF, left ventricular ejection fraction; CK-MB, creatine kinase-MB; eGFR, estimated glomerular filtration rate; TSH, thyroid stimulating hormone; T4, thyroxine; FT4, free thyroxine; FT3, free triiodothyronine; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; MI, myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; STEMI, ST-segment elevated myocardial infarction; NSTEMI, non-ST-segment elevated myocardial infarction; IVUS, intravascular ultrasound; IABP, intra-aortic balloon counterpulsation; ACEI, angiotensin-converting enzyme inhibitors; ARB, angiotensin II receptor antagonists.

Table 2 Association between serum T3 level and clinical outcomes

	Low T3 group (n = 196)	High T3 group (n = 604)	Unadjusted HR (95% CI)	P value	Adjusted HR (95% CI)	P value
Death	11 (5.6)	4 (0.7)	8.71(2.77–27.36)	<0.001	5.09 (1.21–21.30)	0.026
Cardiac death	8 (4.1)	4 (0.7)	6.36 (1.92–21.1)	0.003	9.48 (1.87–48.04)	0.007
MACCE	46 (25.5)	94 (15.6)	1.57 (1.11–2.24)	0.012	0.87 (0.58–1.33)	0.525

Data are presented as n (%). MACCE was defined as the composite of all-cause death, myocardial infarction, unplanned target vessel revascularization, stent thrombosis and stroke. Abbreviations: T3, triiodothyronine; MACCE, major adverse cardiovascular and cerebrovascular events.

Background: The prognostic value of triiodothyronine (T3) remains unknown in acute myocardial infarction (AMI) population with left main disease and/or three-vessel disease (LMD/3VD).

Methods: 800 patients with LMD/3VD, who underwent PCI for AMI, were consecutively enrolled throughout 2013. Patients were divided into two groups based on an optimal cut off value of T3 predicting for 2-year mortality. Long-term clinical outcomes were estimated.

Results: During 2-year follow-up, significantly more deaths (5.6% vs 0.7%, $p < 0.001$) and major adverse cardiovascular and cerebrovascular events (25.5% vs 12.5%, $p = 0.011$) occurred in patients with lower T3 level compared with those with higher T3 level. Multivariable Cox hazard analysis showed that a lower T3 level was associated with an increased risk of 2-year mortality (hazard ratio 5.09, 95% confidence interval 1.22–21.30, $p = 0.026$).

Conclusions: Lower levels of total T3 were well correlated with 2-year mortality in AMI patients with LMD/3VD.

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I-37 | Coronary Lesions at Ostial, Mid and Distal Segment Were Caused Separately by Injuries Created in Multilevel Step up Detrimental Flow Dynamics: A Dual Study by Conventional Angiographic Assessment and Machine Learning AI program

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Background: Based on hydraulics principles, coronary lesions are hypothesized to be started by the cavitation phenomenon (explosion of air bubbles) which is seen frequently in domestic or industrial pipes. With distal negative suctioning in diastole, if Coronary Dynamic Pressure (CDP) decreases below Vapor Pressure (VP), bubbles form. During systole, CDP recovers above VP, the bubbles explode which creates jet waves injuring the endothelium, the first step of atherosclerosis process. How could these events be located, recorded and tabulated?

Methods: Patients with stable CAD with single-vessel lesion on angiograms were selected. Their angiograms were reviewed, in which the flow was identified as Type 0: Laminar; Type 1: Peripheral layer of stagnant contrast; Type 2: Retrograde; Type 3: Turbulent; Type 5: Persistent presence of contrast distally (no flow). AI programs were used such as OpenCV, Scikit-Image on Python for automatic segmentation of arteries and DeepVesselNet for predicting the centerline. Angiograms were exported to the Convolutional Neural Network for training AI model. We then used square cells fit with coronary arteries

diameter that will slide based on the centerline. To calculate the flow, the changes in pixel intensity were recorded to determine the type of flow. Calculating the number of pixels was utilized to measure the gap between centerline and borderlines which helps to identify the lesions.

Results: In 150 angiograms, Type 0 flows happened more at the exit of a bifurcation branch. Almost all the stable lesions in the mid-segment were due to Type 1 and 2. The severe and unstable lesions were caused by Type 1,2 and 3 combined. This observation matched with the location of 82% of ruptured plaques. The time length of Type 2 flow lasted more than 30 frames encompassing 2 systoles. The AI protocol could identify the type of flows and lesions.

Conclusions: This is the first time, the matching of the location of ruptured plaques and turbulent flow representing the collision between antegrade flow in diastole and retrograde flow in systole was confirmed. These finding may help to find the precise measures to prevent ACS.

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I-38 | In-Hospital Mortality of Acute Myocardial Infarction in Young Adults (18-44 Years Old): A Nationwide Seasonal and Regional Comparison

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Atlanta VA Medical Center, United States; Kar Man Low, Harbor UCLA Medical Center, United States; Tarang Parekh, George Mason University, United States; Fariah A Haque, Jawaharlal Nehru Medical Center (JNMC), India; Nanush Damarlapally, Coleman College of Health Sciences, United States; Kishorbhai Gangani, Texas Health Arlington Memorial Hospital, United States; Gautam Kumar, Emory University, United States; Rajesh Sachdeva, Morehouse School of Medicine, United States

Background: Acute myocardial infarction (AMI) in young adults is often excluded from studies and is understudied as compared to older adults. We aim to study the collective seasonal and regional variations in mortality rates in young-onset (18-44 years old) AMI.

Methods: The National Inpatient Sample (2007-2014) was queried to identify in-hospital mortality in young-onset AMI by utilizing suitable ICD-9 codes. We further analyzed the averaged mortality rates in different regions (West, Midwest, South, and Northeast) and seasons (winter, spring, summer, and fall) over 8 years by using descriptive statistics.

Results: Out of 255,222 young-onset AMI cases, 4140 (1.6%) experienced all-cause in-hospital mortality. Winter season demonstrated the highest average mortality rate of 1.8% across all regions in the US. West region observed the highest mortality rate of 2.2% in winter and summer. In comparison, Northeast region has the lowest rate of 1.6% in winter and 1.1% in summer. The opposite is observed during spring and fall seasons, with higher mortality rates in Midwest and South regions (Figure 1).

Conclusions: Our study confirms a seasonal pattern in mortality even in young-onset AMI cases, with winter being the deadliest season. The fact that the West region registered the highest mortality as

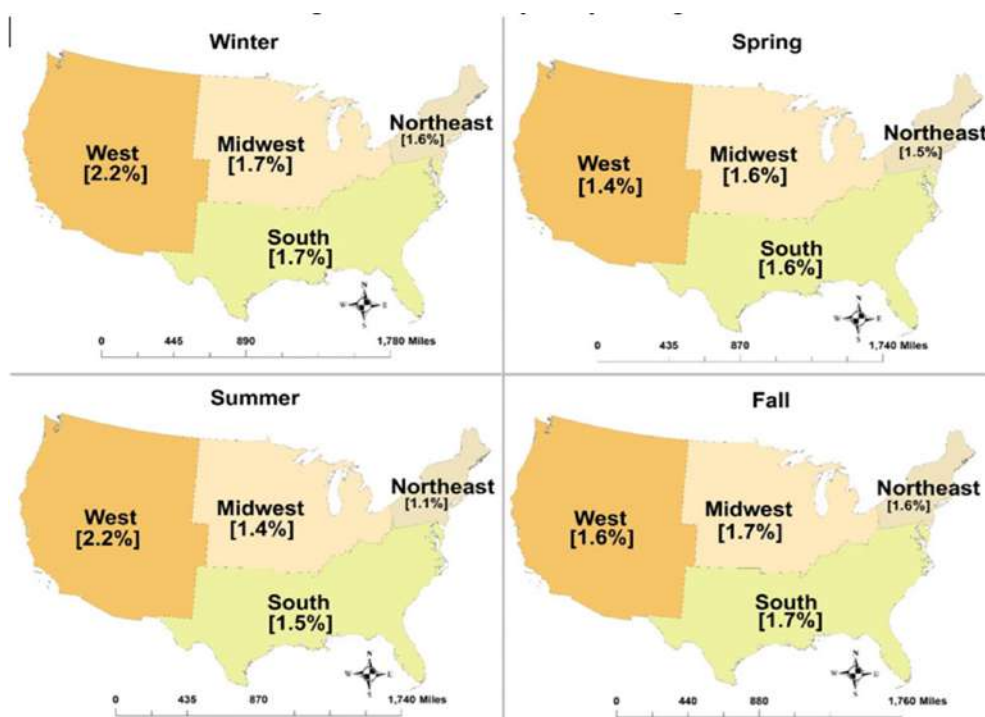


Figure 1

compared to the lowest in Northeast in both winter (2.2% vs 1.6%) and summer (2.2% vs 1.1%) suggests that not just winter, but extreme weather may be associated with higher mortality in young-onset AMI as well.

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I-39 | Young Patients with ST-Elevation Myocardial Infarction – An Assessment of Risk Factors and Peri-Procedural Outcomes

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Background: Advances in prevention of cardiovascular disease have resulted in an overall reduction in the incidence of cardiovascular (CV) events and its associated morbidity and mortality. However, recent data has revealed that the rates of events has not decreased in young patients. Thus, we focused on risk factors and outcomes for index ST-elevation myocardial infarction (STEMI) in young patients as compared to older patients.

Methods: Patients in the Northern New England (NNE) Research Network who presented with STEMI and underwent percutaneous coronary intervention (PCI) from 2013-2017 were included. Age was stratified as ≤ 45 vs ≥ 46 years. Baseline characteristics, comorbidities, procedural complications, including mortality, stroke and myocardial infarction were compared between the two groups. All variables were categorical and were analyzed using chi-square test. Significance was set at two-sided $p < 0.05$.

Results: Of all patients who presented with STEMI, 8.4% were ≤ 45 . The younger cohort was significantly more likely to be male (77.9% vs 72.4%, $p = 0.01$), to have a higher body surface area ($p < 0.001$) but significantly less to have risk factors for coronary artery disease, including diabetes (22.7% vs 17.9% $p = 0.02$), COPD (10.4% vs. 3.9% $p < 0.001$), PVD (12.0% vs. 2.6% $p < 0.001$), CHF (6.4% vs. 2.6% $p < 0.001$), prior CVA (7.7% vs. 1.1% $p < 0.001$), prior CABG (5.2% vs. 1.1% $p < 0.001$) and prior PTCA (20.0% vs. 11.9% $p < 0.001$). One vessel coronary disease was more likely in the younger cohort (79.4% vs. 61.5%, $p < 0.001$). Although there was no difference in post-procedural stroke or MI between the two groups, in-hospital mortality was significantly higher in older patients (3.0% vs 0.6%, $p = 0.01$).

Conclusions: In this observational study, we show that younger patients with STEMI are more likely to have one-vessel coronary artery disease and have less comorbidities. Importantly, they are 5 times more likely to survive their hospitalization compared to the older cohort, likely due to lower prevalence of comorbidities. More

data is needed to evaluate long term cardiovascular outcomes in younger patients presenting with STEMI.

Disclosures: J. Frampton *Nothing to disclose*. S. Henkin *Nothing to disclose*.

I-40 | Shock in Acute Myocardial Infarction Patients, is Prior Coronary Bypass Surgery Patients a Marker of Worse Outcome?

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Background: Cardiogenic shock (CS) in patients with acute myocardial infarction (AMI) is a marker of worse prognosis with extremely high mortality rates. We assessed the impact of prior revascularization by either coronary artery bypass graft surgery (CABG) or percutaneous coronary intervention (PCI) on in-hospital outcomes of AMI patients with CS undergoing primary PCI.

Methods: Between 1/2010 and 5/2019, a total of 1,170 patients were diagnosed with AMI and CS, defined by New York State Percutaneous Coronary Interventions Reporting System (PCIRS) as acute and persistent systolic blood pressure < 80 mmHg on mechanical or pharmacological support. Baseline clinical, angiographic and procedural characteristics, as well as in-hospital outcomes were prospectively collected among all patients undergoing primary PCI as part of the New York State PCIRS data collection.

Results: There were no significant baseline differences between the two groups. Patients with a prior CABG were older and had a history of heart failure (Table). There was a trend towards higher mortality rates in post CABG patients but longer length of stay in post PCI patients. The combined endpoint of death, reinfarction, acute kidney failure requiring dialysis or stroke (MARCCE) was numerically higher in post CABG patients but did not reach statistical significance.

Table 1

	Prior PCI (n=88)	Prior CABG (n=29)	p value
Age	67±12	69±10	0.04
Male (%)	66 (75)	23 (79)	0.22
Hypertension (%)	76 (88)	27 (93)	0.90
Dyslipidemia (%)	79 (90)	27 (93)	0.84
Congestive Heart Failure (%)	24 (27)	15 (52)	0.02
IABP/Impella (%)	15 (17)	4 (14)	0.56
TIMI Major Bleed (%)	22 (25)	5 (17)	0.38
Acute Kidney Injury/Dialysis (%)	3 (3.4)	2 (6.9)	0.63
Stroke (%)	1 (0.8)	0	0.93
In-hospital mortality (%)	17 (19)	10 (35)	0.09
MARCCE (Death/MI/AKI/CVA) (%)	39 (44)	16 (55)	0.31
Length of Stay (days)	12.0±16	9.8±8.6	0.07

Conclusions: The results of this study show that in patients with AMI and CS undergoing PCI: 1) Patients with a prior history of CABG are usually older at presentation and had a prior history of heart failure; 2) there was a trend to higher in-hospital mortality rates in post CABG patient but MARCCE rates were similar in both groups.

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I-41 | Anomalous Right Coronary Artery With Malignant Course Presenting as Stemi in a Teenage Female

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Background: Coronary anomalies account for 1.3% of cardiac catheterizations. Of these, 8% are anomalous right coronary artery (ARCA). Sudden cardiac death was reported in some cases. We report a case of inferior wall STEMI and ARCA with malignant course arising from the left coronary cusp.

Methods: A healthy 17-year-old female presented with syncope and chest pain while showering after exercise. Inferior-lead ST, troponin, and CK MB were all elevated. Echocardiogram showed normal ejection fraction and minimal inferior hypokinesis. Despite persistent pain, she declined cardiac catheterization. A cardiac MRI confirmed inferior wall infarct and coronary CT angiogram revealed anomalous origin of the right coronary artery arising from the left coronary cusp and coursing intramurally between the great vessels. Surgical unroofing of the right coronary artery and moving of the bifurcation of the pulmonary artery towards the left pulmonary artery proved successful.

Results: An autopsy series of 10 patients with ARCA arising from the left cusp revealed 3 sudden cardiac deaths with ARCA being the only cardiac abnormality on autopsy. The other 7 had no cardiac problems. Cardiac dysfunction was noted in 9 of 31 other patients with this anomaly but the underlying mechanism was not clear.

Conclusions: In ARCA, the ostium of the right coronary artery displays a slit-like orifice and odd angulation that may be exacerbated during exercise, due to aortic expansion, resulting in myocardial ischemia.

Surgical intervention may be warranted to address mortality and morbidity.

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I-42 | Credibility of Risk scores in predicting coronary artery disease severity in non-ST segment elevation acute coronary syndrome patients.

Shady Hussein, Mansoura University, Egypt

Background: Patients with NSTEMI-ACS are at varying risks of death and recurrent cardiac events, early risk stratification plays a central role, different scores are now available based on initial clinical history, ECG, and laboratory tests that enable early risk stratification on admission.

Methods: A prospective study was conducted including 100 patients (age, 45–68 years) with NSTEMI-ACS who were admitted at our hospital from January 2018 to January 2019. The two RSs (TIMI& GRACE) were calculated from the initial clinical history, electrocardiogram, and laboratory values collected and recorded on admission. All patients were subjected to conventional coronary angiography during admission, Patients were divided into two groups: 1) patients with syntax score ≤ 32 (test group, 80 patients) and 2) patients with syntax score > 32 (comparative group, 20 patients). Median follow-up duration was 6 (4–9) days.

Results: Regarding correlation between coronary angiographic severity based on syntax score and the clinical profile based on the two RSs (TIMI&GRACE) in NSTEMI-ACS patients, statistically significant correlation were found between GRACE score and syntax score ($r = 0.789$; $P = 0.001$) with GRACE score accuracy: 94% and negative predictive value (NPV): 98.7%, whereas no statistically significant correlation were found between TIMI score and syntax score ($r = 0.087$; $P = 0.388$) with TIMI score accuracy: 32% and NPV: 73.1%.

Conclusions: In conclusion the GRACE score provides a quick and reliable prediction of CAD severity in NSTEMI-ACS patients, It allows accurate risk estimation, categorizes patients and consequently can help in making accurate therapeutic decisions either with the use of invasive strategies in high risk selected patients or the use of conservative strategies in low risk patients in presence of limited resources.

Disclosures: S. Hussein *Nothing to disclose.*

I-43 | Impaction of early successful primary percutaneous coronary intervention on global left ventricular systolic function in ST elevation myocardial infarction patients

Shady Hussein, Mansoura University, Egypt

Background: primary percutaneous coronary intervention (PPCI) is the standard treatment in patients with ST elevation myocardial infarction (STEMI) achieving a Thrombolysis In Myocardial Infarction (TIMI) flow grade 3 in 90% of patients, However, favorable outcomes with PPCI may be attenuated by intra-hospital and inter-hospital transport delays.

Methods: A prospective study was conducted including 30 patients (age, 22–82 years) with acute STEMI who underwent successful PPCI within 24 hours of presentation at our hospital from February 2018 to May 2019. Patients were divided into two groups: I) Early presenters treated with PPCI within 6 hours of presentation (test group, 19 patients) and II) Late presenters treated with PPCI after 6 hours up to 24 hours of presentation (comparative group, 11 patients). Trans-thoracic echo (TTE) with assessment of left ventricle EF (LVEF), wall motion score (WMS) and wall motion score index (WMSI) was performed to all patients in the first day of presentation, 1 month and 2 months interval. Median follow-up duration was 2 months.

Results: Regarding TTE follow up (at presentation, 1 month and 2 month) of LVEF, WMS and WMSI, There was statistical significant difference between the two groups, The early group showed improved EF (at presentation 44.74% vs 38.54%; $P = 0.005$, 1 month follow up 59.89% vs 45.63%; $P < 0.001$ and 2 months follow up 60.16% vs 47.73%; $P < 0.001$), improved WMS (at presentation 24.26% vs 29.27%; $P = 0.003$, 1 month follow up 17.21% vs 25.18%; $P < 0.001$ and 2 months follow up 17.05% vs 24.36%; $P < 0.001$) and improved WMSI (at presentation 1.52% vs 1.83%; $P = 0.002$, 1 month follow up 1.07% vs 1.57%; $P < 0.001$ and 2 months follow up 1.06% vs 1.52%; $P < 0.001$) than the late group.

Conclusions: In patients with STEMI treated by PPCI, prolonged ischemic time is associated with impaired myocardial function and perfusion and larger infarct size even after opening of epicardial artery due to distal embolization and impaired myocardial perfusion Therefore, all efforts should be made to shorten the delay to reperfusion in order to achieve better myocardial perfusion.

Disclosures: S. Hussein *Nothing to disclose.*

I-44 | Thirty-Day Readmission Rates and Causes After Takotsubo Syndrome With or Without Malignancy: A Nationwide Readmissions Database Analysis

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Background: Readmission after Takotsubo syndrome (TTS) in patients with malignancy has not been fully described. We sought to examine

30-day readmission rates and cause of readmissions of TTS patients with or without malignancy.

Methods: The Nationwide Readmissions Databases (2010 to 2014) were queried to identify and compare baseline characteristics and outcomes in hospitalization for TTS with and without malignancy. Primary outcome was the frequency of 30-day readmission.

Results: We identified 61,588 hospitalizations for Takotsubo syndrome. Mean age was 70.6 ± 0.2 in TTS patients with malignancy ($n = 7,542$, 12.2%) and 66.1 ± 0.1 in those without malignancy ($n = 54,041$, 87.8%). Female patients were predominant in both TTS patients with malignancy (86.2%) and without malignancy (89.2%). Mortality during the index admission was higher in TTS with malignancy compared with those without malignancy (4.1% vs. 2.1%, $P < 0.001$). Thirty-day readmission rate was higher in TTS patients with malignancy than those without malignancy (15.9% vs. 11.0%, $P < 0.001$). TTS patients with malignancy had significantly increased risk of 30-day readmissions compared to those without malignancy (adjusted odds ratio: 1.35; confidence interval: 1.18 to 1.56; $P < 0.01$). In TTS patients with malignancy, 75.5% of readmissions were caused by non-cardiac problems, with infectious problems being most common (20.1%). In TTS patients without malignancy, 68.1% of readmissions were caused by non-cardiac problems, with respiratory problems being most common (12.4%).

Conclusions: In patients hospitalized with TTS, the presence of malignancy was associated with increased risk of 30-day readmissions. Most of 30-day readmissions were attributable to non-cardiac causes although specific etiologies differed between cohorts. These data warrant careful patient-specific management approaches among TTS patients.

Disclosures: S. C. Wong: Boston Scientific Corp.: Advisory Board/Board Member; Medtronic: Advisory Board/Board Member; Boston Scientific Corp.: Advisory Board/Board Member; S. J. Jang *Nothing to disclose.* I. Yeo *Nothing to disclose.* J. W. Cheung *Nothing to disclose.* D. N. Feldman *Nothing to disclose.* H. S. Singh *Nothing to disclose.* R. M. Minutello *Nothing to disclose.* G. W. Bergman *Nothing to disclose.* L. K. Kim *Nothing to disclose.*

I-45 | Long-term Clinical Outcomes for Non-ST Elevation Acute Coronary Syndrome Patients with High-Risk Angiographic Findings undergoing Percutaneous Coronary Intervention

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Background: Coronary disease severity is important for therapeutic decision-making and prognostication among patients presenting with Non-ST Elevation Acute Coronary Syndrome (NSTEMI-ACS). However, long-term outcome in patients undergoing Percutaneous Coronary Intervention (PCI) with High-Risk Coronary Anatomy (HRCA) is still unknown. We aim to evaluate the long-term prognosis of NSTEMI-ACS patients with HRCA.

Methods: NSTEMI-ACS patients undergoing PCI in Fuwai Hospital in 2013 were prospectively enrolled and divided into HRCA and Low-Risk Coronary Anatomy (LRCA) group according to whether angiography complies with the HRCA definition. HRCA was defined as left main disease >50%, proximal LAD lesion >70%, or 2- to 3- vessel disease involving the LAD. Prognosis impact on 2-year major adverse cardiovascular and cerebrovascular events (MACCE) is analyzed.

Results: 3,752 patients belonged to HRCA group, while 1,232 patients belonged to LRCA group. Compared with LRCA group, patients in HRCA group had worse baseline characteristics including higher age,

more comorbidities and worse angiographic findings. Patients in HRCA group had higher incidence of 2-year unplanned revascularization (9.7% vs. 5.1%, $p < 0.001$) and MACCE (13.1% vs. 8.8%, $p < 0.001$). Kaplan-Meier survival analysis showed similar results. After adjusting for confounding factors, HRCA is independently associated with higher risk of 2-year revascularization (HR = 1.636, 95% CI = 1.225 - 2.186, $p = 0.001$) and MACCE (HR = 1.275, 95% CI = 1.019 - 1.596, $p = 0.034$).

Conclusions: In our large cohort of Chinese patients, HRCA is an independent risk factor for 2-year unplanned revascularization and MACCE.

Disclosures: S. Jia *Nothing to disclose*. C. Zhang *Nothing to disclose*. Y. Liu *Nothing to disclose*. D. Yuan *Nothing to disclose*. R. Gao *Nothing to disclose*. Y. Yang *Nothing to disclose*. B. Xu *Nothing to disclose*. Z. Gao *Nothing to disclose*. J. Yuan *Nothing to disclose*.

I-46 | Midterm Outcomes of Ulnar vs. Radial Percutaneous Coronary Intervention in Acute Myocardial Infarction Using Ultrasound Access

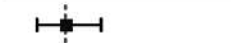
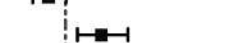
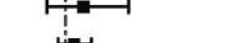
Subrata Kar, Texas Tech University Health Sciences Center El Paso, United States; Aayush Shah, Texas Tech University Health Sciences Center El Paso, United States

Background: Ultrasound is a valuable tool for precise small vessel access. No study has evaluated the midterm outcomes of ultrasound guided ulnar versus radial cardiac catheterization (CC) and percutaneous coronary intervention (PCI) in acute myocardial infarction (AMI).

Methods: We performed an observational prospective study of 188 patients (58±11 years, 123 males, 65%) at an academic medical center from October 2016 to November 2019 (median follow-up of 13 months) and compared the outcomes of ultrasound guided ulnar versus radial artery CC and PCI. Groups were divided into ulnar (n=89, 47.3%) or radial access (n=99, 52.7%). Primary endpoints included death, AMI, stroke, repeat revascularization, stent thrombosis, stent restenosis, and access site complications. Secondary endpoints included the number of access attempts and conversion to femoral access.

Results: In the ulnar group (56±10 years, median follow-up of 13 months, Interquartile Range [IQR] 6, 26) none of the primary endpoints occurred. In the radial group (59±11 years, median follow-up of 13 months [IQR 5, 23]), 4 patients (4.0%) expired (2 cardiac [1 myocarditis] and 2 non-cardiac). In the secondary endpoints, the number of access attempts amongst ulnar or radial was not significantly different ($p=0.872$) nor was conversion to femoral access ($p=0.307$). AMI occurred in 104 patients (55.3%), of which, 82 (78.8%) had PCI. Forty-nine patients in the ulnar group (55.7%) and 55 in the radial group (55.6%, $p=0.367$) had an AMI. No significant difference was found between the number of patients undergoing ulnar versus radial PCI (n=42, 47.2%; n=40, 40.4%; $p=0.367$). Diabetes was present in 49.5% (n=93), hypertension in 79.3% (n=149), and hyperlipidemia in 66.0% (n=124).

Table 4. Multivariable Cox Regression Analysis of HRCA on clinical outcomes

HRCA			
	Hazard Ratio (95% Confidence Interval)		p
All-cause death		0.885 (0.465 - 1.682)	0.708
Cardiac death		1.164 (0.439 - 3.084)	0.760
Myocardial Infarction		0.623 (0.383 - 1.011)	0.055
Revascularization		1.636 (1.225 - 2.186)	0.001
In-stent Thrombosis		1.185 (0.524 - 2.682)	0.683
Stroke		1.194 (0.649 - 2.198)	0.568
Bleeding		1.133 (0.860 - 1.492)	0.375
MACCE		1.275 (1.019 - 1.596)	0.034

HRCA = High-risk Coronary Anatomy; LRCA = Low Risk Coronary Anatomy; MACCE = Major Adverse Cardiac and Cerebrovascular Events.

Adjusted variables: age, diabetes, hypertension, previous stroke, peripheral vascular disease, preprocedural creatinine, preprocedural glomerular filtration rate, left ventricular ejection fraction, preprocedural blood glucose, hsCRP, β -blocker usage, preprocedural SYNTAX score, IVUS usage, IABP usage, PTCA only, BMS implantation, second generation DES implantation, biodegradable polymer DES implantation, other types of stent implantation, HRCA.

Conclusions: Ulnar or radial PCI using ultrasound guidance showed 4 deaths in the radial group (2 non cardiac), while no complications occurred in the ulnar group. Conversion to femoral or the number of access attempts showed no difference between ulnar or radial CC. PCI was performed in 79% of patients with AMI. Ulnar PCI is a safe alternative access and it enables the future use of radial for coronary angiography, PCI, coronary artery bypass grafting, and dialysis access.

Disclosures: S. Kar *Nothing to disclose.* A. Shah *Nothing to disclose.*

I-47 | One Year Outcomes of Ulnar, Dorsal Distal Radial, and Radial Artery Ultrasound Guided Cardiac Catheterization and Percutaneous Coronary Intervention

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Background: Ultrasound access allows visualization for accurate vessel access. No study has evaluated the 1-year outcomes of ultrasound guided ulnar vs. dorsal distal radial (DDR) vs. radial artery cardiac catheterization (CC) and percutaneous coronary intervention (PCI) in acute myocardial infarction (AMI).

Methods: We performed an observational prospective study of 203 patients (58±11 years, 134 males, 66%) at an academic medical center from October 2016 to November 2019 (median follow-up of 12 months) and compared the outcomes of ultrasound guided ulnar, DDR, and radial artery CC and PCI. Groups were divided into ulnar (89 patients, 43.8%), DDR (15 patients, 7.4%), and radial access (99 patients, 48.8%). Primary endpoints included death, AMI, stroke, repeat revascularization, stent thrombosis, stent restenosis, and access site complications. Secondary endpoints included the number of access attempts and conversion to femoral access.

Results: In the ulnar (56±10 years, median follow-up of 13 months, Interquartile Range [IQR 6, 26]) and DDR group (67±18 years, median follow-up of 6 months [IQR 1, 11]), none of the primary endpoints occurred. The radial group (59±11 years, median follow-up of 13 months [IQR 5, 23]) had 4 mortalities (1 lymphocytic myocarditis, 1 suspected pulmonary embolism, 1 metastatic cancer, and 1 AMI with cardiac arrest, multisystem organ failure, and cardiogenic shock). The secondary endpoints of access attempts (p=0.235) and conversion to femoral access was not significantly different amongst groups (p=0.592). A total of 114 patients (56.2%) had an AMI, of which, 90 (78.9%) had PCI. AMI occurred in 49 ulnar (55.1%), 10 DDR (66.7%), and 55 radial patients (56.1%, p=0.703). No significant difference was found in the number of patients undergoing ulnar, DDR, or radial PCI (n=42, 36.8%; n=8, 7.0%; n=40, 35.1%; p=0.505).

Conclusions: Ulnar and DDR access showed no complications, while radial had 4 mortalities (1-year median follow-up). Conversion to

femoral access or the number of access attempts was not different amongst groups. Therefore, ulnar and DDR PCI are safe alternatives and can conserve the radial artery for forthcoming use in coronary angiography, PCI, and/or coronary artery bypass grafting.

Disclosures: S. Kar *Nothing to disclose.* A. Shah *Nothing to disclose.*

I-48 | Efficacy and Safety of Prasugrel versus Ticagrelor for Patients with Acute Coronary Syndrome undergoing Percutaneous Coronary Intervention: An Analysis of 21,386 Patients

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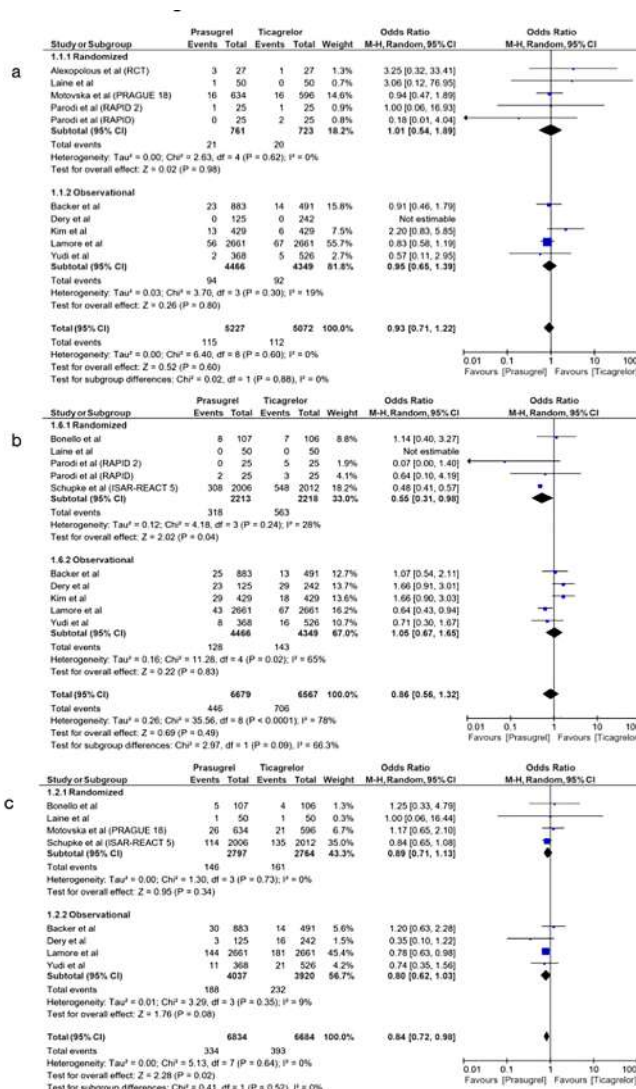


Fig 1. (a) all-cause mortality, (b) any bleeding and (c) MACE at 30-days.

College of Medicine, United States; Ihab Hamzeh, Baylor College of Medicine, United States; Nasser M Lakkis, Baylor College of Medicine, United States; Mahboob Alam, Baylor College of Medicine, United States

Background: In patients presenting with Acute Coronary Syndrome (ACS) and undergoing percutaneous intervention (PCI), comparisons of Prasugrel versus Ticagrelor have shown varying results.

Methods: We performed an aggregate data meta-analysis of 18 studies (7 randomized, 11 observational) comparing the two drugs in patients with ACS undergoing PCI along with sub-group analyses based on study design using random effects model. Our primary outcome was all-cause mortality at 30-days and 1-YEAR follow-up. Secondary outcomes included myocardial infarction (MI), stroke, any bleeding, stent thrombosis and a composite outcome major adverse cardiovascular events (MACE).

Results: Baseline demographics were comparable. All-cause mortality was comparable between the two groups at 30-day (OR 0.93, 0.71-1.22) and 1-year (OR 0.96, 0.61-1.50) follow up (figure 1). The two groups had comparable rates of stroke, stent thrombosis and MI. However, at 30-days, Prasugrel had an advantage over Ticagrelor in-terms of MACE (OR 0.84, 0.72-0.98) and incidence of bleeding in the sub-group analysis of randomized trials (OR 0.55, 0.31-0.98). The advantage in MACE was however not seen at 1-year follow-up. Rates of bleeding showed a trend favoring prasugrel at 1-year but did not reach statistical significance (OR 0.81, 0.65-1.01).

Conclusions: Prasugrel, compared to Ticagrelor has a similar efficacy profile but it might have a relatively better safety profile, however long-term data is needed before robust conclusions can be drawn.

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I-49 | Drug-eluting versus bare-metal stents in older patients with ST-elevation myocardial infarction

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Background: Older patients represent a growing population with an increased risk of cardiovascular disease. More data pertaining to

utilization and clinical outcomes of drug-eluting stents (DES) compared with bare-metal stents (BMS) in ST-elevation myocardial infarction (STEMI) are needed.

Methods: The Nationwide Inpatient Sample database was queried between 2007 and 2014 for all patients aged ≥ 70 who presented with STEMI and underwent percutaneous coronary intervention (PCI). Trend analysis as well as propensity score matching was utilized to evaluate the in-hospital clinical outcomes of DES versus BMS.

Results: There were 179,690 weighted patients aged ≥ 70 who presented with STEMI and underwent PCI (110,806 DES vs 68,884 BMS). Of those patients, there were temporal increased in DES utilization compared with BMS from 19.07% (vs 18.54%) in 2007 to 50.35% (vs 15.59%) in 2014 ($P < 0.0001$). Compared with BMS, DES usage was associated with significantly reduced in-hospital mortality (7.37% vs 11.93%; odd ratio [OR]: 0.59; 95% confidence interval [CI]: 0.54-0.65), fatal arrhythmias (OR 0.83; 95% CI: 0.77-0.90), bleeding requiring transfusion (OR: 0.76; 95% CI: 0.62-0.94), acute kidney injury (OR 0.86; 95% CI: 0.79-0.93), cardiogenic shock (OR: 0.68; 95% CI: 0.68-0.74), without increased risk of vascular injury requiring surgery, perioperative infection, or increased average length of stay. Notably, there was an increased hospital costs with DES compared with BMS (30,158 vs 28,357 USD; $P < 0.0001$).

Conclusions: In patients aged ≥ 70 who presented with STEMI, utilization of DES was associated with lower in-hospital mortality rates and demonstrated a similar safety profile compared with BMS.

Disclosures: B. Kheiri *Nothing to disclose*. H. Abubakar *Nothing to disclose*. O. Adegba *Nothing to disclose*. A. Subahi *Nothing to disclose*. E. Akintoye *Nothing to disclose*. Q. Radaideh *Nothing to disclose*. M. Osman *Nothing to disclose*.

I-50 | Fragmented QRS as a prognostic tool in patients with Non-ST elevated Acute Coronary Syndrome

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Background: The presence of fragmented QRS (fQRS) in a resting 12-lead ECG indicates an increased risk of adverse outcomes and has been thought to be a predictor of cardiac events in patients with coronary artery disease. However, its utility as a prognostic tool in patients with Non-ST elevated Acute Coronary Syndrome (NSTEMI) has not been well documented.

Methods: This was a single-center, prospective, observational study in patients presenting with acute onset chest pain and diagnosed as NSTEMI. fQRS pattern was defined as presence of an additional R' or crocheta wave, notching in nadir of the S wave or fragmentation of RS or QS complexes in 2 contiguous leads corresponding to major coronary artery territory. Based on the presence of fQRS pattern on

the admission ECG, these patients were divided into 2 groups (Group1: NSTEACS with fQRS and Group 2: NSTEACS without fQRS). All patients were followed up for 18 months and all major adverse cardiac events (MACE) were recorded.

Results: Of the 290 patients enrolled, 279 completed the study protocol. The mean age was 59.4 ± 11.5 years with a majority of them being males (71%). fQRS pattern was documented in 52/279 (18%) patients. MACE was reported in 39/279 (14%) subjects. Patients in Group 1 had significantly higher frequency of MACE (19/52 (36.5%) vs 20/227 (8.8%); $P=0.001$), greater mean QRS duration (104.7 ± 24.5 vs 92.03 ± 16.7 ; $P=0.001$) and increased serum creatinine levels (1.44 ± 0.62 vs 1.17 ± 0.37 ; $P=0.001$) as compared to Group 2. Multivariate logistic regression analysis identified fQRS (OR:2.3; 95% CI:0.93-6.03; $P=0.046$), Killip Class (OR: 3.05;95% CI:1.72-5.40; $P = 0.001$) and creatinine (OR: 4.38;95% CI:1.74-11.07; $P = 0.002$) to be independent predictor of MACE in these patients.

Conclusions: Presence of fQRS on 12-lead ECG on admission is associated with poor long-term prognosis in patients with NSTEACS.

Disclosures: S. Kunal *Nothing to disclose*. V. Pathak *Nothing to disclose*.

I-51 | Comparative evaluation of different risk scores for prediction of contrast induced nephropathy in patients with Acute Coronary Syndrome

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Background: Contrast induced nephropathy (CIN) continues to be a key complication of percutaneous coronary intervention (PCI). CHA2DS2-VASC has recently been used to predict occurrence of CIN in patients with acute coronary syndrome (ACS) undergoing PCI. This study aims to compare the various risk scores predicting CIN.

Methods: A total of 410 patients with ACS undergoing PCI were enrolled in this study. A detailed clinical history, risk factor assessment, renal function tests and contrast volume exposure were documented. In these patients, four CIN predicting risk scores viz. CHA2DS2-VASC, Mehran, Chen and ACEF-CIN scores were computed. Based on occurrence of CIN (defined as: elevation of serum creatinine ≥ 0.5 mg/dL or $\geq 25\%$ increase in baseline serum creatinine levels within 48 hrs after PCI), these patients were divided into two groups: Group A (patients with CIN) and Group B (patients without CIN). Receiver operating characteristic (ROC) curve analysis was done for comparative evaluation of various risk scores for prediction of CIN.

Results: Of the 410 patients enrolled, CIN was reported in 55 (13.4%) [Group A]. Patients in Group A had significantly greater frequency of hypertensives and diabetics with a lower left ventricular ejection fraction and higher IABP usage. ROC curve analysis showed that Mehran

score had the best predictive ability for CIN (AUC: 0.90,95% CI 0.85-0.94) followed by CHA2DS2-VASC score (AUC: 0.84,95% CI 0.78-0.90). Chen score (AUC: 0.66, 95% CI 0.57-0.75) and ACEF-CIN score (AUC: 0.65, 95% CI 0.57-0.73) had moderately good predictive ability for CIN. A CHA2DS2-VASC score ≥ 3 had a sensitivity of 91% and a specificity of 62% to predict CIN.

Conclusions: CHA2DS2-VASC and Mehran scores were the best predictors of CIN in patients with ACS as compared to the Chen score and ACEF-CIN score.

Disclosures: S. Kunal *Nothing to disclose*. V. Pathak *Nothing to disclose*. S. M. Sharma *Nothing to disclose*. A. Chaudhary *Nothing to disclose*.

I-52 | Age-Stratified Sex Disparities in Care and Outcomes in Patients with St-Elevation Myocardial Infarction

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Background: Women are under-treated and have worse outcomes than men after acute myocardial infarction. We conducted a comprehensive and contemporary examination of the age-stratified differences between women and men hospitalized with ST-elevation myocardial infarction (STEMI) with respect to baseline comorbidities, reperfusion and revascularization therapies, and in-hospital mortality and complications.

Methods: Using the National Inpatient Samples (NIS) registry, we evaluated 1,260,200 hospitalizations for STEMI between 2010-2016, of which 32% were for women. The age-stratified sex differences in care measures and mortality were examined. Stepwise multivariable adjustment models including baseline comorbidities, hospital characteristics, and reperfusion and revascularization therapies were utilized to compare measures and outcomes across different age subgroups.

Results: Overall, women with STEMI were older than their male counterparts and had more comorbidities. They were less likely to receive fibrinolytic therapy, percutaneous coronary intervention (PCI), and coronary artery bypass surgery (CABG). Lower adjusted rates of PCI and CABG were also observed among women with STEMI across all age subgroups. Overall, women had higher unadjusted in-hospital mortality, which persisted after multivariable adjustment (11.1% vs. 6.8%; adjusted OR 1.039, 95% CI: 1.003-1.077). The unadjusted difference in in-hospital mortality was found across all age subgroups. However, the age-stratified differences in mortality became non-significant after multivariable adjustment to account for differences in revascularization, except among STEMI patients age 19-49 years (women vs. men: 3.9% vs. 2.6%; adjusted OR for in-hospital mortality of 1.259, 95% CI: 1.083-1.464).

Conclusions: In the current era, women still received less reperfusion and revascularization therapies after STEMI, with higher in-hospital mortality and complications, compared to men. The sex disparities in revascularization after STEMI were observed across all age subgroups. Younger women with STEMI, in particular, experienced higher adjusted in-hospital mortality compared to men.

Disclosures: J. Liu *Nothing to disclose*. A. Elbadawi *Nothing to disclose*. I. Y. Elgendy *Nothing to disclose*. M. S. Megaly *Nothing to disclose*. G. Ogunbayo *Nothing to disclose*. C. Krittanawong *Nothing to disclose*. S. S. Virani *Nothing to disclose*. C. Ballantyne *Nothing to disclose*. L. Petersen *Nothing to disclose*. M. Albert *Nothing to disclose*. D. L. Bhatt *Nothing to disclose*. B. Bozkurt *Nothing to disclose*. D. Paniagua *Nothing to disclose*. A. E. Denktas *Nothing to disclose*. M. Khalid *Nothing to disclose*. H. Jneid *Nothing to disclose*.

I-53 | ApoB/A-I ratio predicts lesion severity and clinical outcomes in diabetic patients with acute coronary syndrome

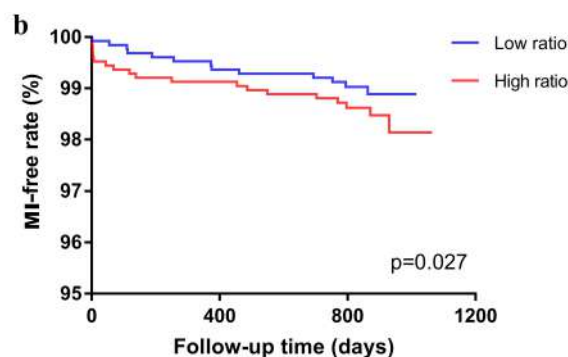
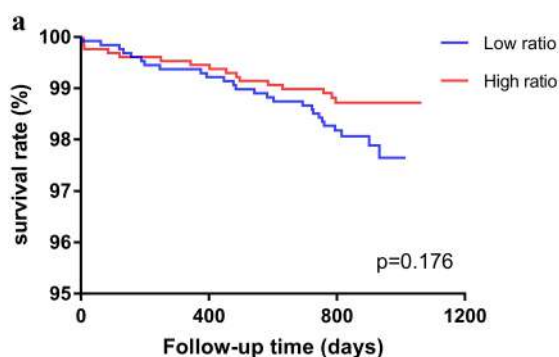
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Background: Dyslipidemia plays a crucial role in acute coronary syndrome (ACS). Paucity data are available about the impact of apolipoprotein (apo) B/A-I ratio on the severity and outcomes in diabetic patients with ACS.

Methods: In 2013, 2563 diabetic patients with ACS were consecutively included. They were divided into two groups based on apoB/A-I ratio on admission: <0.63 (n=1279, 49.9%) and ≥ 0.63 (n=1284, 50.1%). Angiographic characteristics were determined by SYNTAX score (SS).

Results: Patients with high apoB/A-I ratio had fewer comorbidities, but more glucose and lipid abnormalities. High apo ratio was associated with more onset of acute myocardial infarction (MI) and higher rates of intermediate-high SS ($p < 0.05$). Multivariable logistic regression analysis showed that apo ratio (OR 1.34, 95% confidence interval 1.04-1.73, $p = 0.024$), acute MI, and glomerular filtration rate



were independent factors of SS. Moreover, consistent results were found in the subgroups with normal levels of conventional lipid parameters. During a median follow-up period of 878 days, while two groups had similar survival rates, significant differences were found in periprocedural MI (1.0% versus 2.2%, $p=0.019$) and total MI (2.0% versus 3.3%, $p=0.028$). After adjusting confounders, high apoB/A-I ratio remained independently predictive of MI, the risks of which were both doubled during periprocedural period and long term.

Conclusions: ApoB/apoA-I ratio is an independent predictor for complicated lesions and future MI in patients with diabetes and ACS.

Disclosures: Y. Liu *Nothing to disclose*. S. Jia *Nothing to disclose*. D. Yuan *Nothing to disclose*. N. Xu *Nothing to disclose*. Y. Yao *Nothing to disclose*. L. Jiang *Nothing to disclose*. Y. Song *Nothing to disclose*. X. Zhao *Nothing to disclose*. Y. Yang *Nothing to disclose*. R. Gao *Nothing to disclose*. B. Xu *Nothing to disclose*. J. Yuan *Nothing to disclose*.

I-54 | Early Antiplatelet De-escalation After Percutaneous Coronary Intervention: A Bayesian Network Meta-Analysis of Various De-escalation Strategies

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Background: The duration of dual antiplatelet therapy (DAPT) after percutaneous coronary intervention (PCI) with drug eluting stent (DES) remains controversial. We sought to compare the safety and efficacy of the strategy of early de-escalation of DAPT (1-3 months) to monotherapy with either P2Y12 inhibitor or aspirin versus 12 months DAPT after PCI with DES.

Methods: We searched Medline, Embase, Cochrane library and online databases through September 2019 and selected seven randomized controlled trials (35,785 patients). A Bayesian network meta-analysis was conducted with random effects model. The primary endpoints were cardiovascular mortality and total bleeding events.

Results: At a median follow-up of 12-months, compared with 12-months of DAPT, there was no significant difference in cardiovascular mortality between 1-month DAPT followed by P2Y12 inhibitor monotherapy (Hazard ratio [HR], 0.84 [95% credible interval, 0.29-2.43]), 3-months of DAPT followed by P2Y12 inhibitor monotherapy (HR, 0.74 [0.39-1.46]), or 3 months of DAPT (HR, 1.00 [0.54-1.86]) followed by aspirin monotherapy. De-escalation of DAPT to P2Y12 inhibitor monotherapy after 1-month (HR, 0.28 [0.10-0.83]), or 3-months (HR, 0.57 [0.33-0.98]), were associated with significant decrease in total bleeding events, while de-escalation of DAPT to

aspirin after 3-months did not decrease total bleeding events (HR, 0.75 [0.43-1.20]). There were no significant differences in terms of all-cause mortality, myocardial infarction, definite or probable stent thrombosis or stroke among different DAPT strategies.

Conclusions: This network meta-analysis suggests that following PCI with DES, early de-escalation of DAPT (1-3 months) to monotherapy with a P2Y12 inhibitor instead of aspirin might be a safer and equally effective approach compared with 12 months of DAPT.

Disclosures: A. N. Lone *Nothing to disclose*. M. Z. Khan *Nothing to disclose*. M. U. Khan *Nothing to disclose*. M. S. Khan *Nothing to disclose*. S. U. Khan *Nothing to disclose*.

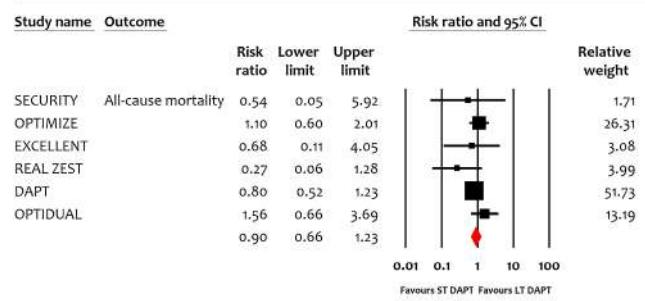
I-55 | Dual Antiplatelet Therapy After Percutaneous Coronary Intervention with Drug-Eluting Stent in Diabetic Patients: A Meta-Analysis of Randomized Clinical Trials

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Background: The optimal duration of dual antiplatelet therapy (DAPT) is unclear in patients with diabetes mellitus who undergo percutaneous coronary intervention (PCI) with drug eluting stent (DES).

Methods: Seven randomized controlled trials comprising diabetic patients were selected using electronic databases of Medline, Embase, Cochrane library through December 2019. Short-term(ST) DAPT (≤ 12 months) vs long-term(LT) DAPT (>12 months) were compared. Meta-analysis was performed using random effects model.

Results: Total of 6904 diabetic patients were included in analysis. At median follow-up of 2 years, short-term DAPT was not associated with higher risk of all-cause mortality (Risk Ratio (RR) 0.90, [95% confidence interval, 0.66-1.23]), cardiovascular mortality (RR, 0.98, [0.67-1.44]), cerebrovascular accident (RR, 1.04, [0.59-1.84]),



myocardial infarction (RR, 1.24 [0.88-1.75]), definite or probable stent thrombosis (RR, 1.68, [0.96-2.96]), target vessel revascularization (RR, 1.14 [0.57-2.29]) or major adverse cardiovascular outcomes (RR, 0.93 [0.54-1.62]) compared with long-term DAPT. Conversely, short-term DAPT was associated with lower risk of major bleeding (RR, 0.58 [0.38-0.90]) compared with long-term DAPT.

Conclusions: In patients with diabetes mellitus who underwent PCI with DES, short-term DAPT was associated with lower risk of bleeding without increasing the risk of mortality or adverse cardiovascular outcomes.

Disclosures: A. N. Lone *Nothing to disclose*. M. U. Khan *Nothing to disclose*. M. Z. Khan *Nothing to disclose*. M. S. Khan *Nothing to disclose*. S. U. Khan *Nothing to disclose*.

I-56 | Long-Term Outcomes in Percutaneous Coronary Intervention of Late Presentation of ST-Elevation Myocardial Infarction

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Background: There is a small proportion of patients who present late after symptom onset during ST-elevation myocardial infarction (STEMI). For patients presenting greater than 12 hours after symptom onset during STEMI, current guidelines do not recommend percutaneous coronary intervention (PCI) unless there are ongoing signs of ischemia.

Methods: We retrospectively identified all STEMI patients from 2011 to 2018 presenting more than 12 hours after symptom onset at our institution. Patients were divided into those who did or did not undergo PCI. The primary outcome was death or heart failure admission after discharge.

Results: Among 67 patients in the cohort (age 63.2 ± 12.5 years, 46% female), gender was similar, but those who underwent PCI were younger (59.9 vs 70.7 years, $p=0.003$). In-hospital and post-discharge adverse events are shown in Table 1. While in-hospital event rates

were similar in the two groups, after discharge from the initial hospitalization, the primary outcome of death or heart failure admission was less frequent in patients who underwent PCI (15% vs 55%, $p=0.0007$) during a median follow-up of 2.3 years with a trend noted for improved survival with PCI ($p=0.06$).

Conclusions: In a contemporary cohort, PCI in patients with STEMI who present more than 12 hours after symptom onset was associated with improved survival free of heart failure admissions. Confirmation of these findings in other cohorts could have an important impact on clinical practice and guideline recommendations.

Disclosures: P. W. McNair *Nothing to disclose*. D. Cook *Nothing to disclose*. E. C. Keeley *Nothing to disclose*. K. Bilchick *Nothing to disclose*.

I-57 | Outcomes with Drug-coated balloons in Acute Myocardial Infarction

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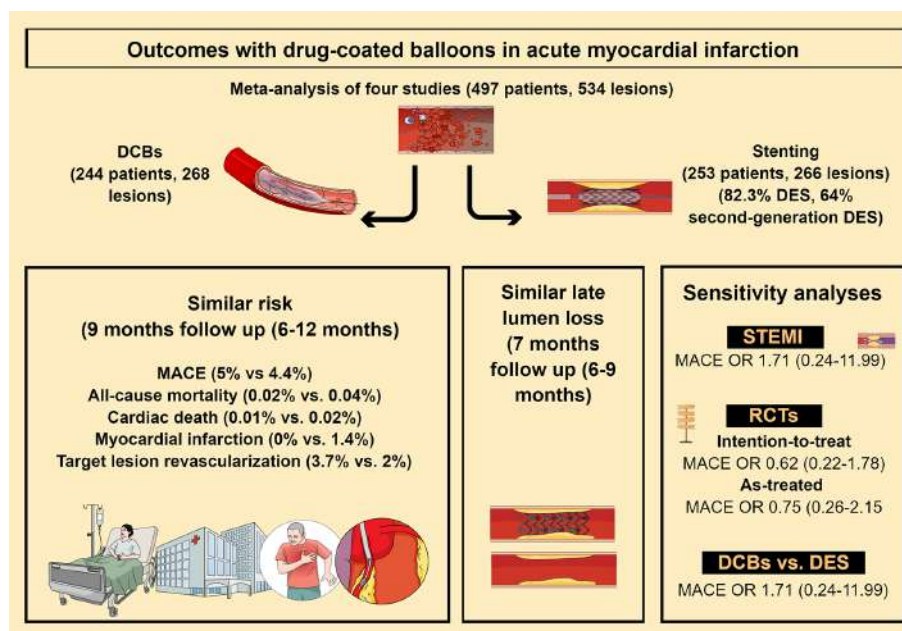
Background: The use of drug-coated balloons (DCBs) in acute myocardial infarction (AMI) has received limited study.

Methods: We performed a meta-analysis of all published studies reporting the outcomes of DCBs vs. stenting in AMI patients.

Results: Four studies with 497 patients (534 lesions) were included (three randomized controlled trials and one observational study). During a mean follow-up of 9 months (range 6-12 months), DCBs

Table 1. Patient variables and outcomes

Variable	Total (n=67)	PCI (n=47)	No PCI (n=20)	p-value
Age (in years)	63.2 (± 12.5)	59.9 (± 11.0)	70.7 (± 12.6)	0.003
Female	31 (46%)	19 (40%)	12 (60%)	0.14
In-hospital LVEF (%)	43 (± 13)	43 (± 14)	42 (± 12)	0.65
Heart failure during hospitalization	15 (22%)	10 (21%)	5 (25%)	0.76
Shock during hospitalization	13 (19%)	9 (19%)	4 (20%)	1.00
In-hospital mortality	3 (4%)	1 (2%)	2 (10%)	0.21
LVEF at <6 month follow-up (%)	45 (± 12)	48 (± 10)	40 (± 14)	0.19
LVEF at >12 follow-up (%)	50 (± 15)	54 (± 14)	43 (± 14)	0.19
Post-discharge mortality	14 (21%)	7 (15%)	7 (35%)	0.064
Post-discharge mortality/heart failure hospitalization	18 (27%)	7 (15%)	11 (55%)	0.0007



were associated with similar risk of major adverse cardiovascular events (5 % vs. 4.4%; OR 1.24, 95% CI: [0.34, 4.51], $p=0.74$, $I^2=35\%$), all-cause mortality (0.02 % vs. 0.04 %; OR 0.77, 95% CI: [0.15, 3.91], $p=0.75$, $I^2=25\%$), cardiac death (0.01 % vs. 0.02 %; OR 0.64, 95% CI: [0.16, 2.64], $p=0.54$), myocardial infarction (0 % vs. 1.4 %; OR 0.18, 95% CI: [0.01, 3.56], $p=0.26$), and target lesion revascularization (3.7 % vs. 2%; OR 1.74, 95% CI: [0.42, 7.13], $p=0.44$, $I^2=17\%$) compared with stenting. During a mean follow-up of 7 months (range 6-9 months), DCBs had similar late lumen loss compared with stenting (mean difference 0.04 mm, 95% CI [-0.21-0.28], $p=0.77$, $I^2=92\%$).

Conclusions: Use of DCBs is associated with similar angiographic and mid-term clinical outcomes as compared with stenting in AMI patients. Larger studies with longer-term follow-up are needed to assess the clinical utility of DCBs in AMI.

Disclosures: J. D. Abbott: Recor: Clinical trial adjudication; Astra Zeneca: Principal Investigator for a Research Study; Bristol Myers Squibb: Principal Investigator for a Research Study; Sinomed: Principal Investigator for a Research Study; Boehringer Ingelheim: Principal Investigator for a Research Study; Abbott Vascular: Principal Investigator for a Research Study; Boston Scientific Corporation: Principal Investigator for a Research Study; S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; M. S. Megaly Nothing to disclose. K. G. Buda Nothing

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I-58 | Non-home discharge after Percutaneous Coronary Intervention for NSTEMI in nonagenarians

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Background: Quality of life post PCI in nonagenarians is not well described in the literature. We sought to assess the predictors of non-home discharges in nonagenarians who had PCI for NSTEMI.

Methods: Using the Nationwide inpatient sample 2016-2017, NSTEMI patients aged 90 and above, who underwent PCI were identified. We excluded patients with STEMI, as well as patients who died during the admission. The final population was then divided into two groups: discharge home, and non-home discharge i.e. short-term hospital, skilled nursing facility, intermediate care facility, or any other facility. We looked at complications, in-hospital outcomes and predictors of non-home discharge.

Results: Out of 6370 discharges, 69.8% were home discharges while 30.1% were non-home discharges. Non-home discharge patients had more females (55.47 vs 45.06%, $p<0.001$), heart failure (HF) (63.02 vs

43.48%, $p < 0.001$), diabetes mellitus (DM) (33.85 vs 26.18%, $p < 0.005$), which were also independent predictors of non-home discharge [Females [OR-1.6 (1.21, 2.1), $p < 0.001$], HF [OR-1.71 (1.27, 2.31), $p < 0.001$], DM [OR-1.35 (1.02, 1.83), $p < 0.03$]]. Complications like cardiogenic shock (6.51 vs 1.38%, $p < 0.001$), blood transfusion rates (7.29 vs 2.36%, $p < 0.001$), acute kidney injury (AKI) (41.9 vs 19.4%, $p < 0.001$), respiratory failure (25 vs 7.23%, $p < 0.001$) were higher in the non-home group. AKI [OR-2.43 (1.75, 3.37), $p < 0.001$] and Respiratory failure [OR-2.34 (1.58, 3.46), $p < 0.001$] were independent predictors of non-home discharge.

Conclusions: A third of nonagenarians with NSTEMI who underwent PCI are discharged to a facility other than home. Post-operative organ dysfunction is an independent predictor of non-home discharge.

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I-59 | Echocardiographic assessment of right ventricular function in patients with inferior wall myocardial infarction and angiographic correlation with proximal right coronary artery stenosis

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Background: Presence of right ventricular infarction imposes a higher risk of adverse events in inferior wall myocardial infarction. The presence of right ventricular infarction imposes an increased risk of shock, arrhythmia and death in inferior wall myocardial infarction

Methods: In this study we attempted to correlate various indices of right ventricular function assessed by echocardiography with the presence of proximal right coronary artery stenosis in patients with inferior wall myocardial infarction. . . . A case-control study is performed on thirty patients with inferior wall myocardial infarction and twenty control enrolled in the study

Results: In this study, tissue doppler systolic annular velocity of the right ventricular free wall was an indicator of the culprit lesion along the right coronary artery in acute inferior wall myocardial infarction. . . Patients who show $S' \leq 0.145$ m/s and the $MPI \geq 0.475$ the lesion was most likely at the proximal right coronary artery before giving the right ventricular branch. The tricuspid annular plane systolic excursion (TAPSE) in patients with inferior wall myocardial infarction was found when it is ≤ 1.95 cm the lesion is most likely at the proximal right coronary artery before giving the right ventricular branch.

Conclusions: The right ventricular function indices assessed by tissue doppler echocardiography become impaired in patients with inferior wall myocardial infarction when the lesion occur in the proximal right coronary artery before giving the right ventricular branch which

imposes a high risk of adverse events like shock, arrhythmia and death in inferior wall myocardial infarction

Disclosures: P. H. K. Nashed Sr. *Nothing to disclose*.

I-60 | Clinical outcomes associated with coronary sinus reducer implantation in patients with refractory angina – An updated systematic review

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Background: Coronary sinus (CS) reducer is an emerging novel therapeutic approach for patients with coronary artery disease who are not amenable for revascularization. It is indicated for patients suffering from severe angina refractory to optimal medical therapy.

Methods: We conducted a systematic search on Pubmed, Medline, Cochrane Library, Web of Science for the articles that presented data on the safety and efficacy of the CS reducer in patients with refractory angina from January 2000 through May 2019. The following search terms were used: "Coronary sinus reducer implantation" "CS reducing device." The primary outcome of interest is improvement in Canadian cardiovascular society (CCS) score, which defines the efficacy of the CS reducer.

Results: The above search design resulted in Nine studies (Eight observational studies & One randomized clinical trial) with 370 patients. Implantation was successful in 361/370 (97.5%) patients; failed in 9/370 (2.4%) patients due to unsuitable CS anatomy. CS reducer was effective in 272/344 (79%) patients, measured by overall CCS class improvement. Mean CCS class improved from 3.12 at baseline to 1.8 after a median follow up of 30 months. Improvement in Seattle Angina Questionnaire score, Exercise duration, 6-min-walk test also demonstrated the benefits of the CS reducer. Early (30-day) and Late (90-day) periprocedural complications occurred in 9/370 (2.4%) patients.

Conclusions: The contemporary data on CS reducer device showed impressive device success, reduction in anginal symptoms, low rates of complications. Nonetheless, bigger randomized controlled trials are necessary to explicate its effectiveness.

Disclosures: V. S. K. Pajjuru *Nothing to disclose*. I. Jackson *Nothing to disclose*. A. Thandra *Nothing to disclose*. D. R. Apala *Nothing to disclose*. V. M. Alla *Nothing to disclose*. V. G. Andukuri *Nothing to disclose*. A. Kabach *Nothing to disclose*.

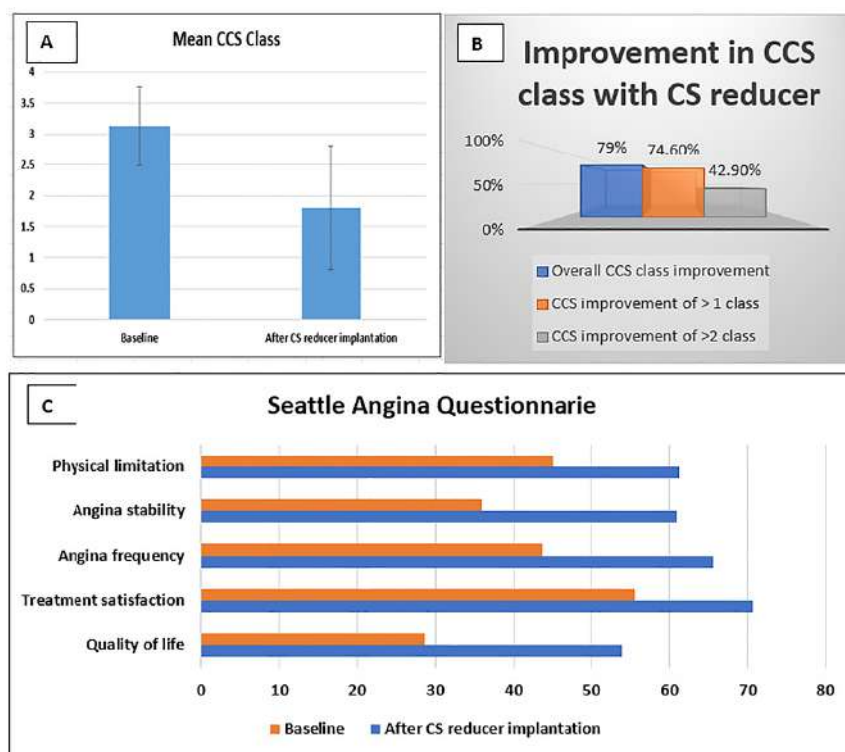


Figure 1. Impact of CS reducer in patients with refractory angina.

Panels A-C. A significant benefit in anginal symptoms was observed after Reducer implantation, as highlighted by **A)** a significantly lower mean CCS class and **B)** a higher proportion of patients in a lower CCS class. **C)** Reduction in physical limitation, decreased angina symptoms, improved exercise tolerance, and quality of life as shown by higher SAQ scores after CS reducer implantation.

I-61 | Predict clinical and bleeding risks on decision of duration of antiplatelet therapy in patients with acute coronary syndrome undergone percutaneous coronary intervention

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Background: Clinical decision making surrounding the optimal duration and combination of dual antiplatelet therapy (DAPT) must be done in acute coronary syndrome (ACS) patients treated with percutaneous coronary intervention (PCI). We have constructed model to provide clinical and bleeding risk prediction tool at follow-up period and changes as time goes on.

Methods: 2,712 ACS patients was enrolled from SMART-DATE trials. 6.5% of patients occurred MACCE (composite of all-cause death, recurrent myocardial infarction, any revascularization and stroke) during 18m follow-up periods. BARC type 2-5 bleeding events occurred at 3.1% of patients. We have identified predictors for the MACCE and Bleeding events using several regression methods. The performance of model was validated within dataset as 80% train set and 20% test set.

Results: SMART model built using 20 predictors (age, BMI, diabetes, systolic BP, hemoglobin, BUN, creatinine, pre-peak troponin, LVEF, hs CRP, glucose, type of stent, transradial approach, size of guiding

catheter, diseased vessel, duration of DAPT 6m or 12m) was used for calculating risk of MACCE and bleeding at 6, 12, and 18 month. Model for MACCE showed 0.802 of area under curve (AUC), 81.2% of sensitivity, 73.7% of specificity, and model for bleeding showed 0.881 of AUC, 85.7% of sensitivity, 75.7% of specificity. We could predict risk of MACCE and bleeding at 6, 12, and 18 month according to the duration of DAPT (6 or 12 month).

Conclusions: SMART model based on over 2700 ACS patients treated with PCI, which provides risk prediction of MACCE and bleeding events upto 18 month. In the context of a comprehensive clinical evaluation process, this tool can support clinical decision making for duration of DAPT

Disclosures: J. S. Park *Nothing to disclose.*

I-62 | Patients with Opioid Use Disorder Have Lower Rate of Percutaneous Coronary Intervention Compared to Their Counterparts: A Propensity Matched Analysis from National Inpatient Sample

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Table 1: Comparison of in-hospital outcomes and treatment strategies in patients with and without opioid use disorders.

Outcomes	No OUD (N=2253)	OUD (N=2253)	Odds Ratio (95% CI) *	P Value
In-hospital complications				
In Hospital Mortality	3.3%	4.2%	1.26(0.92-1.72)	0.13
Cardiogenic Shock	4.4%	5.5%	1.25 (0.95-1.64)	0.09
Cardiac Arrest	2.8%	4.7%	1.73(1.26-2.37)	<0.001
Vascular Complications	0.7%	1.0%	1.44(0.76-2.73)	0.26
Acute Kidney Injury	10.4%	17.4%	1.81(1.52-2.15)	<0.001
Acute Kidney Injury needing hemodialysis	0.4%	0.7%	1.50(0.67-3.3)	0.31
Major bleeding needing transfusion	0.4%	0.4%		0.63
Treatment strategies				
Cardiac catheterization	72.2%	63.2%	0.66(0.58-0.75)	<0.001
PCI	48.5%	37.0%	0.62(0.55-0.70)	<0.001
Non-DES	13.0%	14.8%	1.1(1.97-1.37)	0.08
DES	32.3%	19.5%	0.51(0.44-0.58)	<0.001
CABG	8.6%	8.6%	0.99(0.80-1.22)	0.95

DES= drug eluting stent, PCI= percutaneous coronary intervention, CABG= coronary artery bypass grafting.

*Propensity matched for age, sex, race, chronic heart failure, chronic lung disease, depression, diabetes, hypertension, obesity, valve disorders, smoking, dyslipidemia, known coronary artery disease, prior myocardial infarction, prior percutaneous coronary intervention and prior coronary bypass grafting.

States; Prakash Acharya, The University Of Kansas Medical Center, United States; Kartik Munshi, The University Of Kansas Medical Center, United States; Zubair Shah, The University Of Kansas Medical Center, United States; Kamal Gupta, University of Kansas Hospital, United States

Background: It remains uncertain, if patients with opioid abuse disorder (OUD) receive discrepant care after acute coronary syndrome (ACS).

Methods: National Inpatient Sample was queried from Jan 2006 to Sept 2015 to identify all patients ≥ 18 years admitted with primary diagnosis of ACS. Patients were grouped based on presence/absence of OUD, with exclusion of patient using other illicit drugs. Propensity matching (1:1) was performed for between OUD and non-OUD patients with a caliper of 0.1. Inter-group comparison of revascularization strategies and cardiovascular complications was performed.

Results: Out of 5517248 admissions for ACS, 13030 (0.2%) (unweighted n= 2670) had OUD and yielded unweighted 2253- well matched pairs. Among OUD patients, mean age was 56.9 years with 36.5% females and 48% Medicaid. About 592 (26.3%) of OUD patients presented with ST-elevation myocardial infarction (STEMI). No differences in-hospital mortality, cardiogenic shock or other major complication were noted (Table 1). Cardiac arrest was higher in OUD group vs no OUD (2.8% vs 4.7%; $p < 0.001$). OUD group had lower rate of cardiac catheterization (CC) and percutaneous coronary intervention (PCI) with lower rates of drug eluting stents implantation (DES). No differences in rate of coronary bypass grafting was noted ($p = 0.95$). Similar findings were noted in the NSTEMI cohort, whereas in STEMI cohort, no difference in CC/PCI but higher implantation of non-DES was noted.

Conclusions: About 1 in 10 OUD patients presenting with ACS do not receive CC or PCI during index admission, which may affect their long

term outcomes. Also, rate of implantation of non-DES is much higher in OUD patients.

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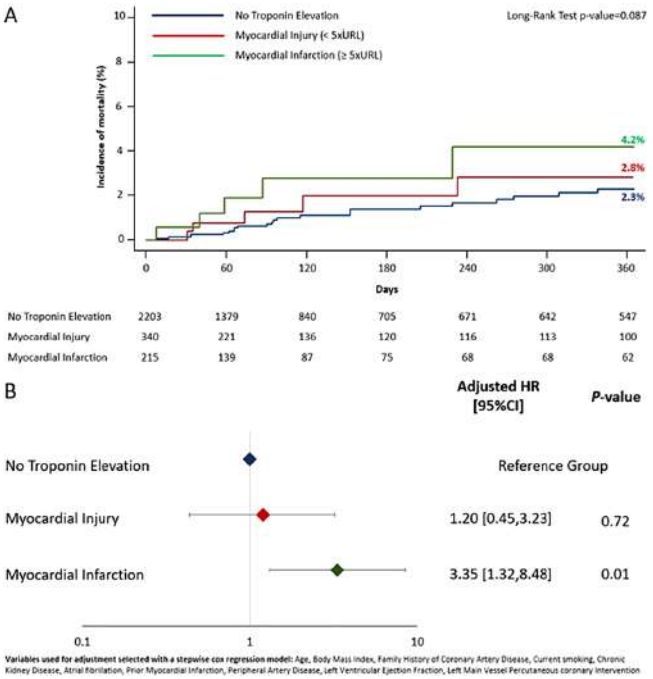
I-63 | Impact of periprocedural myocardial infarction on long term mortality in patients with normal baseline troponin

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Background: Patients undergoing percutaneous coronary interventions (PCI) are at risk for periprocedural myocardial infarction (PMI). However, the prognostic significance of PMI remains unclear since limited real world data are currently available.

Methods: We included patients with a negative baseline troponin undergoing PCI from 2009 to 2017. Those with missing troponin values, ST-segment elevation MI, non ST-segment elevation MI or congestive heart failure on presentation were excluded from the analysis. Patients were stratified into three groups according to troponin-I values 24 hours post procedure. No elevation was the reference group; troponin elevation $< 5 \times$ upper reference limit (URL) was defined as myocardial injury and troponin elevation $\geq 5 \times$ URL as PMI according to the 3rd universal definition of MI. The primary endpoint of the analysis was 1-year mortality.

Results: Out of a total of 2,758 patients, 340 (12.3%) had myocardial injury and 215 (7.8%) PMI. Patients with myocardial injury or PMI had a higher incidence of mortality at 1 year follow-up. After adjusting for potential confounders, PMI (HR 3.35, 95% CI 1.32-8.84; $p = 0.01$) but not myocardial injury (HR 1.20, 95% CI 0.45-3.23; $p = 0.72$) was associated with significantly higher 1 year mortality risk.



Conclusions: Although modest myocardial injury was not associated with adverse events, PMI (troponin-I elevation >5x URL) correlated with 1-year mortality.

Disclosures: R. Mehran: Abbott (St. Jude): Advisory Board/Board Member and Research Funding to Institution; Boston Scientific Corp.: Advisory Board/Board Member; Medtronic: Research Funding to Institution; Claret Medical: Ownership Interests: Stocks, Stock Options; Elixir Medical: Ownership Interests: Stocks, Stock Options; Watermark Research Partners: DSMB Membership Paid to Institution; Orbus Neich: Research Funding to Institution; Novartis: Research Funding to Institution; CSL Behring: Research Funding to Institution; DSI: Research Funding to Institution; BMS: Research Funding to Institution; Beth Israel Deaconess: Research Funding to Institution; Bayer: Research Funding to Institution; Astra Zeneca: Research Funding to Institution; Roivant Sciences Inc: Consulting; Volcano Corporation: Consulting; Sanofi: Consulting; Janssen: Consulting; PLx Pharma: Consulting; Siemens Medical Solutions: Consulting; Medscape: Consulting; G. D. Dangas: Abbott (St. Jude): Advisory Board/Board Member and

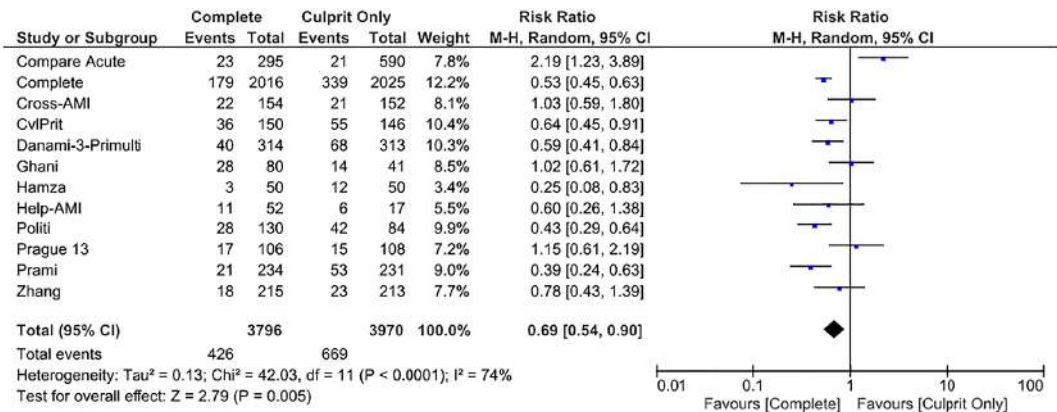
Consulting; Boston Scientific Corp.: Advisory Board/Board Member; Philips (Volcano): Consulting; Medtronic: Ownership Interests: Stocks, Stock Options; AstraZeneca: Advisory Board/Board Member and Principal Investigator for a Research Study; Bayer: Consulting and Principal Investigator for a Research Study; SanofiAventis: Advisory Board/Board Member; Janssen: Advisory Board/Board Member and Principal Investigator for a Research Study; Siemens: Advisory Board/Board Member; U. Baber: Astra Zeneca: Research Funding to Institution; Boston Scientific Corp.: Consulting; S. K. Sharma: Boston Scientific Corp.: Advisory Board/Board Member; Cardiovascular Sysytems Inc: Advisory Board/Board Member; TriReme: Advisory Board/Board Member; A. Roumeliotis Nothing to disclose. D. Cao Nothing to disclose. R. Goel Nothing to disclose. R. Chandiramani Nothing to disclose. J. Nicolas Nothing to disclose. B. Claessen Nothing to disclose. S. Sartori Nothing to disclose. D. A. Power Nothing to disclose. M. Healy Nothing to disclose. J. Suleman Nothing to disclose. P. Krishnan Nothing to disclose. N. Barman Nothing to disclose. J. C. Kovacic Nothing to disclose. A. S. Kini Nothing to disclose.

I-64 | Culprit Vessel Only versus Complete Revascularization in Patients with ST-Segment Elevation Myocardial Infarction and Multivessel Disease: An Updated Meta-analysis

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Background: Multivessel coronary artery disease is often encountered during primary percutaneous intervention (PCI) for patients presenting with ST-segment elevation myocardial infarction (STEMI). Optimal revascularization strategy in such patients remains debated.

Methods: We searched multiple electronic databases for randomized controlled trials (RCTs) comparing complete (CR) versus culprit vessel only (CoR) PCI revascularization strategy in STEMI patients with



multivessel disease. Random effects meta-analysis was conducted to calculate risk ratio (RR) and 95% confidence interval for several end-points.

Results: Twelve RCTs with a total of 7766 patients (CR n=3796, COR n=3970) and median follow up of 30.5 months were included in the final analysis. In terms of efficacy, CR was associated with a lower rate of major adverse cardiovascular events (MACE) [RR 0.69 (95% CI 0.54-0.90) p=0.005] and repeat revascularization [RR 0.50 (0.32-0.79); p=0.003] compared with CoR. There was no significant differences in all-cause death [0.86 (95% CI 0.70-1.06)], cardiovascular death [0.79 (0.60-1.04); p=0.09] and myocardial infarction [0.74 (0.54-1.03); p=0.07] between the two strategies. Major bleeding and contrast induced nephropathy were similar between groups.

Conclusions: Among patients with STEMI and multivessel disease undergoing PCI, a CR strategy is safe and associated with a significantly decreased risk for MACE and repeat revascularizations compared with CoR.

Disclosures: A. Rout *Nothing to disclose.* A. Garg *Nothing to disclose.* C. Sossou *Nothing to disclose.* U. Tantry *Nothing to disclose.* K. P. Bliden *Nothing to disclose.* J. B. Kostis *Nothing to disclose.* P. A. Gurbel *Nothing to disclose.*

I-65 | Interventional cardiology training centres are more likely to receive reperfusion and have lower risk-adjusted in-hospital mortality after STEMI compared with individual cardiac centers

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Background: Primary percutaneous coronary intervention is a fruitful management to reperfuse the heart muscles and relieve angina in case of ST segment elevation myocardial infarction. Prior data have shown a survival advantage with admission to cardiology training centres for acute myocardial infarction. However, most prior studies report data on patients hospitalized over a decade ago.

Methods: We queried the 2012 to 2017 National Inpatient Sample databases to identify all patients aged ≥ 18 years hospitalized with the principal diagnosis of ST-segment elevation myocardial infarction (STEMI). Primary PCI was performed to all patients with drug eluting stents. Multivariable logistic regression models were constructed to compare rates of reperfusion and in-hospital outcomes between patients admitted to interventional cardiology training vs non training cardiac centres.

Results: 15623 patients with STEMI, 7988 (51.13%) were admitted to interventional cardiology training centres. Compared with patients admitted to non training cardiac centres, those at training cardiac centres were more likely to receive reperfusion therapy during the hospitalization (84.6% vs 78.4%; adjusted odds ratio [OR] 1.62; 95% confidence interval [CI], 1.56-1.69; P <.002) and had lower risk-adjusted in-hospital mortality (3.8 % vs 7.1%; adjusted OR 0.82; 95% CI, 0.80-0.84; P <.002). After further adjustment for differences in use of in-hospital reperfusion therapy, the association of training cardiac centres status with lower risk-adjusted in-hospital mortality was significantly attenuated but remained statistically significant (adjusted OR 0.94; 95% CI, 0.92-0.96; P =.003).

Conclusions: Our results revealed that cardiac centres performance for STEMI continues to be better at training cardiac centres with in optimized door to balloon time and better coronary intensive care. Study suggest that patients admitted to training cardiac centres are more likely to receive reperfusion and have lower risk-adjusted in-hospital mortality after STEMI.

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I-66 | The Fibrillating Heart and the Saving ECPPELLA

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Background: In-hospital cardiac arrest (IHCA) has high mortality with survival to discharge rate of only 20%. We present a patient with NSTEMI complicated with persistent VF despite CPR requiring emergent VA-ECMO and Impella CP placement as a bridge to remission.

Case: Methods: A 65-year-old male with HTN and DM presented with chest pain. He was diagnosed with NSTEMI (with elevated troponin of 3.73 ng/ml and LVEF of 5-10%). In the hospital, the patient's NSTEMI was complicated with VF and cardiac arrest. The patient underwent >45 minutes of CPR including multiple shocks and attained ROSC. En route to the cath lab, he lost his pulse again and CPR was restarted. He required another 20 minutes of CPR during which VA-ECMO and Impella CP were placed. LHC showed thrombotic 100% occlusion of dRCA, CTO of oLAD, and 80% OM1 disease. The patient had DES placement in RCA and was intubated. Finally, defibrillation led to intrinsic pulsatile sinus rhythm. Labs deteriorated with Cr 2.4 mg/dL and

AST to 428 U/L. Later, ECMO was successfully decannulated followed by Impella removal after a few days. Labs normalized. LVEF improved to 25-30%. The patient improved clinically, remained in the hospital for 20 days, and was discharged to an acute care facility.

Discussion: Results: Our patient suffered from IHCA from ischemic VF secondary to NSTEMI along with having a baseline of multi-vessel coronary artery disease and low LVEF. Given the higher salvageability opportunity of IHCA (compared to out of hospital cardiac arrest), the decision was made to repeatedly resuscitate, revascularize and mechanically support with VA-ECMO and Impella CP.

Conclusions: Emergent VA-ECMO and Impella placement in patients with in-hospital cardiac arrest with expected good salvageability can provide the circulatory support for organs, the time to perform other therapeutic interventions, and be life-saving.

Disclosures: M. K. Soufi *Nothing to disclose*. S. A. Gilani *Nothing to disclose*. G. Levy *Nothing to disclose*. A. J. DeAnda *Nothing to disclose*. J. A. Hernandez-Montfort *Nothing to disclose*.

I-67 | 'Weekend Effect' in the Management and Outcomes of Acute Myocardial Infarction in the United States, 2000-2016

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Background: There are limited contemporary United States data evaluating the impact of admission day on outcomes in acute myocardial infarction (AMI).

Methods: Adult (>18 years) AMI admissions were identified using the National Inpatient Sample (2000-2016). Inter-hospital transfers were excluded. Timing of coronary angiography (CA) and percutaneous coronary intervention (PCI) relative to the day of admission was identified. Early CA and PCI were defined as those performed on day zero. Outcomes of interest included in-hospital mortality, receipt of early CA, timing of CA and PCI, resource utilization and discharge disposition in weekend vs. weekday admissions.

Results: Of the 9,041,819 AMI admissions, 26.6% were admitted on weekends. Compared to 2000, in 2016, there was an increase in weekend ST-segment-elevation myocardial infarction (STEMI) admissions (adjusted odds ratio [aOR] 1.12 [95% confidence interval {CI} 1.08-1.16]; $p<0.001$) but not non-ST-segment-elevation myocardial infarction (NSTEMI) (aOR 1.01 [95% CI 0.98-1.02]; $p=0.21$). Compared to the weekday admissions, weekend admissions received less frequent CA (59.9% vs. 58.8%), early CA (26.0% vs. 20.8%) and PCI (38.4% vs. 37.6%); $p<0.001$. There was a steady increase in CA and PCI use during the 17-year period. Mean time to CA was higher in the

weekend group (1.2 ± 1.8 vs. 1.0 ± 1.8 days) compared to the weekday group; $p<0.001$. Day of admission did not influence in-hospital mortality (aOR 1.01 [95% CI 1.00-1.01]; $p=0.05$), but weekend admissions had fewer discharges to home (58.7% vs. 59.7%; $p<0.001$).

Conclusions: There were no differences in outcomes of AMI admissions on weekdays and weekends in the United States in the contemporary era despite less prompt CA.

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I-68 | Using Machine Learning to Quantify Mechanisms Causing Rupture of Culprit Lesions in Acute Coronary Syndrome: Length of the Segment and of the Time Depicting Collision of Antegrade and Retrograde Coronary Flow

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Background: Coronary artery disease (CAD) is hypothesized to be caused by cavitation (explosion of air bubbles) which is seen frequently in domestic or industrial pipes. With distal negative suctioning in diastole, if the coronary dynamic pressure decreases below the vapor pressure (VP), bubbles will form. They implode when the coronary pressure recovers > the VP in systole and create jet waves weakening, rupturing the cap of plaques, triggering acute coronary syndrome (ACS).

Methods: Angiograms with culprit lesions (recorded at 15 frames/second) were reviewed frame by frame. The first frame was of the artery completely filled with contrast. The following frames showed the (white) blood moving in. The flow could be LAMINAR, TURBULENT (mixing of blood in white and contrast in black) or RETROGRADE (black column traveling backward). The turbulent flow reflects the collision between antegrade and retrograde flow. The investigations included the direction and duration of flows. The intensity of turbulence was measured by (1) length and (2) the prolonged time of coronary segment with turbulence. The AI programs were trained to Use the U-Net deep learning for medical image segmentation and then build the UNet model based on the previous dataset (Images, ImageMask)

Results: Angiograms of 20 patients showed laminar flow (85%) in diastole. The flow became turbulent at systole with diffuse coarse mixing of black (contrast) and white (blood) at the MID SEGMENT of the left circumflex artery (LCX) or the right coronary artery (RCA). The presence of turbulence matched the location of 86% of ruptured plaques. The time of retrograde flow lasted more than 2 systoles. Special protocols were used successfully to train AI to recognize the lesions, antegrade, retrograde flow, turbulence and the persisting retrograde stagnant area.

Conclusions: This is the first time, the matching of location of ruptured plaques and turbulent flow representing the collision between antegrade flow in diastole and retrograde flow in systole was confirmed and compared between humans and AI. These results may help to understand the genesis and offer precise prevention and treatment in ACS

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I-69 | Does SYNTAX Score Predict Outcomes in STEMI Patients with Cardiogenic Shock?

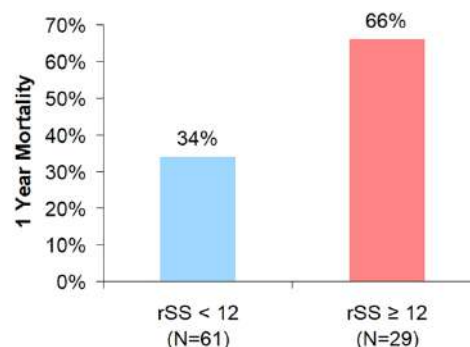
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Brett Hiebert, University of Manitoba Faculty of Medicine, Canada;
Kunal Minhas, University of Manitoba Faculty of Medicine, Canada

Background: ST-segment elevation myocardial infarction (STEMI) carries poor prognosis particularly when the disease is complicated by cardiogenic shock (CS). Baseline SYNTAX score (bSS) and residual SYNTAX score have been studied for predicting mortality in STEMI patients, but the usefulness of these scores in the context of CS has not been well studied. Our study aims to address this gap by examining the predictive value of bSS and rSS in the context of STEMI complicated by CS.

Methods: Files of patients admitted with STEMI complicated by CS at St. Boniface General Hospital from 2010 to 2017 were identified and studied. Pre-procedure demographics and procedural information were analyzed. One-year mortality was the primary outcome of interest.

Results: A total of 90 records were eligible to be included in the study analysis. The overall one-year mortality of the entire cohort was 44%. No association was found between bSS and mortality. rSS of 12 was shown to be the landmark for identifying population at increased risk of death for both short term and long term. rSS remained an independent predictor of mortality in multivariate model when adjusted with other non-cardiac clinical risk factors for mortality.

Conclusions: Findings from our study suggest that failure to achieve rSS<12 is associated with increased risk of death for the context of STEMI complicated by CS.



Disclosures: Y. H. Wei *Nothing to disclose.* B. Hiebert *Nothing to disclose.* K. Minhas *Nothing to disclose.*

I-70 | Vascular complication of distal transradial approach in patients with acute myocardial infarction who underwent primary percutaneous coronary intervention

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Background: The distal transradial approach (dTRA) for coronary catheterisation is a newly introduced alternative to the conventional transradial approach. This study investigated the incidence of vascular complication of the dTRA in patients with acute myocardial infarction (AMI) who underwent primary percutaneous coronary intervention (PCI).

Methods: Consecutive 131 patients with AMI who underwent primary PCI between April 2018 and October 2019 were investigated. The dTRA was used as the primary approach whenever feasible in this study period. The bleeding complication after dTRA and the patency of the radial artery were investigated. The patency of the radial artery was examined using Doppler ultrasound in follow-up period.

Results: Among the 131 AMI patients, 116 patients (88.5%) underwent successful primary PCI using the dTRA. The patients included 83 men (71.6%), and the mean age was 70.4 ± 12.9 years. A 5- or 6-French sheath (conventional or slender) was used in the primary procedure. The average time to achieving hemostasis was 5.0 ± 4.1 hours; TIMI minor bleeding was observed in 2 patients (1.5%) and there were no TIMI major bleeding. Color Doppler sonography of the radial artery was performed in 90 patients with the mean follow-up period of 229 ± 183 days, and radial artery occlusion were not observed in this series.

Conclusions: The application of dTRA is considered to have low incidences of bleeding complication and radial artery occlusion in the patients with AMI.

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COMPLEX PCI & RESTENOSIS (EXCLUDING LEFT MAIN & MULTI-VESSEL INTERVENTION)

I-71 | Effect of the software emulated moving superposition of the coronary tree on fluoroscopy as a guidance tool in imaging of the collaterals in CTO recanalisation

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Background: With the help of the software for superposition of the moving coronary tree on fluoroscopy (Dynamic Coronary Roadmap), we developed a technique that allows the operator to perform PCI of a CTO lesion relying solely on the coronary roadmap of the collaterals from the other coronary artery without the need of additional contrast. The moving structures that are present in both the roadmap and in the live fluoroscopy images are a precise overlay of the coronary vessel tree, the combination of the two moving exactly with the cardiac and beating motion.

Methods: We analyzed 25 patients on which we performed PCI of a CTO. All of them were performed using the dynamic coronary roadmap for the collateral imaging and antegrade wire escalation was the primary crossing technique, regardless of the J-CTO score. Our goal was to enter the distal lumen with the antegrade approach with monocannulation, with the collateral imaging help of the dynamic coronary roadmap. The median age of the patients was 65 years, 16% were females, 56% had previous MI, none of them had previous CABG, 32% had diabetes, 68% had previous PCI, the median Air Kerma was 1183 mGy, median procedure time 77min, median fluoroscopy time 36min, mean contrast volume 180,6ml (min 70ml, max 365ml); 60% were bicannulated, 40% had just radial approach.

Results: Target vessel was LAD (24%), LCX (8%) and RCA (68%). Successful wire passage to the target vessel was obtained in 60%, crossing to the LAD in 100%, to LCX in 0% and RCA in 44%. The median J-CTO score was 1,7; Conversion to retrograde approach was 24%, MACE was 0. Successful recanalisation (RWE and AWE combined) was obtained in 84% of the cases.

Conclusions: DCR guided PCI of a CTO can be considered as a safe alternative to the classical approach with collateral injections from the other coronary artery. The software overlaying of the images on the live fluoroscopy is good and mapping of the collaterals is precise, but the results are best when obtaining cranial projections and when recanalizing LAD, though we struggled to enter successfully antegradely in the RCA. The need of contrast agent injections is minimized in compared to standard bicannulation as well as radiation exposure and in some cases just monocannulation is enough to safely finish the procedure.

Disclosures: J. Avramovic *Nothing to disclose*. M. Mezgec *Nothing to disclose*. G. Vercek *Nothing to disclose*. L. Usaj *Nothing to disclose*. G. Plevnik *Nothing to disclose*. S. Korosec *Nothing to disclose*.

I-72 | Clinical Outcomes of Severely Calcified Focal and Diffuse Lesions Treated with Orbital Atherectomy

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Background: Percutaneous Coronary intervention (PCI) in the setting of coronary artery calcification (CAC) is associated with lower procedural success and higher complication rates. Furthermore, lesion length is a predictor of worse PCI outcomes. To understand the use of orbital atherectomy (OA) in treating calcified coronary lesions of varying length, we compared the safety and efficacy of OA plus DES placement in focal and diffuse coronary lesions.

Methods: Retrospective data was obtained from patients with severe CAC undergoing OA followed by DES placement at IU Health Methodist Hospital from October 2015-December 2018. Data was pooled and patients divided into focal (≤ 24 mm) or diffuse (>24 mm) lesion groups depending on total stent(s) length during PCI. Demographic variables, procedural variables and 30 day MACE rates were then compared between groups.

Results: A total of 200 lesions were analyzed (104 focal and 96 diffuse). There were no statistically significant differences in baseline demographics, medical history or procedural variables between groups. The average stent length for the focal and diffuse groups were 17.8 ± 4.0 mm and 32.9 ± 7.8 mm (range: 25-70mm), respectively ($p < 0.0001$). Radial access was more common in the focal group at 54%, compared to 41%. Non-flow limiting coronary dissections were more common in the diffuse compared to the focal group (8% and 3% respectively). However, no dissections resulted in abrupt vessel closure in either group. Cardiac deaths and 30 day MACE were similarly low in both groups. Vascular/bleeding complications were higher in the diffuse group (14 vs. 7 events, respectively).

Conclusions: This single center, retrospective analysis demonstrates that diffuse, calcified coronary lesions can be safely treated using OA prior to DES placement. While non-flow limiting coronary dissections were more common in treating diffuse lesions, these dissections did

not translate to increased death or 30 day MACE. Vascular/bleeding complications occurred more often when treating patients with diffuse lesions, but femoral access was more commonly used in this patient group. We conclude, lesions of varying lengths can be safely and effectively treated using orbital atherectomy prior to DES placement.

Disclosures: M. H. Bahrami *Nothing to disclose*. G. E. Revtyak *Nothing to disclose*.

I-73 | Acute Kidney Injury following Index versus Staged Percutaneous Coronary Intervention in Acute Coronary Syndrome with Multivessel Involvement: A Meta-Analysis

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Background: The present evidence from randomized control trial(RCTs) suggests the superiority of complete as compared to culprit only revascularization in MI patients with multivessel involvement. Further index revascularization is superior to staged revascularization.

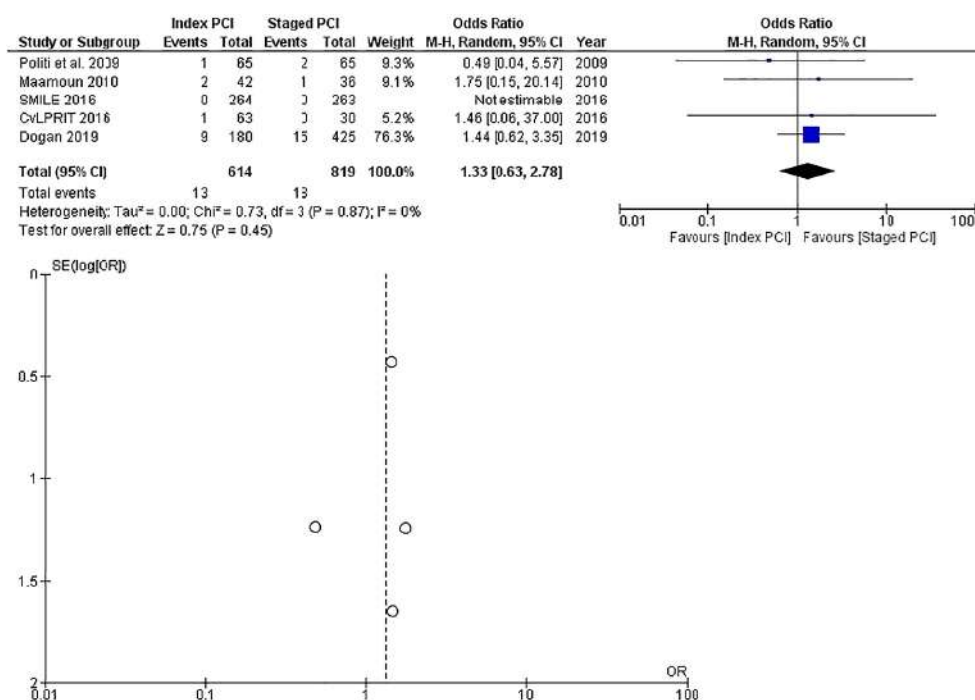
However,with increasing dose of contrast material used during PCI, the rate of AKI increases. Whether staged delivery of contrast material during PCI plays a role in preventing AKI is controversial. Also, AKI is a major complication of PCI associated with extended hospital stay and poor outcomes.

Methods: A systematic search of PubMed/Medline and EMBASE data was performed for all the studies comparing the outcome AKI after index vs staged PCI for multivessel ACS. We calculated comprehensive odds ratio (ORs) and 95% confidence intervals (CIs) using a random-effects model.

Results: We found 3 RCTs, one post hoc analysis (CvLPRIT) and one registry (Dogan) comprising a total of 1433 PCI procedures (614 index and 819 staged PCI) (**Figure 1, Panel A**). The primary outcome was development of AKI. Our study demonstrated that there was no significant difference in the occurrence of AKI between the two groups (OR= 1.33; 95% CI: 0.63-2.78, $I^2 = 0\%$, $P=0.45$). There was no heterogeneity among the included trials. Funnel plot looks asymmetrical which suggests higher than minimal publication bias (**Figure 1, Panel B**).

Conclusions: We couldn't find a significant association between the type of PCI and the risk of developing AKI. Hence, renal complications shouldn't be considered as an important factor while deciding the type of PCI in such patients.

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I-74 | PCI is safe and cost-effective for cancer patients with chronic total occlusion: Propensity score and machine learning augmented nationally representative case-control study of over 30 million hospitalizations

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Background: We sought to produce the first nationally representative analysis of mortality and cost analysis for patients with chronic total occlusion (CTO) of coronary arteries by cancer versus non-cancer.

Methods: Propensity score adjusted and backward propagation neural network machine learning augmented multivariable regression was conducted for the above outcomes in this case-control study of the United States' largest and most current all-payer hospitalized dataset, the 2016 National Inpatient Sample. Regression models were fully adjusted for age, race, income, geographic region, cancer metastases, NIS-calculated mortality risk by Diagnosis Related Group (DRG), and the likelihood of undergoing PCI (in addition to length of stay [LOS] for cost). To produce nationally representative estimates, analyses were also adjusted for the complex survey design.

Results: Of the 30,195,722 adult hospitalized patients, 120,815 (0.40%) had CTO of whom 11.24% had cancer with 22.29% of them with active malignancy. Among CTO patients, the most common cancer types among 36 primary organ sites were prostate (24.45%), skin (16.28%), breast (9.73%), lung (7.92%), and colon (7.70%); the highest mortality was for prostate (18.95%), lung (15.79%), skin (14.74%), bladder (9.47%), and leukemia (8.42%). There were no mortality cases among CTO patients with Hodgkins lymphoma who underwent PCI. In multivariable regression among CTO patients, mortality was not significantly different for patients with cancer versus without (OR 1.00, 95%CI 0.63-1.60; $p=0.996$) or in the sub-group of those with CAD and inpatient PCI (OR 0.83, 95%CI 0.62-1.12; $p=0.227$). Mortality was comparable for all cancer types, except for Hodgkins lymphoma which significantly increased mortality among CTO patients (OR 8.02, 95% CI 1.29-50.00; $p=0.026$), but not if they underwent PCI. LOS and cost were also comparable among CTO patients overall regardless of cancer versus no cancer.

Conclusions: This large nationally representative study suggests PCI can safely be performed in patient for cancer patients regardless of primary organ site without increasing hospital costs, and that there may be a higher CTO burden by primary malignancy.

Disclosures: D. J. Monlezun *Nothing to disclose*. C. Grable *Nothing to disclose*. K. Hoang *Nothing to disclose*. R. Gaiba *Nothing to disclose*. S. Chauhan *Nothing to disclose*. L. Hostetter *Nothing to disclose*. N. Thomason *Nothing to disclose*. R. Jacob *Nothing to disclose*. N. Palaskas *Nothing to disclose*. C. A. Iliescu *Nothing to disclose*.

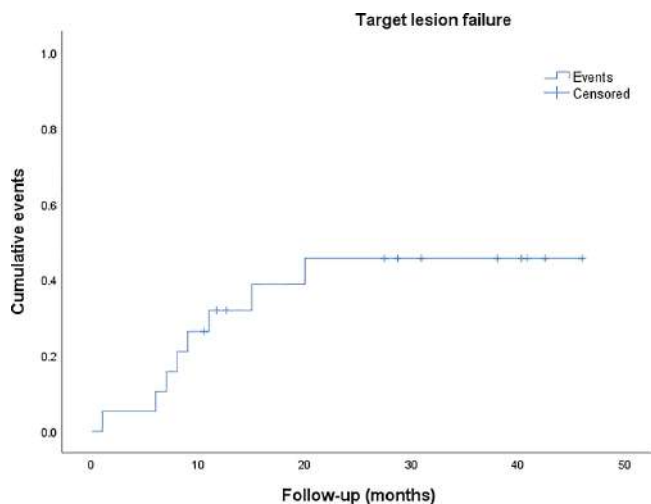
I-75 | Outcomes with combined laser atherectomy and intravascular brachytherapy in recurrent drug-eluting in-stent restenosis

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Background: Recurrent DES-ISR can be challenging to treat. Combined use of laser atherectomy and VBT for this indication has received limited study.

Methods: We report the long-term outcomes of patients with recurrent DES ISR treated with combined VBT and excimer laser atherectomy from January 2014 to September 2018 [target lesion failure (TLF), defined as the composite of clinically driven target lesion revascularization (TLR), target lesion myocardial infarction (MI), and target lesion-related cardiac death].

Results: During the study period, 116 patients (143 lesions) underwent VBT, of which 19 patients (19 lesions) underwent combined laser atherectomy and VBT. Patients were mostly 74% males (74%)



with mean age 64 ± 11 years, 31% had diabetes, and 53% had prior bypass surgery. The target lesions were complex: 63% had at least 3 previous stent layers and 68% had more than 4 prior episodes of ISR. Intravascular ultrasound was used in 52.6%. During a mean follow-up of 30 ± 14 months, the rates of TLF, TLR, and target lesion MI were 42.1%, 42.1%, and 5%, respectively. No patient died.

Conclusions: Combined use of laser atherectomy and VBT is feasible in patients with resistant DES ISR but is associated with high rate of target lesion failure.

Disclosures: P. Sorajja: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member and Consulting; Medtronic: Consulting and Speaker Bureau; Edwards Lifesciences: Consulting; W.L. Gore and Associates, Inc.: Consulting; S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; M. S. Megaly Nothing to disclose. M. Glogoza Nothing to disclose. I. Xenogiannis Nothing to disclose. E. Vemmu Nothing to disclose. I. Nikolakopoulos Nothing to disclose. M. A. Omer Nothing to disclose. L. Willson Nothing to disclose. D. Monyak Nothing to disclose. P. Sullivan Nothing to disclose. L. Stanberry Nothing to disclose. I. J. Chavez Nothing to disclose. M. R. Mooney Nothing to disclose. J. H. Traverse Nothing to disclose. Y. L. Wang Nothing to disclose. A. K. Poulou Nothing to disclose. M. N. Burke Nothing to disclose.

I-76 | Percutaneous Coronary Interventions in Octogenarians with Chronic Total Occlusions

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Background: With increasing revascularization rates of Chronic total occlusions (CTO), several elderly patients are undergoing percutaneous coronary intervention (PCI). We sought to assess age related differences in outcomes in elective revascularization of CTO.

Methods: Using the nationwide inpatient sample 2016-2017, all elective admissions with a diagnosis CTO, who underwent a PCI were identified. Patients who presented with acute coronary syndromes were excluded. They were divided into two groups: age < 80 vs ≥ 80 . Comorbidities, complications, in-hospital outcomes and resource use were assessed. Logistic regression analysis was used to identify independent predictors of in-hospital mortality among the elderly group.

Results: Out of 11,390 patients with CTO who had PCI, 18.7% ($n=2130$) were aged ≥ 80 . Compared to the younger cohort, patients ≥ 80 had a higher prevalence of heart failure (HF) (39% vs 27%, $p < 0.001$), hypertension (56% vs 46%, $p < 0.001$) and chronic kidney disease (CKD) (35.21% vs 22.3%, $p < 0.001$). Post-operative Cardiogenic Shock (CS) (3.52% vs 2.97%, $p=0.55$), acute kidney injury (AKI) (10.8% vs 8.15%, $p=0.07$), Impella use (2.58% vs 1.35%, $p=0.03$) were higher in elderly. Length of hospitalization and procedural costs were comparable between both groups. Rates of In-hospital mortality (4% vs 1%, $p=0.003$), and non-home discharge (9% vs 5%, $p < 0.001$), were higher in elderly. Among the elderly cohort, multivariable logistic regression analysis showed CS: $p=0.02$, AKI: $p=0.03$, as independent predictors of in-patient mortality while HF ($p=0.01$) and Ischemic Stroke ($p=0.03$) were significantly associated with non-home discharge.

Conclusions: PCI for CTO in octogenarians is feasible albeit an increased incidence of complications, in-hospital mortality and a higher likelihood of non-home discharges. Cardiogenic shock, acute kidney injury are independent predictors of in-hospital mortality.

Disclosures: H. Mehta Nothing to disclose. A. K. Okoh Nothing to disclose. S. Singh Nothing to disclose. K. P. Kurpad Nothing to disclose. G. K. Mangat Nothing to disclose. A. Salemi Nothing to disclose. S. Waxman Nothing to disclose.

I-77 | Impact of Obesity on outcomes of cAute Coronary Syndrome patients with Chronic Total Occlusion: Insights from the nationwide inpatient sample 2016-17

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Background: Chronic total occlusion (CTO) is defined as 100% stenosis of a coronary artery for more than three months. CTOs are present in as many as 17% of all patients presenting with acute coronary syndrome (ACS). In this study, we sought to assess the effect of obesity on ACS patients with CTO.

Methods: Using the Nationwide Inpatient Sample (NIS), adults admitted with ACS with an associated diagnosis of CTO during the year 2016 were identified, collectively referred to as ACS-CTO patients.

They were divided into 2 groups - obese (BMI>30) and non-obese (BMI<30). We compared comorbidities, complications, outcomes and interventions between the two groups. Statistical significance was assigned at $P<0.05$.

Results: Out of 12,935 patients hospitalized with ACS-CTO in 2016, 14.2% patients were obese. Obese patients were younger (62.3 vs 67.2 years; $p<0.001$) and were more likely to be females (35.6 vs 28.8%; $p<0.001$). Comorbidities including heart failure, hypertension and diabetes were more common in the obese group. Cardiogenic shock (6.9% vs 9.7%; $p<0.001$) and overall mortality (3.52 vs 5.24%; $p=0.003$) were more common in non-obese group. Fewer patients in the obese group underwent PCI compared to the non-obese group (30.2 vs 32.6%; $p=0.04$).

Conclusions: Although obesity is associated with increased plaque burden and overall risk of coronary artery disease, our study revealed that obese patients with CTO who presented with ACS, had fewer complications and a lower mortality rate compared to non-obese patients.

Disclosures: H. Mehta *Nothing to disclose*. M. Pahuja *Nothing to disclose*. S. Singh *Nothing to disclose*. A. K. Okoh *Nothing to disclose*. S. Amin *Nothing to disclose*. K. Hawthorne *Nothing to disclose*.

Figure A: Comorbidities

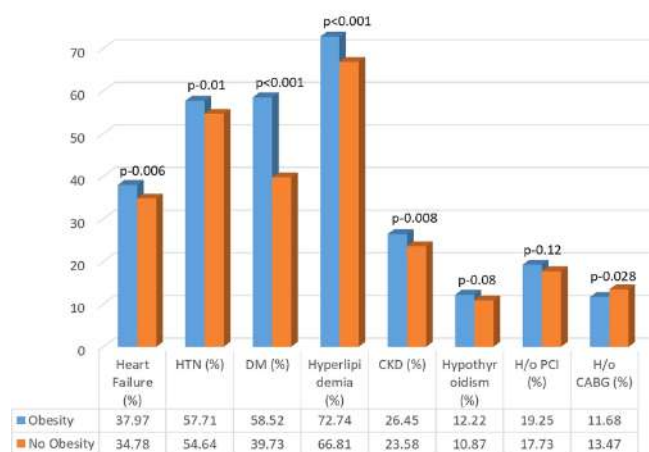
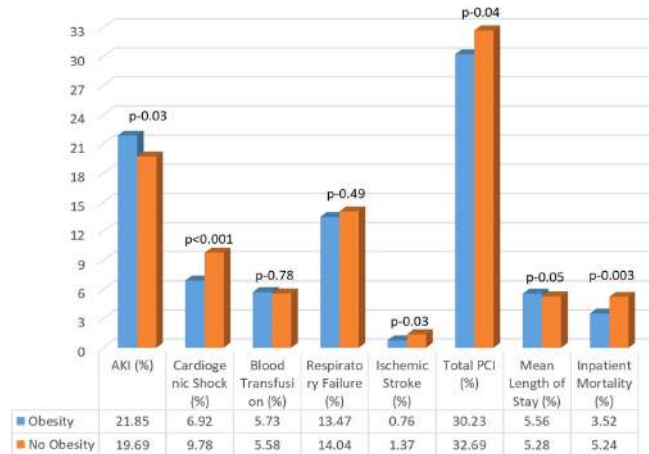


Figure B: Complications, Interventions and Outcomes



I-78 | Treatment of drug-coated balloon combined with rotational atherectomy is effective for the DCB failure in-stent restenosis lesions

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Background: Drug-coated balloon (DCB) angioplasty could be a standard treatment for in-stent restenosis (ISR) lesions. Previously studies have reported that repeat DCB angioplasty for DCB failure had a much higher restenosis rate than the Everolimus-eluting stent (EES) deployment for DCB failure ISR lesions. EES had better late angiographic results compared with DCB, probably because of larger acute gain. Only with balloon angioplasty would it be difficult to obtain a sufficient lumen area. Acute gain was an important factor leading to favorable angiographic results of stenting. This study compared angiographic outcomes after DCB combined with rotational atherectomy to obtain larger acute gain and repeat DCB only.

Methods: From April 2014 to March 2016, we performed DCB angioplasty for 150 ISR lesions, of which 24 recurrent ISR lesions underwent DCB combined with rotational atherectomy (13 lesions) or repeat DCB only (11 lesions). The choice of treatment strategy was decided at the operator's discretion.

Results: In DCB combined with rotational atherectomy group, Rota Barr size/ Artery ratio was 0.69. Angiographic outcomes were evaluated by follow-up angiography at six to eight months after procedure. The baseline characteristics were similar between the two group. Post-procedural

minimum lumen diameter (MLD) and acute gain were significantly larger in the DCB combined with rotational atherectomy group than in repeat DCB only group (2.70 ± 0.47 mm vs. 2.36 ± 0.36 mm, $p = 0.03$; 1.84 ± 0.49 mm, vs. 1.45 ± 0.32 mm, $P = 0.02$; respectively). At follow-up angiography, minimum lumen diameter was significantly larger and the binary restenosis rate was significantly lower after DCB combined with rotational atherectomy than after repeat DCB only (2.55 ± 0.69 mm vs. 1.92 ± 0.96 mm $p = 0.04$; 15.4% vs. 54.5%, $p = 0.02$; respectively), whereas late lumen loss was not different between the two groups (0.15 ± 0.46 mm vs. 0.44 ± 0.96 mm, $p = 0.17$).

Conclusions: DCB combined with rotational atherectomy procedure might be more effective for DCB failure than repeat DCB only angioplasty. And additional stenting for DCB failure lesions could be avoided with DCB combined with rotational atherectomy procedure.

Disclosures: H. Nagai: Abbott (St. Jude): Speaker Bureau;

I-79 | In-Hospital and Follow-Up Outcomes after Chronic Total Occlusion Percutaneous Coronary Intervention According to Left Ventricular Ejection Fraction: Insights from the PROGRESS-CTO Registry

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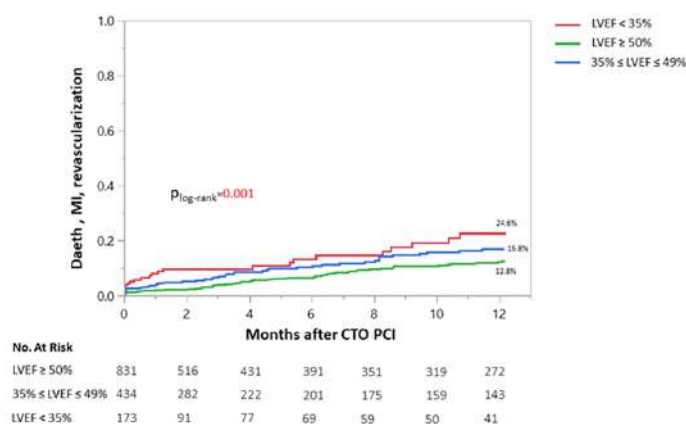
Elbarouni, St. Boniface General Hospital, Canada; Michail Koutouzis, Hellenic Red Cross Hospital of Athens, Greece; Ioannis Tsiafoutsis, Hellenic Red Cross Hospital of Athens, Greece; James W. Choi, Cardiology Consultants of Texas, United States; Evangelia Vemmu, Minneapolis Heart Institute Foundation, United States; Iosif Xenogiannis, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Bavana V Rangan, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Santiago Garcia, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Shuaib Abdullah, VA North Texas Health Care System and University of Texas Southwestern Medical Center, United States; Subhash Banerjee, Dallas Veterans Affairs Medical Center, United States; M. Nicholas Burke, Minneapolis Heart Institute, United States; Emmanouil S. Brilakis, Minneapolis Heart Institute, United States

Background: Outcomes of chronic total occlusion percutaneous coronary intervention (CTO PCI) according to baseline left ventricular ejection fraction (LVEF) have received limited study.

Methods: We compared clinical, angiographic, procedural characteristics and outcomes of 1,441 CTO PCIs performed in patients with known ejection fraction and available follow-up. We compared patients with LVEF $\geq 50\%$ ($N=834$), LVEF 35%-49% ($N=434$) and LVEF $< 35\%$ ($N=173$).

Results: Left anterior descending CTO was significantly more common in the low LVEF group (24% vs 25% vs 42%, $p < 0.001$). The J-CTO score was similar (2.4 ± 1.3 vs 2.5 ± 1.2 vs 2.4 ± 1.2 , $p = 0.5$), as was procedural success (85% vs 83% vs 88%, $p = 0.5$) with the incidence of in-hospital major adverse cardiovascular events being numerically but not statistically higher in the LVEF $< 35\%$ group (2% vs 3.5% vs. 4.6%, $p = 0.12$). The composite endpoint of death, myocardial infarction (MI) and revascularization at 1 year was more common in the LVEF $< 35\%$ group (13% vs 17% vs 25%, $p_{\log\text{-rank}} = 0.001$) (Figure). There was a significant difference in 1-year mortality (12.8% vs 16.8% vs 24.6%, $p < 0.001$), but not in MI (1.9% vs 4.4% vs 5.6%, $p = 0.07$) and revascularization rates (7.4% vs 8.9% vs 10.7%, $p = 0.8$).

Figure. Incidence of the composite endpoint of death, myocardial infarction and revascularization in patients undergoing CTO PCI, classified according to ejection fraction.



Conclusions: CTO PCI can be performed with high success rates and acceptable in-hospital complication rates irrespectively of LVEF, but patients with LVEF<35% have worse one-year outcomes.

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I-80 | Follow-up Outcomes After Chronic Total Occlusion Percutaneous Coronary Intervention According To Target Vessel: Insights From The PROGRESS-CTO Registry

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Center, United States; Alpesh R. Shah, Houston Methodist Hospital, United States; Evangelia Vemmu, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Iosif Xenogiannis, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Bavana V Rangan, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Santiago Garcia, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; Shuaib Abdullah, VA North Texas Health Care System and University of Texas Southwestern Medical Center, United States; Subhash Banerjee, Dallas Veterans Affairs Medical Center, United States; M. Nicholas Burke, Minneapolis Heart Institute, United States; Emmanouil S. Brilakis, Minneapolis Heart Institute, United States

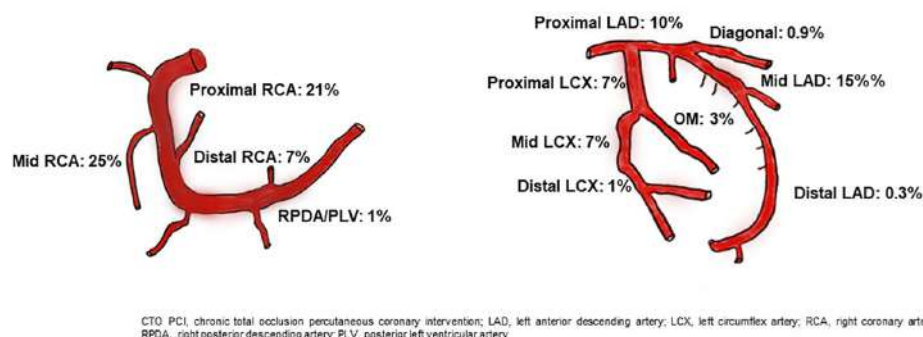
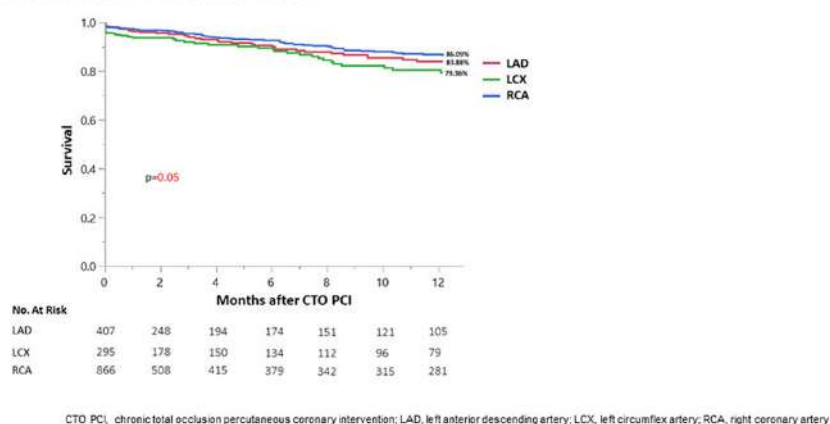
Background: Outcomes of Chronic Total Occlusion Percutaneous Coronary Intervention (CTO PCI) according to target vessel have received limited study.

Methods: We compared clinical, angiographic, procedural characteristics and outcomes of 1,568 right coronary artery (RCA), left anterior descending artery (LAD) and Left Circumflex (LCX) CTO PCIs with follow-up outcomes available.

Results: Mid RCA was the most common target vessel (**Figure 1**). The J-CTO score was 2 [1,3] vs 3 [2,4] vs 3 [2,4], $p<0.0001$ (LAD vs LCX vs RCA respectively). Technical success was lower in RCA (89% vs 85% vs 84%, $p=0.05$). In-hospital MACE did not differ significantly (2.7% vs 4.8% vs 2.9%, $p=0.3$). LCX CTO had higher incidence of the composite of death, myocardial infarction (MI) and revascularization rates at 1 year (**Figure 2**) ($p_{\log\text{-rank}}=0.05$).

Conclusions: LCX lesions are associated with the worst and RCA lesions with the best 1-year outcomes, while LAD CTOs are the least complex.

Disclosures: K. Alaswad: D. Karpaliotis: J. Khatri: Abbott (St. Jude): Proctor and Speaker Bureau; F. A. Jaffer: Abbott (St. Jude): Consulting; Boston Scientific Corp.: Consulting; Siemens: Consulting; H. Samady: Abbott (St. Jude): Principal Investigator for a Research Study; Medtronic: Principal Investigator for a Research Study; S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; S. Banerjee: Medtronic: Consulting; AstrZeneca: Consulting; LIVMOR: Consulting and Spouse; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; I. Nikolakopoulos Nothing to disclose. O. Krestyaninov Nothing to disclose. D. Khelinskii Nothing to disclose. A. Doing Nothing to disclose. P. Dattilo Nothing to disclose. A. M. Sheikh Nothing to disclose. C. Toma Nothing to disclose. T. Patel Nothing to disclose.

Figure 1. Most frequent target vessel segments in CTO PCI.**Figure 2.** Kaplan Meier Curves for the composite endpoint of death, myocardial infarction and revascularization.

B. Jefferson *Nothing to disclose*. R. H. Chandwaney *Nothing to disclose*.
 W. Jaber *Nothing to disclose*. A. R. Shah *Nothing to disclose*.
 E. Vemmou *Nothing to disclose*. I. Xenogiannis *Nothing to disclose*. B. V.
 Rangan *Nothing to disclose*. S. Abdullah *Nothing to disclose*. M. N.
 Burke *Nothing to disclose*.

I-81 | Outcomes of Impella use as Prophylactic versus Bailout Strategy in Patients Undergoing Non-Emergent Percutaneous Coronary Intervention

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Background: Prophylactic support with Impella in hemodynamically stable patients undergoing non-emergent percutaneous coronary intervention (PCI), also termed Impella protected PCI, is now a well-established indication in a selective patient population at high risk for hemodynamic collapse during PCI. However some physicians may eschew preventive hemodynamic support and prefer a bailout strategy should hemodynamic collapse occur.

Methods: We aimed to compare the outcomes of patients entered in the cVAD prospective study who underwent Impella protected PCI (ProPCI group) with those who received bailout Impella support for cardiogenic shock onset during non-emergent PCI (Bailout group). A total of 1,028 patients supported with Impella 2.5 (34.9%) or Impella CP (65.0%) meeting the study inclusion criteria were entered into the cVAD database as of July 2019 (971 in ProPCI group and 40 in Bailout group). An additional 17 were identified in the USpella registry for a total of 57 Bailout patients. In this group the procedural complication leading to hemodynamic collapse was refractory hypotension in 37 (64.9%) patients and coronary perforation/dissection in 20 (35.1%).

Results: Females were more prevalent in the Bailout group (50.9% vs. 27.2%, $p = 0.0002$) and the median baseline LVEF was significantly higher (40% vs 30%, $p < 0.0001$). In this group heart failure was less prevalent (42.1% vs 56.9%, $p = 0.04$) as was left main disease (40.0% vs 56.1%, $p = 0.025$). In-hospital mortality was significantly higher in the Bailout group (41.9% vs. 4.3%, $p < 0.0001$) and was similar across patients experiencing hemodynamic collapse secondary to refractory hypotension or coronary perforation/dissection (48.7% vs. 50.0%, $p = 0.99$). Though females were disproportionately more likely to require bailout support, female in-hospital mortality was excessively high but not significantly higher compared to male (55.2% vs 42.9%, $p = 0.43$).

Conclusions: Failure to prospectively identify and prophylactically implement hemodynamic support in patients at high risk for hemodynamic collapse during non-emergent PCI leads to excessive in-hospital mortality. This failure to identify patients who would benefit from prophylactic support appears to be more prevalent in women

Disclosures: W. W. O'Neill: *Abiomed: Consulting; Boston Scientific Corp.: Consulting; Edwards Lifesciences: Consulting; J. J. Popma: Boston Scientific Corp.: Advisory Board/Board Member; Medtronic: Principal Investigator for a Research Study; Edwards Lifesciences: Principal Investigator for a Research Study; J. W. Moses Nothing to disclose.*

I-82 | Higher Utilization of Guide Extension Catheter Use in Patients with Higher Likelihood of More Complex Atherosclerotic Disease as Indexed by Conventional Clinical Risk Factors

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Background: Traditional cardiovascular risk factors may be more prevalent in patients with more complex coronary anatomy. This study looks at the predictive value of these risk factors in use of guide extension catheters.

Methods: Data was obtained for all percutaneous coronary interventions (PCI) performed at the Sanford Cardiovascular Institute between January 2011 and June 2019. The cardiovascular risk factors that were studied include age, gender, BMI, smoking status, and the presence of hypertension, hyperlipidemia, and diabetes mellitus. These risk factors were compared for patients who required use of a guide

extension catheter versus those who did not, as per provider preference. Comparisons were made by linear regression.

Results: A total of 9,525 PCI's were performed with a total of 6,757 unique patients. A total of 3113 (32.68%) of these cases required use of a guide extension catheter (GuideLiner®) per provider preference. Patients were found to have a statistically significant increase in all studied risk factors in the guide extension catheter group, except for smoking and BMI. The incidence of current tobacco use was found to be lower in the guide extension catheter group. There was no difference in BMI's between the groups. This data may be found in table 1.

Conclusions: The incidence of the studied cardiovascular risk factors was found to be higher in the guide extension catheter group and smoking was lower. BMI was found to be no different. These findings overall may reflect more atherosclerotic disease burden and more disease complexity and as such need for more guide/ device support to complete the PCI.

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I-83 | In-stent vs. de novo chronic total occlusion outcomes: Insights from the PROGRESS-CTO registry

Evangelia Vemmou, Minneapolis Heart Institute Foundation, United States

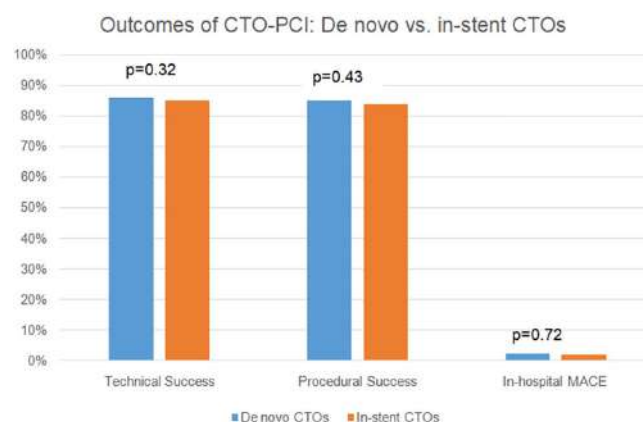
Background: The outcomes of percutaneous coronary intervention (PCI) for in-stent chronic total occlusions (CTOs) have received limited study.

Methods: We examined the clinical, angiographic characteristics and procedural outcomes of 5,986 CTO-PCIs performed at 30 US and international centers between 2012 and 2019.

Results: In-stent CTOs represented 16% of the total procedures. Patients with in-stent CTOs were younger (64 [57, 70] vs. 65 [58, 72] years, $p=0.0033$) and had a higher prevalence of diabetes mellitus (48%

TABLE 1: PREVALENCE OF CARDIOVASCULAR RISK FACTORS IN CASES UTILIZING GUIDE EXTENSION CATHETERS

GUIDE EXTENSION CATHETER USED	Yes	No	P-Value
TOTAL CASES	N = 3113	N = 6413	N = 9526
AGE (YEARS)	69.61 ± 11.84	66.54 ± 12.29	<0.0001
BMI (KG/M ²)	30.94 ± 7.06	30.76 ± 6.73	0.3264
GENDER (MALE)	1423 (71.2%)	3231 (67.9%)	0.0089
SMOKING	474 (19.5%)	1202 (24.1%)	<0.0001
HYPERTENSION	2105 (86.5%)	4016 (80.3%)	<0.0001
HYPERLIPIDEMIA	1986 (81.8%)	3741 (75.0%)	<0.0001
DIABETES MELLITUS	1001 (41.3%)	1616 (32.6%)	<0.0001



vs. 41%, $P=0.0003$). In-stent CTOs had higher J-CTO score (3 [2, 3] vs. 2 [1, 3], $p=0.0051$). Retrograde crossing was used less often (36% vs. 28%, $p<0.0001$) and intravascular ultrasound more often (51% vs. 39%, $p<0.0001$) in the in-stent CTO group. The in-stent CTO group had more balloon uncrossable (14% vs. 10%, $p=0.0252$) and balloon undilatable (20% vs. 10%, $p<0.0001$) lesions. Compared with de novo CTOs, in-stent CTO-PCIs had similar technical success (85% vs. 86%, $p=0.32$), procedural success (84% vs. 85%, $p=0.43$) and incidence of in-hospital major adverse cardiovascular events (2% vs. 2.2%, $p=0.72$).

Conclusions: In-stent CTOs represent 16% of all CTOs and have higher complexity but can be recanalized with similar success and in-hospital major adverse events as de novo CTOs.

Disclosures: E. Vemou *Nothing to disclose.*

I-84 | Contrast utilization patterns during CTO-PCI: Insights from the PROGRESS-CTO registry

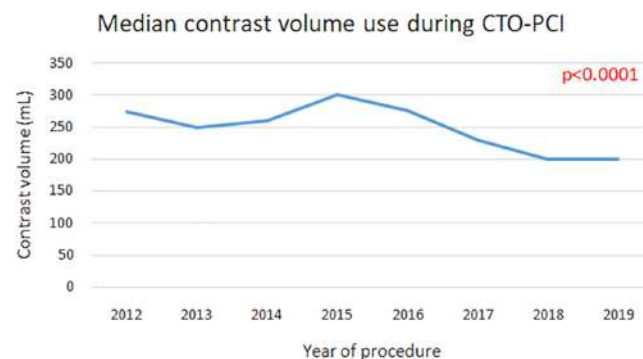
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Background: Chronic total occlusion (CTO) percutaneous coronary intervention (PCI) may require large contrast volume.

Methods: We examined contrast utilization in 5,440 patients undergoing CTO PCI at 30 US and international centers between 2012 and 2019. We compared the group of patients that had contrast volume above vs. below the median (240 mL).

Results: Mean age was 64.5 ± 10 years, 83% of patients were men and 42% had diabetes mellitus. Median pre-procedural creatinine was 1.01 [0.76-1.2] mg/dL and 2% of patients were on dialysis. Median contrast volume was 240 [170,320] mL and decreased over time (**Figure**). Patients with high contrast volume were more likely to have undergone ad-hoc CTO-PCI (13.2% vs. 8.9%, $p<0.0001$) and had higher median J-CTO score (3 [2,3] vs. 2 [1, 3], $p<0.0001$). The higher contrast volume group had higher use of retrograde crossing strategy (43% vs. 27%, $p<0.0001$), lower procedural and technical success (82% vs. 88% and 84% vs. 89%, respectively, $p<0.0001$), higher incidence of in-hospital major adverse events (3% vs. 1.5%, $p=0.0001$), and longer procedure time (139 [98,201] vs. 96 [62,148] min, $p<0.0001$). The use of intravascular ultrasound was associated with lower contrast volume (57% vs 43%, $p<0.0001$).



Conclusions: Contrast volume used during CTO-PCI has been decreasing over the years. Higher lesion complexity, procedural failure, and the occurrence of complications are associated with higher contrast volume.

Disclosures: K. Alaswad: Boston Scientific Corp.: Consulting; Terumo: Consulting; Abbott (St. Jude): Consultant, not financial; D. Karpaliotis: Abbott (St. Jude): Speaker Honoraria; Boston Scientific Corp.: Speaker Honoraria; Medtronic: Speaker Honoraria; Vascular Solutions: Speaker Honoraria; J. Khatri: Abbott (St. Jude): Proctor and Speaker Bureau; F. A. Jaffer: Abbott (St. Jude): Consulting; Boston Scientific Corp.: Consulting; Siemens: Consulting; B. Elbarouni: Teleflex: Speaker Bureau; H. Samady: Abbott (St. Jude): Principal Investigator for a Research Study; Medtronic: Principal Investigator for a Research Study; R. W. Yeh: NHL and BI: career development award (1K23HL118138) from the National Heart, Lung, and Blood Institute.; N. Abi Rafeh: Boston Scientific Corp.: Proctor and Speaker honoraria; Abbott (St. Jude): Proctor and Speaker honoraria; N. J. Lembo: Abbott (St. Jude): Speaker Bureau; Boston Scientific Corp.: Speaker Bureau; Medtronic: Speaker Bureau; Abiomed: Speaker Bureau; A. J. Kirtane: Medtronic, Boston Scientific, Abbott Vascular, Abiomed, CSI, CathWorks, Siemens, Philips, ReCor Medical: Institutional funding to Columbia University and/or Cardiovascular Research Foundation from Medtronic, Boston Scientific, Abbott Vascular, Abiomed, CSI, CathWorks, Siemens, Philips, ReCor Medical; M. A. Parikh: Abbott (St. Jude): Speaker Bureau; Medtronic: Speaker Bureau; Boston Scientific Corp.: Speaker Bureau; CSI, Trireme: Speaker Bureau; Medtronic: Advisory Board/Board Member; Abbott (St. Jude): Advisory Board/Board Member; Philips: Advisory Board/Board Member; Z. A. Ali: Astra Zeneca: Speaker Bureau; Abiomed: Consulting; Amgen: Consulting; Boston Scientific Corp.: Advisory Board/Board Member and Consulting; Abbott (St. Jude): Principal Investigator for a Research Study; Cardiovascular Systems, Inc.: Principal Investigator for a Research Study; Shockwave Medical: Ownership Interests: Stocks, Stock Options; S. Banerjee: Medtronic: Consulting; AstraZeneca: Consulting; LIVMOR: Consulting and Spouse; S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; E. Vemmou *Nothing to disclose*. O. Krestyaninov *Nothing to disclose*. D. Khelinskii *Nothing to disclose*. J. W. Choi *Nothing to disclose*. M. P. Patel *Nothing to disclose*. E. Mahmud *Nothing to disclose*. A. Doing *Nothing to disclose*. P. Dattilo *Nothing to disclose*. M. Koutouzis *Nothing to disclose*. I. Tsiafouts *Nothing to disclose*. B. F. Uretsky *Nothing to disclose*. C. Toma *Nothing to disclose*. M. Love *Nothing to disclose*. W. Jaber *Nothing to disclose*. B. Jefferson *Nothing to disclose*. T. N. Patel *Nothing to disclose*. A. M. Sheikh *Nothing to disclose*. H. Tamez *Nothing to disclose*. A. ElGuindy *Nothing to disclose*.

A. Maallouf *Nothing to disclose*. F. Abou Jaoudeh *Nothing to disclose*. I. Xenogiannis *Nothing to disclose*. I. Nikolakopoulos *Nothing to disclose*. B. V. Rangan *Nothing to disclose*. M. A. Omer *Nothing to disclose*. M. S. Megaly *Nothing to disclose*. F. Gkargkoulas *Nothing to disclose*. J. W. Moses *Nothing to disclose*. S. Abdullah *Nothing to disclose*. M. N. Burke *Nothing to disclose*.

I-85 | Radiation dose during CTO-PCI: Insights from the PROGRESS-CTO registry

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Institute, Russian Federation; Dmitrii Khelinskii, Meshalkin Novosibirsk Research Institute, Russian Federation; Subhash Banerjee, University Of Texas - Southwestern, United States; Shuaib Abdullah, VA North Texas Health Care System and University of Texas Southwestern Medical Center, United States; Santiago Garcia, Minneapolis Heart Institute Foundation at Abbott Northwestern Hospital, United States; M. Nicholas Burke, Minneapolis Heart Institute, United States; Emmanouil S. Brilakis, Minneapolis Heart Institute, United States

Background: Chronic total occlusion (CTO) percutaneous coronary intervention (PCI) can be associated with increased risk of excessive radiation.

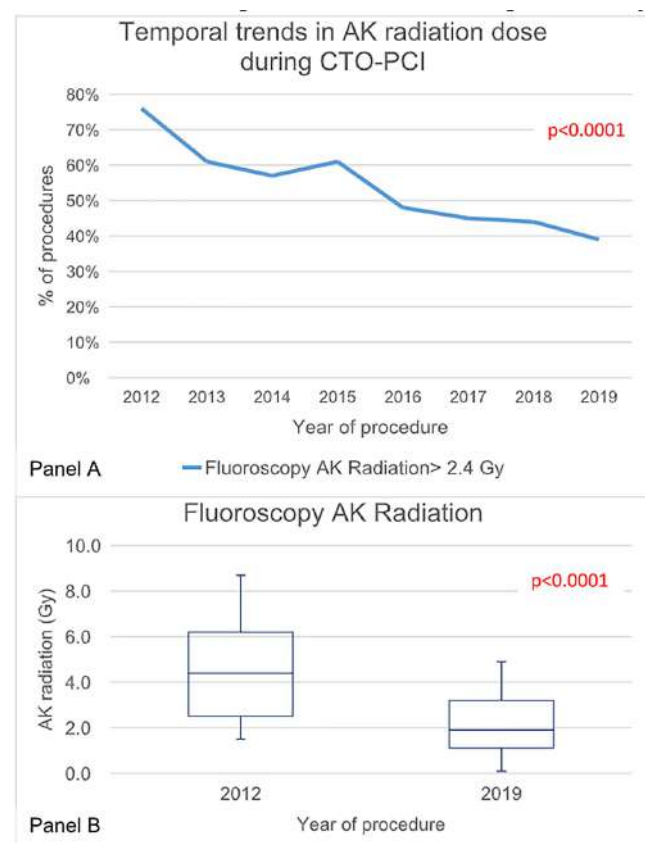
Methods: We examined radiation dose in 5,635 patients undergoing CTO-PCI at 28 US and international centers between 2012 and 2019. We compared the group of patients that had fluoroscopy air kerma (AK) radiation dose above the median (>2.4 Gy) and those who had AK radiation dose below the median (≤ 2.4 Gy).

Results: Mean age was 64.5 ± 10 years and 83% of patients were men. Median AK radiation dose was 2.4 [1.3–4.1] Gy. The proportion of procedures that had AK dose >2.4 Gy decreased over time (Figure, Panel A). Median AK radiation dose was significantly lower in 2019 vs. 2012 (1.9 [1.1, 3.2] vs. 4.4 [2.5, 6.2] Gray, $p < 0.0001$) (Figure, Panel B). Median body mass index was higher in the higher radiation group (31.4 [27.9, 35.8] vs 28.4 [25.5, 32.3], $p < 0.0001$). Patients in the higher radiation dose group were more likely to have previous

coronary artery bypass graft surgery compared with patients in the lower radiation group (41% vs. 28%, $p < 0.0001$). Median J-CTO score (3 [2,4] vs. 2 [1, 3], $p < 0.0001$) and median procedure time (167 [119,223] vs. 104 [72,143] min, $p < 0.0001$) were higher in the higher radiation group. Technical and procedural success were lower in the higher radiation group (84% vs. 91%, 82% vs. 90%, respectively, $p < 0.0001$) and the incidence of in-hospital major adverse cardiovascular events was higher (3.3% vs. 1.7%, $p = 0.0025$). There was no reported radiation skin injury.

Conclusions: AK radiation dose during CTO-PCI has significantly decreased in recent years among high-volume, experienced centers.

Disclosures: K. Alaswad: Boston Scientific Corp.: Consulting; Terumo: Consulting; Abbott (St. Jude): Consultant, not financial; D. Karpaliotis: Abbott (St. Jude): Speaker Honoraria; Boston Scientific Corp.: Speaker Honoraria; Medtronic: Speaker Honoraria; Vascular Solutions: Speaker Honoraria; J. Khatri: Abbott (St. Jude): Proctor and Speaker Bureau; B. Elbarouni: Teleflex: Speaker Bureau; H. Samady: Abbott (St. Jude): Principal Investigator for a Research Study; Medtronic: Principal Investigator for a Research Study; R. W. Yeh: NHL and BI: career development award (1K23HL118138) from the National Heart, Lung, and Blood Institute.; F. A. Jaffer: Abbott (St. Jude): Consulting; Boston Scientific Corp.: Consulting; Siemens: Consulting; N. Abi Rafeh: Boston Scientific Corp.: Proctor and Speaker honoraria; Abbott (St. Jude): Proctor and Speaker honoraria; N. J. Lembo: Abbott (St. Jude): Speaker Bureau; Boston Scientific Corp.: Speaker Bureau; Medtronic: Speaker Bureau; Abiomed: Speaker Bureau; A. J. Kirtane: Medtronic, Boston Scientific, Abbott Vascular, Abiomed, CSI, CathWorks, Siemens, Philips, ReCor Medical: Institutional funding to Columbia University and/or Cardiovascular Research Foundation from Medtronic, Boston Scientific, Abbott Vascular, Abiomed, CSI, CathWorks, Siemens, Philips, ReCor Medical; M. A. Parikh: Abbott (St. Jude): Speaker Bureau; Medtronic: Speaker Bureau; Boston Scientific Corp.: Speaker Bureau; CSI, Trirame: Speaker Bureau; Medtronic: Advisory Board/Board Member; Abbott (St. Jude): Advisory Board/Board Member; Philips: Advisory Board/Board Member; Z. A. Ali: Astra Zeneca: Speaker Bureau; Abiomed: Consulting; Amgen: Consulting; Boston Scientific Corp.: Advisory Board/Board Member and Consulting; Abbott (St. Jude): Principal Investigator for a Research Study; Cardiovascular Systems, Inc.: Principal Investigator for a Research Study; Shockwave Medical: Ownership Interests: Stocks, Stock Options; S. Banerjee: Medtronic: Consulting; AstrZeneca: Consulting; LIVMOR: Consulting and Spouse; S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; E. Vemmou Nothing to disclose. A. Doing Nothing to disclose. P. Dattilo Nothing to disclose. B. F. Uretsky Nothing to disclose.



M. Love *Nothing to disclose*. A. M. Sheikh *Nothing to disclose*. W. Jaber *Nothing to disclose*. B. Jefferson *Nothing to disclose*. T. N. Patel *Nothing to disclose*. M. P. Patel *Nothing to disclose*. E. Mahmud *Nothing to disclose*. H. Tamez *Nothing to disclose*. A. ElGuindy *Nothing to disclose*. J. W. Choi *Nothing to disclose*. A. Maallouf *Nothing to disclose*. F. Abou Jaoudeh *Nothing to disclose*. I. Xenogiannis *Nothing to disclose*. I. Nikolakopoulos *Nothing to disclose*. B. V. Rangan *Nothing to disclose*. M. A. Omer *Nothing to disclose*. M. S. Megaly *Nothing to disclose*. F. Gkargkoulas *Nothing to disclose*. J. W. Moses *Nothing to disclose*. C. Toma *Nothing to disclose*. O. Krestyaninov *Nothing to disclose*. D. Khelinskii *Nothing to disclose*. S. Abdullah *Nothing to disclose*. M. N. Burke *Nothing to disclose*.

I-86 | Percutaneous coronary intervention complexity and risk of adverse events in relation to high bleeding risk among patients receiving drug-eluting stents: Insights from a large single-center cohort study

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Background: The relation between complex percutaneous coronary intervention (PCI), high bleeding risk (HBR), and adverse events after coronary artery implantation of drug-eluting stents has been incompletely characterized. This study sought to investigate the ischemic and bleeding events after complex PCI including a stratification according to HBR estimated by PARIS bleeding risk score.

Methods: Between January 2013 and December 2013, 10,167 consecutive patients undergoing PCI were prospectively enrolled in Fuwai PCI Registry. Complex PCI was defined when having at least one of the following characteristics: 3 vessels treated, ≥ 3 stents implanted, ≥ 3 lesions treated, bifurcation with 2 stents implanted, total stent length >60 mm, treatment of chronic total occlusion, unprotected left main PCI, in-stent restenosis target lesion, and severely calcified lesion requiring a rotator system. The primary ischemic endpoint was major adverse cardiovascular events (MACE) [composite of cardiac death, myocardial infarction, and definite/probable stent thrombosis], and primary bleeding endpoint was Bleeding Academic Research Consortium (BARC) type 2, 3, or 5 bleeding.

Results: The median duration of follow-up was 29 months. In adjusted Cox regression analysis, patients having complex PCI procedures experienced higher risks of MACE (hazard ratio [HR]: 1.63, 95% confidence interval [CI]: 1.38-1.92; $P<0.001$), compared with non-complex PCI. In contrast, the risk of clinically relevant bleeding was statistically similar between the 2 groups (HR: 0.86 [0.66-1.11]; $P=0.238$). There was no statistical interaction between HBR (PARIS bleeding score ≥ 8 or <8) and complex PCI in regard to MACE (adjusted $P_{\text{interaction}}=0.388$) and clinically relevant bleeding (adjusted $P_{\text{interaction}}=0.279$).

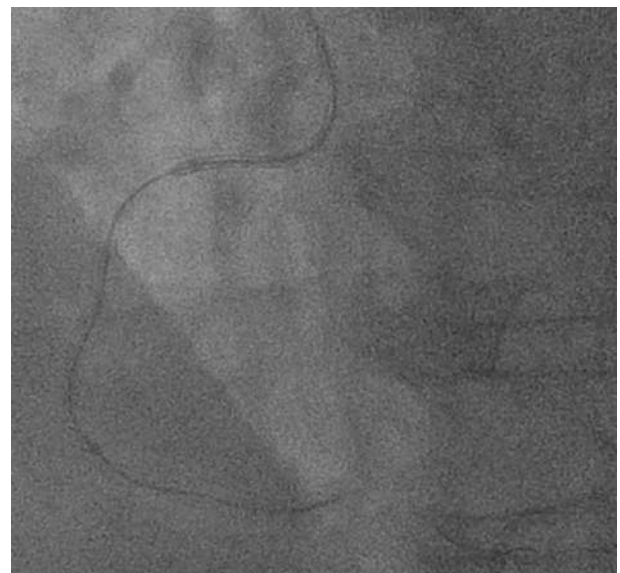
Conclusions: Patients who had undergone complex PCI resulted in substantially more ischemic events, without an increase in clinically relevant bleeding risk; and these associations did not seem to be modified by HBR status. More intensified antiplatelet therapy may be beneficial for patients with complex percutaneous coronary revascularization procedures.

Disclosures: H. Wang *Nothing to disclose*. R. Gao *Nothing to disclose*. Y. Yang *Nothing to disclose*. D. Yin *Nothing to disclose*. B. Xu *Nothing to disclose*. K. Dou *Nothing to disclose*.

I-87 | Trailblazing with Coronary Microcatheters – Early Use Equals Early Success

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Background: Coronary revascularization has continually developed since its inception in 1977. CTOs are present in 15-20% of cases at the time of coronary angiography and the frequency of balloon-uncrossable lesions with greater than TIMI 1 flow is also being seen frequently. We present a case series in which coronary microcatheters



(CMC) are used to "trailblaze" and allow for subsequent balloon dilation and PCI. CMC create a microchannel that allows for subsequent delivery of vital equipment. Early CMC utilization led to reduction in procedural duration, radiation exposure, contrast load, and increased procedural success.

Methods: 20 subjects were retrospectively selected from a catheterization database at a high-volume heart hospital from 1/2018-12/2019. Every PCI performed involved CMC usage. Cases with "Corsair", "Turnpike", "Caravel", and "Finecross" CMC reported were searched and non-CTO PCI cases were manually reviewed. Procedural metrics and success rate were analyzed.

Results: CMC were used quickly in 100% of cases after initial balloons would not cross. Early CMC use facilitated procedural success and lower procedural duration, radiation exposure, and contrast dye load. 80% of cases were trans-radial. Procedural success was achieved in all cases.

Conclusions: Quick utilization of CMC in complex PCI appears to have significant impact on procedural success, radiation exposure, contrast dye usage, and procedural duration. Implementation of CMC should be the second step in crossing algorithm [e.g. if initial balloon(s) will not cross] of severely diseased coronary arteries. Prospective analysis is needed to confirm this retrospective finding.

Disclosures: J. P. Wilson *Nothing to disclose*. M. S. Petrasko *Nothing to disclose*. M. Blue, *Nothing to disclose*. T. Stys *Nothing to disclose*. A. T. Stys *Nothing to disclose*.

VALVULAR INTERVENTIONS (EXCLUDING TAVR)

II-1 | Temporal trends of short-term outcomes following Mitraclip

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Background: MitraClip has been introduced as an alternative in treating mitral valve regurgitation. The number of percutaneous edge-to-edge mitral regurgitation valve repairs with MitraClip has increased since its FDA approval in 2014. There is a paucity of data about the trend in procedural outcomes of MitraClip from large samples. We aim to evaluate the contemporary trends in the use and outcomes of MitraClip for mitral valve regurgitation using the National Readmission Database.

Methods: Patients who underwent MitraClip during 2014-2016 were reviewed using the Nationwide Readmissions Database. We assessed rates of in-hospital mortality, stroke, prolonged hospital stay (more than 4 days), and 30-day readmission over years.

Results: A total of 5,074 patients underwent MitraClip; 815 in 2014, 1,756 in 2015, and 2,503 in 2016, with a median age of 79 years, 80 years and 81 years, respectively. Heart failure was present in 74.7%, 74.8%, and 78.8% of patients, in 2014, 2015, and 2016, respectively, while 69.9%, 72%, and 59.3% of patients, respectively, had hypertension. In-hospital mortality following MitraClip decreased from 3.4% in 2014 to 2.3% in 2016 but this decrease was not statistically significant ($P=.059$). Similarly, stroke rate decreased from 1.3% in 2012 to 0.8% in 2016 but this decrease was not statistically significant ($P=.183$). However, the rate of prolonged hospital stays decreased significantly from 43.1% in 2014 to 26.3% in 2016 ($P<.001$). Overall 30-day readmission rate was 15% and did not change significantly over the study period ($P=.568$).

Conclusions: MitraClip mortality, morbidity and hospital stay are decreasing with increasing experience.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; O. Abdelfattah *Nothing to disclose*. A. M. Saad *Nothing to disclose*. M. M. Gad *Nothing to disclose*. T. Isogai *Nothing to disclose*. O. Okasha *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. T. Ahmed *Nothing to disclose*. S. Shekhar *Nothing to disclose*. A. Krishnaswamy *Nothing to disclose*.

II-2 | The Safety and Efficacy of Combined Transcatheter Pulmonary Valve Replacement and Electrophysiology Procedures

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Background: Patients with pulmonary valve disease require multiple procedures over their lifetime. TPVR is a widely accepted alternative to surgical valve placement in patients with a stenotic or insufficient right ventricular outflow tract. These patients are frequently in need of an additional EP procedure for diagnosis or intervention, which are traditionally not performed concomitantly.

Methods: A retrospective review was undertaken for combined TPVR and EP procedures performed in the cardiac catheterization laboratory from January 2011 to October 2019. Patients undergoing TPVR and EP procedure in the same cath lab visit were matched with a TPVR

control and EP control patient of similar age and cardiac anatomy. Data collected included patient demographics, procedure data, recovery time, hospital length of stay, and hospital charges. The two groups were compared using a paired t-test.

Results: A total of 8 patients undergoing TPVR and EP procedures were identified, 7 patients were included in the statistical analysis due to the need for pacemaker implantation secondary to heart block in one patient. Of these patients, 50% were males; the median age at the time of the procedure was 18 years. The most common diagnosis was tetralogy of Fallot (n=4) followed by complex dextro-transposition of great arteries (n=2), pulmonary stenosis (n=2), and double outlet right ventricle (n=1). Compared to controls, combined cases had shorter recovery times with median of 18.9 hours [IQR 18.35-19.5] vs 27.98 hours [IQR 21.42-39.25], p-value 0.031, shorter hospital length of stay 27.5 hours [IQR 26.47-31.4] vs 38.4 hours [IQR 33.42-51.50], p-value 0.016, and a 51% reduction in total hospital charges \$171,640 [IQR 135.43-219.22] vs \$333,560 [IQR 263.20-400.98], p-value 0.016. There were no significant differences in radiation dose or procedure time between the combined TPVR/EP procedure group and the control group (TPVR + EP). Those who had the combination procedure had median radiation time of 30.5 minutes [IQR 29.6-47.9], and dose area product median of 215 [IQR 158-935] mGy.

Conclusions: Combining TPVR and EP procedures is feasible, safe, and economically advantageous. A larger multicenter study may be required to show broad applicability

Disclosures: O. Abu Anza *Nothing to disclose*. L. Ochoa *Nothing to disclose*. D. McLennan *Nothing to disclose*. I. H. Law *Nothing to disclose*. P. Porayette *Nothing to disclose*. J. R. Maldonado *Nothing to disclose*. O. Aldoss *Nothing to disclose*.

II-3 | Current Trends in the Utilization of Mitraclip: Analysis of the Nationwide Inpatient Sample Database

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Background: The Mitraclip is an evolving newer, minimally invasive procedure for severe mitral regurgitation. This study was performed to recognize demographic features and analyze the current trends in use of the Mitraclip clip in the US between 2010-2014 and 2016 utilizing the NIS database.

Methods: Nationwide Inpatient Sample (NIS) data was used to extract data of patients undergoing Mitraclip procedure during index admission for years 2010-2014 and 2016. The 2015 data was not available for analysis. Patients were identified by ICD-9 procedure code 35.97 for

the years 2010-2014 which represents percutaneous mitral valve repair with implant and for year 2016 by ICD-10 PCS code – 02UG3JZ which represents supplement mitral valve with synthetic substitute, percutaneous approach. Demographic features and trends in the use of Mitraclip over the years 2010-2014 and 2016 period were analyzed.

Results: A total of 2,948 indexed procedures of percutaneous mitral valve repair were performed in between 2010-2014, and 4,345 in the year 2016. Of all patients 59% were males and 41% were females between 2010-2014 whereas in 2016 the procedure was evenly distributed at 50% between males and females. The Mitraclip was used most often in patients aged 65-84 years (51.6%) for years 2010-2014 which consistent in year 2016 (57.5%) for the same age group. The main insurance was Medicare paying for 75% from 2010-2014 and 85% for the year 2016 of all procedures. Vast majority of implantations were performed in urban hospitals (95.61%) in 2010-2014 and remained consistent (91.5%) in 2016 at urban teaching institutions.

Conclusions: Our data has shown an upward trend in Mitraclip implantation, with 1.47-fold increase in the total procedures performed in the year 2016 when compared to a combined 5-year procedural volume between 2010-2014. It is anticipated that this trend will continue. The results of recently published COAPT trial should contribute to the expansion of Mitraclip procedure in the US.

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II-4 | Outcomes of Percutaneous Transcatheter Mitral Valve Repair (MitraClip System) in Octogenarians in the United States. Analysis from Nationwide Readmission Database

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Background: Advanced age is an independent risk factor associated with mitral valve surgery deferral. Transcatheter mitral valve repair (TMVR) has emerged as an alternative therapeutic option for the treatment of severe mitral regurgitation in patients with prohibitive or high surgical risk. The impact of age on outcomes of patients selected for TMVR using MitraClip remain largely unknown in the United States.

Methods: We queried the National Readmission Database to identify TMVR admissions from January 2014 to December 2016. Baseline

Table 1: Baseline Characteristics and Outcomes of Transcatheter Mitral Valve Repair using MitraClip in patients aged ≥ 80 years versus less than 80 years.

Baseline Characteristics				
	Age <80 N=4506	Age>/=80 N=5065	P value	
Age mean(SD)	68.42(10)	85.40(3.1)	<0.01	
Male	2413(53.6)	2575(50.8)	0.008	
Female	2092(46.4)	2490(49.2))	0.008	
Hypertension	2834(62.9)	3439(67.9)	<0.01	
Elective admission	3056(67.9)	3784(74.4)	<0.01	
Diabetes mellitus	894(19.8)	786(15.5)	<0.01	
Uncomplicated				
Diabetes Mellitus Complicated	418(9.3)	178(3.5)	<0.01	
Peripheral Vascular Disease	645(14.3)	641(12.7)	0.018	
Rheumatoid Arthritis	175(3.9)	146(2.9)	0.007	
Obesity (BMI>30)	571(12.7)	204(4.0)	<0.01	
Hypothyroidism	654(14.5)	953(18.8)	<0.01	
Coagulopathy	571(12.7)	521(10.3)	<0.01	
Chronic Blood loss	29(0.6)	40(0.8)	0.46	
Anemia				
History of Chronic Lung Diseases	1404(31.2)	1039(20.5)	<0.01	
Chronic Kidney Disease	1610(35.7)	1812(25.8)	0.98	
Chronic Liver Disease	156(3.5)	45(0.9)	<0.01	
Outcomes	Age <80 N=4506	Age>/=80 N=5065	Odds Ratio (CI)	P Value
In hospital mortality	3.4%	2.8%	0.81(0.64-1.02)	0.085
In-hospital Stroke	1.2%	1.1%	0.92(0.63-1.33)	0.70
Acute Kidney Injury	15.6%	13.5%	0.84(0.75-0.94)	<0.01
LOS > 4 days	60.9%	72.2%	1.66(1.52-1.81)	<0.01
Discharge to Skilled Nursing	8.9%	13.8%	1.64(1.44-1.87)	<0.01
30 Days Readmission Rate	12.8%	14.9%	1.18(1.05-1.33)	0.004
30 Days Mortality	4.8%	5.5%	1.14(0.82-1.59)	0.45

Numbers are n (%) or mean $\pm$ SD (where indicated). N- number, SD- Standard deviation, BMI- Body mass index, CABG- Coronary artery bypass graft, PCI- Percutaneous coronary intervention, CAD- Coronary artery disease, CHF- Congestive heart failure, LOS-Length of Stay

characteristics and outcomes were stratified by age (≥ 80 years and <80 years).

Results: A total of 9,571 patients with TMVR were identified with 5,065 ≥ 80 years of age (Octogenarians) and 4,056 less than 80. Compared to other group, Octogenarians were more commonly electively admitted and had reduced prevalence of diabetes mellitus, peripheral vascular disease, obesity, chronic kidney, lung and liver disease (Table 1) In-hospital mortality, stroke and 30 day mortality did not differ between the two groups. However, octogenarians had a longer (>4 days) length of hospital stay (72.2% VS 61%; $P<0.01$), were more commonly discharged to skilled nursing facility (13.8% VS 8.9%; $P<0.01$) and had a higher 30 day readmission rate (14.9% VS 12.8%; $P=0.004$).

Conclusions: In this nationwide observational study, octogenarians had similar rate of in-hospital complications and 30-day mortality, but higher 30-day readmission rate compared to younger patients. Further prospective studies are suggested to explore these associations

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II-5 | Procedural and Clinical Outcomes of Mechanical Aspiration of Tricuspid Valve Endocarditis with an 8 French System

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Background: Intravenous drug use (IVDU) associated tricuspid valve endocarditis (TVE) is associated with a high mortality despite early surgical debridement and antibiotic therapy. Patients with septic shock, septicemia, and pulmonary emboli are poor surgical candidates and have high rates of recurrence. Debulking using percutaneous mechanical aspiration system is an alternative to surgery. We report a retrospective case series of patients undergoing percutaneous mechanical aspiration using an 8 French System in patients who were refractory to antibiotic therapy.

Methods: Retrospective review of 30 patients with IVDU in 2 years at a single center, presenting with septicemia and pulmonary emboli from native TVE, despite antibiotics, who had undergone percutaneous aspiration were included. Patients were all evaluated for surgical debridement by a cardiothoracic surgeon. Patient with multi-valve involvement were excluded. Procedures were performed under moderate sedation with

intracardiac echo guidance and a steerable guide with a CAT8 Penumbra aspiration catheter. Chi square testing was used for statistical analysis.

Results: All procedures successfully removed some vegetation. There were no intra-procedural deaths or complications. Procedures were performed under moderate conscious sedation in all patients. 23% required blood transfusion post procedure due to blood loss (n=7). The first 11 cases had a transfusion rate of 54% vs 5 % (p<0.01). Survival of index hospitalization was 90% (n=27). Septic shock on admission was associated with survival at 30 days (40% vs 100%, p<0.01). Pathological specimens all showed necrotic debris with no myocardial or valve tissue. Follow up blood cultures were clear in all surviving patients. Readmission rate was 6% (n=2) at 30 days. The degree of debulking was not associated with recurrence or mortality.

Conclusions: Percutaneous mechanical aspiration with an 8 F system is a safe and feasible alternative for debulking of TVE associated with IVDU. Further prospective studies are needed to evaluate long-term efficacy.

Disclosures: Y. Akhtar *Nothing to disclose*. S. Adigun *Nothing to disclose*. W. Walker *Nothing to disclose*.

II-6 | The trans-septal approach in transcatheter mitral valve-in-valve implantation for degenerative bioprosthesis

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Background: Transcatheter Mitral Valve-in-Valve Implantation (TMViV) has recently emerged as a novel therapy for degenerated mitral valve bioprosthesis. Re-operative mitral valve surgery is associated with a substantial risk of mortality and morbidity. The objective of this study was to describe the outcomes of transcatheter mitral valve-in-valve implantations in our cardiac center.

Methods: Twenty-two patients underwent the valve-in-valve procedure because of bioprosthesis degeneration from March 2017 to October 2018. Clinical, echocardiographic, procedural details and survival at follow up were assessed.

Results: Eight patients refused re-operative cardiac surgery while others were deemed a high risk for conventional re-operative sternotomy. All patients had TMViV performed via a trans-septal approach, and the prosthesis was implanted successfully with immediate hemodynamic improvement in 20 patients. One patient had tamponade (4.55%), two had permanent pacemaker insertion (9.09%), two patients had a renal impairment (9.09%), and three patients had

vascular complications (13.64%). There was one aborted procedure for the failure to cross the tissue valve with a transcatheter valve, and one patient was converted to an emergency mitral valve surgery. All patients were discharged in NYHA class I/II and NYHA class was markedly improved at one-year follow-up (p= 0.002).

Conclusions: Trans-septal mitral valve-in-valve implantation can be performed safely for degenerative mitral valve bioprosthesis and with favorable early clinical and hemodynamic outcomes.

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II-7 | The Effect of Mild and Moderate Aortic Valve Stenosis on Outcomes of Transcatheter Mitral Valve Repair-A Single Center Study

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Background: The effect of mild and moderate aortic stenosis (AS) on outcomes of MitraClip Transcatheter Mitral Valve repair (TMVr) has not been established. This study aims to investigate the effect of mild and moderate AS on in-hospital outcomes following MitraClip.

Methods: We performed a retrospective analysis evaluating 108 consecutive patients who underwent MitraClip TMVr for management of severe mitral regurgitation between 2015 and 2019 at University of Maryland Medical Center. Echocardiography studies obtained within 1 month of the procedures were reviewed. The primary outcome was the development of acute respiratory failure after MitraClip, defined as increased oxygen requirement secondary to development of pulmonary edema within 24 hours of the procedure. Secondary outcomes included procedural success rate, in-hospital mortality, and extended length of stay (LOS) > 72 hours. One-way Anova was used to discern statistical significance between the two study groups.

Results: Of the 108 patients, 94 had no AS, while 14 had mild or moderate AS (mean aortic valve area $1.41 \pm 0.48 \text{ cm}^2$). The mean age of the AS group was 79.4 ± 9.3 years with 50% females, while the mean age of the no AS group was 76.5 ± 10.0 years with 46.8% females. The mean left ventricular ejection fraction was similar between the two groups (AS: $48.2 \pm 14.5\%$ vs no AS: $43.5 \pm 15.0\%$). There was no

significant difference in the prevalence of chronic obstructive pulmonary disease, pulmonary hypertension, and coronary artery disease between groups. There was a significant increase in the rate of acute respiratory failure post MitraClip in the AS group compared to the no AS group (35.0% vs 11.0%, p -value <0.01). There was no significant difference between groups in terms of procedural success (100% vs 97.0%), mortality rate (0% vs 4.0%), and extended LOS (71.4% vs 53.2%). Of note, the mortality cases observed in the no AS group were salvage procedures performed in the setting of cardiogenic shock.

Conclusions: These findings suggest an increased risk of acute respiratory failure post MitraClip TMVr in patients with mild and moderate AS compared to no AS. Further studies with larger cohorts are required to confirm the aforementioned findings.

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II-8 | Trends and Outcomes of Performing Coronary Angiogram Prior to Percutaneous Mitral Valve Repair Using the Mitraclip Device

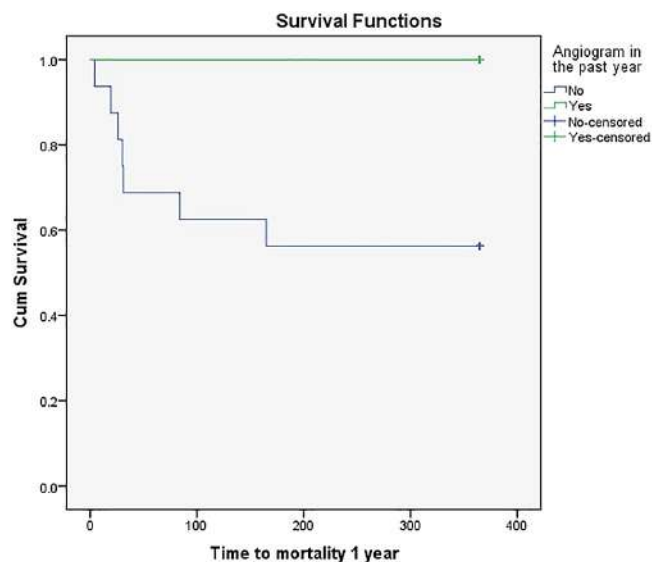
Jaafar Alward, Rush University Medical Center, United States; Christina Anderson, Rush University Medical Center, United States; Clifford J. Kavinsky, Rush University Medical Center, United States; Hussam Suradi, Rush University Medical Center/ Rush Medical College, United States

Background: Coronary artery disease is highly prevalent in patients undergoing percutaneous mitral valve repair (PMVR). Current practice is variable in terms of performing coronary angiogram prior to PMVR. The aim of this study was to investigate the impact of performing coronary angiogram on post-PMVR outcomes.

Methods: A retrospective study of patients with severe degenerative mitral regurgitation who underwent PMVR using MitraClip device from 2015-2019. Demographic and clinical data were collected via available electronic medical records. The population was dichotomized according to whether they had a coronary angiogram in the year prior to PMVR. The primary outcome was composite of all-cause mortality and major adverse cardiac and cerebrovascular events. Statistical analysis was done using Fisher's exact, Student's t-test and log rank analysis.

Results: The total sample size was 53 patients (57% female, 43% male) with mean age of 74. The median follow-up period was 258 days. Nineteen patients (36%) underwent coronary angiogram in the year prior to PMVR. Kaplan-Meier analysis revealed that primary outcome was significantly lower at one year follow up in patients who underwent coronary angiogram within 1 year prior to PMVR ($p=0.019$).

Conclusions: Little is known about the impact of performing coronary angiogram in relation to outcomes post-PMVR. Despite a small sample



size, patients who underwent a coronary angiogram in the year prior to PMVR had better outcomes at 1 year post-procedure. Larger studies are needed to provide more robust evidence.

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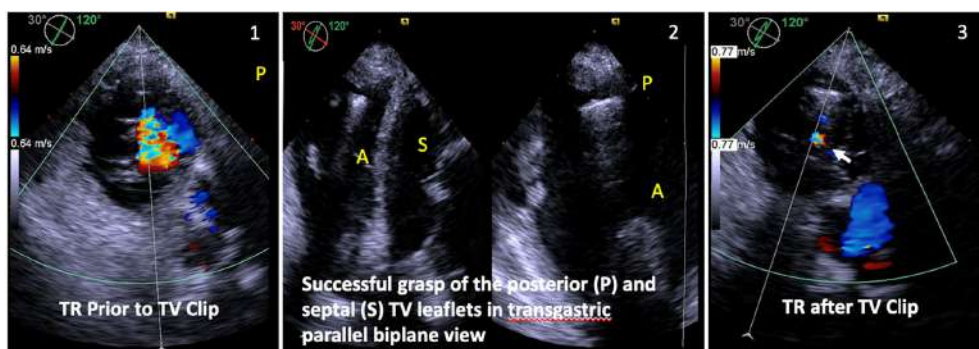
II-9 | Transcatheter Repair of Tricuspid Valve Using Transgastric Parallel Bipalve View

Amir Azarbal, Yale New Haven Hospital, United States; Lissa Sugeng, Yale New Haven Hospital, United States; Vratika Agrawal, Yale New Haven Hospital, United States; Ryan Kaple, Yale New Haven Hospital, United States

Background: Transcatheter options for tricuspid valve (TV) repair and replacement are under development. The MitraClip system (Abbott, Santa Clara, CA) is approved to treat both primary and secondary mitral regurgitation (MR). As experience with the MitraClip system in the tricuspid position grows, the techniques and optimal transesophageal grasping views continue to evolve.

Methods: 82-years-old female with severe MR, severe tricuspid regurgitation (TR) and recurrent admissions for congestive heart failure exacerbation despite maximally tolerated medical therapy was referred for transcatheter mitral and tricuspid repair.

Results: Using the standard technique, with transesophageal (TEE) and fluoroscopic guidance, one MitraClip XTR was deployed with capture of A2 and P2 leaflets resulting in reduction of MR to mild. We then turned our attention to the tricuspid valve. The steerable guide catheter was withdrawn to right atrium. After opening the XTR clip and fine tuning the orientation using the transgastric short-axis view on TEE, multiple grasping attempts were made with 4-chamber and right ventricular inflow-outflow X-plane views that were unsuccessful due to inadequate visualization of TV leaflets. The TEE probe was



then advanced to obtain transgastric parallel biplane view resulting in adequate visualization and successful grasping of posterior (P) and septal (S) leaflets. The TR severity was decreased to mild.(Figure)

Conclusions: To our knowledge, this is the first report of successful transcatheter repair of the tricuspid valve with MitraClip system utilizing transgastric parallel biplane as the TEE grasping view.

Disclosures: R. Kaple: Abbott (St. Jude): Speaker Bureau; A. Azarbal Nothing to disclose. L. Sugeng Nothing to disclose. V. Agrawal Nothing to disclose.

II-10 | Clinical Outcomes of Transcatheter Mitral Valve Repair Using Multiple Mitraclips: A Comparative Analysis

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Characteristics	Entire Cohort N=70	1 Clip n=37	2 Clips n=27	3 Clips n=6	P-value
Age	80.8 ± 6.4	82.9 ± 6.6	83.7 ± 6.6	82.8 ± 4.7	0.899
Gender, male	38 (54.3)	20 (54.1)	14 (51.9)	4 (66.7)	0.877
Body Mass Index, kg/m ²	25.0 ± 4.8	25.0 ± 5.0	24.8 ± 4.7	26.0 ± 5.2	0.850
Hypertension	60 (85.7)	35 (94.6)	21 (77.8)	4 (66.7)	0.035
Diabetes	20 (28.6)	14 (37.8)	5 (18.5)	1 (16.7)	0.194
Atrial fibrillation	40 (57.1)	22 (59.5)	17 (63.0)	1 (16.7)	0.125
COPD	15 (21.4)	9 (24.3)	5 (18.5)	1 (16.7)	0.905
Chronic kidney disease	34 (48.6)	21 (56.8)	12 (44.4)	1 (16.7)	0.189
LVEF >40%	56 (80.3)	29 (78.9)	23 (85.2)	4 (66.7)	0.134
STS Risk Score	9.8 ± 5.3	11.3 ± 5.9	7.9 ± 3.4	8.8 ± 5.8	0.036
Conversion to open surgery	3 (4.3)	0 (0)	2 (7.4)	1 (16.7)	0.056
Technical success	68 (97.1)	37 (100.0)	25 (92.6)	6 (100.0)	0.311
Device success	59 (84.3)	34 (91.9)	22 (81.5)	3 (50.0)	0.033
Structural failure	1 (1.4)	0 (0.0)	0 (0.0)	1 (16.7)	0.086
Functional failure	9 (12.8)	4 (10.8)	3 (11.1)	2 (33.3)	0.283
Device-related technical failure	3 (4.3)	0 (0.0)	2 (7.4)	1 (16.7)	0.056
Procedural success	53 (75.7)	31 (83.8)	19 (70.4)	3 (50.0)	0.120
Ventilator time, days	0.3 ± 1.0	0.2 ± 1.2	0.4 ± 0.9	0.5 ± 0.8	0.807
Pressor requirement	7 (10.0)	2 (5.4)	4 (14.8)	1 (16.7)	0.309
Length of stay, days	4 [3 – 6.3]	4 [3 – 5.5]	4 [3 – 6]	11 [6.8 – 38.8]	<0.001
Major complication	7 (10.0)	2 (5.4)	2 (7.4)	3 (50.0)	0.014
Minor complication	14 (20.0)	4 (10.8)	7 (25.9)	3 (50.0)	0.043
MACCE	6 (8.6)	1 (2.7)	4 (14.8)	1 (16.7)	0.175
1-Year Mortality	10 (14.3)	6 (16.2)	2 (7.4)	2 (33.3)	0.168

Values expressed as mean ± SD, median [interquartile range], or n (%), as appropriate.

1. University Of Miami/JFK Medical Center Palm Beach Regional Consortium, United States; Huzefa Bhopalwala, Mayo Clinic, United States; Mark Rothenberg, JFK Medical Center, United States; Marcos Nores, JFK Medical Center, United States

Background: During the MitraClip (MC) procedure, more than 1 clip may be needed to effectively reduce symptomatic mitral regurgitation. Yet, the impact of multiple clips on clinical outcomes is unknown.

Methods: Data from 70 consecutive MC procedures from October 2014 to October 2016 were retrospectively gathered at a tertiary cardiovascular center. Patients were stratified based on the number of MC deployed and excluded when MC was not deployed due to delivery failure or specific device related complications. Operative and post-operative outcomes were analyzed.

Results: Rates of technical success and procedural success were similar in all three groups. However, patients that required more than one clip had lower rates of device success. Patients who received more than one clip had higher rates major and minor in-hospital complications and longer lengths of stay (LOS). Postoperative pressor and ventilator requirement, in-hospital major adverse cardiac and cerebrovascular event (MACCE), and 1-year mortality were similar between all three groups.

Conclusions: More than one clip placement during a MC procedure is associated with lower device success and increased adverse outcomes.

Disclosures: N. Dewaswala *Nothing to disclose*. S. Stamou *Nothing to disclose*. S. Lacy *Nothing to disclose*. D. Tsang *Nothing to disclose*. M. Abdul Qader *Nothing to disclose*. H. Bhopalwala *Nothing to disclose*. M. Rothenberg *Nothing to disclose*. M. Nores *Nothing to disclose*.

II-11 | Outcomes of Transcatheter Mitral Valve Repair with the Mitraclip System in the Elderly

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1. University Of Miami/JFK Medical Center Palm Beach Regional Consortium, United States; Mohamed Abdul Qader, 1. University Of Miami/JFK Medical Center Palm Beach Regional Consortium, United States; Darren Tsang, 1. University Of Miami/JFK Medical Center Palm Beach Regional Consortium, United States; Spencer Lacy, 1. University Of Miami/JFK Medical Center Palm Beach Regional Consortium, United States; Huzefa Bhopalwala, Mayo Clinic, United States; Mark Rothenberg, JFK Medical Center, United States; Marcos Nores, JFK Medical Center, United States

Background: The elderly represents a high-risk group of patients, often have more comorbid conditions, and have worse outcomes compared to younger patients. Procedural and clinical outcomes data for elderly patients undergoing treatment of severe mitral regurgitation using the MitraClip (MC) system is limited.

Methods: Data from consecutive patients who underwent a MC procedure from October 2014 to October 2016 at a tertiary

Characteristics	Entire Cohort N=76	< 85 n=37	≥ 85 n=39	P-value
Age	83.5 ± 6.3	78.8 ± 5.3	88.0 ± 2.9	<0.001
Gender, male	40 (52.6)	19 (51.4)	21 (53.9)	0.828
Body Mass Index, kg/m ²	24.8 ± 4.8	26.2 ± 5.5	23.6 ± 3.7	0.019
Hypertension	65 (85.5)	30 (81.1)	35 (89.7)	0.283
Diabetes	20 (26.3)	15 (40.5)	5 (12.8)	0.009
Atrial fibrillation	45 (59.2)	18 (48.7)	27 (69.2)	0.068
COPD	15 (19.7)	10 (27.0)	5 (12.8)	0.120
Chronic kidney disease	35 (46.1)	18 (48.7)	17 (43.6)	0.658
LVEF >40%	60 (88.2)	30 (85.7)	30 (90.9)	0.710
STS Risk Score	9.2 ± 5.2	9.1 ± 5.9	10.8 ± 4.3	0.160
MitraClips deployed, n				0.447
Procedure aborted	6 (7.9)	1 (2.7)	5 (12.8)	
1	37 (48.7)	20 (54.1)	17 (43.6)	
2	27 (35.5)	13 (35.1)	14 (35.9)	
3	6 (7.9)	3 (8.1)	3 (7.7)	
Conversion to surgery	3 (4.0)	2 (5.4)	1 (2.6)	0.610
Technical success	68 (89.5)	34 (91.2)	34 (87.2)	0.712
Device success	59 (77.6)	30 (81.1)	29 (74.4)	0.482
Delivery failure	4 (5.3)	1 (2.7)	3 (7.7)	0.330
Structural failure	1 (1.3)	0 (0)	1 (2.6)	1.000
Functional failure	9 (11.8)	4 (10.8)	5 (12.8)	1.000
Device-related	5 (6.6)	2 (5.4)	3 (7.7)	1.000
technical failure				
Ventilator time, days	0.3 ± 1.0	0.3 ± 0.8	0.3 ± 1.2	0.965
Length of stay, days	4 [3 – 6.8]	4 [3 – 7.5]	4 [3 – 6]	0.857
Major complication	9 (11.8)	3 (8.1)	6 (15.4)	0.481
MACCE	7 (9.2)	2 (5.4)	5 (12.8)	0.432
Pressor support	9 (11.8)	3 (8.1)	6 (15.4)	0.481
Procedural success	53 (69.7)	28 (75.7)	25 (64.1)	0.272
1-Year Mortality	11 (14.5)	5 (13.5)	6 (15.4)	1.000

Values expressed as mean ± SD, median [interquartile range], or n (%), as appropriate.

cardiovascular center was retrospectively reviewed. Patients were stratified according to age. Of 76 patients, 39 were ≥85 years old (elderly) and 37 were <85 years old (younger). Outcome measures included periprocedural major cardiac adverse and cerebrovascular events (MACCE), procedural success, hospital length of stay, post-operative complications and 1-year mortality.

Results: No significant differences in outcomes were elucidated between groups, including procedural success, hospital length of stay, major complications, ventilator or pressor requirements. MACCE occurred in 12.8% (n = 5) of elderly patients compared to 5.4% (n = 2) in younger patients (p=0.432). One-year mortality was 15.4% (n = 6) in the elderly group and 13.5% (n = 5) in younger patients (p=1.000).

Conclusions: MC therapy is safe and effective in patients with advanced age.

Disclosures: N. Dewaswala *Nothing to disclose*. S. Stamou *Nothing to disclose*. M. Abdul Qader *Nothing to disclose*. D. Tsang *Nothing to disclose*. S. Lacy *Nothing to disclose*. H. Bhopalwala *Nothing to disclose*. M. Rothenberg *Nothing to disclose*. M. Nores *Nothing to disclose*.

II-12 | Three-Dimensional Transesophageal Echocardiography guided Mitraclip: A Prospective Observational Study (The Near Fluoro-less MitraClip)

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O. von Mering, Division of Interventional and Structural Cardiology, University of Alabama Birmingham, United States; Mustafa Ahmed, Division of Interventional and Structural Cardiology, University of Alabama Birmingham, United States

Background: In addition to fluoroscopy, Trans-esophageal guidance remains an essential element in guiding mitral clip procedures. Three-dimensional (3D TEE) echocardiography can potentially eliminate the need for fluoroscopy and reduce radiation exposure without compromising the efficacy and safety of the procedure.

Methods: A single-center prospective observational study for patients admitted with severe mitral regurgitation (MR) treated with MitraClip. A total of 20 patients were treated utilizing a minimal fluoroscopic 3D TEE guided technique from September 2016 to January 2017. The study follow-up consisted of repeat imaging at 7 days, 30 days, 6 months and 1-year post procedure. Fluoro time, total procedural time, MR reduction, and procedural outcomes were recorded. Major adverse cardiac outcomes including heart failure, stroke, MI, or death were reported at 30 days and 1 year. Procedural success was defined as reduction of heart failure (NYHA class) severity by greater than one level, as well as reducing MR to less than or equal (2+) grade.

Results: Procedural fluoroscopic time ranged from 0 to 2.8 minutes, with a median of 0.3 and a mean of 1 minute. Only one intraprocedural complication was encountered. For most patients, fluoroscopy time represented less than 1% of the total procedural and device implantation times. At 30 days, procedural success was 95% (19/20) without any adverse cardiovascular events reported. Re-admission for heart failure was encountered in five patients, and four patients died on 1-year follow up. Successful MR reduction persisted in 75% of the cohort at 1-year.

Conclusions: Three-dimensional TEE guided MitraClip with a reduced fluoroscopic technique appears to be safe and feasible in guiding integral portions of the procedure with non-inferior results when compared to previously published registries.

Disclosures: M. Ahmed: *Abbott (St. Jude): Principal Investigator for a Research Study; Medtronic: Speaker Bureau; Edwards Lifesciences: Principal Investigator for a Research Study*; A. J. Ebrahimi *Nothing to disclose*. A. Abdul Jabbar *Nothing to disclose*. C. V. Venero *Nothing to disclose*. G. O. von Mering *Nothing to disclose*.

II-13 | Triple versus Double Orifice Valves After MitraClip: Clinical Features and Outcomes

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Dali Fan, University of California, Davis Medical Center, United States; Gagan Singh, UC Davis Medical Center, United States; Jason H. Rogers, UC Davis Medical Center, United States

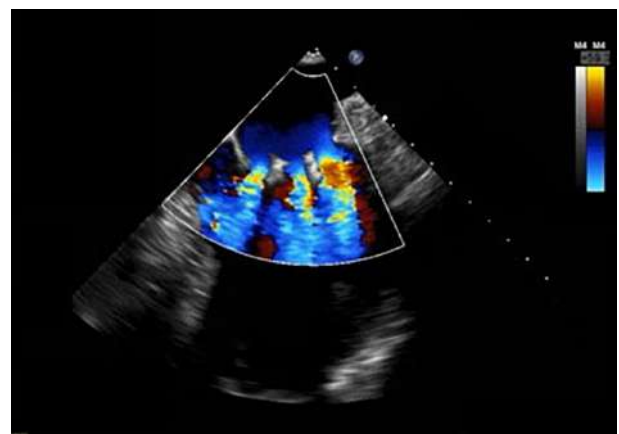
Background: Procedural and clinical outcomes of triple orifice valves created by MitraClip therapy have not been previously characterized.

Methods: 144 patients undergoing MitraClip were retrospectively analyzed from 2014-2017. 88 of these had 2 clips placed, and 33 had clips placed on different valve segments (i.e., A1/P1 and A2/P2), creating potential triple-orifice valves. A triple orifice valve was defined as having three orifices (Figure) with all diastolic inflow diameters >4 mm (the width of a MitraClip). We reviewed pre- and post-procedure valve characteristics.

Results: Patients with triple-orifice valves after MitraClip (n=16) had lower baseline mean pressure gradients across the mitral valve compared to double orifice valves (1.6 ± 0.8 vs 2.5 ± 1.5 mmHg, $p = 0.0004$), but did not have significantly different post-procedure gradients (4.9 ± 2.2 vs 4.6 ± 2.4 mmHg, $p = 0.7$). Baseline mitral valve area was larger in triple orifice but not significantly different (4.6 ± 2.0 vs 4.2 ± 1.2 cm², $p = 0.44$). MR grade pre-clip was not different (3.7 ± 0.48 vs 3.7 ± 0.5 , $p = \text{NS}$). MR post-clip was not significantly different (1.25 ± 1.0 vs 1.2 ± 0.8 , $p = 0.8$).

Conclusions: In this single center retrospective study, we found that the creation of a triple-orifice mitral valve after MitraClip had a comparable impact on the final gradients when compared to double orifice, perhaps due to lower baseline gradients. Overall MR reduction was similar. The need to create triple orifice valves in selected patients is often driven by more complex baseline disease with multiple or wide jets. This will be the subject of further analysis.

Disclosures: T. Smith: *Abbott (St. Jude): Consulting; Pipeline: Consulting*; G. Singh: *Boston Scientific Corp.: Consulting and Speaker Bureau*; J. H. Rogers: *Boston Scientific Corp.: Consulting; Abbott (St. Jude): Consulting*; W.L. Gore and Associates, Inc.: *Consulting*; M. Eng *Nothing to disclose*. L. Chen *Nothing to disclose*. B. Stripe *Nothing to disclose*. J. Yap *Nothing to disclose*. E. Aman *Nothing to disclose*. D. Fan *Nothing to disclose*.



II-14 | Machine Learning-Based In-Hospital Mortality Prediction for Transcatheter Mitral Valve Repair in the United States

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Background: Transcatheter mitral valve repair (TMVr) utilization has increased significantly in the United States over the last years. Yet, a risk prediction tool for adverse events has not been developed. We aimed to generate a machine learning-based algorithm to predict in-hospital mortality after TMVr.

Methods: Patients who underwent TMVr between 2012 and 2015 were identified using the national inpatient sample (NIS) database. The study population was randomly divided into a training set (n=636) and a testing set (n=213). Prediction models for in-hospital mortality were obtained using five supervised machine learning classifiers.

Results: A total of 849 TMVr were analyzed in our study. The overall in-hospital mortality was 3.1%. A naive Bayes (NB) model had the best discrimination for fifteen variables with an Area Under the Curve of 0.83 (95% CI, 0.80-0.87) compared to 0.77 for logistic regression (95% CI, 0.58-0.95), 0.73 for artificial neural network (95% CI, 0.55-0.91) and 0.67 for both random forest and support vector machine (95% CI, 0.47-0.87). However, both random forest and logistic regression models obtained for ten variables were as good as the best NB model with an AUC=0.82 (95% CI, 0.79-0.86, $p=0.34$). History of coronary artery disease, renal failure and smoking were the three most significant predictors of in-hospital mortality.

Conclusions: We developed a robust machine learning-derived model to predict in-hospital mortality in patients undergoing TMVr. While the best model was obtained by NB, conventional logistic regression generated an alternative model with a comparable performance.

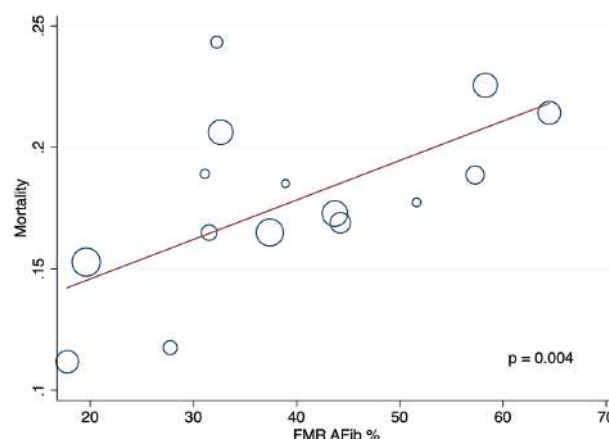
Disclosures: D. F. Hernandez Suarez *Nothing to disclose*. G. Kim *Nothing to disclose*. P. Villablanca *Nothing to disclose*. J. M. Wiley *Nothing to disclose*. A. Roche-Lima *Nothing to disclose*.

II-15 | Atrial Fibrillation and Transcatheter Repair of Functional Mitral Regurgitation. Evidence from a Meta Regression

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Background: Atrial fibrillation (AF) is a common arrhythmia in patients with severe functional mitral regurgitation (FMR) undergoing transcatheter mitral valve repair with the MitraClip device. Although AF has been consistently shown to be associated with poor outcomes post mitral valve surgery, the impact of AF on outcomes of MitraClip in patients with FMR is not well studied.

Methods: Prospective, retrospective, observational and randomized controlled trials on MitraClip reporting AF and FMR as one of the vari-



ables were included from inception till January 2019 were reviewed and extracted.

Results: The initial search strategy yielded 1694 studies (EMBASE 919, MEDLINE 535, Web of Science 173, Cochrane 66) amongst which 15 studies met the inclusion criteria. From a total of 5184 patients, 2105 (51.60%) patients were identified to have FMR and AF. All cause 30-day mortality in patients with FMR was 3.76% (95% CI 2.87– 4.66) and one-year mortality was 17.89% (95% CI 16.01 – 19.71). The Meta Regression analysis studying impact of AF on 30-day mortality in patients with FMR was nonsignificant but was statistically significant for increased mortality at one year (t 3.44, 95% CI 0.0006, 0.0027; $p=0.004$; Figure). No difference in procedural success was observed in regard to procedural success in both groups.

Conclusions: This meta regression identifies AF as an independent prognostic factor with negative impact on long-term mortality post MitraClip in patients with FMR.

Disclosures: S. Kaur *Nothing to disclose*. D. S. Sadana *Nothing to disclose*. J. Patel *Nothing to disclose*. M. M. Gad *Nothing to disclose*. K. Sankaramangalam *Nothing to disclose*. A. Krishnaswamy *Nothing to disclose*. R. Miyasaka *Nothing to disclose*. S. C. Harb *Nothing to disclose*. S. R. Kapadia *Nothing to disclose*.

II-16 | Contemporary trends in Percutaneous Mitral Valve Repair, Insight from National Inpatient Sample

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School Of Medicine, United States; Muhammad B Munir, West Virginia University School Of Medicine, United States

Background: Mitral regurgitation is the most common valvular heart disease in the USA. Until recently, surgical options were the only available strategies for treatment, per-cutaneous mitral valve repair (PMVR) using the commercially available (Mitraclip system; Abbot Vascular, Inc) has revolutionized the field and has emerged as an effective therapeutic option.

Methods: We analyzed National Inpatient Sample data from January 2012 to December 2016 using ICD-9-CM codes and ICD-10-CM codes. Pearson's χ^2 test, Analysis of variance (ANOVA) test and Fisher's exact test were used where applicable. Multiple Logistic regression was performed to estimate odds ratios (ORs) to determine predictors for mortality in patients undergoing PMVR. P value of < 0.05 was considered significant. R 3.5 was used for analysis.

Results: 9,125 patients underwent PMVR. 6,765 (74.3%) cases were elective. 4,295 (47.1%) were females. Mean age was 76.2(11.6) yrs. Mortality was 2.5% (225). The mean cost of hospitalization was 208,143 \$ and mean length of stay was 5.9 days. Mortality and

mean length of stay has decreased, although cost of stay has increased (Figure). Congestive heart failure (OR, 8.61 [95% CI, 4.18-17.71, $P<0.01$], chronic renal failure (OR, 1.61 [95% CI, 1.13-2.30, $P<0.01$]), chronic liver disease (OR, 4.09 [95% CI, 2.14-7.84, $P<0.01$]) and diabetes mellitus (OR, 1.61 [95% CI, 1.08-2.55, $P<0.01$]) were associated with high mortality. The mortality has improved over the years (OR, 0.79 [95% CI, 0.69-0.92, $P<0.01$]).

Conclusions: PMVR use is becoming more common, while the mortality and length of stay has decreased recently, mean cost of stay has increased.

Disclosures: M. Z. Khan *Nothing to disclose.* M. U. Khan *Nothing to disclose.* S. U. Khan *Nothing to disclose.* M. B. Munir *Nothing to disclose.*

II-17 | Effective Gene Delivery to Myocardium with Modified mRNA in a Radiopaque Medium Enables Real-time Assessment under Fluoroscopy Image Guiding

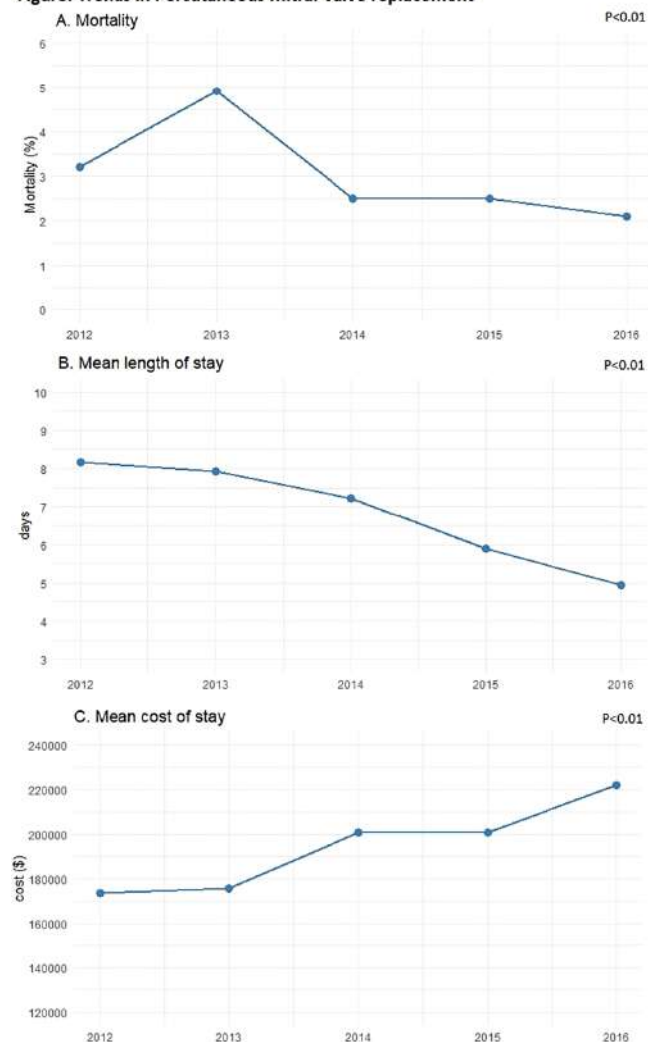
Nam Kyun Kim, Emory University, United States; Ki Hong Lee, Emory University, United States; Jonathan Langberg, Emory University, United States; Jared Beyersdorf, Georgia Institute of Technology, United States; Natasha Fernandez, Emory University, United States; Philip Santangelo, Georgia Institute of Technology, United States; Hee Cheol Cho, Emory University, United States

Background: The confirming modality for direct gene injection and retention to the myocardium through a transvascular approach is vital, yet not well established. We tested feasibility of a radiographic contrast media as a gene delivery vehicle, and fluoroscopic assessment of intramyocardial retention as well as proper function of a transgene.

Methods: We tested tissue contrast of various concentrations of iopamidol (2, 5, 20, 30 and 40%) following intramuscular injection. Effectiveness of GFP mRNA transfer was measured in a rat heart, using 0, 2, 5 or 20% iopamidol solutions. Therapeutic efficacy of this approach was assessed by TBX18 mRNA's ability to generate biological pacing. TBX18 mRNA (n=6) and GFP mRNA (n=2) mixed with iopamidol was injected to complete AV block (CAVB)-induced Yorkshire pigs through transvascular approach under fluoroscopic guidance. CAVB pigs were supported by back-up pacemaker set to VVI at 50 BPM. Isoproterenol challenges were performed on the 2nd and 4th weeks post-injection to determine maximum heart rate. Telemetry was implanted to record 24/7 heart rate over 2-weeks in GFP and TBX18 mRNA-treated pigs (n=1).

Results: Intermuscular fluoroscopic imaging shows sufficient contrast with 20% iopamidol. GFP fluorescence intensity was similar for all concentrations (0, 2, 5 and 20%) of iopamidol 5-days post-injection in rat hearts. Using a 20% iopamidol in mRNA solution, we were able to confirm translocation and retention of the injectate by fluoroscopic imaging during the injection procedure (n=8). At 2-weeks post-

Figure. Trends in Percutaneous Mitral Valve replacement



injection maximum heart rate of TBX18 and GFP mRNA-injected CAVB pigs with isoproterenol was 77 ± 12 and 43 ± 13 BPM, respectively. This difference became further significant at 4-weeks, showing higher maximum heart rate in TBX18 mRNA-treated CAVB pigs (93 ± 19 vs. 48 ± 3 BPM, $P < 0.05$). Mean heart rate during the first 2-weeks was higher in the TBX18-treated CAVB pig (69 ± 16) than GFP (54 ± 10 , $p < 0.05$), close to the threshold pacing rate of the back-up pacemaker.

Conclusions: Modified mRNA mixed with radiographic contrast agent provides sufficient contrast to confirm cardiac gene delivery with fluoroscopic guidance, while maintaining effective gene transfer and expression.

Disclosures: N. K. Kim *Nothing to disclose*. K. H. Lee *Nothing to disclose*. J. Langberg *Nothing to disclose*. J. Beyersdorf *Nothing to disclose*. N. Fernandez *Nothing to disclose*. P. Santangelo *Nothing to disclose*. H. C. Cho *Nothing to disclose*.

II-18 | Transseptal Transcatheter Mitral Valve Replacement Using transcatheter Heart Valves - Feasibility, Experiences & Outcomes

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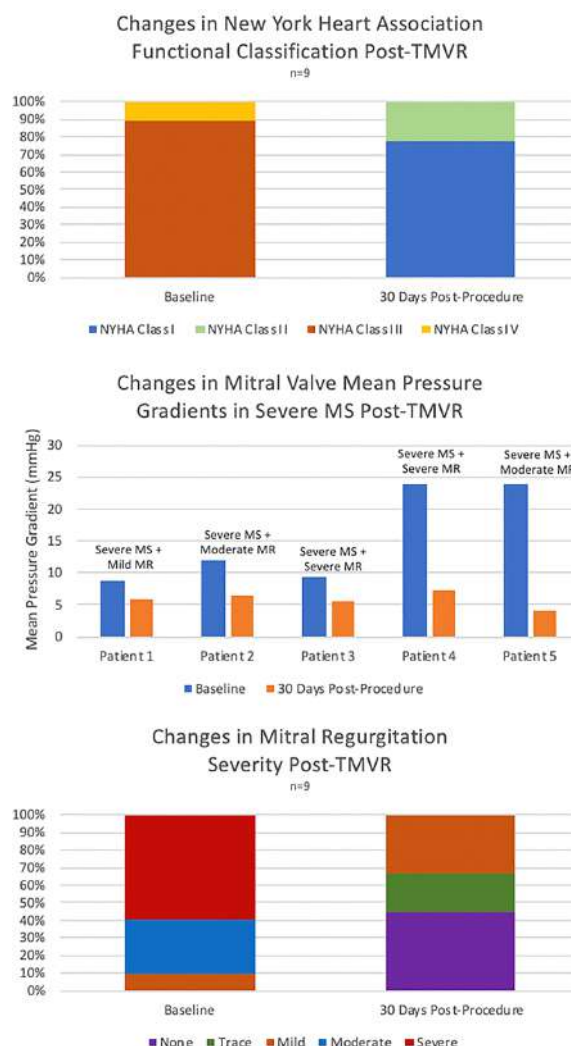
Background: Mitral valve pathology can range from severe mitral regurgitation (MR) to mitral stenosis (MS), leading to secondary complications. Surgical replacement or repair of the valve is feasible in low to intermediate risk but can be challenging in high risk patients. Transcatheter mitral valve replacement (TMVR) with prosthetic heart valves provides an alternative treatment modality in this population.

Methods: Retrospective review of all TMVR performed in our institution from January 2016 to April 2019. We evaluated baseline characteristics, post-procedural outcomes including all-cause mortality, cardiovascular mortality, hospitalizations and MACE to 6 months follow up.

Results: 9 patients underwent transseptal TMVR (4 valve-in-valve, 3 valve in ring and 2 native valve) due to severe MS (3) or severe MR (4) or combination of both (2). Mean age was 68 ± 13 years and 55% were female. Baseline LVEF was $47 \pm 10\%$ and mean STS Score for replacement and repair was $6 \pm 2\%$ and $3 \pm 1\%$.

All patients survived to 6 months with no hospitalizations or MACE and improved in New York Heart Association symptoms from Class III or IV to Class I or II. Mean MV gradients decreased 15.6 to 5.7 mmHg and MVA increased 0.9 ± 0.2 to 1.5 ± 0.5 with severe MS. MR severity decreased to none (2), trace (1), and mild (3) from severe MR.

Conclusions: Transseptal TMVR with balloon expandable valves is feasible in high risk patients and showed promising 6 month outcomes in our single center experience. Long term studies in larger populations is needed.



Disclosures: K. Kumar *Nothing to disclose*. S. Reddy *Nothing to disclose*. B. Dhakal *Nothing to disclose*. R. Shetty *Nothing to disclose*. K. Lotun *Nothing to disclose*.

II-20 | The association between pre-existing atrial fibrillation and the long-term outcomes among patients who underwent transcatheter mitral valve repair: a systemic review and meta-analysis

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Background: Transcatheter mitral valve repair (TMVR) is a novel intervention to treat patients with symptomatic degenerative severe mitral valve regurgitation (MR) with a high or prohibitive surgical risk. Atrial fibrillation (AF) is an abnormal cardiac rhythm that is prevalent among patients with severe MR. Recent studies suggest that pre-existing AF

is associated with an increase in all-cause mortality in patients undergoing TMVR, although the relationship is inconclusive. Thus, we conducted a systematic review of the literature and a meta-analysis to investigate this association.

Methods: We comprehensively searched the databases of PUBMED, MEDLINE, and EMBASE from the inception to December 2019. Included studies were published studies that reported an association between pre-existing AF and long-term outcomes among patients who underwent TMVR. Data from each study were systematically combined with a random-effects, generic inverse variance method to calculate pooled risk ratios and their 95% confidence intervals. Sensitivity analysis, funnel plots, and Egger's tests were assessed for the validity of the results.

Results: Ten observational studies were included in this meta-analysis involving 12,808 patients undergoing TMVR. Pre-existing AF was associated with a pooled 38.5% increase in all-cause mortality rate (pooled risk ratio 1.385, 95% confidence interval 1.243 to 1.543, p -value < 0.001). In addition, pre-existing AF was associated with increased cardiovascular mortality (pooled risk ratio 1.700, p -value 0.059), heart failure hospitalization (pooled risk ratio 1.168, p -value 0.040), and a composite outcome between heart failure hospitalization and mortality (pooled risk ratio 1.623, p -value 0.054). Sensitivity analysis showed no significant deviation from the 95% confidence interval of the pooled risk ratios. There was no significant evidence of publication bias from the funnel plots and Egger's tests.

Conclusions: Among patients undergoing TMVR, pre-existing AF is associated with poor outcomes, including higher all-cause mortality, cardiovascular mortality, and heart failure hospitalization. Further study is necessary to identify interventions that improve outcomes in these high-risk patients.

Disclosures: N. Limprutthidham *Nothing to disclose*. T. Riangwiwat *Nothing to disclose*. R. Mekritthikrai *Nothing to disclose*. N. Prasitlumkum *Nothing to disclose*.

II-21 | The Impact of Coagulopathies on Short-term In-Hospital Outcomes in Patients undergoing Surgical Heart Valve Replacement

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Background: Coagulopathies are a prevalent condition seen in the United States and are a known and serious cause of complications in

surgical procedures like surgical heart valve replacement. However, there is little data on the in-hospital management outcomes of surgical heart valve replacement in patients with coagulopathies. We investigated the in-hospital management, outcomes, and mortality in patients who received surgical heart valve replacement when they had a known coagulopathy.

Methods: This retrospective cohort study utilized the Nationwide Inpatient Sample to identify patients (18+) from 2012-2015 with a primary procedural history of surgical heart valve replacement of any of the four valves. ICD-9 codes were used to identify patients with a coagulopathy, and exclude patients with missing identifiers (age, gender, death). Data analyses assessed hospital length of stay (LOS), total hospital charges, and mortality. Statistical analysis was performed using chi-square and independent sample t-tests.

Results: We identified a total of 65,156 patient encounters during the study period who underwent surgical heart valve replacement of either the tricuspid, pulmonic, mitral, or aortic valve. 18,982 (29.1%) had a comorbid diagnosis of a coagulopathy. Patient encounters with a comorbid diagnosis of a coagulopathy had a significantly higher rate of mortality (5.2% vs. 3.1%, p < .001), LOS (10.88 days vs. 9.73 days, p < .001), and total hospital charges (\$210,988.29 vs. \$180,128.96, p < .001).

Conclusions: To our knowledge, this is the first study assessing the outcomes of surgical heart valve replacement in patients with coagulopathies. When comparing patient encounters with a known coagulopathy, total hospital charges, LOS, and in-hospital mortality were significantly higher than patient encounters without a coagulopathy who received a surgical heart valve replacement. Physicians should consider a bridging anticoagulant therapy (low molecular weight heparin) individualized based on the patient's risk factors following surgery. Physicians should also consider a transcatheter heart valve replacement approach to help reduce bleeding and transfusion requirements.

Disclosures: C. Marolt *Nothing to disclose*. V. Gordon *Nothing to disclose*. K. Johnson *Nothing to disclose*. J. Rowe *Nothing to disclose*. K. Hans *Nothing to disclose*. A. Lewis *Nothing to disclose*. S. A. Keim *Nothing to disclose*.

II-22 | Atrial Functional Mitral Regurgitation Compared to Primary Degenerative Mitral Regurgitation: Clinical Characteristics, Management Options, and Outcomes

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Table 1 – Baseline characteristics and Echo variables

Baseline characteristics	PMR (n=244, 86%)	AFMR (n=39, 14%)	P VALUE
Age (mean +/- SD)	70 +/- 14	71 +/- 13	0.768
Female (%)	39.8	56.4	0.050
Afib (%)	61.9	76.9	0.059
Persistent/permanent Afib (%)	13.1	28.2	<0.001
Hypertension (%)	76.2	94.9	0.008
Hyperlipidemia (%)	70.5	74.4	0.621
Coronary artery disease (%)	39.3	48.7	0.268
Diabetes Mellitus (%)	18.5	46.2	<0.001
Pacemaker (%)	13.5	33.3	<0.001
Prior cardiac surgery (other than mitral) (%)	12.7	43.6	<0.001
Beta-Blockers and/or antiarrhythmic (%)	70.9	82.1	0.583
Aspirin (%)	67.2	64.1	0.702
Cholesterol lowering (%)	61.1	61.5	0.799
ACEI/ARB (%)	30.7	28.2	0.749
Diuretic (%)	48.8	76.9	<0.001
Anticoagulant (%)	43.4	51.3	0.647
Concomitant severe TR (%)	4.5	23.1	0.015
Estimated RVSP (mean +/- SD)	43.4 +/- 18.9	53.8 +/- 18.9	0.001
LA volume (mean +/- SD)	109.6 +/- 54.5	130.9 +/- 79.8	0.125

Afib = atrial fibrillation, ACEI = Angiotensin-converting enzyme inhibitors, ARB = Angiotensin II receptor blockers; TR = tricuspid regurgitation

Background: Atrial functional mitral regurgitation (AFMR) is increasingly recognized, though not clearly defined clinically. We sought to compare AFMR to primary degenerative mitral regurgitation (PMR).

Methods: Retrospective analysis of patients aged 18+ years with severe MR and preserved LV function (LVEF >55%) by TEE between 2011-2018. Patients with prior mitral surgery, endocarditis, or HOCM were excluded. AFMR was defined by the absence of leaflet pathology.

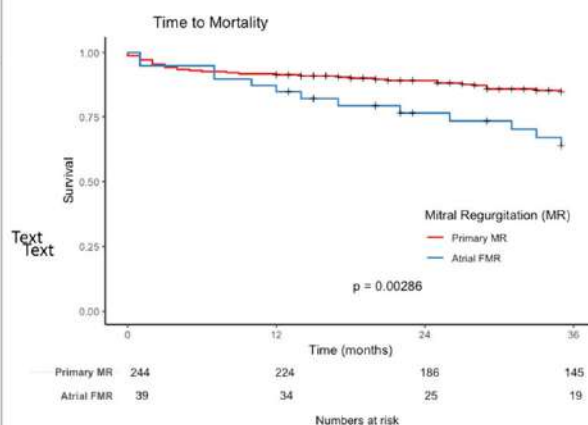
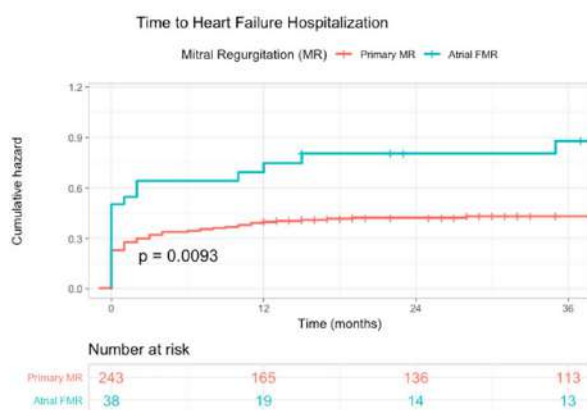
Results: 283 patients were identified (AFMR = 14%, PMR = 86%). Their baseline clinical and echo variables are compared in table 1. AFMR had more comorbidities, pacemakers, persistent/permanent Afib, higher RVSP, and more severe TR. In terms of valvular

interventions, PMR patients underwent more valvular procedures (82.8% vs. 59%, $p < 0.001$) and more repairs (66% vs. 28.2%, $p < 0.001$). At 3 years, AFMR pts had significantly higher rates of heart failure hospitalizations and death (figure 1).

Conclusions: AFMR patients have more comorbidities, fewer valvular interventions, and worse outcomes compared to PMR patients.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; O. Mesi *Nothing to disclose*. M. M. Gad *Nothing to disclose*. A. D. Crane *Nothing to disclose*. J. Ramchand *Nothing to disclose*. R. Puri *Nothing to disclose*. P. Wierup *Nothing to disclose*. B. Griffin *Nothing to disclose*. S. C. Harb *Nothing to disclose*.

Figure 1. Death and Heart failure hospitalization



II-23 | Atrial Functional Mitral Regurgitation: An Under-Recognized Clinical Entity with Poor Outcomes and no Defined Management

Oltion Mesi, Cleveland Clinic, United States; Mohamed M Gad, Cleveland Clinic, United States; Alejandro D Crane, Cleveland Clinic, United States; Jay Ramchand, Cleveland Clinic, United States; Rishi Puri, Quebec Heart and Lung Institute, Canada; Per Wierup, Cleveland Clinic, United States; Brian Griffin, Cleveland Clinic, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States; Serge C Harb, Cleveland Clinic, United States

Background: Current guidelines and device enrollment studies do not identify atrial functional mitral regurgitation (AFMR) as a separate entity. We sought to describe it clinically.

Methods: Retrospective analysis of patient aged 18+ years with severe MR and preserved LV function (LVEF >55%) by TEE between 2011-2018. Prior mitral valve surgery, prolapse/flail, endocarditis, and HOCM were excluded. AFMR was defined by the absence of leaflet pathology.

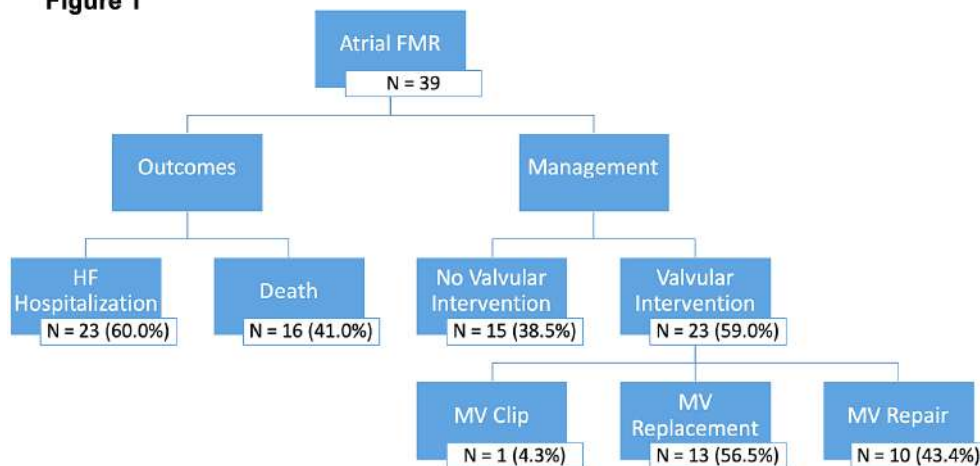
Results: 41 pts were identified, with 2 lost to follow-up. Mean age was 71 +/- 13, and 56% were women. Patients had a significant burden of comorbidities (Table 1), including AF in 77% with a pacemaker in 33%. Significant tricuspid regurgitation (≥moderate) was noted in 59%. During follow-up [22 months, IQR (7-49)], 39% did not undergo a valve intervention, 41% died, and 60% had a heart failure hospitalization (Fig 1). Surgical MV replacement, repair and MitraClip were undertaken in 13, 10 and 1 pts, respectively.

Conclusions: AFMR associates with significant comorbidities and poor outcomes, with no defined optimal management options.

Table 1

Variable	N = 39
Age (mean +/- SD)	71 +/-13
Female (%)	56.4
Afib (%)	76.9
Persistent/permanent Afib (%)	28.2
EP ablation (%)	7.7
Hypertension (%)	94.9
Hyperlipidemia (%)	74.4
Coronary artery disease (%)	48.7
Diabetes Mellitus (%)	46.2
Pacemaker (%)	33.3
Prior cardiac surgery (other than mitral) (%)	43.6
Beta-Blockers and/or antiarrhythmic (%)	82.1
Aspirin (%)	64.1
Cholesterol lowering (%)	61.5
ACEI/ARB (%)	28.2
Diuretic (%)	76.9
Anticoagulant (%)	51.3
Concomitant significant (moderate or more) TR (%)	58.9
Estimated RVSP (mean +/- SD)	53.8 +/- 18.9
LA volume (mean +/- SD)	130.9 +/- 79.8
Right ventricular dysfunction	28.2%
Right ventricular dilation	35.9%

Figure 1



*One patient underwent mitral valve repair followed by replacement

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; O. Mesi *Nothing to disclose*. M. M. Gad *Nothing to disclose*. A. D. Crane *Nothing to disclose*. J. Ramchand *Nothing to disclose*. R. Puri *Nothing to disclose*. P. Wierup *Nothing to disclose*. B. Griffin *Nothing to disclose*. S. C. Harb *Nothing to disclose*.

II-24 | Systematic Review & Meta-analysis of Safety & Efficacy of Percutaneous Pulmonary Valve Implantation

Wasiq Faraz Rawasia, West Virginia University Heart Institute, United States; Mohammed Osman, West Virginia University Medical Center, United States; Firzah A Abdul Mujeeb, Civil Hospital, Dow University of Health Science Karachi, Pakistan; Mohamad Alkhoul, Mayo Clinic - School of Medicine, United States

Background: There is paucity of data on the safety and efficacy of percutaneous pulmonary valve implantation (PPVI) in the management of acquired or congenital pulmonary valve stenosis.

Methods: We conducted a systematic review and meta-analysis based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. Observational or clinical trials reporting the outcomes of PPVI were identified from the literature search of the major databases. Random effects model was used for pooling the outcomes for the meta-analysis.

Results: 53 studies with 4,153 patients who underwent PPVI were included in the final analysis. There were low rates of postprocedural complications including, death (1%, 95% CI 1%-2%), access site complications (1%, 95% CI 1%-2%), prosthesis displacement/dislodgement (2%, 95% CI 1%-3%), and coronary compression or dissection (3%, 95% CI 1%-5%). The procedure was successful in 96% (95% CI 94%-98%) with low percentage of surgical conversion (1%, 95% CI 0%-2%).

In regards to follow-up on other outcomes, the rate of mortality, reintervention and endocarditis remained low; (1%, 95% CI 1%-2%), (8%, 95% CI 5%-10%) and (5%, 95% CI 3%-7%), respectively.

Conclusions: PPVI is overall safe and effective treatment modality with low post-procedural complications and mortality. However, on the long term there is a relatively higher rates of reintervention and risk of endocarditis.

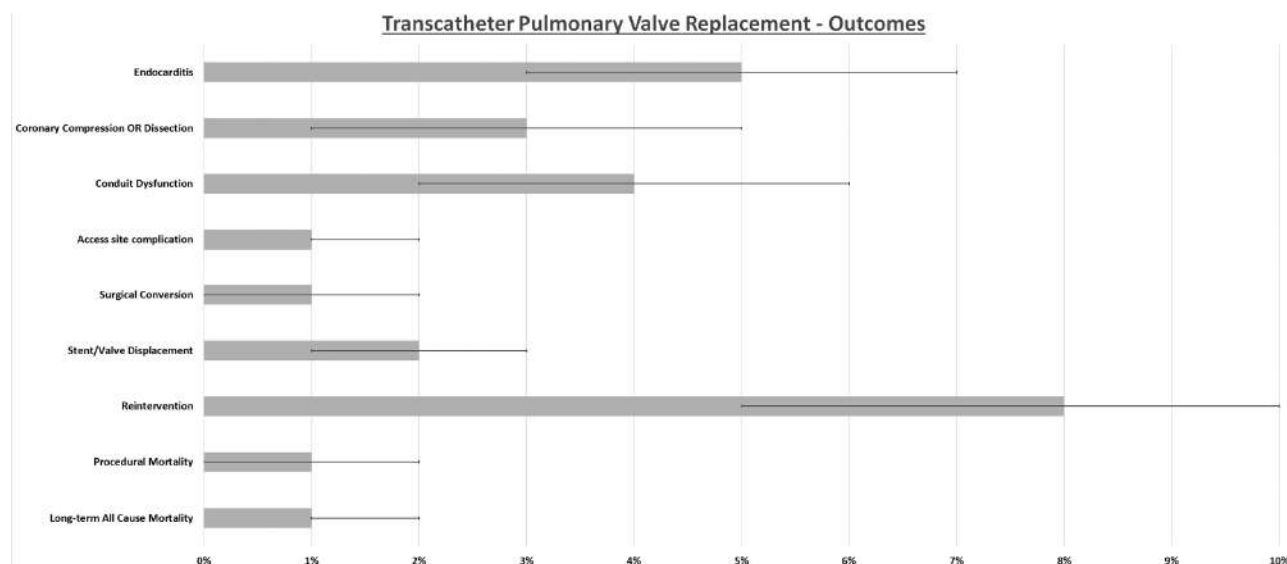
Disclosures: W. F. Rawasia *Nothing to disclose*. M. Osman *Nothing to disclose*. F. A. Abdul Mujeeb *Nothing to disclose*. M. Alkhoul *Nothing to disclose*.

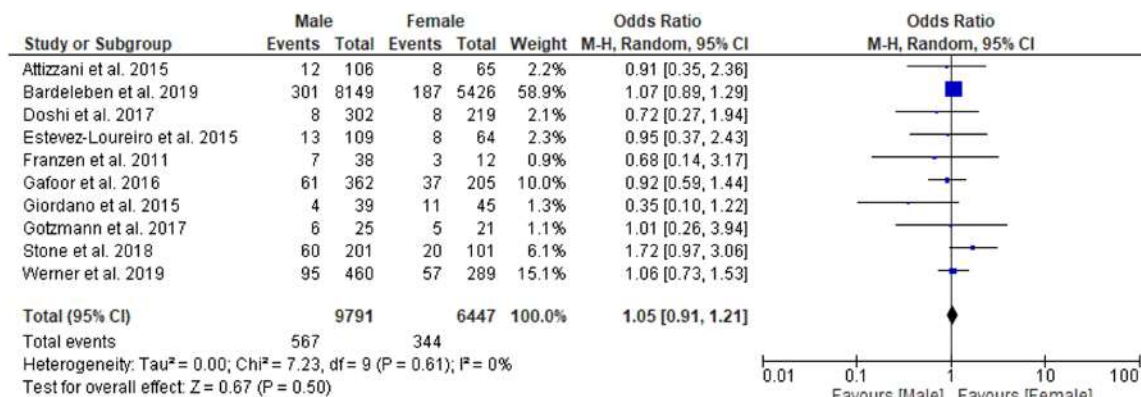
II-25 | Impact of Gender on Outcomes of Transcatheter mitral valve repair with MitraClip: A Meta-analysis

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Background: Gender disparities in outcomes after mitral valve surgery are well known. There are only studies reporting the influence of gender on outcomes following mitral valve repair using MitraClip (MC) device. In this meta-analysis, we describe outcomes by gender after edge-to-edge mitral valve repair with MC.

Methods: Studies reporting the gender specific outcomes in patients treated with MC were reviewed from January 2010 to November 2019. Outcomes evaluated include All-cause mortality, New York Heart Association (NYHA) class, readmission for heart failure or mitral regurgitation (MR) severity at the longest follow up. Pooled odds ratio (OR) and 95% confidence interval (CI) were calculated using random effects models.





Results: Eleven studies with 16,469 patients (9931 males and 6538 females) were included. There was no difference in all-cause mortality (OR: 1.05, 95% CI: 0.91-1.21, $p=0.50$), MR severity (OR: 0.74, 95% CI: 0.39-1.39, $p=0.35$) or readmission for heart failure (OR: 0.87, 95% CI: 0.53-1.43, $p=0.58$). However, NYHA class III/IV was more frequent in female patients as compared to male patients at the end of follow up (OR: 0.64, 95% CI: 0.52-0.79, $p<0.0001$).

Conclusions: Our meta-analysis suggests that female patients have worse NYHA functional class after MC without any difference in all-cause mortality, readmissions for heart failure or MR severity when compared to male patients.

Disclosures: U. Mustafa *Nothing to disclose*. P. Gill *Nothing to disclose*. G. S. N. Mina *Nothing to disclose*. S. R. Bailey *Nothing to disclose*.

II-26 | A Comparison of the Efficacy of Percutaneous Mitral Valve Repair in Patients With and Without Atrial Fibrillation: A Systematic Review and Meta-Analysis

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Background: Atrial fibrillation (AF) often accompanies mitral regurgitation and has been associated with poor outcomes after surgical mitral valve repair. Outcomes after percutaneous mitral valve repair (PMVR) in patients with AF have not been well-defined.

Methods: PubMed, EMBASE, Scopus, Web of Science and Cochrane Library were searched for randomized controlled trials and cohort studies reporting outcomes after PMVR in patients with and without AF.

Results: Six studies were included for analysis, pooling 7,562 patients total. Patients with AF had worse 30-day and 1-year all-cause mortality

(OR: 1.43, 95% CI: 1.04 – 1.98; and OR: 1.33, 95% CI: 1.15 – 1.54). At 1 year, patients with AF were less likely to have symptom improvement to New York Heart Association Class I or II (OR: 0.72, 95% CI: 0.57 – 0.93) and more likely to be hospitalized for heart failure (OR: 1.21, 95% CI: 1.02 – 1.42). There was no difference in procedural success, defined as residual mitral regurgitation grade 2 or lower, after PMVR (OR: 1.00, 95% CI: 0.84 – 1.19), and no difference of stroke at 30 days or 1 year (OR: 0.91, 95% CI: 0.30 – 2.75; and OR: 1.05, 95% CI: 0.64 – 1.71).

Conclusions: Similar to patients who undergo mitral valve surgery, patients with AF who undergo PMVR have worse outcomes than those without AF despite initial procedural success. Further studies are needed to investigate this association.

Disclosures: M. G. Cohen: Abiomed: Consulting and Speaker Bureau; Merit Medical: Consulting; AstraZeneca: Consulting; Medtronic: Consulting; Accumed Radial Systems: Ownership Interests: Stocks, Stock Options; E. de Marchena: Abbott (St. Jude): Patent Holder/Intellectual Property Rights; N. Olarte *Nothing to disclose*. M. Rivera *Nothing to disclose*. V. Becerra *Nothing to disclose*. M. Fernandes *Nothing to disclose*. C. E. Alfonso *Nothing to disclose*.

II-27 | Percutaneous Mitral Valve Repair Outcomes in Patients with Chronic Kidney Disease

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Background: Percutaneous mitral valve repair with the MitraClip device (Abbott, Santa Clara, CA) has emerged as a treatment option for symptomatic patients with moderate to severe mitral regurgitation with high surgical risk. It's unclear whether the presence of chronic kidney disease (CKD) affects procedural outcomes of percutaneous mitral valve repair.

Methods: The study population was extracted from the 2016 Nationwide Readmissions Data (NRD) using International Classification of Diseases, tenth edition, clinical modifications/procedure coding system (ICD-9-CM/PCS) for MitraClip, CKD, and procedural complications. Study endpoints included in-hospital all-cause mortality, cardiogenic shock, bleeding, need for blood transfusion, vascular complications, and length of index hospital stay (LOS).

Results: A total of 2,539 discharges had MitraClip during the index hospitalization and 37.9% had history of CKD. Mean age was 78.5 years and 46.6% were female. Compared to patients with normal kidney function, the presence of preexisting CKD was associated with higher in-hospital all-cause mortality (3.6% versus 1.6%, $p<0.001$), cardiogenic shock (5.6% versus 2.5%, $p<0.001$), bleeding (12.2% versus 8.3%, $p=0.001$), need for blood transfusion (7.2% versus 2.7%, $p<0.001$), and longer LOS (7.4 versus 4.1 days, $p<0.001$). There was no significant difference in terms of vascular complications (0.4% versus 0.3%, $p=0.48$).

Conclusions: In patients undergoing MitraClip procedure, the presence of preexisting CKD was associated with significantly higher in-hospital morbidity and mortality.

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II-28 | In-Hospital Outcomes of Percutaneous Mitral Valve Repair in Patients with Chronic Obstructive Pulmonary Disease: Insights from The National Inpatient Sample Database

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Background: There is lack of data on the outcomes of percutaneous mitral valve repair (PMVR) for mitral regurgitation in patients with chronic obstructive pulmonary disease (COPD).

Methods: We assessed the nationwide trends, characteristics and in-hospital outcomes in patients with mitral regurgitation treated with PMVR among patients with or without COPD within the National Inpatient Sample (NIS) database.

Results: A total of 9,125 patients underwent PMVR in the period between January 2012 to December 2016, of whom 2,495 (27.3%) patients had concomitant COPD. Comparing COPD patients to non-COPD patients, COPD patients had higher proportion of females (48.3%

as compared to 46.6, $p=0.16$), were younger (75.8 ± 10.0 years versus 76.4 ± 12.2 years; $p=0.04$), had higher prevalence of peripheral vascular disease (17.4% vs 13.5%; $p<0.01$) and renal failure (39.3% vs 37%; $p<0.01$). After propensity matching there was no significant difference in mortality among the COPD group vs non-COPD patients (2.6% vs 2.9%; $p=0.6$). Patients with COPD had higher proportion of in-hospital morbidities including ST-segment elevation myocardial infarction (1.8% vs 1.0%; $p=0.02$), cardiogenic shock (1.4% vs 0.4%; $p<0.01$), vascular complications (2% vs 0.8, $p<0.01$), pneumothorax (1% vs 0.4%; $p<0.01$) and septic shock (1.2% vs 0.4%; $p<0.01$). Moreover, surrogates of severe disability (Mechanical intubation and non-home discharges), cost of hospitalization and length of stay were higher in the COPD group.

Conclusions: There was no difference in mortality between the COPD and non-COPD patients after PMVR. Moreover, we observed higher rates of in-hospital morbidities, surrogates of severe disability and higher resources utilization by the COPD group

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II-29 | Impact of Chronic Lung Disease on the Outcomes of Transcatheter Mitral-Valve Repair in Functional Mitral Regurgitation: The COAPT Trial

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Background: Chronic obstructive pulmonary disease (COPD) often co-exists with severe functional mitral regurgitation (FMR) in heart failure (HF). Whether HF pts with COPD derive less benefit from transcatheter mitral valve repair (TMVr) is unknown.

Table. Association of Baseline Chronic Lung Disease (COPD) with Clinical and QOL Benefit of TMVr

2-Year Outcome	TMVr	Standard Care	HR or Difference in QOL Score (95% CI)	P Value for Interaction
Death				
COPD	43.4%	39.7%	1.13 (0.67–1.93)	0.01
No COPD	23.5%	43.8%	0.49 (0.35–0.69)	
HF hospitalization				
COPD	43.0%	61.2%	0.61 (0.37–1.01)	0.38
No COPD	32.5%	55.2%	0.48 (0.36–0.64)	
KCCQ-QS				
COPD	62.9 $\pm$ 27.8	52.2 $\pm$ 20.3	14.6 (3.1–25.9)	0.76
No COPD	73.2 $\pm$ 21.9	60.6 $\pm$ 26.1	12.6 (7.0–18.1)	

Methods: The COAPT trial randomized 614 pts with HF and 3-4+ FMR to TMVr with MitraClip + guideline-directed medical therapy (GDMT) or GDMT alone. We used Cox proportional regression models or ANCOVA models to assess the association between COPD and 2-year clinical and quality of life (QOL) outcomes. Of note, pts with severe COPD requiring home oxygen or chronic oral steroid use were excluded from COAPT.

Results: COPD was present in 143 (23.3%) pts. Pts with COPD had worse baseline health status compared with pts without COPD (KCCQ-Overall Summary [OS] score 46.1 vs 54.3, $p<0.001$). COPD was associated with reduced benefit of TMVr with respect to 2-year mortality (HR 1.13 (95%CI 0.67–1.93) with COPD vs 0.49 (95%CI 0.35–0.69) without COPD, $P_{\text{int}}=0.01$) but not HF hospitalization (HR 0.61 (95%CI 0.37–1.01) with COPD vs 0.48 (95%CI 0.36–0.64) without COPD, $P_{\text{int}}=0.38$). The QOL benefit of TMVr was similar among pts with vs without COPD ($P_{\text{int}}=0.76$) (Table).

Conclusions: In COAPT, baseline COPD was associated with a reduced survival benefit of TMVr, but baseline COPD did not impact the benefit of TMVr on either HF hospitalizations or disease-specific health status. These data suggest that pts with persistent 3-4+ FMR and COPD should be considered for TMVr if HF-related symptoms persist despite maximally-tolerated GDMT.

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II-30 | Transcatheter Mitral Valve Repair and Replacement versus Open Mitral Valve Replacement: A Comparative Analysis of National Inpatient Sample (NIS) Database

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Yasar Sattar, Icahn School of Medicine at Mount Sinai Elmhurst, United States; Wajahat Humayun, Thomas Jefferson University, United States; David Lee Fischman, Thomas Jefferson University Hospital, United States

Background: Transcatheter mitral valve repair and replacement (TMVR) is a recent, minimally invasive, and safer alternative to conventional open-heart mitral valve replacement (OMVR). The present study aims to compare the burden, demographics, cost, and complications of TMVR and OMVR.

Methods: The United States National Inpatient Sample (NIS) for the year 2017 was queried to identify all cases of TMVR and OMVR. The categorical and continuous data were analyzed using the Pearson chi-square and independent t-test analysis, respectively.

Results: A total of 19580 patients were identified; (OMVR 94%, 18460, and (6%, 1120, TMVR). The mean age for patients who underwent OMVR and TMVR was 63 ± 14 years and $67\pm$ years, respectively. Both cohorts consisted predominantly of Caucasian patients (73% vs. 74.0%). The mean cost for TMVR was 383401 US dollars (\$), significantly higher compared to OMVR (\$318882), with $p= <0.001$. The average number of days from admission to the TMVR procedure was 2.63 days, significantly lower compared to the OMVR group (3.02 days), $p=0.015$. The average in-hospital length of stay (LOS) was substantially lower ($p=<0.001$) by 0.388 days for the TMVR group compared to the OMVR group (11.56 vs. 14.01 days, respectively). The patients who underwent TMVR were more likely to belong to a household with an income in the 4th quartile (26.1% vs. 22.0%) and less likely to be in the 1st quartile (22.1% vs. 27.8%). The in-hospital mortality was significantly higher for the TMVR group (150/1120) at 13.4% as compared to the OMVR group (985/18455) 5.3% with a p-value of 0.01. However, on logistic regression, adjusted in-hospital mortality for co-morbidities showed no significant difference between the two groups ($p=0.67$).

Conclusions: TMVR patients are more likely to be older and financially affluent. TMVR is associated with a high procedure-related cost but shorter hospital stay. The crude mortality events were high in TMVR compared to OMVR, possibly due to the inclusion of the older and sicker population requiring emergent procedures.

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II-31 | In-patient, 30 days and One-year Mortality Outcomes of Patients Receiving Mitral Clip: A Systematic Review and Meta-analysis

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Schleicher, Cleveland Clinic Foundation, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States

Background: Mitral Clip (MC) implantation is the recommended treatment for patients with severe symptomatic mitral regurgitation not responding to medical therapy and prohibitive surgical risk. We aim to identify incidence and predictors of short- and long-term outcomes of these patients using technique of pooled data meta-analysis.

Methods: According to PRISMA 2009 guidelines, Medline, Embase and Cochrane CENTRAL databases were searched from inception until July 3, 2019. Primary outcome studied was all-cause cumulative mortality at discharge, 30-days and 1-year. Re-hospitalization due to heart failure after discharge was studied as secondary outcomes.

Results: Of 2,394 references, 16 studies enrolling 8227 patients were included. Pooled estimates from random effects analysis showed that incidence of all-cause cumulative mortality at discharge, 30-days and one year is 2.56 [95%CI: 2.23-2.93; $I^2=0\%$], 4.42 [95%CI: 3.68-.30; $I^2=54\%$] and 20.99 [95%CI: 18.97-23.15; $I^2=74.9\%$] deaths per 100 MC procedures respectively. Rate of hospitalization due to heart failure at 30 days and 1-year was noticed as 3.9% [95% CI: 1.69-8.64, $I^2=92.5\%$] and 30% [95%CI: 23.41-37.58, $I^2=95.8\%$] respectively. History of heart failure, log.euroscoreII, NTproBNP and clip detachment before discharge significantly predicted mortality on meta-regression.

Conclusions: Our meta-analysis revealed that MC procedure is associated with low (2.6%) mortality at discharge. There is additional 1.86% mortality within 30 days. One-year mortality reaches 21%. Understanding the causes of early and late mortality after mitral clip requires additional studies although it appears that severity of disease, comorbidities and success of the procedure predict one-year mortality.

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United States; Sandeep Nathan, The University of Chicago, United States; Atman P. Shah, The University of Chicago, United States

Background: Transcatheter pulmonary valve implantation (TPVI) is utilized to treat patients with pulmonic valve (PV) or conduit dysfunction who have had complex congenital heart surgery and have developed right heart failure as a result of either PV stenosis or regurgitation. These complex cases have traditionally been managed with general anesthesia (GA). Conscious sedation (CS) during the procedure has emerged as an alternative to GA. The purpose of this study was to assess the clinical safety and feasibility of CS in TPVI.

Methods: We performed a retrospective review of 16 consecutive TPVI cases done at a single center. Baseline and procedural characteristics were compared. Statistical analysis was performed via ANOVA with a p value <0.05 considered significant.

Results: 53% were male (9/16) with an age range of 16-69 (median 32) and all underwent successful TPVI (11/12 with Sapien S3 and 1/12 with Melody valve). 11 patients underwent GA and 5 underwent CS. Average case length was less with CS compared to GA (98 minutes vs. 169 minutes, $p = 0.027$). The average length of hospital stay (hrs.) was reduced (63.23 vs. 33.1, $p = 0.072$). There were no differences in procedural outcomes, survival, or complications between the two groups. Radiation exposure and contrast volume were not statistically different.

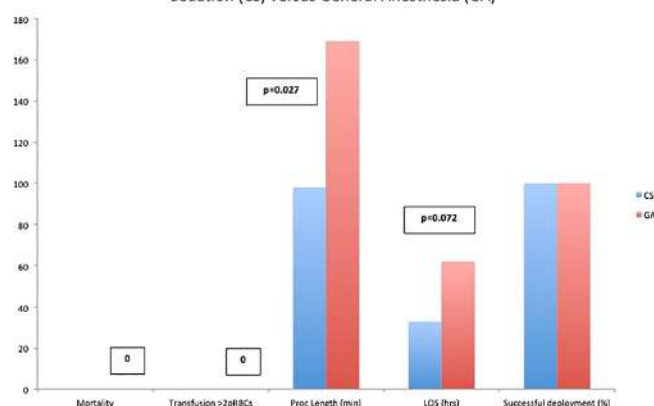
Conclusions: TPVI is an effective therapy for patients who have developed PV or right ventricular conduit dysfunction. The use of CS in patients undergoing TPVI is associated with similar clinical efficacy and safety compared to GA with reduced procedural times. Further studies are needed, as CS may be an adequate alternative to GA.

Disclosures: S. Nathan: Abiomed: Consulting; Medtronic: Consulting; Cardiovascular Systems, Inc.: Consulting; Maquet: Consulting; Terumo Interventional Systems: Consulting; Merit Medical: Consulting; Janssen: Consulting; D. Weibeler Nothing to disclose. J. Friant Nothing to disclose. J. Park Nothing to disclose. J. M. Venturini Nothing to disclose. P. M. Larsen Nothing to disclose. R. J. Kalathiya Nothing to disclose. J. E. Blair Nothing to disclose. J. Paul Nothing to disclose. A. P. Shah Nothing to disclose.

II-32 | Conscious Sedation is Associated with Similar Clinical Outcomes and Reduced Procedure Times Compared to General Anesthesia in Patients Undergoing Transcatheter Pulmonic Valve Implantation

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Clinical and Procedural Characteristics of Patients Undergoing TPVI with Conscious Sedation (CS) versus General Anesthesia (GA)



II-33 | Safety and Feasibility of Percutaneous Vacuum Assisted Thrombectomy With Cerebral Protection In Patients With Right and Left-Sided Cardiac Lesions

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Background: Percutaneous Vacuum Assisted Thrombectomy (AngioVac) treatment of right atrial thrombus with patent foramen ovale (PFO) and left-sided cardiac lesions is an emerging therapeutic modality with potential to increase the risk of systemic embolization. Sentinel cerebral protection has been utilized in Trans-catheter Aortic Valve Replacement (TAVR) to reduce peri-procedural stroke rate and increase stroke-free survival, but its implications outside of TAVR have not been explored.

Methods: We retrospectively identified 5 cases between January 2018 and 2020 utilizing Sentinel cerebral protection in patients that underwent AngioVac thrombectomy for high-risk lesions in right and left cardiac chambers.

Results: Table 1 details patient characteristics, procedural indications and outcomes. Right atrial thrombectomy in the presence of a PFO was performed in 3 cases. AngioVac of left cardiac chambers was performed in 2 cases (mitral valve vegetation, left ventricular mass debulking). Successful thrombectomy/debulking was achieved in all cases. There were no neurological complications including on follow-up neuroimaging in 2 cases. There were no procedure-related complications including bleeding, stroke, myocardial infarction, or death. All patients survived to hospital discharge.

Conclusions: This case series demonstrates safety and feasibility of AngioVac thrombectomy of high-risk right and left sided cardiac lesions while utilizing Sentinel cerebral protection.

Disclosures: D. M. Zlotnick: *Abiomed: Speaker Bureau; AstraZeneca: Speaker Bureau; Angiodynamics: Speaker Bureau*; Y. Yatsynovich *Nothing to disclose*. T. T. Ramanan *Nothing to disclose*. V. Maheshwari *Nothing to disclose*. V. S. Iyer *Nothing to disclose*.

OTHER ENDOVASCULAR INTERVENTIONS (INCLUDING RENAL DENERVATION AND AAA)

II-34 | Computational Analysis of Ideal EndoAnchor Positioning in Endovascular Treatment of Abdominal Aortic Aneurysm

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Background: While endovascular aortic repairs (EVAR) have become increasingly utilized in the treatment of abdominal aortic aneurysms (AAA), type 1A endoleaks from a loss of proximal seal remain a limitation. EndoAnchors have been studied as an effective method to prevent stent migration, but the optimal positioning of EndoAnchors within the proximal seal zone has not been examined. Therefore we sought to model the ideal location for EndoAnchor deployment.

Methods: A patient's AAA DICOM CT images were processed and segmented to model the aneurysm. Data was collected for 4 models, 3 with EndoAnchors positioned at varying locations in the proximal seal zone and a control without EndoAnchors. The models were analyzed using finite element analysis to determine changes in contact of the wall-stent interface as pressure increases. The models were pressurized on the luminal surface to 120 mmHg and 200 mmHg to mimic a normotensive versus hypertensive conditions. The primary endpoint was stability of the wall-stent interface, defined as the maintenance of contact area between the surfaces in mm².

Case	Age	Sex	Indication	Procedure Performed	Neurological changes post-procedure	F/u Neuroimaging
1	64	Male	Cryptogenic CVA, R atrial pacemaker lead thrombus, +PFO	AngioVac thrombectomy, cerebral protection, PFO closure	None	stable without new lesions
2	72	Female	Left ventricular 1cm mass, severe MS and MV bio-prosthesis failure	Transapical AngioVac thrombectomy, cerebral protection, TMVR	None	No
3	76	Female	Submassive PE, large RA thrombus with extension into interatrial septum and LA	AngioVac thrombectomy, cerebral protection	None	No
4	86	Female	Embolic CVA, MV endocarditis	Trans-septal AngioVac thrombectomy, cerebral protection (Sentinel)	None	No
5	42	Male	Right basal ganglia CVA, bilateral PE, large right atrial thrombus attached to +PFO	AngioVac thrombectomy, cerebral protection (Sentinel) and PFO closure	None	stable without new lesions

Results: In the normotensive model, the 3 EndoAnchor positions resulted in similar stability of the proximal zone interface, and all performed better than the model without EndoAnchors. At a pressure of 200 mmHg, the most proximal EndoAnchors had approximately 30% more contact area between the stent and the wall compared to the model without EndoAnchors, and 15% more than the models with more distal positioning.

Conclusions: Our computational model suggests that EndoAnchors provide stability of the proximal seal zone, with proximally positioned EndoAnchors most effective compared to medial and distal positioning particularly when modeling a patient with hypertension. Future research will aim to understand the impact of EndoAnchor placement for patients with hostile AAA neck geometries.

Disclosures: L. Pocivavsek: *Aruga Technologies, LLC.: Ownership Interests; Stocks, Stock Options*; R. Milner: *Medtronic: Consulting*; W.L. Gore and Associates, Inc.: *Consulting*; E. N. Abbott *Nothing to disclose*. T. Babrowski *Nothing to disclose*.

II-35 | Characteristics and outcomes of pulmonary angioplasty with or without stenting for sarcoidosis-associated pulmonary hypertension: systematic review and individual participant data meta-analysis

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Background: There is scarce and contradictive evidence for the role of balloon angioplasty (BA) and stenting in patients with sarcoidosis-associated pulmonary hypertension (SAPH); a terminal condition. We conducted a systematic review and individual participant data (IPD) meta-analysis of outcomes of pulmonary BA with or without stenting in patients with SAPH.

Methods: We conducted a systematic search on 11/01/2019 using the terms "sarcoidosis" and "pulmonary hypertension" in ClinicalTrials.gov, Cochrane, Embase, and Pubmed. We also screened citations from included studies and other sources. We included abstracts and articles of patients with SAPH undergoing BA. Pulmonary procedures for non-SAPH were excluded. We requested the missing data from reference authors. We assessed the risk of bias with the Newcastle-Ottawa and WHO-UMC (adapted version) quality assessment tools.

Results: Of the 1,412 references initially retrieved, seven met selection criteria. Among 17 patients identified, the average age was 58.6 (± 9.06) years, 82.4% were female, the most common ethnic group was Chinese (57.1%). Most patients had baseline NYHA FC III or IV, and had been on steroids preprocedurally. Mean baseline mPAP was

50.6 (± 21.2) mmHg. Changes in 6MWD were available for 11 patients, all of whom improved. Mean change in 6MWD in 8 patients (same cohort) was 219.6 m ($p < 0.028$).

Twelve patients received arterial stents to their right or left trunks, or smaller branches. Two also had venous stenting. There were 24 admissions to the catheterization laboratory (CL). Eleven patients had only one CL encounter for BA $\pm$ stenting. Another 6 patients required 2-3 CL admissions for dilatation or to treat adverse outcomes of previous procedures. There were 10 adverse outcomes including: 4 in-stent restenosis, 2 dissections, and 2 embolisms. Median follow up was 6 (IQR 15) months. There were no deaths.

Conclusions: BA and stenting of pulmonary vessels may help to improve functional status in patients with SAPH, even in those with mediastinal fibrosis; a terminal condition. This is evidenced by an unanimous improvement in their 6MWD; which remains an important therapeutic goal in PH. Although, some complications were observed, all patients survived follow up.

Disclosures: A. daSilva-deAbreu *Nothing to disclose*. W. Bracamonte-Baran *Nothing to disclose*. J. D. Tafur Soto *Nothing to disclose*. S. Mandras *Nothing to disclose*.

II-36 | Clinical Outcomes of Catheter-Guided Renal Denervation for the Treatment of Heart Failure With Reduced Ejection Fraction

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Background: Catheter-guided renal artery denervation (RDN) works on sympathetic system deactivation. It can treat resistant hypertension and modulate sympathetic system hyper stimulation of heart failure patients with reduced ejection fraction (HFrEF). We aimed to investigate the clinical use of RDN for HFrEF patients.

Methods: We searched Pub Med and Cochrane for all clinical studies that directly compared RDN to guideline-directed medical therapy (GDMT) for patients with HFrEF. Primary outcome was LVEF reduction. Secondary outcomes were LVEDD and heart failure hospitalizations. We used Fixed or Random Effect analysis using the Cochrane Handbook of Systematic Reviews and RevMan 5.2 for statistical analysis.

Results: A total of 4 studies (three RCT's and one prospective) provided a total of 191 patients, 96 in the RDN group and 95 in the control. Mean follow up was 10 ± 3.5 months. LVEF was significantly 6.41% (2.86-9.95, $p < 0.01$) higher in the RDN group compared to the control. Secondary outcomes analysis disclosed significantly 5.48 mm (4.14-6.81, $p < 0.01$) smaller LVEDD in RDN group. Heart failure hospitalizations were significantly less in the RDN group (27% vs. 74%, $p < 0.01$).

Conclusions: RDN for the treatment of HFref improved outcomes including LVEF, LVEDD and hospitalizations compared to GDMT only. Overall data is scarce and lacks of mortality analysis. Therefore further randomized clinical studies should be pursued.

Disclosures: D. Garcia *Nothing to disclose*. M. M. Ansari *Nothing to disclose*.

II-37 | Endovascular Intervention and Open Surgical Repair for Chronic Mesenteric Ischemia

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Background: Chronic mesenteric ischemia can be managed by open surgical repair (OS) or alternatively, by endovascular repair. Clinical outcomes may vary between these two modalities. We evaluated the clinical and procedural outcomes between the two treatment modalities through a meta-analysis of current clinical studies.

Methods: Systematic review of Pub Med, Chocrane and Embase database were performed for all clinical studies that directly compared OS and endovascular therapy for chronic mesenteric ischemia. Primary outcomes were post-procedure mortality. Secondary outcomes included long-term survival, restenosis and secondary lesion patency. We used random effect analysis according to the Cochrane-Handbook of Systematic Reviews and RevMan 5.2 for statistical analysis.

Results: A total of 19 studies (18 retrospective and one prospective) provided a total of 9,279 patients (3,830 in the endovascular

group and 5,449 in the OS). Majority of patients were men older than 65 years. There was a trend towards less the post procedural death in the endovascular (1.3% vs. 5.6%, $p = 0.1$). There was no difference in long-term survival between endovascular and OS group either (80% vs. 78%, $p=1$). Restenosis rate was significantly better in the OS group (20% vs. 32%, $p<0.01$). Vascular complications were significantly less in the endovascular group (18% vs. 38%, $p<0.01$).

Conclusions: Our analysis suggested that endovascular therapy has good mortality and complications rate although OS is associated to superior patency over the time. Endovascular therapy might be indicated for the patients who are not a good surgical candidate. Newer generation of stents can help to improve lesion patency. Further randomized studies are warranted.

Disclosures: D. Garcia *Nothing to disclose*. M. M. Ansari *Nothing to disclose*.

II-38 | Periprocedural outcomes of endovascular lithotripsy for the treatment of calcified carotid artery lesions

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Background: Calcified lesions remain a challenge for endovascular procedures and increase the overall morbidity and mortality.

Patient	Age, years	Sex	Caucasian	Significant medical history	Anti-thrombotic therapy	Statin, yes/no	Location of lesion	% of stenosis	Type of Shockwave balloon	Inflation: Atm	Number of pulses of ultrasound energy	PTA technique	Procedure success (residual stenosis <30%)	Procedural complications
case 1	72	M	yes	dys, DM, HTN, prior MI, CHF, CAD, CLD, smoking hx	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	70	4x40mm	4atm	40	Xact 9-7x40mm	yes	no
case 2	80	M	yes	dys, HTN, prior MI, CHF, CAD, CVD, CLD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	CCA	90	4x60mm; 5x60mm	8 atm; 6 atm	180; 180	Xact 8x40mm	yes	no
case 3	75	F	yes	dys, DM, HTN, prior MI, CAD, CVD, CLD, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	CCA-ICA	95	4x40mm	4 atm; 6 atm	7; 7	CarotidWallstent 7x30mm	yes	no
case 4	67	M	yes	dys, HTN, prior MI, CAD, CVD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	90	4x40mm	4 atm; 6 atm	5; 5	CarotidWallstent 9x30 mm	yes	no
case 5	48	M	yes	dys, HTN, prior MI, CAD, CVD, smoking hx	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	90	5x60mm	4 atm	110	Viatrac 5x40mm	yes	Shockwave balloon rupture x 2
case 6	70	M	yes	dys, HTN, CHF, CAD, CVD, CLD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	95	3.5x40mm	4 atm	20	Xact 9x40mm; Xact 8x30mm	yes	no
case 7	73	M	yes	dys, DM, HTN, CHF, CAD, CLD, CKD, smoking hx, PAD	warfarin 5mg	yes	CCA-ICA	70-80	3.5x40mm	4 atm	40	Xact 8x40mm	yes	hypotension
case 8	73	M	yes	dys, DM, HTN, CHF, CAD, CLD, CKD, smoking hx, PAD	warfarin 5mg	yes	ICA	70	4x40mm	4 atm	20; 28	Xact 9x40mm	yes	no
case 9	69	M	yes	dys, HTN, prior MI, CHF, CAD, CVD, CLD, CKD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	90	3.5x40mm	4 atm	40	Xact 8x40mm	yes	no
case 10	72	M	yes	dys, DM, HTN, CHF, CAD, CVD, CLD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	CCA-ICA	95	3.5x60mm	4 atm	90	Xact 9-7x30mm	yes	no
case 11	77	M	yes	dys, DM, HTN, prior MI, CAD, CVD, CLD, smoking hx, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	80	6x60mm	6 atm	180	Lutonix DCB 6x40mm	yes	transient bradycardia
case 12	78	M	yes	dys, HTN, CAD, PAD	DAPT (ASA: 81mg/clopidogrel 75mg)	yes	ICA	85	4x40mm	6 atm	10	RoadSaver 8x20mm	yes	hypotension

Intravascular lithotripsy is increasingly utilized at different vascular beds, while additional experience is being conducted.

Methods: Twelve patients from various centers, were treated for heavily calcified carotid lesions utilizing intravascular lithotripsy followed by percutaneous transluminal angioplasty (i.e. stenting or balloon angioplasty).

Results: In this case series most patients were males, with a median age of 72.5 years. All patients had a significant past medical history with many cardiovascular comorbidities. At presentation, ten patients were on dual anti-platelet therapy, while two patients were on warfarin. All procedures were elective and were performed under local anesthesia. In ten cases, intravascular lithotripsy was followed by stenting, while in the two patients balloon angioplasty was performed. The median fluoroscopy time was 16.5min, while the median contrast volume required was 87.5ml. All procedures were technically successful (<30% residual stenosis), without any neurological sequelae and the patients were eventually discharged on dual antiplatelet therapy. Patients and procedural characteristics are presented in **Table 1**.

Conclusions: Our experience demonstrates that lithotripsy could be an effective approach for the management of severe calcified carotid lesions, facilitating angioplasty of complex lesions. Further research is warranted in order to determine whether intravascular lithotripsy at this vascular bed is safe and effective in terms of short and late-term outcomes.

Disclosures: P. A. Soukas: *Philips (Volcano): Principal Investigator for a Research Study; W.L. Gore and Associates, Inc.: Principal Investigator for a Research Study; Shockwave Medical: Principal Investigator for a Research Study; Intact Vascular: Principal Investigator for a Research Study; Bard: Principal Investigator for a Research Study; PQ Bypass: Principal Investigator for a Research Study; Surmodics, Inc.: Principal Investigator for a Research Study; Micromedical Solutions: Principal Investigator for a Research Study; E. J. Armstrong: Dr. Armstrong is a consultant to Abbott Vascular, Boston Scientific, Cardiovascular Systems Incorporated (CSI), Medtronic, Philips, and PQ Bypass. All other authors have no relationships to disclose.: Consulting; S. Giannopoulos Nothing to disclose. G. Vadalà Nothing to disclose. B. Kuhn Nothing to disclose. C. L. Stoltz Nothing to disclose.*

II-39 | Outcomes of Stenting Subclavian Artery Stenosis After Coronary Artery Bypass Grafting

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States; Ray Zadeegan, Kaiser Permanente Los Angeles Medical Center, United States

Background: Subclavian artery stenosis can potentially lead to symptomatic myocardial ischemia or coronary-subclavian steal syndrome in patients who have undergone coronary artery bypass grafting (CABG) with a left internal mammary artery (LIMA). There is a paucity of data on the outcomes of subclavian artery stenting after CABG.

Methods: Patients status post CABG with a LIMA who underwent stenting for subclavian artery stenosis between January 2012 and January 2019 at Kaiser Permanente Regional Cardiac Catheterization Laboratory were included. Clinical data and outcomes were analyzed.

Results: A total of 34 patients (mean age 71.4 ± 10.5 years, 53% female) with symptomatic subclavian artery stenosis underwent stenting (88% for stenosis, 12% for occluded lesions). Procedural success was 94.1% (32/34). 30-day all-cause mortality was 5.9% (n=2), non-fatal myocardial infarction (MI) 8.8% (n=3), and stroke or transient ischemic attack (TIA) 5.9% (n=2). At a median follow-up of 4.1 years (Interquartile range 2.3-6.8 years), all-cause mortality was 11.8%, cardiovascular mortality 5.9%, non-fatal MI 17.6%, and stroke or TIA 8.8%. In-stent restenosis occurred in only 2 (5.9%) patients. Average stent length was 23.7 ± 16.1 mm and diameter was 6.9 ± 0.7 mm. Age was an independent predictor for a combined incidence of death, MI, and stroke or TIA (Hazard ratio 1.2, 95% Confidence Interval 1.02-1.4, $p=0.03$) after adjusting for hypertension, diabetes, hyperlipidemia, chronic kidney disease, smoker, and peripheral vascular disease.

Conclusions: Stenting for subclavian artery stenosis in patients who underwent CABG with a LIMA is technically feasible with a high success rate, and safe with a low incidence of short- and long-term adverse outcomes. There is a low rate of in-stent restenosis.

Disclosures: V. J. Aharonian: *Medtronic: Consulting and Principal Investigator for a Research Study; M. D. Nadadur Nothing to disclose. D. Q. Phan Nothing to disclose. M. Qattan Nothing to disclose. S. S. Brar Nothing to disclose. P. W. Mansukhani Nothing to disclose. N. A. Moore Nothing to disclose. R. Zadeegan Nothing to disclose.*

II-40 | Angiographic Differences and Limb Related Outcomes In Patients With Intermittent Claudication and Critical Limb Ischemia Undergoing Endovascular Lower Extremity Revascularization: Insights from the Excellence In Peripheral Artery Disease Registry

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CVA Heart and Vascular Institute, United States; Peter Monteleone, The University of Texas - Austin, United States; Khusrow A. Niazi, Emory University Hospital, United States; Emmanouil S. Brilakis, Minneapolis Heart Institute, United States; Ehrin J. Armstrong, Denver Veterans Affairs Medical Center, United States; Subhash Banerjee, Dallas Veterans Affairs Medical Center, United States

Background: PAD is a spectrum of disease ranging from intermittent claudication (IC) to critical limb ischemia (CLI). It remains unclear how the angiographic and lesion level differences between these two groups impact long term limb-related outcomes. We sought to characterize these differences between IC and CLI patients undergoing lower extremity (LE) intervention in a large endovascular registry.

Methods: We studied patients in the Excellence In Peripheral Artery Disease (XLPAD) registry from 2005 to 2018 undergoing percutaneous LE intervention for either IC or CLI. Patients were determined to have IC or CLI based on their Rutherford classification (class 1-3: IC, class 4-6: CLI), and all variables and outcomes were compared between these two groups.

Results: 3045 patients underwent LE intervention for IC (n=1868) or CLI (n=1177). Patients with CLI were more likely to have diabetes (68% vs 47%; $p<0.001$), CKD (24% vs 10%; $p<0.001$), and CHF (15% vs 12%; $p=0.005$). The target vessel was more commonly the superficial femoral artery (SFA) in IC patients (74% vs 43%; $p<0.001$) and a below the knee (BTK) vessel in CLI patients (52% vs 21%; $p<0.001$). IC patients were more likely to have multilevel disease affecting the iliac artery and SFA (44% vs 19%; $p<0.001$) while CLI patients were more likely to have multilevel disease affecting the SFA and BTK vessels (74% vs 50%; $p<0.001$). 0 or 1 vessel BTK run-off was more common in CLI patients (32% vs 13%; $p<0.001$). IC patients had longer (140 ± 98 mm vs 124 ± 94 mm; $p<0.001$) and more severely calcified (44% vs 37%; $p<0.001$) lesions. The incidence of CTO lesions was higher in CLI patients (57% vs 50%; $p=0.001$). IC patients had greater use of atherectomy (50% vs 46%; $p=0.013$), drug coated balloons (16% vs 13%; $p=0.028$) and stents (58% vs 48%; $p<0.001$). One year major adverse limb events (death, repeat target limb revascularization or target limb amputation) was higher in CLI patients (31% vs 19%, $p<0.001$).

Conclusions: Patients with IC and CLI have significant patient level, anatomic, and lesion level differences which affect the final treatment strategy and long term limb outcomes. These findings may highlight differences in the underlying pathophysiology of IC and CLI.

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Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; E. J. Armstrong: Dr. Armstrong is a consultant to Abbott Vascular, Boston Scientific, Cardiovascular Systems Incorporated (CSI), Medtronic, Philips, and PQ Bypass. All other authors have no relationships to disclose.: Consulting; S. Banerjee: Medtronic: Consulting; AstrZeneca: Consulting; LIVMOR: Consulting and Spouse; K. Patel Nothing to disclose. R. Kabir Nothing to disclose. Y. Liu Nothing to disclose. I. Tejani Nothing to disclose. D. C. Metzger Nothing to disclose. K. A. Niazi Nothing to disclose.

II-41 | Renal Denervation in Heart Failure with Reduced Ejection Fraction: A Meta-Analysis of Randomized Control Trials

Justin Shipman, Mayo Clinic Arizona, United States; Pradyumna Agasthi, Mayo Clinic Arizona, United States; Pattara Rattanawong, Mayo Clinic Arizona, United States; Reza Arsanjani, Mayo Clinic Arizona, United States

Background: Renal Denervation (RDN) is a catheter-based ablation procedure designed to treat resistant hypertension, but has also been used to decrease sympathetic activation in patients with known heart failure (HF). The objective of our study is to determine the effect of RDN on blood pressure, heart rate, and ejection fraction in comparison to medical therapy alone in patients with heart failure with reduced ejection fraction (HFrEF).

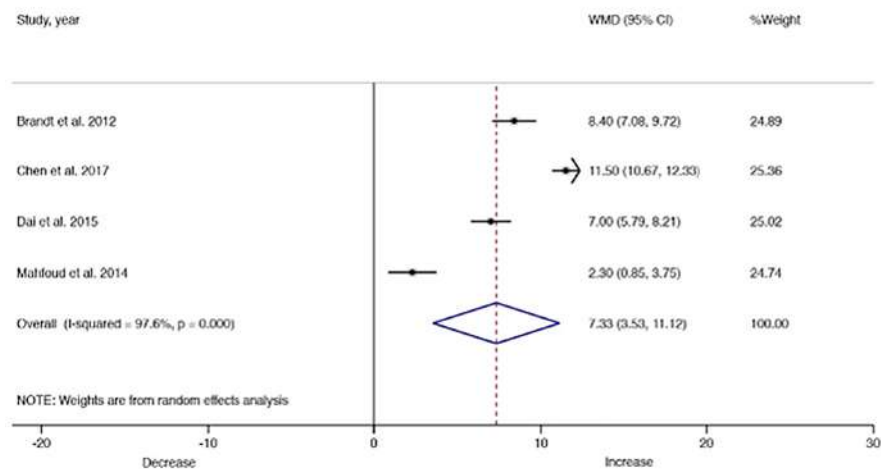
Methods: We performed an extensive literature search of the MEDLINE and EMBASE databases from inception to December 2019. Included studies were randomized control trials (RCT) that reported the effect of RDN on blood pressure, heart rate, and ejection fraction at baseline and 6 months. We calculated a weighted mean difference (WMD) with 95% confidence intervals (CI) between RDN and medical therapy control groups.

Results: Our search yielded 439 studies of which we included four studies comprising 141 patients treated with RDN and 75 patients treated with medical therapy alone. The WMD of ejection fraction improvement from baseline to six months in the RDN group compared to the control group was 7.33% (95% CI 3.53 to 11.12, $p < 0.01$). The WMD of heart rate reduction from baseline to six months in the RDN group compared to the control group was -7.43 (95% CI -14.78 to -0.08, $p = 0.047$). There was no statistically significant difference in blood pressure in patients treated with RDN versus medical therapy alone.

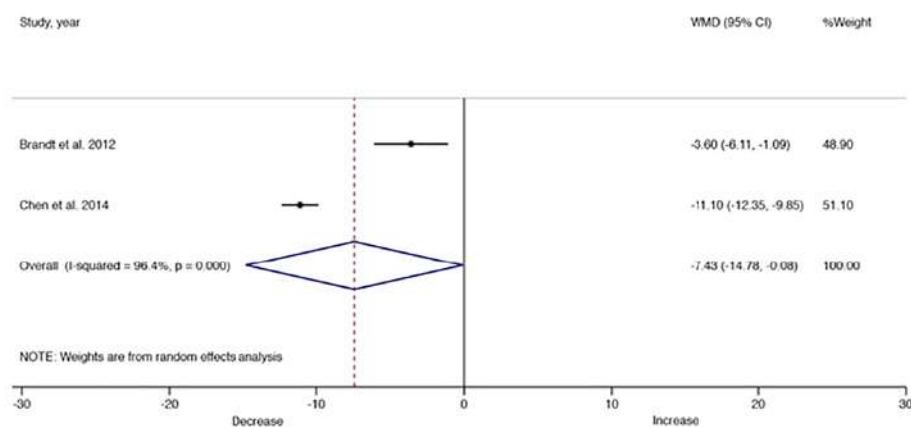
Conclusions: Our meta-analysis of four RCTs showed a significant improvement in ejection fraction and heart rate reduction in patients with HFrEF treated with RDN. There was no significant benefit on blood pressure at 6 months with RDN.

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Ejection Fraction



Heart Rate



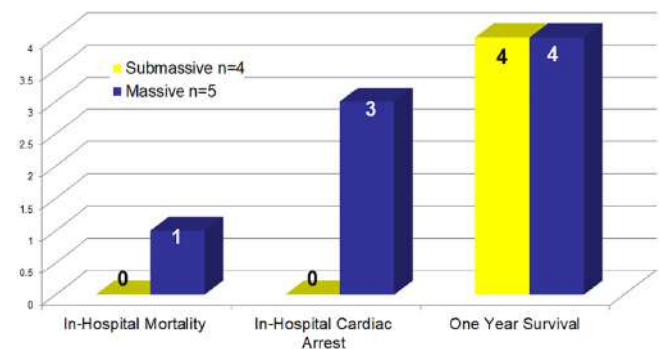
PULMONARY EMBOLISM

II-42 | Surgical Embolectomy for Management of Acute Submassive and Massive Pulmonary Embolism

Jeremiah F Haines, Loyola University Medical Center, United States; Stephen Morris, Loyola University Medical Center, United States; Katerina Porcaro, Loyola University Medical Center, United States; Yevgeniy Brailovsky, Loyola University Medical Center, United States; R. Anthony Perez-Tamayo, Loyola University Medical Center, United States; Jason Frazier, St. Mary Medical Center, United States; Jeffery Schwartz, Loyola University Medical Center, United States; Edwin McGee, Loyola University Medical Center, United States; Mamdoah Bakhos, Loyola University Medical Center, United States; Sorcha Allen, Loyola University Medical Center, United States; Lucas Chan, Loyola University Medical Center, United States; Dalila Masic, Loyola University Medical Center, United States; Erin Mancl, Loyola University Medical Center, United States; Amir Darki, Loyola University Medical Center, United States

Background: Pulmonary embolism (PE) is associated with morbidity and mortality and may require fibrinolysis. Some patients have contraindications to fibrinolytic therapy and require urgent surgical pulmonary embolectomy (SPE). We sought to investigate clinical characteristics and outcomes of patients requiring urgent SPE.

Methods: We retrospectively analyzed patients who underwent evaluation by pulmonary embolism response team (PERT) at a tertiary care center from 2016 to 2019. We included patients with massive and submassive PE who underwent urgent SPE.



Results: Among 370 consecutive patients evaluated by PERT, 9 (2.43%) patients underwent urgent SPE; 6 (66%) male. 4 patients had submassive PE and 5 had massive PE. Indications for embolectomy were recent surgery (n=5), recent CVA (n=1), intracardiac tumor/thrombus (n=1), large patent foramen ovale (n=1), and clot in transit (n=1). Mean length of stay was 13.8 days. Mean PESI score 119.3 (+/- 52.4). Average time from PERT activation to surgical embolectomy was 13.4 hours. 1 patient who died had a delay in diagnosis of 9 hours and thus 22-hour delay from time of diagnosis to PERT activation, with resultant delay of surgery.

Conclusions: In a tertiary referral center, need for urgent surgical pulmonary embolectomy is relatively low. Rapid evaluation by the multidisciplinary PERT and early surgical embolectomy is associated with low operative mortality and excellent short- and long-term outcomes.

Disclosures: J. F. Haines *Nothing to disclose*. S. Morris *Nothing to disclose*. K. Porcaro *Nothing to disclose*. Y. Brailovsky *Nothing to disclose*. R. A. Perez-Tamayo *Nothing to disclose*. J. Frazier *Nothing to disclose*. J. Schwartz *Nothing to disclose*. E. McGee *Nothing to disclose*. M. Bakhos *Nothing to disclose*. S. Allen *Nothing to disclose*. L. Chan *Nothing to disclose*. D. Masic *Nothing to disclose*. E. Mancl *Nothing to disclose*. A. Darki *Nothing to disclose*.

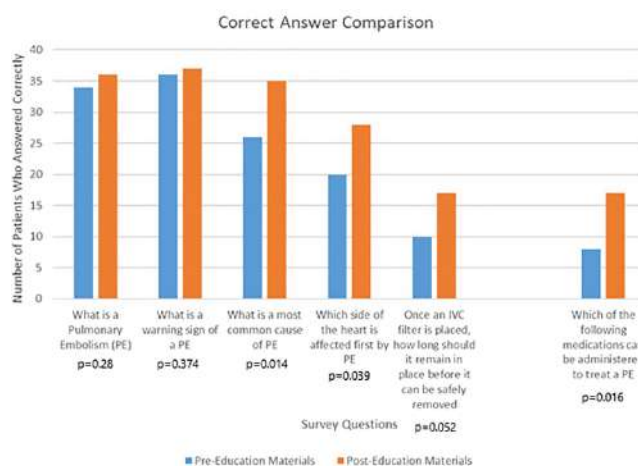
II-43 | Effect of Supplemental Education Materials on Patient Awareness and Understanding of Pulmonary Embolism

Jeremiah F Haines, Loyola University Medical Center, United States; Stephen Morris, Loyola University Medical Center, United States; Lucas Chan, Loyola University Medical Center, United States; Katerina Porcaro, Loyola University Medical Center, United States; Sorcha Allen, Loyola University Medical Center, United States; Dalila Masic, Loyola University Medical Center, United States; Erin Mancl, Loyola University Medical Center, United States; Yevgeniy Brailovsky, Loyola University Medical Center, United States; Amir Darki, Loyola University Medical Center, United States

Background: Patient education is an integral part of management of acute Pulmonary Embolism (PE). We aim to assess the impact of supplemental PE education packet on patient's comprehension of acute PE pathophysiology and treatment options.

Methods: Acute PE patients managed by pulmonary embolism response team (PERT) received a 14-question multiple choice survey during admission. Patients received supplemental education materials prior to discharge and completed a follow up survey in post-PE clinic. The survey included questions on presenting signs/symptoms of acute PE, diagnostic tests, anticoagulation regimens, and other management. We compared the proportion of patients who correctly answered each question at baseline and follow up.

Results: Forty-two patients completed baseline and follow-up surveys. Median time to follow up was thirty-six days. The change in overall survey score pre- vs post-educational material was 1.57 points



(p=0.000258). The educational packet was associated with improvement in patient comprehension about PE and available treatment modalities. (Figure 1)**Conclusions:** Patient education is an integral part of management of Pulmonary embolism. There are substantial gaps between what clinicians convey to the patient and what they comprehend. Educational pamphlets may be useful tool to address some of those gaps.

Disclosures: J. F. Haines *Nothing to disclose*. S. Morris *Nothing to disclose*. L. Chan *Nothing to disclose*. K. Porcaro *Nothing to disclose*. S. Allen *Nothing to disclose*. D. Masic *Nothing to disclose*. E. Mancl *Nothing to disclose*. Y. Brailovsky *Nothing to disclose*. A. Darki *Nothing to disclose*.

II-44 | Regional Variation in Hospital Outcomes among Patients Admitted for Massive Pulmonary Embolism in the United States based on the Nation Inpatient Sample Database

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Background: Massive pulmonary embolism (MPE) constitutes a significant cause of mortality secondary to obstructive shock (i.e. severe right ventricular failure). There have been reports of difference in regional variations in several medical conditions but the data of regional variation in MPE has not been described in detail in the past. Therefore we evaluated the regional variations of outcomes in PE.

Methods: Study was conducted using the National Inpatient Sample (NIS) database from 2010 to 2015. MPE was defined as admissions with a diagnosis of PE on mechanical ventilation, vasopressors or non-septic shock. Regional variation was classified on Census region as defined by the U.S Census Bureau. Analysis was conducted via multivariate-adjusted mixed effect model. The main outcomes were inpatient mortality, length of stay (LOS), cost of hospitalization, and non-routine discharges.

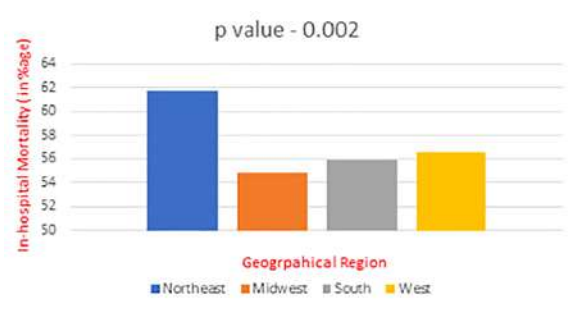


Fig - A - Regional variation in in-hospital mortality rates

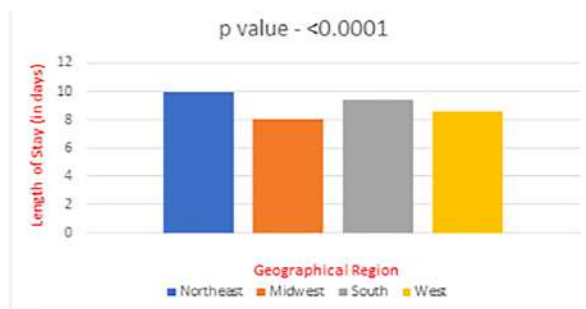


Fig - B - Regional variation in length of hospital stay

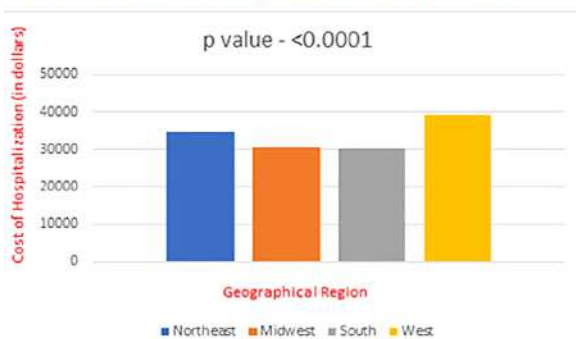


Fig - C - Regional variation in cost of hospitalization

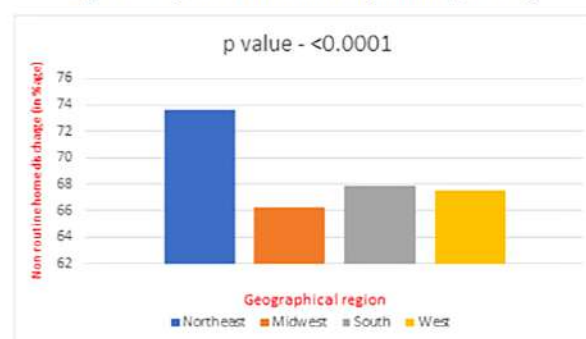


Fig - D - Regional variation in non routine home discharge

Fig - 1 - Fig - A to D above showing regional variability in hospitalization outcomes among patients admitted for massive pulmonary embolism

Results: An estimated 29861 adults were hospitalized with MPE in the U.S. from 2010 to 2015. The mortality rate was highest in North-east (NE)- 61.75% and lowest in Midwest- (MW) 54.87% [p value <0.002]. Similarly, the LOS was longest in NE-9.93 days and shortest in MW - 8.06 days [p value <0.0001]. Cost of hospitalization was highest in West (\$39,000) and lowest in South (\$30,000) [p value - <0.0001]. Non-routine home discharges were highest in NE - 73.63%.

Conclusions: There was a significant regional variation in in-patient mortality, LOS, cost of hospitalization and non-routine home discharges among MPE hospitalization in the U.S. Further research is needed to determine the factors contributing to these regional variations.

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PAD & CLI

II-45 | Outcomes of Peripheral Arterial Disease Interventions in Patients with Chronic Kidney Disease or End Stage Renal Disease - A Meta Analysis

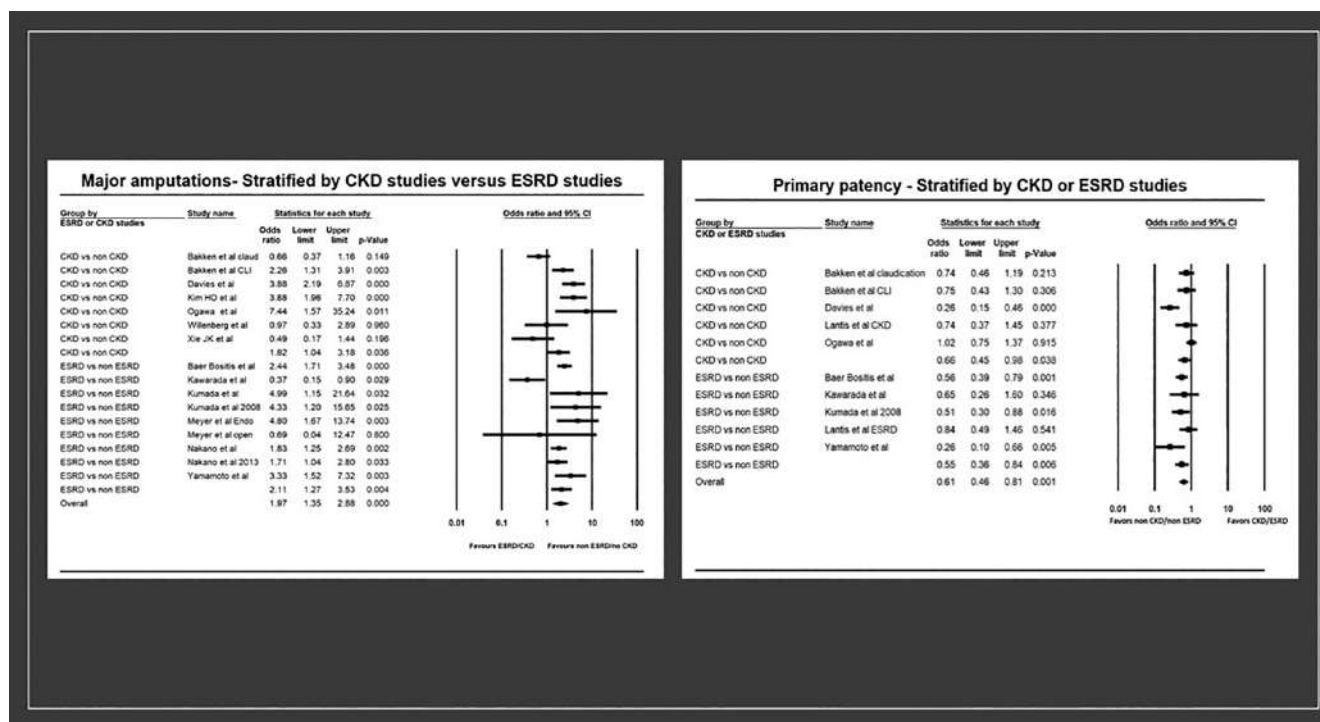
Mahesh Anantha Narayanan, Yale New Haven Hospital, United States; Azfar Bilal Sheikh, Yale - New Haven Hospital, United States;

Sameer Nagpal, Yale New Haven Hospital/Yale University, United States; Qurat-ul-ain Jelani, Yale University School Of Medicine, United States; Kim G Smolderen, Saint Luke's Mid America Heart Institute, United States; Michael S Megaly, Abbott Northwestern Hospital, Minneapolis Heart Institute, United States; Fiorella Llanos, Yale New Haven Hospital/Yale University, United States; Marabel Schneider, Yale New Haven Hospital/Yale University, United States; Carlos I. Mena-Hurtado, Yale University, United States

Background: There is very limited data on outcomes of peripheral arterial disease (PAD) interventions in patients with renal dysfunction, both with chronic kidney disease (CKD) and end stage renal disease (ESRD).

Methods: We analyzed 5 databases from January 2000 to May 2019 for studies comparing outcomes of PAD interventions in patients with and without CKD or ESRD. We included all available observational and randomized trials. We stratified our results based on CKD or ESRD and we included patients with either claudication or chronic limb ischemia (CLI). Our primary outcome was major amputations and primary patency rates.

Results: We included 18 observational trials with a mean follow up of 40+/-12 months. Rates of major amputations were higher in patients with CKD/ESRD compared to those without CKD/ESRD (OR 1.97 (1.35-2.88), P<0.001). Subgroup analysis revealed that there were higher rates of major amputations, both with ESRD (OR 2.11 (1.27-3.53), P=0.004) as well as CKD (OR 1.82 (1.04-3.18), P=0.036). The presence of CKD/ESRD conferred a lower primary patency rate (OR 0.61 (0.46-0.81, P=0.001). Subgroup analysis demonstrated lower



patency rates both in CKD (OR 0.66 (0.45-0.98, $P=0.038$) and in ESRD patients (OR 0.55 (0.36-0.84, $P=0.006$).

Conclusions: In CKD and ESRD patients, PAD interventions are associated with higher rates of major amputations and lower primary patency rates at follow up. Randomized trials to study this sub group population is essential

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II-46 | Outcomes of Chocolate Balloon Angioplasty as an Adjunctive Therapy in Critical Limb Ischemia patients: A Single Center Experience

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Background: Optimal strategy for endovascular therapy in patients with critical limb ischemia (CLI) remains unclear. We aimed to evaluate the safety and efficacy of chocolate percutaneous transluminal angioplasty (PTA) balloon, as an adjunctive treatment with orbital atherectomy (OA), in CLI patients with femoropopliteal and infrapopliteal disease.

Methods: Between October 2017 and June 2019, patients who underwent chocolate balloon PTA as adjunctive therapy, were selected from a prospectively maintained single-center database of CLI patients undergoing endovascular treatment. Outcomes of interest were target vessel revascularization (TVR), ipsilateral limb loss and all cause mortality at 6 months.

Results: We identified 125 CLI patients who underwent 142 endovascular interventions with adjunctive use of chocolate balloon PTA and OA (98%). Mean age of patients was 70 years; 47% were males. There was high prevalence of other comorbidities: hypertension (94%), hyperlipidemia (78%), diabetes mellitus (69%), chronic kidney disease (34%), and active smoking (50%). 77% of interventions involved complex infrapopliteal lesions. Other procedural

Total Procedures	142
Rutherford Classification	
RC 4	67
RC 5	49
RC 6	26
Above-The Knee Lesions	45%
Below-The Knee Lesions	77%
Number of lesions/procedure	2 (1-4)
CTO	90%
Calcification	100%
DCB	35%
Procedure Time (min)	149 (77-300)
Fluoroscopy time (min)	40 (14-80)
Contrast used (ml)	123 (50-225)
Access Complications	3%
Procedure Success rate	99%
Length of stay (median)	Same day discharge

Table 1. Study Procedure Characteristics

characteristics are described in Table 1. At mean follow-up of 6 months, freedom from TVR was 87%, freedom from limb loss was 93% and all-cause mortality was 6%. Bail-out stenting rate was low (4%).

Conclusions: Balloon angioplasty, either alone or as adjunctive therapy, remains the primary modality for CLI interventions. Chocolate Balloon PTA used in adjunction with OA is associated with high safety and efficacy rates in CLI patients with complex lesions.

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II-47 | Three-Year Outcomes of Orbital Atherectomy for the Endovascular Treatment of Infrapopliteal Claudication or Critical Limb Ischemia

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Background: Circumferential modification of calcification using orbital atherectomy (OA) improves vessel compliance, thereby facilitating angioplasty. The aim of this study was to investigate the outcomes of OA for the treatment of patients with claudication or critical limb ischemia.

Methods: We included patients with peripheral arterial disease (PAD) treated with any FDA approved or cleared devices and adjunctive OA for distal femoropopliteal and/or infrapopliteal disease. Data were retrieved from the LIBERTY 360 study (ClinicalTrials.gov; identifier: NCT01855412). Hazard ratios and the respective 95% confidence intervals were synthesized to examine the association between Rutherford category (RC) at baseline and all-cause mortality, target vessel revascularization (TVR), major amputation, major adverse event (MAE) and major amputation/death up to 3 years of follow up.

Results: A total of 503 patients with PAD (RC 2-3:N=214; RC 4-5: N=233; RC 6:N=56), who underwent endovascular treatment for 617 lesions (RC 2-3:N=251; RC 4-5:N=289; RC 6:N=77), were included. The mean lesion length was 78.7mm, 131.4mm and 95.2mm for the three groups. After OA, balloon angioplasty was used in >98% of cases, with bail out stenting necessary in 2.0%, 2.8%, and 0.0% of RC 2-4/4-5/6 cases. 10.8% of the patients developed angiographic

complications, without differences based on presentation. During 3-year follow up, claudicants were at lower risk for MAE, death and major amputation/death than patients with chronic limb threatening ischemia (CTLI). The 3-year Kaplan Meier survival rates were 84.6% for the RC 2-3 group, 76.2% for the RC 4-5 and 63.7% for the RC 6 group. The 3-year freedom from major amputation rate was 100%, 95.3%, and 88.6%, for the RC 2-3, RC 4-5 and RC 6 groups respectively. Among CTLI patients only, the RC at baseline was correlated with the combined outcome of major amputation/death, whereas RC classification did not affect TVR, MAE, major amputation or death rates.

Conclusions: Peripheral artery PTA with adjunctive orbital atherectomy in patients with CTLI or claudication is safe and associated with low major amputation rates after 3-years of follow up. These results demonstrate the utility of OA for patients across the spectrum of PAD.

Disclosures: E. Secemsky: Cardiovascular Systems, Inc.: Principal Investigator for a Research Study; Medtronic: Consulting and Principal Investigator for a Research Study; Cook: Principal Investigator for a Research Study; Bard: Principal Investigator for a Research Study; J. A. Mustapha: Boston Scientific Corp.: Consulting and Principal Investigator for a Research Study; Cardiovascular Systems, Inc.: Consulting; Medtronic: Consulting; Philips (Volcano): Consulting; Terumo: Consulting; PQ Bypass: Consulting and Principal Investigator for a Research Study; Bard Peripheral Vascular: Consulting and Principal Investigator for a Research Study; Cardioflow: Ownership Interests: Stocks, Stock Options; G. L. Adams: Boston Scientific Corp.: Advisory Board/Board Member and Consulting; Abbott (St. Jude): Advisory Board/Board Member and Consulting; Cardiovascular Systems, Inc.: Advisory Board/Board Member and Consulting; Philips (Volcano): Advisory Board/Board Member and Consulting; W.L. Gore and Associates, Inc.: Advisory Board/Board Member and Consulting; G. Pliagas: Dr. Pliagas is a consultant to Cook, Philips, Cardiovascular Systems Incorporated (CSI) and Medtronic.: Consulting; E. J. Armstrong: Dr. Armstrong is a consultant to Abbott Vascular, Boston Scientific, Cardiovascular Systems Incorporated (CSI), Medtronic, Philips, and PQ Bypass. All other authors have no relationships to disclose.: Consulting; S. Giannopoulos *Nothing to disclose*. R. E. Beasley *Nothing to disclose*.

II-48 | The Impact of Peripheral Vascular Disease on Short-Term In-Hospital Outcomes in Patients Undergoing a Fiber-Optic Bronchoscopy

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Background: It is known that peripheral vascular disease (PVD) is associated with numerous complications for patient health. However, there is sparse literature regarding the in-hospital outcomes for patient encounters in which a patient diagnosed with PVD undergoes a fiber-optic bronchoscopy. A high risk of bleeding is a relative contraindication for a fiber-optic bronchoscopy and many PVD patients are on medications that can lead to a risk of bleeding. Therefore, the aim of this study was to investigate short-term in-hospital outcomes for patients with a diagnosis of PVD who underwent a fiber-optic bronchoscopy.

Methods: This retrospective cohort study utilized the Nationwide Inpatient Sample (NIS) to identify patients from 2012-2015 who had undergone a fiber-optic bronchoscopy procedure as coded for by ICD-9. ICD-9 codes were then used to identify those patients with any form of PVD. Data analyses assessed the length of stay (LOS), total hospital charges, and mortality. Patients missing data for any of these variables or under the age of 18 at admission were excluded.

Results: We identified a total of 49,797 patients from the sample years who underwent a fiber-optic bronchoscopy. Of those patient encounters, 2632 also carried a diagnosis of PVD. Those with PVD had statistically significant increases in mortality (13.7% vs 9.2%, $p < .0005$), LOS (12.95 days vs 11.34 days, $p < .0005$), and total charges (\$175,813.27 vs \$148,264.11, $p < .0005$) as compared to the control group of patients who underwent a fiber-optic bronchoscopy without having a diagnosis of PVD.

Conclusions: This study is one of the first to assess short-term in-hospital outcomes for patients with the diagnosis of peripheral vascular disease who underwent a fiber-optic bronchoscopy. When compared to patients who underwent a fiber-optic bronchoscopy without PVD, patients with PVD had statistically significant increases in LOS, mortality, and hospital charges. Due to these results, physicians may want to consider using alternative diagnosis procedures before performing a fiber-optic bronchoscopy on patients with PVD.

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II-49 | The Prevalence Of Peripheral Arterial Disease in Persons Living with HIV; A Miami Health System Cross Sectional Study

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Background: The association between viremic control and PAD has not been clearly delineated. We sought to investigate the association of viremic control, when adjusting for traditional cardiovascular disease (CVD) risk factors, with the prevalence of PAD in Persons Living with HIV (PLWH).

Methods: We analyzed the prevalence and risks of PAD in 985 PLWH at our Special Immunology Clinic at the Jackson Memorial and University of Miami Hospitals from 2017-19. Demographic, clinical, and laboratory information, including viral load (VL) and CD4 counts, were obtained from retrospective review of the electronic health records. PAD was confirmed by ABPI, peripheral vascular doppler ultrasound and/or CT angiography.

Results: The prevalence of PAD was 2.3%. PLWH with PAD were older than those without PAD (64.4 vs. 51.9 years old, $p < 0.001$), with 45.4% female. When compared to those without, PLWH with PAD had more coronary artery disease (17.4% vs 1.4%, $p < 0.001$), heart failure (13% vs. 2.5%, $p < 0.001$) and underwent more percutaneous coronary interventions (8.7% vs. 0.9%, $p < 0.001$). There was no significant difference between active smokers (26.1% vs. 23.8%, $p = 0.800$). There was no significant difference in mean CD4 count (535 vs. 468 cells/uL, $p = 0.24$) or viral load suppression (77.3% vs 71.0% of persons with an undetectable viral load, $p = 0.52$). Using a multivariate logistic regression model, this cohort did not reveal increased odds of PAD occurrence based on viremic control, while adjusting for other confounders including age, gender, systolic blood pressure, HbA1c and smoking (OR: 0.02, 95% CI -0.21-0.33, $p = 0.656$).

Conclusions: Despite the increased risk factors for CVD in our cohort, the prevalence of PAD in PLWH was relatively lower than reported in similar observational studies (5-21%), and lower than seen in age-matched seronegative counterparts in the general US population (4.7%). There was no apparent association between viremic control (indexed by mean CD4 count and VL suppression) and the presence of PAD, when adjusting for traditional CVD risk factors. Variation in symptomatic assessment and diagnostic testing may explain this finding, however further large studies are needed to evaluate the prevalence of PAD and link with HIV disease severity.

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II-50 | Metabolic syndrome may explain the obesity paradox in outcomes after endovascular procedures for critical limb ischemia in peripheral arterial disease

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Background: Obesity is known to increase predisposition to cardiovascular diseases, however there exists evidence that suggests obese patients have better outcomes than their "lighter" counterparts. We aimed to elucidate the factors leading to this paradox in patients undergoing endovascular interventions for acute and critical limb ischemia in PAD.

Methods: We retrospectively analyzed patients (native vessel PAD in 114 limbs, - suprapopliteal 77, infrapopliteal 50, both 13) who underwent endovascular revascularization from Jan,1, 2015 to June 30, 2017 for ALI/CLI (Rutherford class 4-6). Six month outcomes assessed were unplanned major amputations (below/above knee), efficacy (re-intervention i.e. endovascular/ bypass) and complications

(distal embolization, access complications, all cause mortality). Descriptive statistics and multivariate logistic regression was used to analyze the data.

Results: Obesity(BMI) was associated with a lower odds of major amputation (OR=0.86, p=0.05) but this was not seen with efficacy outcomes (OR = 0.97, p=0.37) or complications (OR = 1.01, p=0.69). Metabolic syndrome was associated with a higher odds of all outcomes i.e. major amputations (OR = 3.52, p=0.25), efficacy (OR = 1.12, p=0.81) and complications (OR = 1.64, p=0.37), but this was not statistically significant.

Conclusions: We found that although obesity(BMI) was paradoxically associated with fewer major amputations, when assessed by metabolic syndrome(WHO), this association seemed to reverse. We believe that metabolic syndrome is probably better than obesity to predict outcomes. Larger studies are needed to confirm these findings.

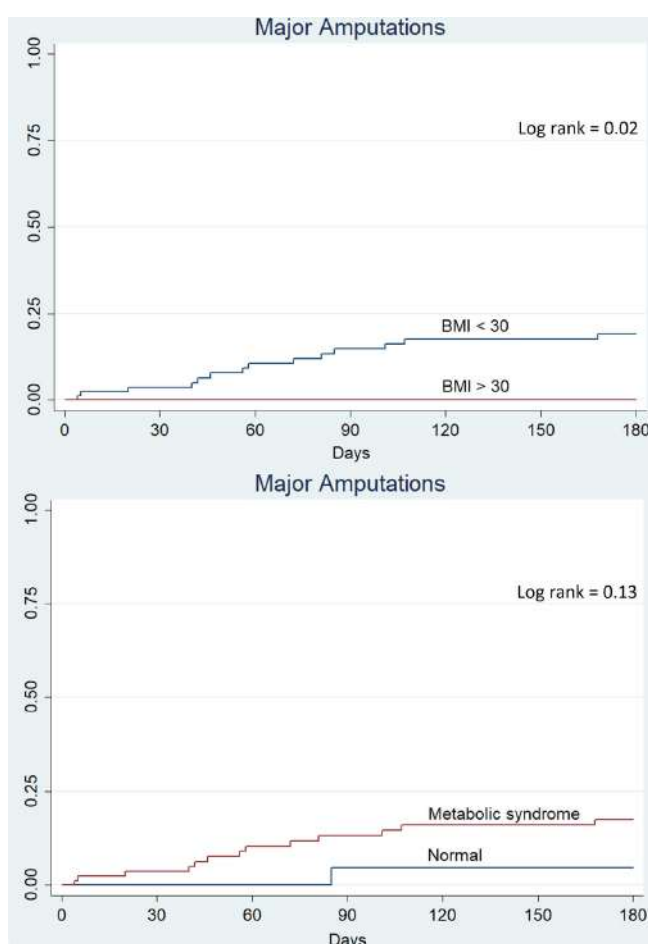
Disclosures: B. K. J. Hanumanthu *Nothing to disclose.* P. Mahato *Nothing to disclose.* A. Goyal *Nothing to disclose.* J. N. Hanumanthu *Nothing to disclose.* A. Kakkar *Nothing to disclose.*

II-51 | Comparison of Antiplatelet Regimens after Endovascular Revascularization of Infringuinal Peripheral Artery Disease: Insights from the XLPAD Registry

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Background: The optimal antiplatelet therapy regimen after endovascular revascularization of infringuinal arteries remains uncertain.

Methods: Using the ongoing multicenter Excellence in Peripheral Artery Disease (XLPAD) registry (NCT01904851), we analyzed antiplatelet prescription trends and outcomes of 2412 patients undergoing endovascular revascularization to compare patients who were prescribed antiplatelet monotherapy to those who were prescribed dual-antiplatelet therapy (DAPT). The primary outcomes assessed over a 12-month period were major adverse limb events (MALEs; a composite of death, repeat endovascular revascularization, surgical revascularization, and target limb amputation) and major adverse cardiovascular events (MACEs; a composite of death, myocardial infarction (MI), and stroke).



Results: Out of 2412 patients in the study, 47.7% (n=1151) were treated with DAPT (1078 received aspirin and clopidogrel, 35 received aspirin and ticagrelor, and 38 received aspirin and prasugrel). Patients who were prescribed DAPT had a significantly ($p<0.05$) higher incidence of preexisting coronary artery disease (CAD)(64.1% vs. 44.7%) and prior MI (26.0% vs. 16.5%). Kaplan-Meier analysis showed no significant difference at 12 months between the DAPT group and antiplatelet monotherapy group in freedom from MALE (87.2% vs. 85.3%, $p=0.10$) or MACE (96.4% vs. 95.9%, $p=0.47$). After adjusting for age, sex, race, and cardiovascular risk factors (diabetes, hypertension, dyslipidemia, smoking) in the DAPT group compared with the antiplatelet monotherapy group, the hazard ratios for MALE and MACE at 12 months were 0.86 (95% CI 0.68-1.11, $p=0.24$) and 0.88 (95% CI 0.55-1.40, $p=0.58$), respectively.

Conclusions: After infrainguinal endovascular revascularization, patients with underlying CAD were more likely to be prescribed DAPT as opposed to antiplatelet monotherapy. Adverse limb and cardiovascular events were similar in patients treated with DAPT and antiplatelet monotherapy.

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II-52 | Outcomes of Minimal Dose versus Standard Dose Radiation in Peripheral Endovascular Intervention for Limb Ischemia

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Background: Peripheral endovascular intervention is typically performed using standard dose radiation (SDR). No study has evaluated their outcomes using minimal dose radiation (MDR) vs. SDR for acute limb ischemia (ALI) or critical limb ischemia (CLI).

Methods: We performed a prospective observational study of 117 patients (66 ± 12 years) at a university hospital from January 2019

to October 2019 (median follow-up of 3 months) and compared the outcomes of MDR (0.5-1.0 frames/second [f/s]) fluoroscopy and 7.5 f/s cine angiography compared with SDR of ≥ 10 f/s fluoroscopy and ≥ 10 f/s cine angiography. Groups were divided into MDR (n=18, 15.4%) or SDR (n=99, 84.6%). Primary endpoints included air kerma (AK), dose area product (DAP), fluoroscopy time (FT), and contrast amount. Secondary endpoints included death, vessel dissection, vessel perforation, pseudoaneurysm, arteriovenous fistula, retroperitoneal bleed, or access site complication.

Results: In the MDR group (69 ± 10 years, median follow-up of 3 months; body mass index 28.8 ± 5.0 kg/m²), the primary endpoints were significantly less compared with SDR (66 ± 12 years, median follow-up of 3 months; body mass index 27.9 ± 6.0 kg/m²). In MDR, AK (15.4 mGy; Interquartile Range [IQR] 8.4, 32.0) and DAP (350.8 μ Gy·m²; IQR 199.2, 888.0) was significantly less than the SDR AK (297.5 mGy; IQR 124.5, 587.1; $p<0.001$) and SDR DAP (6,729.0 μ Gy·m²; IQR 2,767.2, 13,164.5, $p<0.001$). FT in MDR vs. SDR (15.1 minutes, IQR 8.8, 24.5 vs. 22.2 minutes; IQR 14.2, 39.6; $p=0.011$) and contrast use in MDR vs. SDR (62.5 ml; IQR 30.0, 70.0 vs. 112.5; IQR 70.0, 150.0, $p<0.001$) was significantly less in MDR. Peripheral intervention was performed in 72.2% (n=13) of MDR and 83.8% (n=83) of SDR. The secondary endpoints showed no difference between groups. MDR had 1 arterial dissection and SDR had 10 complications (1 retroperitoneal bleed, 9 arterial dissections, $p=0.54$). ALI or CLI occurred in 67.7% of SDR (n=67) and 66.7% (n=12) of MDR.

Conclusions: MDR showed significant reduction in all radiation parameters with no significant difference in complications, which is beneficial for patients and operators. Hence, MDR was efficacious for endovascular intervention in limb ischemia and is a viable alternative.

Disclosures: S. Kar Nothing to disclose. C. Espinoza Nothing to disclose.

II-53 | Extreme alternative access: Safe access at the rib cage level

Hady Lichaa, Saint Thomas Heart, United States

Background: Alternative arterial access is often necessary for successful revascularization of CLI. New approaches may optimize the balance of procedural morbidity and success.

Methods: 57 yo male presented with non healing arterial ulcer of the right shin. He has had bilateral Axillary to common femoral artificial arterial bypass (AFB) 12 years ago for occlusive aorta-iliac disease. Noninvasive imaging showed a patent bypass, severe ostial right SFA stenosis, occluded profunda and occlusive triple vessel infra-popliteal disease. The very large angle of the proximal AFB anastomosis with the axillary artery did not favor right radial or brachial accesses since straightening the proximal anastomosis with a long sheath increases the risk of proximal complications. Moreover, despite all precautions, distal tibio-pedal retrograde access may jeopardize outflow. We decided to proceed with ultrasound guided, micropuncture initiated, 5F antegrade access of the right AFB above a distal right rib.



Results: 6x40 mm DCB was slowly inflated across the ostial SFA up to 10 atmospheres for 4 min resulting in 30% residual stenosis. 20 mg of protamine decreased the ACT from 250 to 152. A pursestring suture was placed around the access site and 20 min manual hold resulted in successful hemostasis.

Conclusions: When a traditional approach to percutaneous arterial revascularization is unfavorable or unsuccessful, risks and benefits of every alternative access site should be carefully and individually considered in CLI cases. Methodical and meticulous percutaneous access of surgical bypass grafts can be a safe and effective option in a specific anatomical subsets.

Disclosures: H. Lichaa: BD Bard: Consulting;

II-54 | Trends and Causes of Readmission Following Peripheral Vascular Intervention In Patients With Peripheral Vascular Disease

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Table 1. Causes of re-hospitalization after peripheral vascular intervention

Causes of Readmission	%
Complications of vascular procedures or medical care	12.7
CLI	11.7
Diabetes with complications	9.8
Gangrene	7.8
Complication of device; implant or graft	7.7
IC	4.9
Septicemia	4.6
Congestive heart failure, non-hypertensive	4.6
Infection of amputation stump	2.6
Gastrointestinal bleed	2.2
Acute renal failure	1.8
Skin and soft tissue disease	1.9
Aortic and peripheral arterial embolism or thrombosis	1.7
Acute myocardial infarction	1.7
Phlebitis, thrombophlebitis and thromboembolism	1.6
Pneumonia	1.7
Cardiac dysrhythmias	1.4
Hypertension with complications	1
Coronary atherosclerosis and other heart disease	1.5
Deficiency and other anemias	1
stroke	0.9
Osteomyelitis	0.8
others	20.5

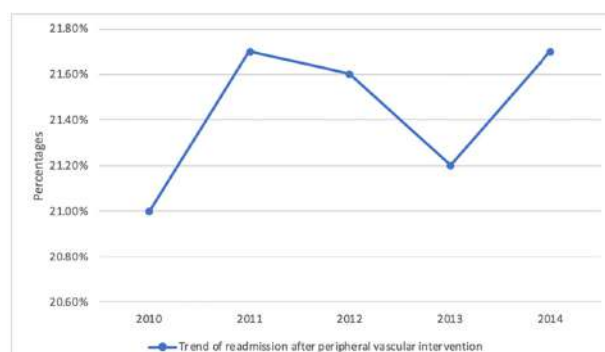


Figure 1. Annual rate of readmission after undergoing peripheral vascular intervention. $P_{trend} = 0.034$

Background: Despite general measures to reduce readmission rates have been taken, there has been a paucity of data regarding the causes of peripheral vascular intervention (PVI) readmission. Thus, we sought to evaluate the causes and predictors of readmissions in patients undergoing PVI

Methods: We performed an observational cohort study of patients admitted with peripheral vascular disease for PVI using the NRD for the years 2010-2014. PVI was defined as angioplasty, atherectomy, and/or stenting of lower limb vessels

Results: The average yearly rate of readmission following PVI procedure is 21.5% with a significant P value of 0.034. Combined cardiovascular causes comprised the majority of readmission causes with a rate of 44%. Of the cardiovascular causes, heart failure accounted for 4.64%, while cardiac dysrhythmias and acute myocardial infarction accounted for 1.4%, 1.7% respectively. Among the peripheral cardiovascular causes CLI forms majority (11.7%) and IC an important cause of readmission (4.9%). The risk of all-cause 30-day readmission was also higher in patients with deficiency anemia, autoimmune disease, heart failure, chronic pulmonary disease, diabetes mellitus, liver disease psychosis, CLI, solid tumor without metastasis, atrial fibrillation, renal failure, liver disease and drug abuse ($P = 0.005$ for all).

Conclusions: Our study shows an average yearly readmission rate of 21.5% after PVI procedure. Chronic comorbidities, prolonged hospitalization and were associated with higher risk of 30-day readmission.

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II-55 | In-hospital outcomes and trends of mechanical circulatory support in patients with peripheral artery disease

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Background: Clinical outcome of temporary mechanical circulatory support (MCS) devices used in patients with peripheral artery disease (PAD) is unknown. We sought to compare outcome and trend of utilization of Intra-aortic balloon pump (IABP) vs extracorporeal membrane oxygenation (ECMO) MCS used in patients with PAD

Methods: Using NIS database between 2004 to 2014, we identified PAD patients aged ≥ 18 years that required IABP or ECMO. Multivariate analysis was performed to examine in-hospital outcomes

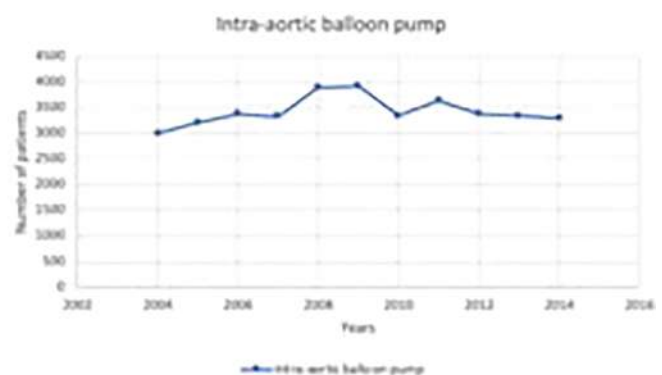
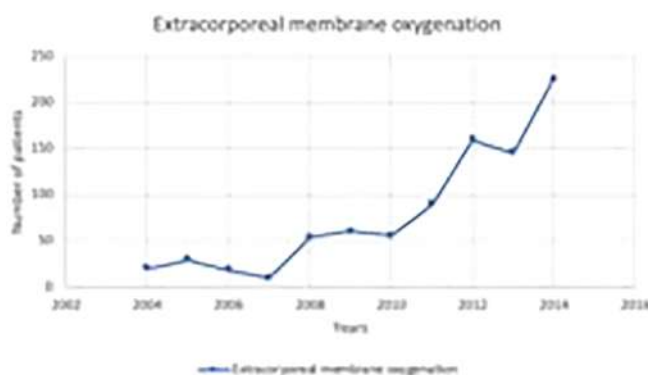
Results: Of 38,566 PAD patients who required temporary MCS, 37,696 used IABP (97.7%), and 870 used ECMO (2.3%). ECMO was associated with higher in-hospital mortality (62.2% vs 22.0%, adjusted odds ratio[aOR]: 6.52 [95% CI: 5.47-7.77] and longer length of hospital stay (median 10 days, Interquartile range [IQR] (5-26) vs 8 days, IQR (5-14); $p < 0.001$) compared with IABP group. The incidence of acute kidney injury (57.6% vs 27.3%, aOR: 2.55 [95% CI: 2.14-3.03]), major bleeding (29.8% vs 11.5%, aOR: 2.49 [95% CI: 2.06-3.01], and limb revascularization (31.7% vs 11.8%, aOR: 1.61 [95% CI: 1.33-1.95]) was higher in ECMO group compared with IABP group. The rate of vascular complications (5.1% vs 4.5%, aOR: 0.87 [95% CI: 0.61-1.25] was similar between both groups. Within study period, ECMO utilization increased in PAD patients from 20 to 225 cases and IABP utilization increased from 3001 to 3295 cases (Ptrend < 0.001 for both).

Conclusions: ECMO use in PAD patients is shown to be associated with worse in-hospital morality and adverse events compared with IABP.

Disclosures: M. C. Alraies: *Abiomed: Royalties*; H. Moussa Pacha *Nothing to disclose*. F. Darmoch *Nothing to disclose*. Y. Al-khadra *Nothing to disclose*. R. Ajmal *Nothing to disclose*. M. Soud *Nothing to disclose*. W. Ullah *Nothing to disclose*. Y. Sattar *Nothing to disclose*. T. Mir *Nothing to disclose*. T. P. Vacek *Nothing to disclose*. O. E. Ali *Nothing to disclose*. A. Asfour *Nothing to disclose*. Z. Hakim *Nothing to disclose*.

II-56 | In-hospital outcomes and trends of Intra-aortic balloon pump and peripheral vascular assist devices in patients with peripheral artery disease requiring mechanical circulatory support

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Hospital, United States; Waqas Ullah, Abington Jefferson Health, United States; Said Ashraf, Wayne State University Detroit Medical Center Harper Hospital, United States; Omar E Ali, Detroit Medical Center Heart Hospital, United States; Zaher Hakim, Detroit Medical Center Heart Hospital, United States; Abedelrahim Asfour, Oakwood Hospital, United States; M. Chadi Alraies, Detroit Medical Center Heart Hospital, United States

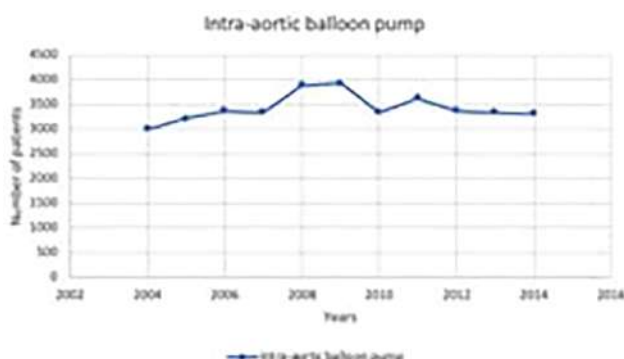
Background: Clinical outcome of mechanical circulatory support (MCS) devices used in patients with peripheral artery disease (PAD) is unknown. We sought to compare the outcome and trend of utilization of intra-aortic balloon pump (IABP) and percutaneous ventricular assist device (PVAD) used in patients with PAD

Methods: Using NIS database between 2004 and 2014, we identified PAD patients aged ≥ 18 years that required IABP and PVAD. Multivariate analysis was performed to examine in-hospital outcomes.

Results: Of 38,566 PAD patients who required MCS, 37,696 used IABP (97.7%), and 2,287 used PVAD (5.9%). PVAD was associated with similar risk of In-hospital mortality (20.8% vs 22.0%, adjusted odds ratio [aOR]: 0.97 [95% CI: 0.86-1.09] and shorter length of hospital stay (median 7 days, Interquartile range [IQR] (3-13) vs 8 days, IQR (5-14); $p < 0.001$). compared with IABP group. The incidence of acute kidney injury (37.1% vs 27.2%, aOR: 1.48 [95% CI: 1.34-1.64]), major bleeding (17.8% vs 11.5%, aOR: 1.72 [95% CI: 1.52-1.95], vascular complications (5.9% vs 4.4%, aOR: 1.65 [95% CI: 1.36-2.01] and limb revascularization (23.8% vs 11.7%, aOR: 2.50 [95% CI: 2.24-2.81]) was higher in PVAD group compared with IABP group. Within study period, PVAD utilization increased in PAD patients from 0 to 590 cases and IABP utilization increased from 3001 to 3295 cases (Ptrend < 0.001 for both).

Conclusions: Despite increased utilization, PVAD seems have higher vascular bleeding complications but similar in-hospital mortality compared with IABP

Disclosures: M. C. Alraies: *Abimed: Royalties*; H. Moussa Pacha *Nothing to disclose*. Y. Al-khadra *Nothing to disclose*. F. Darmoch *Nothing to disclose*. R. Ajmal *Nothing to disclose*. T. Mir *Nothing to disclose*. Y. Sattar *Nothing to disclose*. M. Soud *Nothing to disclose*. K. Kumar *Nothing to disclose*. W. Ullah *Nothing to disclose*. S. Ashraf *Nothing to disclose*. O. E. Ali *Nothing to disclose*. Z. Hakim *Nothing to disclose*. A. Asfour *Nothing to disclose*.



II-57 | Anterior, Posterior, or All-vessel Revascularization for Rutherford Class 2-3 Infrapopliteal PAD: Three-year Results from the LIBERTY 360 study

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Background: Little data guides revascularization of Rutherford class 2-3 (RC 2-3) infrapopliteal PAD. We assessed outcomes after infrapopliteal-only intervention for RC 2-3 disease using prospective observational data from the LIBERTY 360° study.

Methods: LIBERTY patients (N=128) with infrapopliteal-only RC 2-3 disease undergoing any FDA-approved endovascular therapy were divided into 3 groups by revascularization territory and followed for periprocedural, in-hospital, and long-term outcomes as well as vascular quality of life scores (VascuQoL). Logistic regression for odds ratios, Cox proportional hazard models, and ANOVA were utilized to compare outcomes.

Results: Patients underwent anterior (N=37), posterior (N=76), or all-vessel (N=15) infrapopliteal artery revascularization. The majority had plain balloon angioplasty (89.7, 85.5, and 77.4%, respectively). Each group had improvements in RC (mean RC change -1.3 , -1.5 , and -1.5 , respectively). Patients had higher risk of major adverse events and higher risk for repeat target vessel revascularization at 3 years in the all-vessel group compared with anterior and posterior groups (Table). Other outcomes were similar among the three groups. The anterior group showed lower pain subdomain and total VascuQoL scores compared with posterior and all-vessel groups at 2 years ($p=0.016$, $p=0.020$ and $p=0.068$, $p=0.009$, respectively).

Conclusions: Anterior or posterior revascularization may have favorable outcomes compared with all-vessel revascularization, and anterior revascularization may be most beneficial of the three for symptoms in RC 2-3 infrapopliteal PAD patients.

Disclosures: E. J. Armstrong: *Dr. Armstrong is a consultant to Abbott Vascular, Boston Scientific, Cardiovascular Systems Incorporated (CSI),*

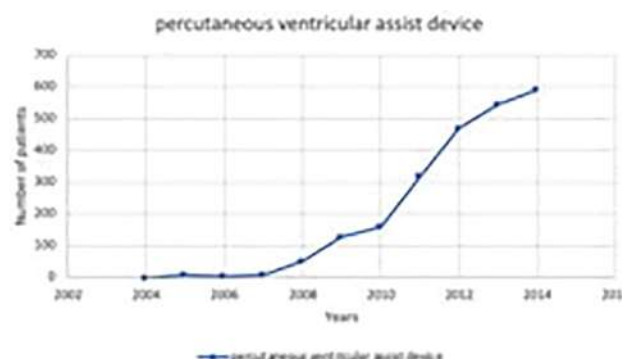


Table: Short-term and 3-year outcomes of anterior, posterior, and all-vessel intervention for RC 2-3 infrapopliteal PAD patients

Short-term outcomes (Odds ratios, OR)	Anterior* intervention (N=37)	Posterior* intervention (N=76)	All-vessel† intervention (N=15)	OR (95% CI) for Anterior vs posterior intervention	OR (95% CI) for Anterior vs all-vessel intervention	OR (95% CI) for Posterior vs all-vessel intervention
Procedural success [‡]	30/36 (83.3%)	60/71 (84.5%)	8/13 (61.5%)	0.97 (0.31-3.07), p=0.959	1.92 (0.54-6.80), p=0.309	1.98 (0.68-5.79), p=0.211
Sever angiographic complications	2/37 (5.4%)	6/74 (8.1%)	3/13 (23.1%)	0.52 (0.06-4.81), p=0.564	0.25 (0.02-2.49), p=0.235	0.47 (0.10-2.24), p=0.346
Severe dissection (Type C-F)	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
Perforation	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
Abrupt closure	1/37 (2.7%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
Distal embolization	1/37 (2.7%)	4/74 (5.4%)	2/13 (15.4%)	0.50 (0.05-4.64), p=0.542	0.18 (0.02-2.16), p=0.177	0.36 (0.05-2.18), p=0.267
In-hospital MAE	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
In-hospital death	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
In-hospital major amputation	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
In-hospital TVR	0/37 (0.0%)	0/74 (0.0%)	0/13 (0.0%)	-	-	-
3-year outcomes (Hazard ratios, HR)	Anterior* intervention (N=37)	Posterior* intervention (N=76)	All-vessel† intervention (N=15)	HR (95% CI) for Anterior vs posterior intervention	HR (95% CI) for Anterior vs all-vessel intervention	HR (95% CI) for Posterior vs all-vessel intervention
Major Adverse Events	4/37 (10.8%)	10/76 (13.2%)	7/15 (46.7%)	0.85 (0.27, 2.70), p=0.778	0.22 (0.06, 0.74), p=0.015	0.24 (0.09, 0.64), p=0.004
Target Vessel Revascularization	4/37 (10.8%)	9/76 (11.8%)	7/15 (46.7%)	0.95 (0.29, 3.09), p=0.935	0.22 (0.06, 0.74), p=0.015	0.22 (0.08, 0.60), p=0.003
Major amputation	0/37 (0.0%)	1/76 (1.3%)	0/15 (0.0%)	Non-estimable, p=0.998	-	Non-estimable, p=0.998
All-cause death	4/37 (10.8%)	13/76 (17.1%)	0/15 (0.0%)	0.62 (0.20, 1.90), p=0.405	Non-estimable, p=0.996	Non-estimable, p=0.994

*All lesions in anterior tibial artery

†All lesions in posterior tibial, tibial-peroneal trunk, and peroneal arteries PT, TPT, PR

‡All lesions in anterior tibial, posterior tibial, tibial-peroneal trunk, and peroneal arteries

§ (<50% residual stenosis, without significant angiographic complications)

Major Adverse Events is the composite outcome of death within 30 days of index procedure, unplanned major (above the ankle) amputation of the target limb, and clinically driven target limb revascularization and/or target vessel revascularization of the target limb after the index procedure

Medtronic, Philips, and PQ Bypass. All other authors have no relationships to disclose. Consulting; T. Salahuddin Nothing to disclose. S. Giannopoulos Nothing to disclose.

II-58 | Intravascular Ultrasound-Guided Balloon-Assisted Re-entry Technique for Complex Lower Extremity Chronic Total Occlusions

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Background: Chronic total occlusions (CTO) of the lower extremity arteries represent a challenging subset of PAD. Multiple CTO strategies are often used, such as wire escalation, re-entry devices, and alternative access sites. One such strategy to cross a CTO is the facilitated IVUS guided balloon rupture re-entry (FIBRE) technique. This approach involves IVUS guided re-entry device rupture of a retrogradely inserted balloon, wire insertion into the ruptured balloon, and subsequent removal of the balloon/wire to externalize the wire to allow definitive treatment. We describe a retrospective analysis of 10 peripheral CTO's successfully crossed using the FIBRE technique.

Methods: A retrospective analysis of 150 patients undergoing peripheral intervention for lower extremity CTO was performed from 2014-2017 at a single institution. 10 patients with chronic total occlusions were identified using the FIBRE technique. Procedural success, 30 day and 6 month patency rates, ankle brachial index improvement, and complications were analyzed.

Results: Ten patients (mean age 72+/- 17 years), had the FIBRE technique to attempt crossing of a CTO of a femoropopliteal artery. Median follow up was 5.3 months (range, 0-6 months). Technical success was achieved in all 10 patients (100%). This technique was used to cross 6 superficial femoral and 4 popliteal arteries. All lesions were successfully revascularized with angioplasty and stenting to cover the re-entry zone. There were no intra-operative or peri-procedural complications reported including vessel perforation, bleeding, distal embolization, or infrapopliteal vessel compromise. Ankle brachial indices (ABI) were obtained at 30 days and 6 months to assess patency in 9/10 patients (90%), 1 patient was lost to follow up. Of the 9 patients, 100% of patients had documented arterial patency at both 30 days and 6 months. Average ABI improved post-procedure (from 0.57 to 0.99). There were no reports of re-intervention, amputation, or death at 6 month follow up.

Conclusions: The facilitated IVUS-guided balloon rupture re-entry (FIBRE) technique is a safe and feasible strategy with excellent technical success in experienced hands for crossing lower extremity CTO when conventional modalities fail.

Disclosures: R. Sangera Nothing to disclose. C. Mercogliano Nothing to disclose. J. C. George Nothing to disclose. V. Varghese Nothing to disclose.

II-59 | Utility of Intravascular Ultrasound in Peripheral Vascular Interventions: Systematic Review and Meta-analysis

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Smolderen, Saint Luke's Mid America Heart Institute, United States; Qurat-ul-ain Jelani, Yale University School Of Medicine, United States; Sameer Nagpal, Yale New Haven Hospital/Yale University, United States; Marabel Schneider, Yale New Haven Hospital/Yale University, United States; Fiorella Llanos, Yale New Haven Hospital/Yale University, United States; Carlos I. Mena-Hurtado, Yale University, United States

Background: Intravascular ultrasound (IVUS) facilitates plaque visualization and angioplasty during peripheral vascular interventions (PVLs) for peripheral arterial disease. It is unclear whether IVUS may improve the durability of PVLs and lead to improved clinical outcomes. We sought to compare outcomes between IVUS- versus angiography (AO)-guided PVLs.

Methods: This is a study level meta-analysis of observational studies. The primary endpoints of this study were rates of primary patency and reintervention. Secondary endpoints included rates of technical success, all-cause mortality, vascular complications, periprocedural adverse events, amputations, and myocardial infarction.

Results: Eight observational studies (including one propensity score matched study) were included in this analysis with 93,551 patients. Mean follow-up was 24.2 ± 15 months. Compared with AO-guided PVLs, there was a non-statistically significant trend towards higher patency rates with IVUS-guided PVLs (RR 1.30, 95% CI: 0.99-1.71, $p=0.062$). A meta-regression of log risk ratio of primary patency rates on follow-up time was not significant ($p=0.366$). There was a non-statistically significant trend towards lower reintervention rates with IVUS-guided PVLs (RR 0.41, 95% CI: 0.15-1.13, $p=0.085$). A meta-regression of log risk ratio of reintervention on follow-up time was statistically significant ($p=0.006$) suggesting IVUS may be associated with fewer patients needing reintervention at longer follow-up. There is a lower risk of periprocedural adverse events (RR 0.81, 95% CI: 0.70-0.94, $p=0.006$) and vascular complications (RR 0.81, 95% CI: 0.68-0.96, $p=0.013$) in the IVUS group. All-cause mortality (RR 0.76, 95% CI 0.56-1.04; $p=0.084$), amputation rates (RR 0.83, 95% CI: 0.32-2.15, $P=0.705$), myocardial infarctions (RR 1.19, 95% CI: 0.58-2.41, $p=0.637$), and technical success (RR 1.01, 95% CI: 0.86-1.19, $P=0.886$) were similar between the groups.

Conclusions: IVUS-guided PVLs were associated with a non-significant trend towards improved primary patency rates and lower rates of reintervention with significantly lower rates of periprocedural adverse events and vascular complications.

Disclosures: K. G. Smolderen: *Boston Scientific Corp.: Grant support; Abbott (St. Jude): Grant support; Terumo: Grant support;* C. I. Mena-Hurtado: *Abbott (St. Jude): Consulting; Cardinal Health: Consulting; Cook Medical: Consulting; Medtronic: Consulting; Boston Scientific Corp.: Consulting; Bard: Consulting;* A. B. Sheikh *Nothing to disclose.* M. Anantha Narayanan *Nothing to disclose.* Q. U. A. Jelani *Nothing to disclose.* S. Nagpal *Nothing to disclose.* M. Schneider *Nothing to disclose.* F. Llanos *Nothing to disclose.*

VENOUS DISEASE (INCLUDING DVT, INSUFFICIENCY)

II-60 | Outcomes of Catheter-Directed Thrombolysis Versus Anticoagulation alone in Patients with Acute Deep Venous Thrombosis, A Systematic Review and Meta-analysis

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Background: Previous studies have shown conflicting data about the impact of catheter-directed thrombolysis (CDT) on outcomes in patients with deep venous thrombosis (DVT).

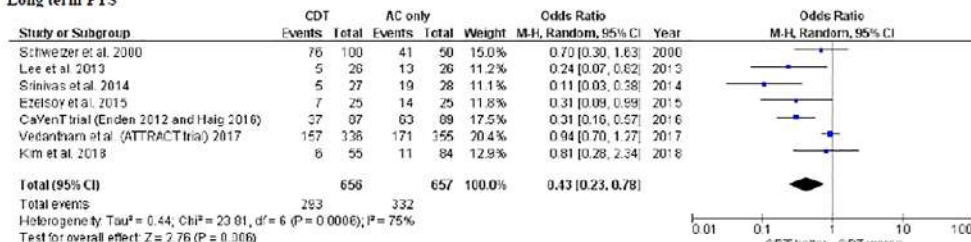
Methods: We performed a systematic review and meta-analysis, including all published studies from 1996 to August 2019 that compared CDT to anticoagulation alone in patients with acute DVT. Our main study outcomes were post thrombotic syndrome (PTS), venous patency and thromboembolism.

Results: Eleven studies (4 randomized control trials and 7 observational studies) with a total of 8737 patients were included. During hospital stay, patients who received CDT had higher major bleeding (2.5% vs. 1.6%; OR 1.46, 95% CI [1.07, 1.98], $p=0.02$), blood transfusion (10.8% vs. 6.2%; OR 1.8, 95% CI [1.52, 2.13], $p<0.001$) and thromboembolism (15.5% vs. 10%; OR 1.67, 95% CI [1.47, 1.91], $p<0.001$) compared with anticoagulation alone. At 6-month follow-up, patients who received CDT had higher venous patency (71.1% vs. 37.7%; OR 5.49, 95% CI [2.63, 11.5], $p<0.001$) and lower PTS (27% vs. 40.7%; OR 0.44, 95% CI [0.22, 0.86], $p=0.02$). During a mean follow-up duration of 30.5 ± 28 months, CDT group continued to have higher venous patency (79.6% vs. 71.8%; OR 3.79, 95% CI [1.54, 9.32], $p=0.004$) and lower PTS (44.7% vs. 50.5%; OR 0.43, 95% CI [0.23, 0.78], $p=0.006$), but no difference in thromboembolism.

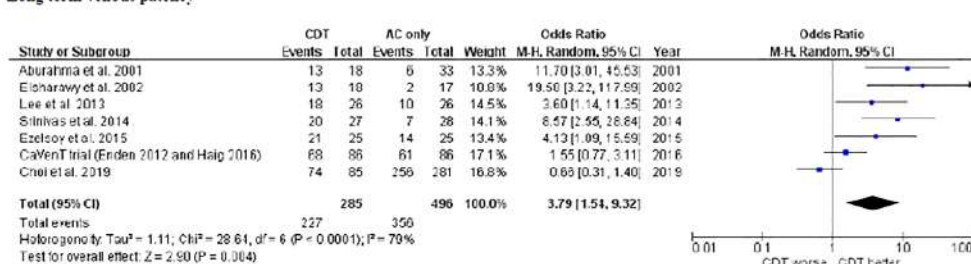
Conclusions: Compared with anticoagulation alone, CDT for patients with acute DVT was associated with a higher risk of thromboembolism and major bleeding after the procedure, but a higher rate of venous patency and lower risk of PTS at 2.5 years follow-up.

Disclosures: B. Abraham *Nothing to disclose.* R. Sedhom *Nothing to disclose.* M. S. Megaly *Nothing to disclose.* M. Saad *Nothing to disclose.* A. Elbadawi *Nothing to disclose.* I. Y. Elgendy *Nothing to disclose.* M. A. Omer *Nothing to disclose.* M. Anantha Narayanan *Nothing to disclose.* A. Attallah *Nothing to disclose.*

Long term PTS



Long term venous patency



Long term recurrent thromboembolism

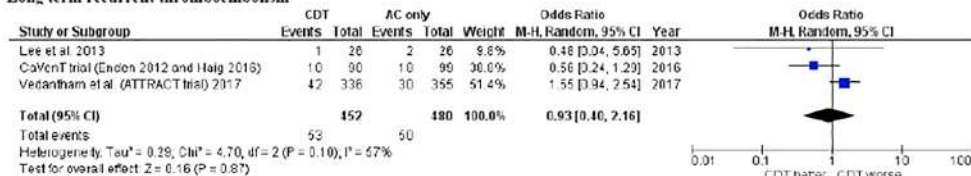


Figure 1. Pooled analysis of the odds of long term outcomes with CDT vs. anticoagulation alone in acute DVT patients; the summary statistic is the odds ratio calculated according to the Mantel-Haenszel method with random effects; marker size is proportional to the study weight.

CDT: catheter-directed thrombolysis; DVT: deep venous thrombosis; PTS: post thrombotic syndrome.

II-61 | Lower bleeding risk with dabigatran over warfarin is driven by non-gastrointestinal bleeding in patients treated for venous thromboembolism

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Background: Dabigatran, a direct oral thrombin inhibitor, is now preferred over warfarin due to improved safety and efficacy profile. Here we compared dabigatran and warfarin in patients treated for venous thromboembolism (VTE) to identify the differences in bleeding outcomes.

Methods: PubMed, Embase, and Cochrane central were systematically searched for all the randomized controlled trials (RCTs) that reported bleeding outcomes relating to dabigatran or warfarin. We limited our patient population to VTE to perform this exploratory analysis and to decrease patient heterogeneity. Our outcomes of interest were gastrointestinal, retroperitoneal and all-cause bleeding. Event rates were pooled to estimate odds ratio (OR) and corresponding 95% confidence intervals (CI).

Results: Data from the 3 RCTs with a total of 7,963 randomized patients showed that dabigatran led to a significantly lower (12.0% vs 15.1%) incidence of any bleeding (OR0.79;95%CI 0.71-0.89; $p < 0.01$). However, gastrointestinal bleeding was significantly higher (2.6% vs

1.8%) in patients treated with dabigatran (OR1.51;95%CI 1.12-2.04; $p < 0.01$). Although there was trend towards higher retroperitoneal bleeding in patients treated with dabigatran, it was statistically insignificant ($p = 0.12$).

Conclusions: Our results demonstrate that in patients treated for VTE, although there were higher total bleeding episodes with the use of warfarin, there was significantly more gastrointestinal bleeding episodes noted with dabigatran use compared to warfarin. This suggests that in patients with VTE and a prior history gastrointestinal bleeding, warfarin may be safer compared to dabigatran.

Disclosures: S. S. Malik *Nothing to disclose.*

II-62 | Predicting Significant Iliac Vein Compression Using a Probability Scoring System Derived from Minimal Luminal Area on Computed Tomography Angiography in Patients Sixty Five Years of Age or Younger

Nicolas W Shammass, Midwest Cardiovascular Research Foundation, United States; Qais Radaideh, Midwest Cardiovascular Research Foundation, United States; Sue Jones-Miller, Midwest Cardiovascular Research Foundation, United States; Neel Patel, Midwest

Study or Subgroup	Dabigatran		Warfarin		Risk Ratio
	Events	Total	Events	Total	MH, Fixed, 95% CI
Outcomes = Gastrointestinal bleeding					
RE-COVER 2009	53	1274	35	1265	1.50 [0.99; 2.29]
RE-MEDY RE-SONATE 2013	2	1430	0	1426	4.99 [0.24; 103.76]
RE-COVER II 2014	48	1279	33	1289	1.47 [0.95; 2.27]
Total (95% CI)		3983		3980	1.51 [1.12; 2.04]

Heterogeneity: $\tau^2 = 0$; $\chi^2 = 0.61$, $df = 2$ ($P = 0.74$); $I^2 = 0\%$

Test for overall effect: $Z = 2.69$ ($P < 0.01$)

Outcomes = Retroperitoneal bleeding

RE-COVER 2009	4	1274	1	1265	3.97 [0.44; 35.49]
RE-COVER II 2014	3	1279	1	1289	3.02 [0.31; 29.03]
Total (95% CI)		2553		2554	3.50 [0.73; 16.84]

Heterogeneity: $\tau^2 = 0$; $\chi^2 = 0.03$, $df = 1$ ($P = 0.87$); $I^2 = 0\%$

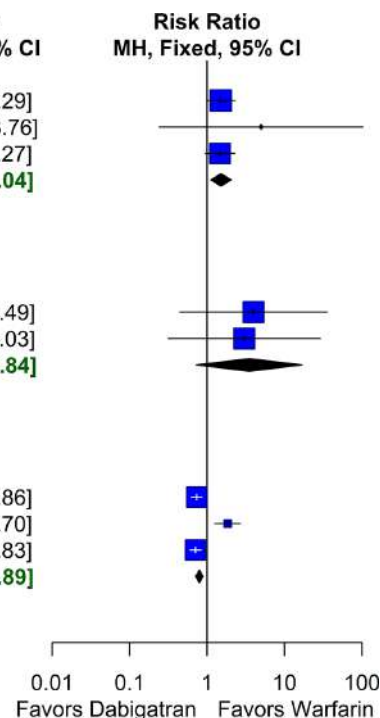
Test for overall effect: $Z = 1.56$ ($P = 0.12$)

Outcomes = Any bleeding

RE-COVER 2009	205	1274	277	1265	0.73 [0.62; 0.86]
RE-MEDY RE-SONATE 2013	72	1430	39	1426	1.84 [1.26; 2.70]
RE-COVER II 2014	200	1279	285	1289	0.71 [0.60; 0.83]
Total (95% CI)		3983		3980	0.79 [0.71; 0.89]

Heterogeneity: $\tau^2 = 0.1072$; $\chi^2 = 21.34$, $df = 2$ ($P < 0.01$); $I^2 = 91\%$

Test for overall effect: $Z = -4.13$ ($P < 0.01$)



Cardiovascular Research Foundation, United States; Gail A Shammass, Midwest Cardiovascular Research Foundation, United States; Torin Kovach, Midwest Cardiovascular Research Foundation, United States; Andrew Shammass, Midwest Cardiovascular Research Foundation, United States; Srikanth Reddy Kasula, Midwest Cardiovascular Research Foundation, United States; Rafat Padaria, Midwest Cardiovascular Research Foundation, United States; Istvan Z Kovach, Midwest Cardiovascular Research Foundation, United States; John Shammass, Midwest Cardiovascular Research Foundation, United States

Background: The presence of 50% or more stenosis on intravascular ultrasound (IVUS) is considered diagnostic of iliac vein compression (ILVC). We have previously evaluated a scoring system combining minimal luminal area (MLA) at the compression site and age to predict ILVC as seen on IVUS. This yielded a low positive predictive value (PPV) and a high negative predictive value (NPV). We present a revised and improved scoring system following an additional number of patients and limited to patients 65 years and younger.

Methods: Patients were included from a retrospective ($n=52$) and prospective ($n=18$) registries of patients who underwent CTA of the pelvis with venous filling phase and IVUS within few weeks apart to evaluate for symptomatic ILVC in one cardiovascular practice. Quantitative vascular analysis was performed on all images obtained. MLA and age were used to calculate a score derived from a previously published logistic regression formula. Patients over the age of 65 were excluded. The predicted findings from the score were compared to the actual presence of compression on IVUS. The revised scoring system is based on a score of < 0.533 and MLA (mm^2) of <140 , ≥ 140 to <200 , and ≥ 200 . The NPV and PPV of each cutoff in predicting ILVC on IVUS were calculated.

Results: A total of 70 symptomatic patients were included (mean age 52.6 ± 12.3 years). The table below shows results of combining CT MLA and calculated scores after correlation with compression ($\geq 50\%$) or no compression ($<50\%$) on IVUS.

Compression	Score ≥ 0.53 and CT (MLA <140 or MLA ≥ 200)
Possible Compression	$140 \leq \text{CT MLA} < 200$
No Compression	Score < 0.53 and CT (MLA <140 or MLA ≥ 200)

For all patients, the sensitivity and specificity of the above combinations were 98.1% and 16.7% respectively with a PPV and a NPV of 77.3% and 75% respectively and an accuracy of 77.1%. For patients with MLA of <140 or ≥ 200 , the sensitivity, specificity, PPV, NPV and accuracy were 97.4%, 33.3%, 86.4%, 75.0% and 85.4% respectively. Intermediate MLA ($140 \leq \text{CT MLA} < 200$) introduced a higher false positives in the model but the sensitivity of the scoring system remained high.

Conclusions: A scoring system using MLA on CTA and age, provides a fairly accurate diagnostic test to predict the presence of significant ILVC as seen on IVUS.

Disclosures: N. W. Shammass: Dr. Shammass receives research and educational grants from Boston Scientific, Intact Vascular, Philips, VMG, and C.R. Bard, Inc. And serves as speaker Bureau for Boehringer Ingelheim, Janssen, Zoll Medical, Novartis. Principal Investigator for a Research Study and Speaker Bureau; Q. Radaideh Nothing to disclose. S. Jones-Miller Nothing to disclose. N. Patel Nothing to disclose. G. A. Shammass

Nothing to disclose. T. Kovach Nothing to disclose. A. Shammash Nothing to disclose. S. R. Kasula Nothing to disclose. R. Padaria Nothing to disclose. I. Z. Kovach Nothing to disclose. J. Shammash Nothing to disclose.

II-63 | Duplicate Common Iliac Veins Requiring Stent Implantation for Venous Obstruction

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Background: Duplicate common iliac vein (CIV) is rarely reported and congenital abnormalities of inferior vena cava has low incidence and is rare. We describe three similar cases of duplicate CIV with left femoro-ilio-caval (FIC) venous obstruction requiring stent implantation.

Methods: and

Results: Cases 1-3

A 66-year-old man with a past medical history of hypertension was found to have left FIC venous obstruction on duplex ultrasound (DU).

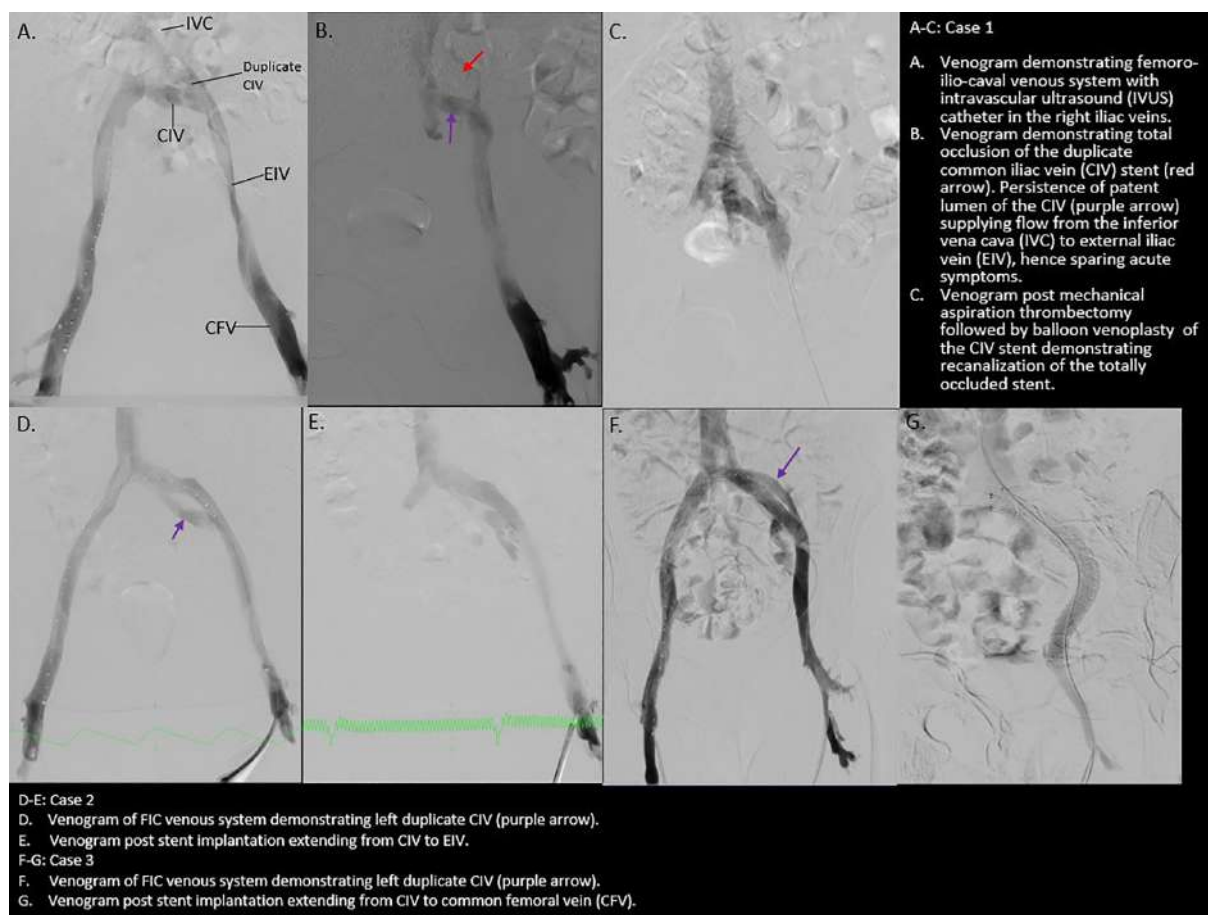
Venogram and intravascular ultrasound (IVUS) revealed evidence of duplicate left CIV. A Wallstent was placed extending from CIV to external iliac vein (EIV). A one-month follow up DU revealed total occlusion of the CIV stent. Thrombectomy and balloon venoplasty was successfully performed. Stent remained patent and free of thrombus on a one-month follow up DU.

A 56-year-old woman with a past medical history of Hashimoto's thyroiditis was found to have left FIC venous obstruction on DU. Venogram and IVUS revealed evidence of duplicate left CIV. A Venovo stent was placed extending from CIV to EIV. One-month follow up DU demonstrated patent stent with no evidence of in-stent restenosis (ISR) or thrombosis.

A 52-year-old woman with a past medical history of hypertension was found to have left FIC venous obstruction on DU. Venogram and IVUS revealed evidence of duplicate left CIV. A Venovo stent was placed extending from CIV to common femoral vein. Two-month follow up DU demonstrated patent stent with no evidence of ISR or thrombosis.

Conclusions: We report the first case series of duplicate CIV requiring stent implantation for left FIC venous obstruction. Similar to duplicate IVC, a duplicate CIV may pose risk of venous thromboembolism.

Disclosures: R. Sogomonian Nothing to disclose. C. Gonzalez Nothing to disclose. D. Misra Nothing to disclose. R. M. Gowda Nothing to disclose.



QUALITY IMPROVEMENT

II-64 | Off- Hours Admission of Patients with Non ST Elevation Acute Coronary Syndromes: Does It Impact The Management Strategy?

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Background: Circadian disparity in managing acute coronary syndromes according to day of admission (working day vs. holiday "Off-hours") has raised debate in literature, so this study sought to investigate the impact of admission day on decision of intervention in patients with NSTEMI-ACS.

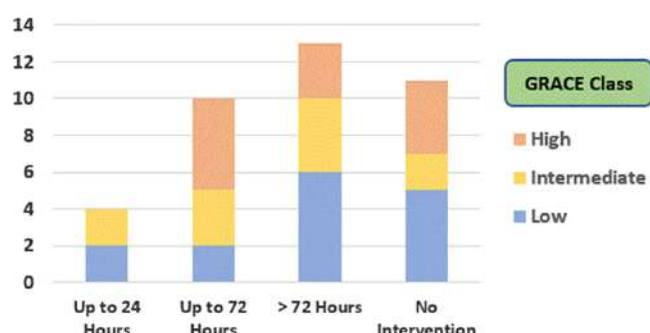
Methods: This study included patients with NSTEMI-ACS, patients' data were collected, GRACE score was calculated for each patient, they were grouped into two categories according to day of admission, working day vs. holiday group.

Results: the study recruited 221 patients, 17.1% of them admitted during holidays. Among holiday group; 73.5% were males and 26.5% were females, mean age was 58.2 ± 12.52 . Of holiday group 63.3% were hypertensive vs. 66.2% in working day counterparts ($p=0.6$), while diabetes reported in 53.1% of holiday group vs. 43.1% ($p=0.2$). Holiday patients were treated invasively in 71.1% versus 62.3% in working day group ($p=0.4$). For those with high GRACE score >140 ; 58.3% of holiday group were treated invasively vs. 47.4% of working day group however none of high risk patients in holiday group were catheterized within first 24 hours.

Conclusions: This study contradicts prior researches that suggested under-utilization of invasive strategy in off-hours admission when compared to working day admission, however, it revealed delay in catheterization of patients admitted in holidays particularly in high risk patients despite the guideline recommendations of early intervention in high risk category, this should call to enhance healthcare system to offer best cardiovascular care regardless time of admission to optimize patients' outcomes.

Disclosures: Z. A. Dakhil *Nothing to disclose*. H. A. Al Farhan *Nothing to disclose*.

Timing to Intervention in Holiday Category According to GRACE Risk Class



II-65 | Saphenous vein graft radio-opaque markers and femoral access reduce contrast use in coronary angiography and graft studies

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Background: Saphenous vein grafts (SVG) are often employed for bypass in addition to internal mammary arteries during CABG operations. Despite the improvement in surgical technique most post CABG patients will require additional coronary artery catheterization in their lifetimes. Radio-opaque markers for SVGs are safe and easy to implant during the CABG operation. The markers were found to have no impact on long term graft patency. However, these markers should make repeat coronary angiography and graft studies easier and allow these procedures to be performed with less contrast thereby reducing the risk of contrast induced nephropathy.

Methods: We systematically reviewed consecutive diagnostic coronary angiograms of all patients with previous CABG at a single large Canadian interventional centre. Basic demographic and clinical data, access site, number of grafts, operator, and amount of contrast used were recorded for analysis. Predictors of amount of contrast used were identified using multiple regression analysis with stepwise elimination of factors utilizing SPSS software.

Results: Between Jan 2016 and May 2019, 746 diagnostic coronary angiograms and graft studies were performed. 328 cases were excluded because the patients had additional procedures done in the same setting. Mean age of patients was 71 (9) years, 12 % were female. 41% of patients had a clip inserted at the time of their bypass surgery. 15% of patients had a single vein graft used at the time of surgery, 43% had two vein grafts and 42% of patients three or more grafts. 56 % of the procedures were performed via the femoral route.

Independent predictors of contrast volume used were access site (187 (64) ml for radial vs 170 (60) ml for femoral), number of grafts used (+24 ml per additional graft) and use of radio-opaque markers during CV surgery (166 (54) ml with surgical clips versus 186 (66) ml without clips). Age, gender and operator were not predictive of the amount of contrast used.

Conclusions: Positioning graft markers at the time of CV surgery can significantly reduce the contrast requirement for subsequent cardiac catheterisation. Even in a high volume radial centre further reductions of contrast use can be achieved by using femoral rather than radial access.

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II-66 | Standardized Checklist Helps Improve Outcomes in PDA Closure in Premature Infants

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Background: Transcatheter closure of patent ductus arteriosus (PDA) in premature infants (<2kg) need special planning and expertise. We made a procedure checklist with the aim to standardize the procedure. The goal of this project was to evaluate the effect of introduction of this standardized checklist on outcomes of this procedure.

Methods: A standardized checklist was made in accordance with the standard guidelines and agreed upon recommendations from the catheterization laboratory staff as well as the pediatric cardiovascular anesthesia team for performing PDA closure procedure in premature infants weighing <2kg. The quality improvement tool was implemented in July, 2018 and pre and post checklist implementation data was collected on the following variables: 1) timings [1a) Door to vascular access time, 1b) total procedure time (vascular access to sheath removal), 1c) door-in to door-out time]; 2) Patient variables [2a) intraprocedural hypothermia (as qualified by WHO neonatal hypothermia guidelines)] and 3) Radiation (air kerma in mGy).

Results: Data on 8 patients prior and on 5 patients post checklist implementation was reviewed. After implementation of the checklist, median door to vascular access time was reduced by 33%. Procedure time was reduced by 33%, and door-in to door-out time was reduced by 11%. Prior to checklist, all 8 infants had hypothermia and the incidence was reduced to 40% (2/5) post checklist implementation. Checklist also reduced equipment wastage (6-12 catheter/wire combinations to 5 post checklist) by using standardized equipment. The standardized checklist also helped reduce median air kerma by 50% (median 8.9mGy to 4.5mGy post). No patient in either group experienced any significant adverse events.

Conclusions: Utilization of a standardized procedural checklist during pre and intra procedure care helped reduce procedure time, door to vascular access time, door-in to door-out time, equipment wastage, hypothermia as well as the radiation exposure. Standardization of transcatheter PDA closure in the premature infant population improves safety and outcomes and should be adopted in all catheterization laboratories performing these procedures.

Disclosures: G. Hiremath: *Bbraun: Consulting*; K. Erickson *Nothing to disclose*. V. Aggarwal *Nothing to disclose*. K. Soule *Nothing to disclose*. M. Richtsfeld *Nothing to disclose*. J. L. Bass *Nothing to disclose*.

II-67 | Comparison of Clinical and Echocardiographic Variables in Heart Failure With Reduced Ejection Fraction Patients With and Without an Implantable Cardioverter Defibrillator

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Background: Implantable cardioverter defibrillators (ICDs) are associated with improved mortality in heart failure with reduced ejection fraction (HFrEF) yet ICDs remain underutilized. The purpose of this study was to assess the utilization percentage for ICDs at our medical center in patients with EF $\leq$ 35% and evaluate variables associated with ICD placement.

Methods: We retrospectively collected clinical and echocardiographic data of 497 patients (2012-2017) identified in our echocardiographic database by LVEF $\leq$ 35%. Patients were divided into two groups for comparison purposes, those with and without ICD placement.

Results: ICD utilization rate was 54%. Mean age of the patients was 63 ± 14 years old and 65% were men. Patients ≥ 60 years old were more likely to have ICD placement compared with <60 years old ($p = 0.045$). Significant differences in echocardiographic variables included patients with an ICD having larger LV internal diastolic and systolic dimension indices ($p = 0.0001$). On multivariable logistic regression, variables positively associated with ICD included lower blood pressure, prior myocardial infarction, atrial fibrillation/flutter and ventricular arrhythmias. Variables negatively associated with ICD included heart rate, coronary artery disease and failure to follow up with an electrophysiologist (Table).

Conclusions: In this retrospective patient series, we found ICD utilization associated with certain echocardiographic characteristics and

Table. Independent Predictors of Implantable Cardioverter Defibrillator Utilization (Yes vs. No)

Variable	OR (95% CI)	p-value
Blood Pressure		
Normal Vs Stage 2 Hypertension	2.06 (1.26-3.37)	0.0039
Elevated Vs Stage 2 Hypertension	2.09 (1.04-4.23)	0.0393
Stage 1 Vs Stage 2 Hypertension	2.02 (1.14-3.58)	0.0163
Heart Rate		
Per One BPM Increase	0.98 (0.96-0.99)	<0.0001
CAD		
Yes Vs No	0.59 (0.35-0.99)	0.0438
Prior Myocardial Infarct		
Yes Vs No	1.78 (1.08-2.90)	0.0224
Atrial fibrillation/flutter		
Yes Vs No	2.25 (1.48-3.41)	0.0001
Ventricular Arrhythmias		
Yes Vs No	4.12 (2.20-7.74)	<0.0001
Failed to Make EP Appointment		
Yes Vs No	0.07 (0.02-0.25)	<0.0001

Abbreviations: CAD: Coronary Artery Disease; BPM: beat per minute; OR: Odds Ratio; CI: Confidence Interval. Note p value <0.05 for all blood pressure group comparisons.

clinical history. Future study of these variables may increase ICD placement and improvement in HFrEF mortality rates.

Disclosures: J. Escovon *Nothing to disclose*. E. Dib *Nothing to disclose*. M. Ahmad *Nothing to disclose*. G. Carayannopoulos *Nothing to disclose*. W. I. Khalife *Nothing to disclose*. A. Sewn *Nothing to disclose*. X. Yu *Nothing to disclose*. W. Zaidi *Nothing to disclose*. R. F. Berbarie *Nothing to disclose*.

II-68 | Anemia influencing rotational atherectomy: how length of stay, total hospital charges, and mortality are negatively impacted

Kanwalgeet Hans, Kansas City University of Medicine and Biosciences, United States; Joanna Rowe, Kansas City University of Medicine and Biosciences, United States; Kenneth Johnson, Kansas City University of Medicine and Biosciences, United States; Victoria Gordon, Kansas City University of Medicine and Biosciences, United States; Adam Lewis, Kansas City University of Medicine and Biosciences, United States; Clayton Marolt, Kansas City University of Medicine and Biosciences, United States

Background: Ischemic heart disease (IHD) negatively impacts the US population and was responsible for over 360,000 deaths in 2017. Anemia, a known exacerbating factor of IHD, is challenging to treat and can increase patient risk for complications during rotational atherectomy, an endovascular approach utilized to treat IHD. Possible complications of this procedure include embolization, coronary spasm, dissection, and vessel perforation with the latter two posing especially detrimental to anemic patients. The aim of this study is to examine the effects of anemia on short-term hospital outcomes including in-patient mortality, total hospital charges, and length of stay (LOS) for patients undergoing rotational atherectomy.

Methods: In conducting this retrospective cohort study, utilization of the Healthcare Cost and Utilization Program Nationwide Inpatient Sample (NIS) from 2012 to September 2015 was performed for any patient (≥ 18 years of age) undergoing rotational atherectomy. Patients

who underwent atherectomy with concomitant anemia were identified using ICD-9 codes. Any patient missing important clinical identifiers (i.e., age, race, gender) were excluded from this study. In-patient mortality, total hospital charges, and LOS were examined. Statistical analysis was implemented using the Chi-Square test to analyze mortality and independent Sample T-tests to evaluate total hospital charges and LOS.

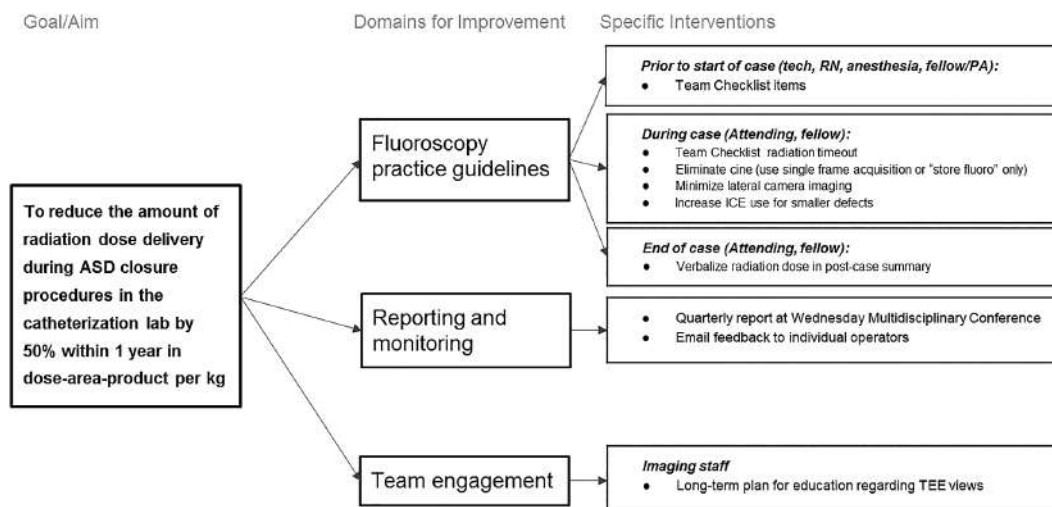
Results: Of the 10,010 patients that underwent rotational atherectomy, 1583 patients had a previous diagnosis of anemia. Anemia corresponded to increased in-patient mortality (4.7% vs 3.0%, $p < 0.001$), total hospital charges (\$126,883 vs \$92,165, $p < 0.001$), and LOS (6.6 days vs 4.0 days, $p < 0.001$) in patients undergoing rotational atherectomy.

Conclusions: Anemic patients enduring rotational atherectomy exhibit increased in-patient mortality, total hospital charges, and LOS. These findings can impact clinical and surgical practice by providing a cost-effective analysis to aid cardiologists in optimizing peri-procedural treatment of IHD seen in patients with comorbid anemia. This can ultimately provide hospital administrators a means to reduce cost and LOS.

Disclosures: K. Hans *Nothing to disclose*. J. Rowe *Nothing to disclose*. K. Johnson *Nothing to disclose*. V. Gordon *Nothing to disclose*. A. Lewis *Nothing to disclose*. C. Marolt *Nothing to disclose*.

II-69 | Radiation reduction in the cardiac catheterization lab during atrial septal defect closure: A single-center quality improvement initiative

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Background: Cardiac catheterization for congenital heart disease is a source of cumulative radiation exposure to patients and staff. Single center quality improvement (QI) initiatives identify targets for improvement and provide efficient feedback. Transcatheter ASD closure was chosen for this QI project based on a homogenous procedural population and inter-operator variability in radiation usage, with the aim to reduce radiation exposure during ASD device closure by 50% over 1 year.

Methods: In January 2019, a key driver plan was created with multi-disciplinary input to identify actionable items to reduce exposure (Figure 1). Patients were included based on intention-to-treat and excluded if additional angiography or intervention(s) were performed. Radiation dose reported as dose area product (DAP) per kilogram ($\mu\text{Gy}\cdot\text{M}^2/\text{kg}$) and summarized by median and IQR for all qualifying cases. The outcome, percent reduction in radiation dose observed over the study period, was determined through comparison with a historical cohort (2018).

Results: Thirty cases met inclusion criteria over the ten months since the implementation of the QI initiative. Median dose (DAP/kg) of 12 [6-21] was observed in the study population compared with 23 [14-60] in the historical cohort, resulting in a 50% dose reduction ($p = 0.002$) in exposure, accelerated by targeted interventions addressing strategic domains for radiation reduction.

Conclusions: Quality improvement initiatives effectively reduce radiation exposure in the catheterization lab. QI interventions are specific to each institution's needs, but the strategies outlined in our key driver plan may be widely reproducible.

Disclosures: D. Harrison *Nothing to disclose*. L. Bergersen *Nothing to disclose*. L. Shirley *Nothing to disclose*. B. Quinn *Nothing to disclose*. J. Michaud *Nothing to disclose*. J. Rivera *Nothing to disclose*. N. Maschietto *Nothing to disclose*.

II-70 | Quality of Life Between Percutaneous Coronary Intervention and Coronary Artery Bypass Graft: A Systematic Review and Meta-Analysis

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education, United States; Muhammad Bilal, Dow University of Health Sciences, Pakistan; Hamza Hafeez, Wright Center for Graduate Medical Education, Scranton, PA., United States; Raza Mian, Wright Center for Graduate Medical Education, Scranton, PA., United States; Muhammad Siddique Pir, The wright center for graduate medical education, United States; Mirza Mujadil Ahmad, Aurora Health Care, United States; Sharath Rajagopalan, The wright center for graduate medical education, United States; Pranjal Boruah, Wright Center for Graduate Medical Education, Scranton, PA., United States

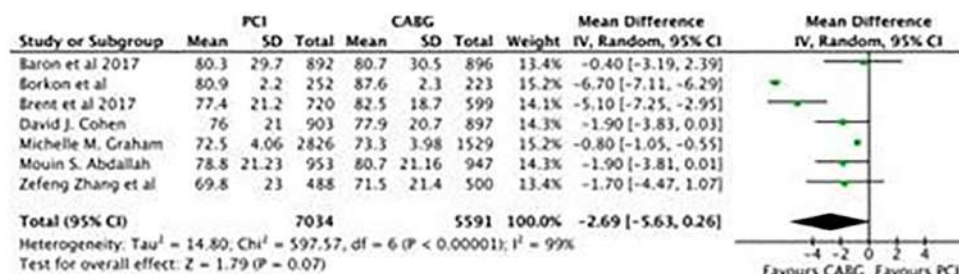
Background: Quality of life (QoL) is an important tool for decision-making and operational planning with regards to patient outcomes. Our group has previously reported a cumulative QoL benefit of CABG over PCI at 1 year. However with the advent of newer generation stents, an updated analysis was performed.

Methods: A meta-analysis was conducted to compare the QoL at 1-year between patients undergoing PCI and CABG using the Seattle Angina Questionnaire (SAQ). An extensive search on PubMed, Cochrane, EMBASE, and MedLine was done. Initial search with PCI and CABG yielded 3,149 studies; adding "quality" narrowed to 298. Seven studies with a total of 12,634 patients (7,034 PCI and 5,591 CABG) were identified. A study-level analysis was done using Review Manager 5.3. A Mantel-Haenszel Random-effects model was used to calculate the pooled mean for homogeneous endpoints. The results are reported as mean with 95% confidence intervals (CIs) and p -value <0.05 was considered significant.

Results: QoL at 1-year using the SAQ was not statistically different for CABG when compared with PCI with average intervention effect [$\text{OR} = -2.69$; 95% $\text{CI} = -5.36$ -0.26] and p -value 0.07 as shown in the forest plot (Figure) with improved trend likely secondary to newer generation stents.

Conclusions: QoL evaluation at 1-year has no significant difference between PCI and CABG contrary to the results published by our group in previous meta-analysis. This is likely contributed by the newer data showing better outcomes with the use of newer generation stents.

Disclosures: A. Haseeb *Nothing to disclose*. N. Saqib *Nothing to disclose*. M. Bilal *Nothing to disclose*. H. Hafeez *Nothing to disclose*. R. Mian *Nothing to disclose*. M. S. Pir *Nothing to disclose*. M. M. Ahmad



Forest plot representing Quality of Life at 1-year between Percutaneous coronary intervention and Coronary artery bypass grafting

Nothing to disclose. S. Rajagopalan Nothing to disclose. P. Boruah Nothing to disclose.

II-71 | Two year mortality in older adults with poor cognition undergoing percutaneous coronary interventions

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Background: Cognitive dysfunction is common in older adults with cardiovascular disease (CVD). Prognostic role of poor cognition is not well studied. We, herein, report two year all-cause mortality among patients receiving percutaneous coronary intervention (PCI) from 2016-2018 at Mayo Clinic, Rochester whose cognition we prospectively assessed and stratified using Mini-Mental State Examination (MMSE).

Methods: We determined cognition by administering MMSE survey in 477 patients ≥ 55 years who underwent PCI procedure. Cognition was stratified into 4 groups: score: 30 (n=149; control group); 28-29 (n=169); 25-27 (n=103) and <25 (56). We also determined frailty (Rockwood criteria), depression (PHQ-2), single-item question for self-reported health.

Results: Patients with low score (MMSE <25) were older (78.2 ± 9.3 vs 71.5 ± 9.3), had poor health status (33% vs. 25%), had higher frailty index of $+0.30$ (39% vs. 15%), and had higher PHQ-2 (22% vs. 4%, all

comparisons significant except poor health status. Patients with MMSE <25 had higher mortality on follow-up [HR 11.9 (3.4, 41.9 $p < 0.001$, Figure) which remained significant following adjustment for age and gender.

Conclusions: Poor MMSE scores for cognition predict long-term mortality among older adults receiving PCI. These data underscore the importance of cognitive function and its routine assessment in patients with CVD.

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II-72 | Differential Radiation Exposure to Interventional Cardiologists in the Contemporary Era

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Background: Exposure to low-dose ionizing radiation is associated with malignancies. Lead garment specifications in the cardiac catheterization laboratory are not currently regulated, potentially resulting in unprotected areas.

Methods: Interventional cardiology attendings and fellows wore 7 dosimeters, one externally on the thyroid shield and six inside the lead apron: bilateral axilla, chest wall, and pelvis. Radiation protection included a lower table-mounted lead drape, upper ceiling-mounted lead shield, and use of 7.5 frames per second during fluoroscopy. All procedures were performed with operators standing to the right of the patient. The primary endpoint was operator radiation exposure to the left versus right axilla. Radiation exposures in millirem (mrem) per participant over the study period are shown as median [interquartile range] and compared between left- and right-sided measures using paired Wilcoxon tests.

Results: Nine participants (66% female) wore dosimeters during 231 cases. Transradial coronary angiography was selected in 81.1% of cases and PCI was performed in 32.1%. A sterile radiation drape placed on the patient abdomen was used in 18.6% of cases. Median dose area product and fluoroscopy time for the participants ranged from 29.0-60.5 Gy $\cdot$ cm ^{2} and 6.2-13.5 minutes, respectively. Radiation

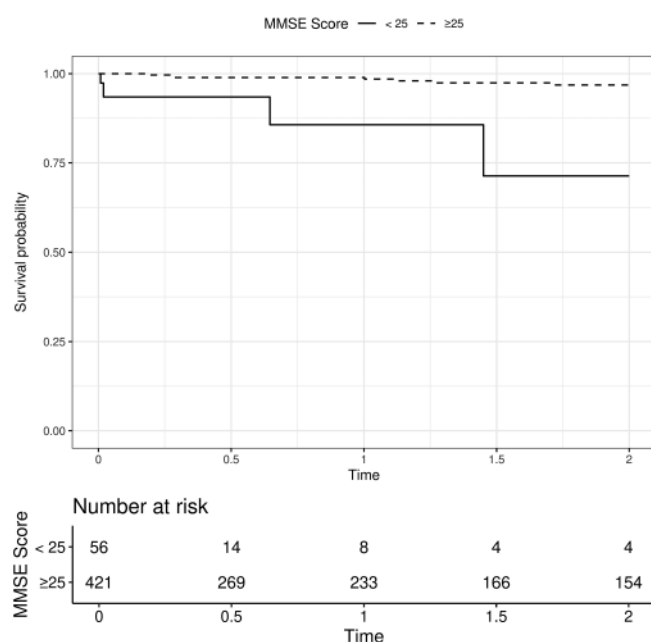
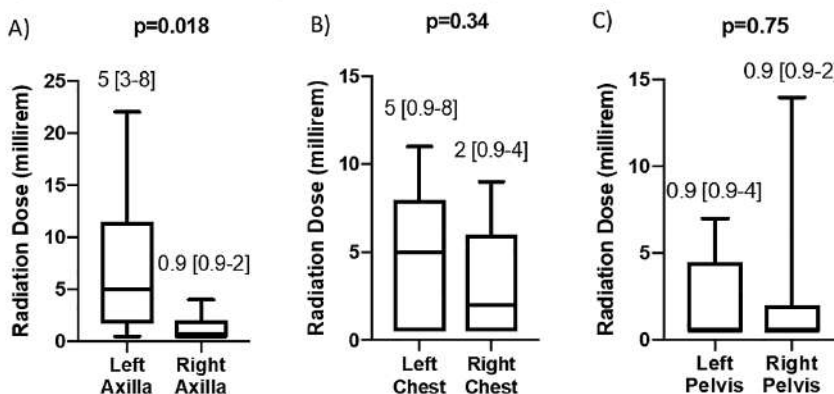


Figure. Left versus right radiation exposure by dosimeter location

A) Box-plot comparing left and right axilla radiation exposure, $p=0.018$. B) Box-plot comparing left and right chest wall radiation exposure, $p=0.34$. C) Box-plot comparing left and right pelvis radiation exposure, $p=0.75$.

exposure at the left axilla was higher than the right axilla (5 vs. 0.9 mrem, $p=0.018$) but did not differ between left or right chest wall and left or right pelvis (Figure).

Conclusions: This analysis demonstrates insufficient protection in the left axillary area. The use of additional left axillary protection should be evaluated.

Disclosures: S. Iqbal: Radux Devices: Advisory Board/Board Member; C. Serrano: AstraZeneca: Consulting; F. Feit: Boston Scientific Corp.: Ownership Interests: Stocks, Stock Options; Medtronic: Ownership Interests: Stocks, Stock Options; Abbott (St. Jude): Consulting; M. Attubato: Boston Scientific Corp.: Consulting; Medtronic: Consulting; Cook Medical Inc.: Consulting; B. Shah: Philips (Volcano): Advisory Board/Board Member; Radux Devices: Advisory Board/Board Member; Terumo Medical: Consulting; L. M. Koshy Nothing to disclose. Y. Xia Nothing to disclose. N. R. Smilowitz Nothing to disclose. S. Bangalore Nothing to disclose. C. A. Thompson Nothing to disclose. L. Razzouk Nothing to disclose.

II-73 | A Blinded Multicenter Trial of Coronary Angiogram Quality with Automated Compared to Hand Contrast Injection

Nobuhito Nozaki, Shinseikai General Hospital Takanohara Central Hospital, Japan; Kazuaki Kataoka, Shinseikai General Hospital Takanohara Central Hospital, Japan; Yasuda Tetsu, Shinseikai General Hospital Takanohara Central Hospital, Japan

Background: Coronary angiography performed using an automated contrast injection system reduces total contrast load, but its effectiveness in providing angiographic quality similar to hand injection has not been rigorously studied. We compared the quality of coronary angiograms obtained by 3 automated injections systems to hand injection.

Methods: 120 clinically obtained angiograms from 4 institutions were randomly selected for study. 30 were performed using hand injection, 30 using ACIST CVi, 30 using SHEEN-MAN Zone Master, and 30 using MEDRAD Avanta. 38 experienced angiographic assessors (25 cardiologists and 8 RT's, and 5 clinical engineers) from 31 different institutions, blinded to the method of injection, graded 2 randomly selected angiogram sets (4 views) from each group on a 1 to 10 scale. Angiograms were analyzed using 4 criteria: contrast density, ability to evaluate lesion severity and side branches, and distal filling.

Results: The average angiographic quality score for each method is shown in Table 1. ACIST CVi system had the highest overall score and had significantly better image quality than MEDRAD Avanta injection. SHEEN-MAN was also had significantly higher image scoring than MEDRAD. Hand injection angiographic quality was non-inferior to the automated injection systems. When the lowest score of the 4 angiograms from each group graded by each observer was deleted, the results did not significantly change.

Conclusions: Automated contrast injection provided image quality that was similar to that obtained by hand injection. The ACIST CVi and SHEEN-MAN systems provided significantly better image quality than the MEDRAD Avanta system.

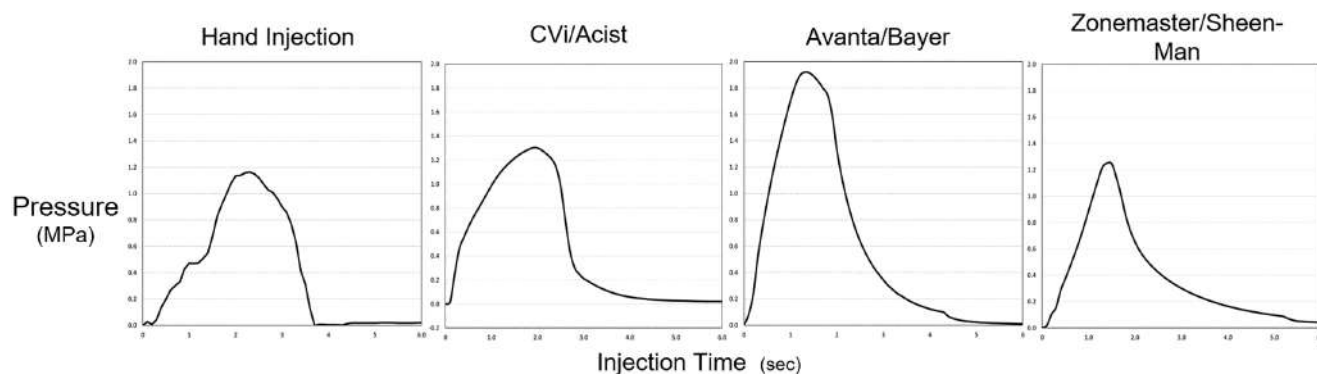
Disclosures: N. Nozaki Nothing to disclose. K. Kataoka Nothing to disclose. Y. Tetsu Nothing to disclose.

II-74 | Comparison of Contrast Injection Pressure Contours With Different Injection Methods for Coronary Angiography

Nobuhito Nozaki, Shinseikai General Hospital Takanohara Central Hospital, Japan; Kazuaki Kataoka, Shinseikai General Hospital Takanohara Central Hospital, Japan; Yasuda Tetsu, Shinseikai General Hospital Takanohara Central Hospital, Japan

Method	Hand Injection	ACIST CVi	SHEEN-MAN Zone Master	MEDRAD Avanta
Score (mean±SD)	5.4±2.4	6.7±1.3*	6.4±1.3*	5.6±1.7

* $p<.001$ vs MEDRAD Avanta [†] $p=.02$ vs MEDRAD Avanta



	Hand Injection	CVi/Acist	Avanta/Bayer	Zonemaster/Sheen-Man
Peak pressure (Mpa)	1.2	1.3	1.9	1.2
Injection Time (sec)	3.1	3.5	4.2	4.9
Rise time to peak (sec)	2.3	1.9	1.3	1.4
Offset time (sec)	3.5	1.6	2.5	3.5

Background: Although automated contrast injection (ACI) for coronary angiography (CA) may reduce contrast dose, concern about the pressure of injection has limited their use in some labs. We compared the injection pressure characteristics of ACI systems to hand-injection.

Methods: A digital pressure monitor was attached to a 3-way stop-cock at the hub of a 4F angiographic catheter. ACI using CVi/ ACIST, Avanta/Bayer, and Zonemaster/Sheen-Man was compared to hand injection during CA by a cardiologist. ACI settings were standardized at flow rate 3ml/sec, volume 6ml, and rise 0.5 second.

Results: The pressure time curves for contrast injection using each method are shown in the Figure and Table. Peak injection pressure was similar between hand, CVi, and Zonemaster methods. Avanta had higher peak pressure. The contour of the injection curve was similar between hand and CVi injection.

Conclusions: There are differences in pressure and injection contour between different methods of contrast injection. CVi/Acist most approximated hand injection.

Disclosures: N. Nozaki *Nothing to disclose*. K. Kataoka *Nothing to disclose*. Y. Tetsu *Nothing to disclose*.

II-75 | Predictors of poor in-hospital outcomes in patients admitted for elective left heart catheterization

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Background: Left heart catheterization (LHC) is a relatively safe procedure and is performed during an elective admission in many non-acute coronary diseases either for diagnostic or therapeutic purpose. We sought to describe the incidence, trend and predictors of poor in

hospital outcomes in patients admitted for elective left heart catheterization using the National Inpatient Sample (NIS) database.

Methods: We utilized the NIS database from 2010 till 2014. We further selected patients who had elective admission and had LHC as the primary procedure performed. Primary outcomes of interest were in hospital death, acute kidney injury(AKI), and acute ischemic stroke. Adjusted odds ratio was calculated to identify the predictors of the primary outcomes.

Results: There was a total of 4,778,663 LHC performed during the study period. 14.5% was performed during an elective admission. Percutaneous coronary intervention was performed in 44.5%, with decreasing trend from 48.6% in 2010 to 37.6% in 2014. The incidence of AKI was 5.7% in 2010 with a progressive increase to 10.7% in 2014. Stroke rates and in hospital mortality rate increased from 1.2% in 2010 to 1.7% in 2014 and 0.9% in 2010 to 1.5% in 2014 respectively. Congestive heart failure(CHF) (OR 2.05; 95% CI: 1.85-2.14), diabetes mellitus(OR 1.81; 95% CI: 1.71-1.92) and obesity (OR 1.40; 95% CI: 1.34-1.45) were associated with higher odds of developing AKI. Female sex was associated with lower odds of developing AKI (OR 0.81; 95% CI: 0.78-0.83). Female sex (OR 1.29; 95% CI: 1.23-1.35), CHF(OR 1.76; 95% CI: 1.58-1.96), peripheral vascular disease (OR 1.42; 95% CI: 1.34-1.50), prior coronary artery bypass graft(OR 1.22; 95% CI: 1.12-1.32) were associated with a higher odds of acute ischemic stroke. Higher in hospital death was seen in patients with liver disease (OR 1.89; 95% CI: 1.61-2.23), pulmonary hypertension(OR 2.06; 95% CI: 1.73-2.45), AKI (OR 4.10; 95% CI: 3.85-4.36), acute stroke (OR 4.99; 95% CI: 4.50-5.54), coronary artery dissection (OR 2.31; 95% CI: 1.93-2.76) and female sex (OR 1.27; 95% CI: 1.20-1.33).

Conclusions: The incidence of adverse outcomes following elective cardiac catheterization is on a rise. More studies are needed to fully explain the upward trend observed in the current study.

Disclosures: O. Olagoke *Nothing to disclose*. K. M. Queral *Nothing to disclose*.

II-76 | Impact of Obesity on the Outcomes After Percutaneous Coronary Intervention

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Background: The obesity paradox, which suggests that obesity provides protective effects on patient survival after percutaneous coronary intervention (PCI), is controversial in the current literature.

Methods: We identified 961,615 weighted PCI hospitalization in the National Inpatient Sample Database from 2016-2017. We classified patients into 3 groups according to their BMI: Non-obese (BMI <30), Obese (BMI 30-40), Morbidly obese (BMI >40). Multiple logistic regression was performed to determine the association between BMI group and adverse in-hospital outcomes and mortality.

Results: The overall in-patient mortality rate was 2.8%. Compared to non-obese patients, in-hospital mortality was significantly lower in patients with obesity (odds ratio [OR]: 0.65 [95% confidence interval (CI): 0.62 to 0.69] and morbid obesity (OR: 0.86 [95% CI: 0.81 to 0.92] (Figure). There were also significantly lower odds of acute stroke among the obese and morbidly obese (OR 0.75, OR 0.66), but there was no significant difference in acute kidney injury or bleeding requiring blood transfusion among the three groups.

Conclusions: In this national cohort of patients undergoing PCI, subjects identified as obese and morbidly obese had lower in-hospital mortality rates compared to Non-obese subjects.

Disclosures: S. Garcia: *Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting*; E. S. Brilakis: *Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker*

Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; M. A. Omer Nothing to disclose. I. Y. Elgendy Nothing to disclose. M. S. Megaly Nothing to disclose.

II-77 | Building a Same Day Discharge Program for Elective PCIs: A Two Year Single Center Experience

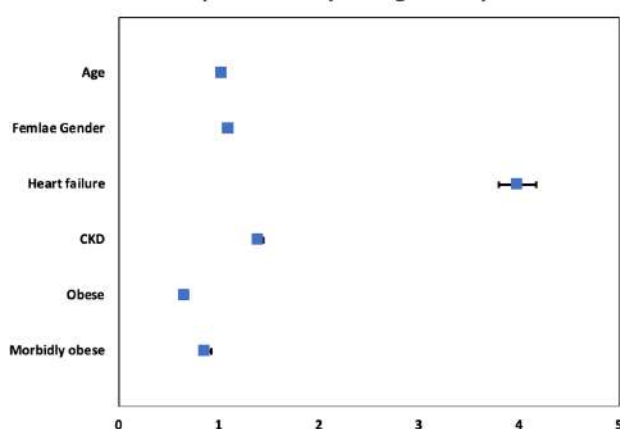
Sridevi R. Pitta, Cox Health Systems, United States; Bo Kim, Cox Health Systems, United States

Background: Same day discharge (SSD) after elective percutaneous coronary intervention (PCI) is associated with lower costs and improved patient satisfaction. Our goal was to Improve SDD rates adapting SCAI SDD protocols.

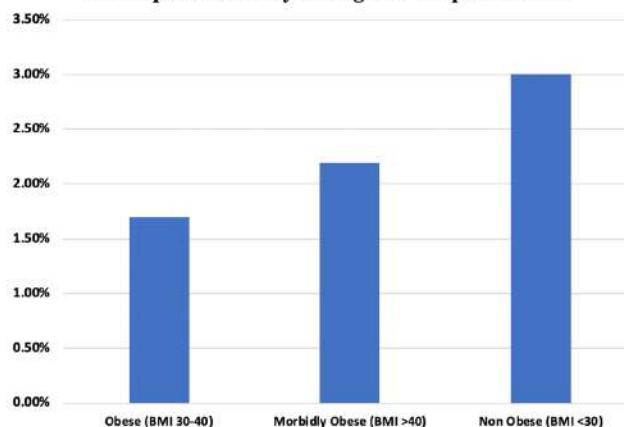
Methods: CoxHealth is a level I STEMI center with 596 beds and a busy cardiology practice, performing over 1,000 PCIs annually. Approximately 30% of our PCI volume are elective cases. In the best interest of the organization and patient care, CoxHealth began to explore variations and improvement opportunities in SDD protocols and practice in January 2018. Metrics examined include SDD rates, deaths, readmissions and unexpected visits to the cardiac cath lab (CCL). Cardiologists, Cath Lab Staff, Administration, Process Improvement (PI) team frequently brainstormed ideas for process improvement, identify inefficiencies and prioritize changes Utilized lean methodology to Eliminate waste, improve efficiency and patient satisfaction.

Results: From January 2018 to October 2019, CoxHealth improved SDD for elective PCIs from 14% to 52% per month (Graph). There were no mortalities, bleeding events or unexpected subsequent cath lab visits in this population. In addition, CoxHealth reduced non-medical criteria overnight stays from 20% in October 2018 to 4% in

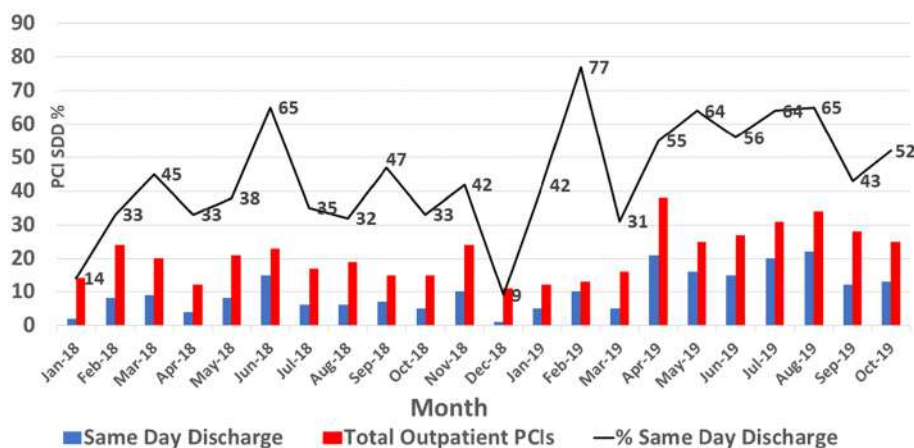
In-Hospital Mortality among PCI Hospitalizations



In-Hospital Mortality among PCI Hospitalizations



CoxHealth Elective PCI Same Day Discharge



October 2019. There is an annual projected savings of over \$142,000, in addition to improved patient satisfaction.

Conclusions: Our experience shows a safe and successful improvement in same day discharge in our elective PCI population. Concepts and skills learned by the project team in applying LEAN methodology will be used in other improvement initiatives in Cath Lab.

Disclosures: S. R. Pitta *Nothing to disclose*. B. Kim *Nothing to disclose*.

II-78 | Utilization of Distal Radial Artery Access for STEMI Interventions: Single Center Experience on Safety and Feasibility

Sridevi R. Pitta, Cox Health Systems, United States; Bo Kim, Cox Health Systems, United States; Leah Cook, Cox Health Systems, United States

Background: Distal radial access (DRA) is a novel technique that has pushed the limits in patient safety and comfort, like transradial artery (TRA) access when it was first introduced. Aim of our was to evaluate the safety and feasibility of DRA for coronary procedures in STEMI patients.

Methods: Cox Health South, a level I STEMI center in Springfield, MO has a high-volume cardiovascular practice with 6 Catheterization labs. Default TRA has been long utilized in the STEMI population at Cox Health. Practice patterns has transitioned from TRA to DRA to further reduce complications and improve patient and operator comfort. Single operator performing TRA transitioned to DRA in the STEMI population with administrative, physician and Cath lab support. D2B (Door to balloon time), processes and patient outcomes were tracked using ACC NCDR data, providing feedback for continuous process improvement.

Results: STEMI DRA coronary interventions was initiated in May 2019. D2B times were compared with transradial and transfemoral access using NCDR 2018 and 2019 data. No adverse outcomes were identified in the DRA population. Data showed that DRA has comparable D2B as transradial access and slightly improved on traditional femoral access (**Table**), without compromising patient outcomes and no increased in-hospital complications of bleeding, pseudoaneurysms or arteriovenous fistula occurred.

Conclusions: Our study demonstrates the safe adaptation of distal radial access in STEMI patients without compromising D2B times and outcomes.

Disclosures: S. R. Pitta *Nothing to disclose*. B. Kim *Nothing to disclose*. L. Cook *Nothing to disclose*.

Table: Details of STEMI Case Volume and Door to balloon times for DRA compared to TRA and transfemoral Access

Patient Volume (cases)	2018	2019	Total
Femoral STEMI (multiple operators)	95	71	166
Radial STEMI (single operator)	25	15	40
Distal Radial STEMI (single operator)	0	19	19
D2B Times (minutes)	2018	2019	Average
Femoral STEMI D2B	52.71	58.5	55.61
Radial STEMI D2B	53.16	51.3	52.23
Distal Radial STEMI D2B	n/a	55.05	55.05

II-79 | Trends in the Utilization of Coronary Revascularization in the United States Medicare Population

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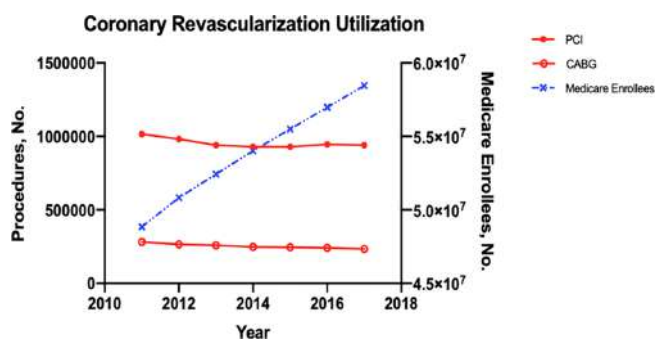
Background: We sought to determine utilization and payment trends of coronary revascularization procedures in the Medicare population.

Methods: This is a population-based, cross sectional study of US Medicare beneficiaries from 2011-2017. The Centers for Medicare and Medicaid Services' database was queried for revascularization procedures using the percutaneous cardiac intervention (PCI) and coronary artery bypass grafting (CABG) current procedural terminology codes. Trends in Medicare enrollees, PCIs, CABGs, and physician reimbursements were analyzed.

Results: The national PCI and CABG utilization per enrollee has decreased by 22.6% (R^2 value = 0.948; $p = 0.001$) and 30.4% (0.959; < 0.001), respectively. For PCI, annual Medicare payout per enrollee and physician compensation per procedure has decreased by 31.1% from \$4.89 to \$3.37 (0.914, 0.001) and 11.0% from \$235.43 to \$209.49 (0.837; 0.004), respectively, and for CABG, decreased 32.2% from \$3.51 to \$2.38 (0.911; 0.001) and 2.5% from \$608.36 to \$592.33 (0.933; < 0.001), respectively.

Conclusions: Even though the US population has aged, as seen through the expanding Medicare population, the number of revascularization procedures has drastically decreased along with physician reimbursement. Among the factors that could account for this trend are effective primary intervention strategies and adherence to clinical guidelines and evidence-based practices. Further understanding of these trends will allow health systems to tailor resources to the aging population.

Disclosures: A. M. Shah *Nothing to disclose*. E. Siddiqui *Nothing to disclose*. A. K. Okoh *Nothing to disclose*. S. Singh *Nothing to disclose*. A. Salemi *Nothing to disclose*. S. Waxman *Nothing to disclose*.



II-80 | Percutaneous Coronary Intervention Outcomes Based on Decision Making Capacity

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Background: Long term outcomes in patients undergoing percutaneous coronary intervention (PCI) based upon decision-making ability has not been studied. We aimed to find long term outcomes after PCI in patients who provided individual versus surrogate consent.

Methods: We retrospectively collected data on patients who underwent PCI as inpatient at Cleveland Clinic between Jan 1, 2015 to Dec 31, 2016. It was a case-control study with data collected for patients with surrogate consent (cases) versus patients with individual consent (controls) at the time of PCI. Cases and controls were matched using propensity analysis. Log Rank test was used for statistical analysis. Outcomes studied were all-cause mortality, major adverse cardiac events MACE (all-cause mortality, acute coronary syndrome, CVA/Stroke), and length of hospital stay (LOS).

Results: Out of 3136 patients who underwent PCI during studied time interval, 183 patients had surrogate consent. Propensity matching yielded 149 patients from each group. All-cause mortality up to 2 year was significantly higher in patients with surrogate consent as compared to patients with individual consent {37 (24.8%) vs 16 (10.7%) deaths, log rank p value < 0.002 }. Mean survival was significantly lower for patients with surrogate consent (137 vs 333 days, log rank p value 0.011). MACE at 1 year was significantly higher in patients with surrogate consent (40 vs 21 events, log rank p value 0.005). LOS for surrogate consenters was also significantly higher {6 days (range 4 to 17) vs 3 days (range 2 to 6) with log rank p value < 0.01 }.

Conclusions: Patients with poor decision-making ability (i.e. with surrogate consent) had significantly worse survival and higher MACE when compared to patients with intact decision-making ability. LOS was also significantly higher in patients with surrogate consents. This study emphasizes on the fact that patients with inability to give consent are at high risk and may need more aggressive post-procedural care.

Disclosures: J. Khatri: Abbott (St. Jude): Proctor and Speaker Bureau; S. R. Kapadia: Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options; J. Singh *Nothing to disclose*. N. Kassis *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. C. Sheth *Nothing to disclose*. A. Bansal *Nothing to disclose*. B. Verma

Nothing to disclose. S. Saxena Nothing to disclose. A. Krishnaswamy Nothing to disclose. S. G. Ellis Nothing to disclose. V. Menon Nothing to disclose.

II-81 | Comparative safety of biodegradable-polymer everolimus-eluting, durable-polymer everolimus-eluting, and durable-polymer zotarolimus-eluting stents in contemporary clinical practice

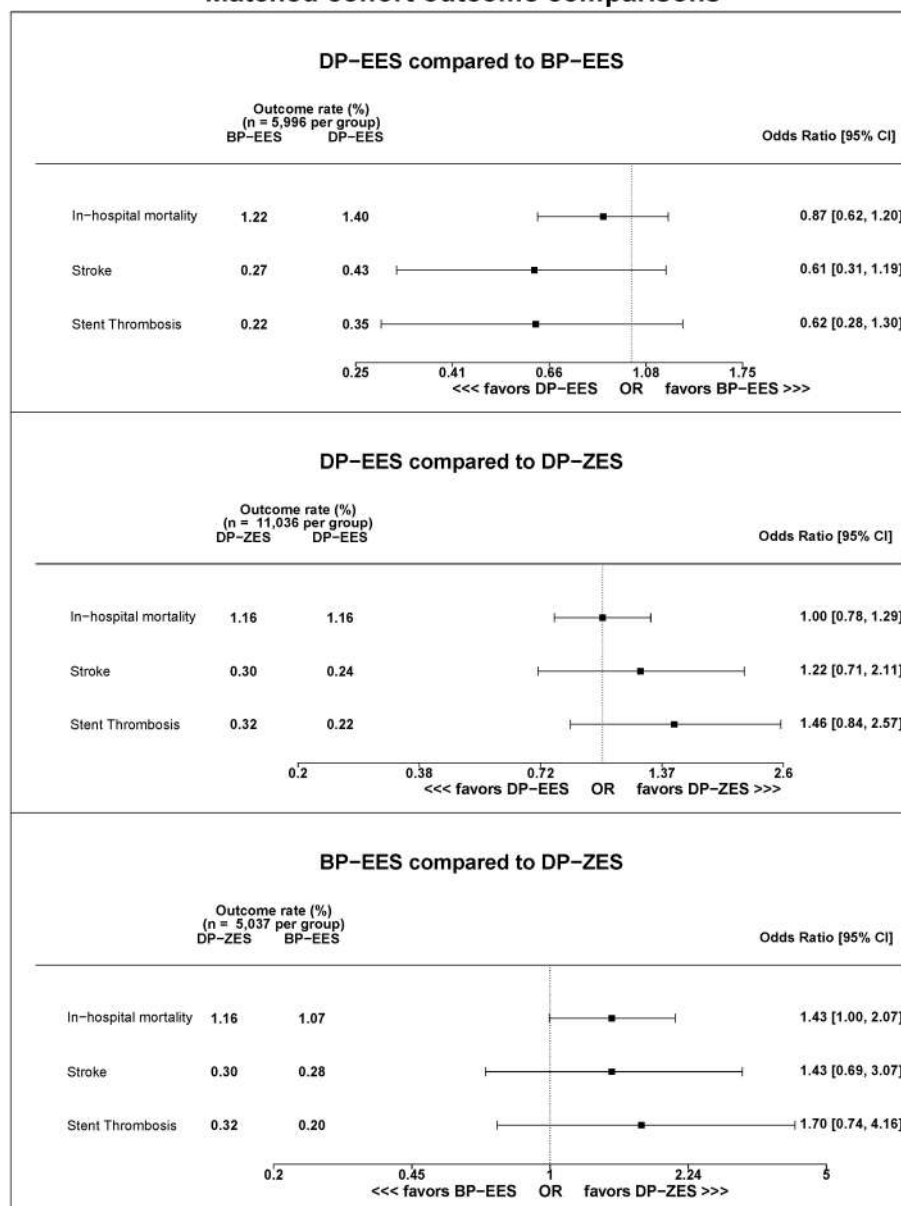
Nadia R. Sutton, University Of Michigan Medical Center, United States; Milan Seth, University Of Michigan Medical Center, United States; Devraj Sukul, University of Michigan Health System, United States; Simon R. Dixon, Beaumont Hospital, United States; Ryan D. Madder, Spectrum Health, United States; Louis A. Cannon,

Cardiac & Vascular Research Center of Northern Michigan, United States; Hitinder S. Gurm, University Of Michigan Medical Center, United States

Background: Uncertainty exists over whether stents (biodegradable-polymer everolimus-eluting (BP-EES) (Synergy, Boston Scientific), durable-polymer everolimus-eluting (DP-EES) (XIENCE, Abbott Vascular), or durable-polymer zotarolimus-eluting (DP-ZES) (Resolute, Medtronic)) commonly used for percutaneous coronary intervention (PCI) have comparable safety.

Methods: All PCI cases from 48 hospitals performed after the introduction of the BP-EES stent in 2015 until the first quarter of 2018 were included. Propensity-matched multivariate analysis was used to adjust for differences in baseline characteristics and procedural variables. After matching, we performed pairwise comparisons between

Matched cohort outcome comparisons



DP-EES and BP-EES, DP-EES and DP-ZES, and BP-EES and DP-ZES for in-hospital post-PCI outcomes. After matching, we determined 2-year post-discharge mortality using Medicare post-discharge data.

Results: During the study period, 53,724 PCI cases were performed. Although baseline characteristics of patients differed between stent types, after matching, there was no difference in in-hospital mortality, stent thrombosis, or post-procedural stroke (Figure). After matching, there was no difference in 2-year post-discharge mortality (DP-EES vs. BP-EES HR 1.10, $p = 0.50$; DP-EES vs. DP-ZES HR 1.03, $p = 0.77$; BP-EES vs. DP-ZES HR 1.20, $p = 0.29$).

Conclusions: Our data suggest a similar risk-adjusted in-hospital outcomes amongst coronary stents commonly used in clinical practice. The absence of a difference in 2-year mortality between BP-EES, DP-EES, and DP-ZES suggests that stent choice decisions could be made based on durability, availability, and cost.

Disclosures: L. A. Cannon: Medtronic: Advisory Board/Board Member; Boston Scientific Corp.: Advisory Board/Board Member; Abbott (St. Jude): Advisory Board/Board Member; N. R. Sutton Nothing to disclose. M. Seth Nothing to disclose. D. Sukul Nothing to disclose. S. R. Dixon Nothing to disclose. R. D. Madder Nothing to disclose. H. S. Gurm Nothing to disclose.

II-82 | Association of Change in Individual Vessel Coronary Artery Calcium Score with Incidence of Myocardial Infarction or Clinically Indicated Revascularization

Andrew Thorp, University of South Dakota Sanford School of Medicine, United States; Chirag K Desai, Sanford USD Medical Center, United States; Tomasz Kozlowski, Sanford Cardiovascular Institute, United States; Adam T. Stys, Sanford Cardiovascular Institute, United States; Tomasz Stys, Sanford Health, United States

Background: The use coronary artery calcium (CAC) scoring has demonstrated prognostic utility in risk stratifying an individual's risk for cardiovascular events. The objective of the present study was to determine if per-vessel change in calcium score with serial measurement predicts myocardial infarction or clinically indicated revascularization.

Methods: Baseline demographics, clinical data, and per-vessel calcium scores were recorded for patients who underwent calcium scanning

twice, during a period of on average 8.5 years. Data on the occurrence of myocardial infarction or revascularization by percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) for any clinical indication was obtained by chart review. Variables were analyzed by individual vessel, including left main coronary artery (LMCA), left anterior descending (LAD), left circumflex (LCX), and right coronary (RCA). Testing for an association between per vessel delta CAC and the occurrence of MI, PCI, or CABG was determined by logistic regression.

Results: 972 patients were identified with 47 (2.38%) having had an MI, PCI, or CABG. Individual vessel change in coronary artery calcium score was found to be statistically significant for each vessel in association with MI, PCI, or CABG, except for the LMCA.

Conclusions: Individual vessel CAC increases over time appears to be associated with an increased likelihood for myocardial infarction, percutaneous intervention, or coronary artery bypass grafting in each coronary artery, except for the LMCA.

Disclosures: A. Thorp Nothing to disclose. C. K. Desai Nothing to disclose. T. Kozlowski Nothing to disclose. A. T. Stys Nothing to disclose. T. Stys Nothing to disclose.

II-83 | Impact of Hypertension Against Traditional Cardiovascular Risk Factors on the Calcium Score Distribution of Individual Coronary Arteries

Andrew Thorp, University of South Dakota Sanford School of Medicine, United States; Chirag K Desai, Sanford USD Medical Center, United States; Phillip Petrasko, Sanford USD Medical Center, United States; Andrew Kremer, University of South Dakota Sanford School of Medicine, United States; Bhavik Patel, University of South Dakota Sanford School of Medicine, United States; Adam T. Stys, Sanford Cardiovascular Institute, United States; Tomasz Stys, Sanford Health, United States

Background: The ACC and AHA recommend coronary artery calcium (CAC) scores as screening tools for patients with borderline to intermediate risk of cardiovascular disease. In this study we investigated the rate of change in whole heart and individual vessel CAC scores as impacted by hypertension.

Methods: Whole heart and individual vessel CAC scores were obtained from patients enrolled in the Sanford Cardiovascular

Table 1: Change in individual coronary artery calcium score from first to second screen in associated with myocardial infarction or revascularization

Coronary Artery	MI, PCI, or CABG		P-Value
	No (1925)	Yes (47)	
Totals			
Left Main Coronary Artery (LMCA)	1.28 ± 24.48	1.70 ± 71.52	0.9145
Left Anterior Descending Coronary Artery (LAD)	41.86 ± 112.31	236.00 ± 210.08	<0.0001
Left Circumflex (LCX)	15.54 ± 68.58	160.19 ± 365.84	<0.0001
Right Coronary Artery (RCA)	20.91 ± 102.78	190.09 ± 267.30	<0.0001
Overall Change in all Vessels	79.61 ± 215.36	578.62 ± 681.44	<0.0001

Table 1: Impact of Hypertension on Individual Vessel and Whole Heart Calcium scores

Coronary Artery	Estimated Change in CAC	P-Value
Left Main Coronary Artery (LMCA)	3.3155	0.0068
Left Anterior Descending (LAD)	55.977	< 0.0001
Left Circumflex (LCX)	21.7331	< 0.0001
Right Coronary Artery (RCA)	21.1694	0.0014
Whole Heart Calcium Score	104.47	< 0.0001

Prevention Program from 02/2008 to 02/2019. The vessels included were the left main coronary artery (LMCA), left anterior descending artery (LAD), left circumflex artery (LCX), and right coronary artery (RCA). A linear mixed effects model was utilized to analyze independent risk factors (gender, age, ethnicity, diabetes, hypertension, dyslipidemia, and smoking status) in a co-variate analysis.

Results: 33,088 patients were identified in the database, including re-screens. 1972 unique patients had an initial CAC screen with repeat testing performed on average 8.41 years later. The rates of change of per vessel and whole heart calcium score are seen in table 1.

Conclusions: Patients with hypertension were found to have statistically significant higher rate of change of their individual vessel and whole heart CAC scores in a co-variate analysis when controlling for other traditional cardiovascular risk factors. The greatest impact was seen in the LAD.

Disclosures: A. Thorp *Nothing to disclose*. C. K. Desai *Nothing to disclose*. P. Petrasko *Nothing to disclose*. A. Kremer *Nothing to disclose*. B. Patel *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

II-84 | Impact of Diabetes Mellitus Against Traditional Cardiovascular Risk Factors on the Calcium Score Distribution of Individual Coronary Arteries

Andrew Thorp, University of South Dakota Sanford School of Medicine, United States; Chirag K Desai, Sanford USD Medical Center, United States; Phillip Petrasko, Sanford USD Medical Center, United States; Andrew Kremer, University of South Dakota Sanford School of Medicine, United States; Adam T. Stys, Sanford Cardiovascular Institute, United States; Tomasz Stys, Sanford Health, United States

Background: The ACC and the AHA recommend the use of coronary artery calcium (CAC) scores as a screening tool in patients with borderline to intermediate risk of cardiovascular disease. This study investigates the rate of change in individual vessel and whole heart calcium scores as impacted by diabetes mellitus.

Methods: Whole heart and individual vessel CAC scores were obtained from patients enrolled in the Sanford Cardiovascular Prevention Program from 02/2008 to 02/2019. The vessels included were the left main coronary artery (LMCA), left anterior descending artery (LAD), left circumflex artery (LCX), and right coronary artery (RCA). A linear mixed effects model was utilized to analyze independent risk factors (gender, age, ethnicity, diabetes, hypertension, dyslipidemia, and smoking status) in a co-variate analysis.

Results: 33,088 patients were identified in the database, including re-screens. 1972 unique patients had an initial CAC screen with repeat testing performed on average 8.41 years later. The rates of change of per vessel and whole heart calcium score are seen in table 1.

Conclusions: Patients with diabetes mellitus were found to have statistically significant higher rate of change of their individual vessel and whole heart CAC scores in a co-variate analysis when controlling for other traditional cardiovascular risk factors. The greatest impact was seen in the LAD.

Disclosures: A. Thorp *Nothing to disclose*. C. K. Desai *Nothing to disclose*. P. Petrasko *Nothing to disclose*. A. Kremer *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

II-85 | Real-World Impact of A Quality Improvement Program for AKI Prevention in the Cardiac Cath Lab

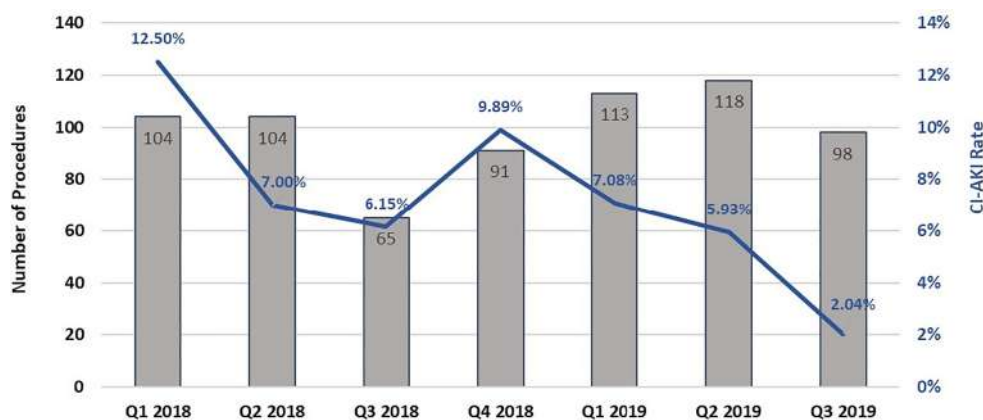
Craig Turner, St. David's South Austin Medical Center, United States; Paul A Tucker, St. David's South Austin Medical Center, United States

Background: Improving outcomes for at-risk patients undergoing angiography is a healthcare priority at our facility. Targeted procedural strategies aimed at prevention of contrast-induced acute kidney injury (CI-AKI) have been the aim of an ongoing quality improvement program. This is an analysis of our program outcomes.

Methods: Our quality improvement protocol included guideline-driven strategies: risk screening and hydration in April of 2018, contrast volume max target of 3x estimated glomerular filtration rate (eGFR) in July,

Table 1: Impact of Diabetes Mellitus on Individual Vessel and Whole Heart Calcium scores

Coronary Artery	Estimated Change in CAC	P-Value
Left Main Coronary Artery (LMCA)	8.4574	< 0.0001
Left Anterior Descending (LAD)	97.0605	< 0.0001
Left Circumflex (LCX)	45.6022	< 0.0001
Right Coronary Artery (RCA)	58.893	< 0.0001
Whole Heart Calcium Score	213.67	< 0.0001



2018 and DyeVert System use in patients with an eGFR <60 or Cr >1.5 or STEMI in October, 2018. CI-AKI was defined as an increase in serum creatinine (SCr) of ≥ 0.3 mg/dL or $\geq 50\%$ within ≤ 48 hours and was tracked via American College of Cardiology's National Cardiovascular Data Registry CathPCI Registry[®] as the risk-adjusted CI-AKI metric. Patients without SCr and on dialysis were excluded.

Results: From Q1 2018 to Q3 2019, there was an absolute reduction in CI-AKI of 10.46% (83.7% relative reduction). This translates to a number-needed-to treat to avoid one event of 10 and a cost savings estimate of \$696 per procedure (assuming program cost of \$350 per procedure and incremental cost of CI-AKI of \$10k).

Conclusions: Preliminary results of this ongoing quality improvement program highlight the clinical and economic effectiveness of a real-world initiative for improving outcomes for at-risk patients undergoing angiography.

Key Words: Contrast-Induced Acute Kidney Injury, Contrast Minimization, DyeVert

Category: Quality Improvement

Disclosures: P. A. Tucker: *Osprey Medical: Ownership Interests: Stocks, Stock Options*; C. Turner *Nothing to disclose*.

II-86 | Prognostic impact of 2018 ESC/EACTS guideline-endorsed high ischemic risk features on clinical outcomes in patients treated with drug-eluting stents: Insights from a large-scale Asian population

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Medical Sciences & Peking Union Medical College, China; Kefei Dou, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China

Background: Recently, 2018 ESC/EACTS guidelines on myocardial revascularization have been proposed to standardize the definition of high ischemic events risk (HIR) features. However, the prevalence and the expected ischemic event rate of HIR patients defined by ESC/EACTS-endorsed criteria are currently unknown in the real-world PCI practice. We sought to investigate the impact of HIR features on clinical outcomes after drug-eluting stents implantation and whether this effect is influenced by high bleeding risk (HBR).

Methods: Between January 2013 and December 2013, a total of 10,167 consecutive patients undergoing PCI were prospectively enrolled in Fuwai PCI Registry. The primary ischemic endpoint was target lesion failure (TLF) (comprising cardiac death, target vessel myocardial infarction, and target lesion revascularization) and the primary bleeding endpoint was clinically relevant bleeding defined as BARC type 2, 3, or 5 bleeding. Guideline-endorsed high-risk features for ischemic events were retrospectively assessed. HBR was defined based on the highest quartile of PARIS bleeding score (≥ 6 or <6).

Results: Median follow-up was 29 months. 5149 patients had at least 1 HIR feature (50.6%), who experienced significantly increased risks of TLF (adjusted hazard ratio [HR]: 1.59, 95% confidence interval [CI]: 1.32-1.93; $P < 0.001$), compared to those with non-HIR features. In contrast, the risk of clinically relevant bleeding was statistically similar between the 2 groups (HR_{adjust} : 0.85 [0.66-1.09]; $P = 0.200$). By including ESC/EACTS-endorsed HIR criteria as a continuous variable, the risk of adverse ischemic events tended to be greater as the number of high-risk procedural characteristics increased (per number of high-risk features increase: TLF, HR_{adjust} : 1.15, 95% CI: 1.07-1.23; $P_{\text{trend}} < 0.001$). Associations between HIR features and adverse events were uniform across HBR strata without evidence of interaction.

Conclusions: ESC/EACTS-endorsed HIR criteria were associated with a substantial risk of ischemic events, with no increase in clinically relevant bleeding in routine clinical practice; and these associations did not seem to be modified by HBR status.

Disclosures: H. Wang *Nothing to disclose*. S. Wang *Nothing to disclose*. B. Xu *Nothing to disclose*. Y. Yang *Nothing to disclose*. R. Gao *Nothing to disclose*. K. Dou *Nothing to disclose*.

II-87 | One and Done is not enough for Accreditation

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Background: Accreditation for Cardiovascular Excellence (ACE) reviews facilities performing PCI using consensus-based standards. Initial accreditation conferred is provisional, deferred, or full. All facilities achieved full accreditation by completing a corrective action plan. Reaccreditation (RA) occurs 2 years after achieving FA. Findings from initial review (IR) to RA are compared below.

Methods: Accreditation standards scored as meets, does not meet, or partially meets grade processes and outcomes. Reviews consist of a site visit by experienced cath lab nurses, as well as a randomized case reviews by expert, blinded, independent operators. Data are recorded on a standardized report forms then downloaded for analysis (JMP 15.0.0, SAS Institute Cary NC).

Results: 21 facilities underwent an IR & RA. Two facilities were deferred on their IR, the remainder were provisional. Three facilities were deferred on the RA review, one of which was initially deferred.

Nineteen site visit variables were significantly different between IR and RA. For 18, more facilities met accreditation standards at RA. These standards pertained to reporting results, indications & informed consent, outcomes, and quality assurance. The only standard lower at RA was a nursing leadership criteria.

Thirteen case variables demonstrated significant differences between IR and RA, but numerical differences were small (1-6% for all parameters). Variables included both diagnostic & revascularization AUC ($\uparrow$ insufficient data) and pre-procedural ischemia (documentation), angiographic quality, severity of disease ($\downarrow$ intermediate lesions), final results and an overall assessment of performance. There was a higher rate of stent under-expansion and single final views, but fewer LV grams performed with an end hole catheter.

Conclusions: Participation in both IR and RA resulted in substantial improvement, the greatest was seen in administrative and process. Although case metrics were improved, changes were smaller suggesting more limited implementation and opportunities for improvement persist. Ongoing participation in accreditation supports local efforts and commitment by the entire team to the processes will result in improved clinical outcome metrics.

Disclosures: B. H. Weiner *Nothing to disclose*. M. J. Cowley *Nothing to disclose*. J. E. Cigarroa *Nothing to disclose*. J. J. Marshall *Nothing to disclose*.

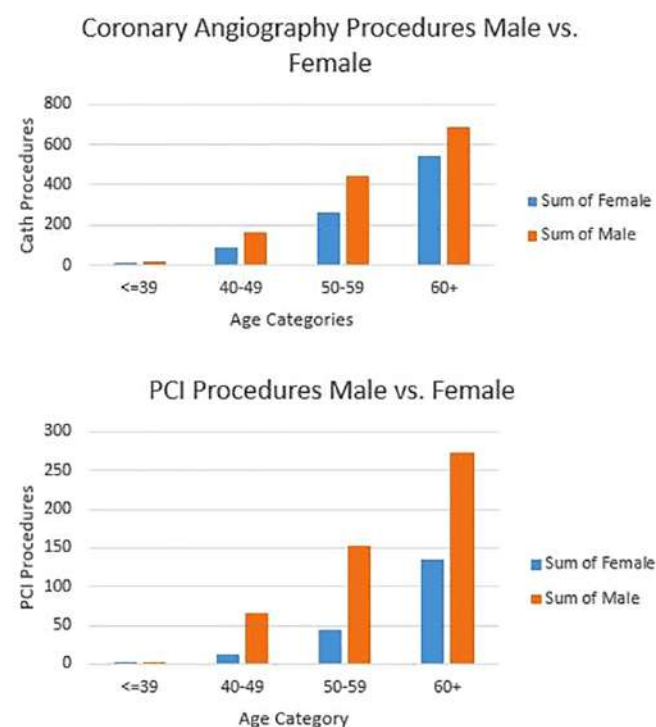
II-88 | Heart Screen Program Unearths Differences in Rates of Coronary Angiography and Revascularization in Men and Women

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Background: Men experience a greater number of adverse cardiovascular outcomes, but women suffer from increased mortality. This study examined differences in coronary angiography (CA), percutaneous coronary intervention (PCI), coronary artery bypass surgery (CAB), and myocardial infarction (MI). Because men have more typical and earlier presentation for heart disease, evaluation is earlier and more aggressive. The purpose of this analysis is to examine differences in cardiac evaluation, revascularization, and MI over an extended time period among different genders.

Methods: Data from 33,088 patients were retrospectively analyzed from 02/2008 to 02/2019 via interrogation of Epic EMR. Sex differences in CA, PCI, CAB, and MI were analyzed in age deciles.

Results: 33,088 patients were studied. When patients were older than 40 years of age, men underwent more CA, PCI, CABG, and suffered more MI as compared to women. As subject age increased, the rate of MACE increased linearly. These findings contrast the findings of multiple prior studies that have shown worse outcomes in women less than 50 years of age.



Conclusions: Among subjects older 40 years, males underwent more clinically indicated invasive procedures as part of treatment of coronary disease. Males also suffered from more MI compared to females. The age category of 60+ had the largest number of procedures and MI. This data illustrates differences in management of coronary artery disease in men and women and should spur research into ways in which cardiovascular care of females with ischemic heart disease can and be improved.

Disclosures: J. P. Wilson *Nothing to disclose*. M. Gedela *Nothing to disclose*. M. Blue *Nothing to disclose*. M. S. Petrasko *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

IMAGING: CT, MR, AND NON-INVASIVE IMAGING

III-1 | Targeted Exclusion of Proximal Obstructive Coronary Disease on Coronary Computed Tomography Angiography For Deferral of Routine Invasive Coronary Angiography Prior to Transcatheter Aortic Valve Replacement

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Background: Aortic stenosis is associated with coronary artery disease (CAD) and routine invasive coronary angiography (ICA) is performed prior to transcatheter aortic valve replacement (TAVR). Evaluation of CAD on computed tomography angiography (CTA) is limited due to coronary calcification, cardiac motion and absence of sublingual nitroglycerin but may be feasible for the exclusion of only proximal CAD.

Methods: 339 patients (52% male, age 79 ± 27) who underwent TAVR between 5/1/18 and 12/20/18 were retrospectively studied. Routine pre-procedure ECG-gated CTA was performed with reconstruction phases in 10% increments. CTA evaluation of proximal CAD performed clinically on request from multidisciplinary heart team. CAD analysis performed on 3D workstations by experienced cardiologists and radiologists. Stenosis grades: 0=normal, 1=1-25%, 2=26-50%, 3=51-70%, 4=71-99%, 5=occluded, 8=absent, 9=uninterpretable.

Results: Of 339 patients, 62 (18%) patients had CTA coronary analysis of which 49 (14%) also had ICA before or at time of TAVR. Of these patients, 21 (43%) patients had no stenosis more than 50% on CTA, and of those 21 patients, 19 (91%) also had no stenosis more than 50% on ICA. 28 patients who had both ICA and CTA had $\geq 50\%$ stenosis in at least one coronary artery on CTA. Of these, 22 (79%) also had $\geq 50\%$ stenosis on ICA. When excluding those with coronary artery bypass grafts (12 patients), 63% of patients had $\geq 50\%$ stenosis on both CTA and ICA. 13 patients had CTA without follow up ICA. Overall including all patients with no CAD on ICA and those who were deferred ICA based on CTA results, 32 (52%) patients avoided or could have avoided ICA, leading to a total theoretical cost saving of \$155,000-310,000. No patients had acute coronary syndrome (ACS) at the time of discharge post TAVR.

Conclusions: Exclusion of proximal obstructive CAD on routine pre-TAVR CTA is feasible and can decrease utilization of ICA with no increase in ACS at the time discharge post TAVR implantation. This strategy can decrease invasive procedures and potentially reduce cost. Further study is needed on longitudinal outcomes with this strategy.

Disclosures: W. W. O'Neill: *Abiomed: Consulting; Boston Scientific Corp.: Consulting; Edwards Lifesciences: Consulting*; Y. Alalwan *Nothing to disclose*. N. Coriasso *Nothing to disclose*. A. Aljamal *Nothing to disclose*. C. L. Hughes *Nothing to disclose*. E. Abdelrahim *Nothing to disclose*. D. D. Wang *Nothing to disclose*. M. Pantelic *Nothing to disclose*. T. Song *Nothing to disclose*. M. H. Eng *Nothing to disclose*. T. Frisoli *Nothing to disclose*. P. Villablanca *Nothing to disclose*. J. F. Wyman *Nothing to disclose*. J. Lee *Nothing to disclose*.

III-2 | Initial Experience Using A Novel High Definition (Hi-Def) Imaging System In Peripheral Arterial Interventions

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Background: A newly developed high definition (Hi-Def) detector allows imaging with a resolution of 76 microns - more than twice that of standard technologies. This unique system consists of a conventional flat panel detector (FPD) with embedded high resolution modes. This is the first report utilizing this technology to guide peripheral interventions.

Methods: Three patients with below-knee arterial occlusions underwent endovascular intervention using this novel Hi-Def imaging system. The Hi-Def mode was used to aid device positioning and stent deployment for the majority of interventions. FPD images were used for qualitative comparison.



Visualization of stent struts is superior under Hi-Def mode (left) as compared to the conventional FPD mode (right) in two of the patients who underwent lower extremity interventions. Note the stent fractures seen using Hi-Def compared to FPD imaging (upper).

Results: All patients underwent successful revascularization of below-knee arterial occlusions. In one patient, guide wire passage across a tortuous segment was unsuccessful with conventional FPD imaging after multiple attempts, but use of Hi-Def mode resulted in prompt success by improving visualization of wire movement within the occlusion. In the other cases, Hi-Def imaging was able to clearly resolve individual stent struts and identify stent fractures and an avulsion not clearly seen in the FPD images. Hi-Def mode was also used for wire passage through the deformed stents struts and to position stents.

Conclusions: Our initial experience using a novel Hi-Def imaging system shows that it can effectively be used in real time to improve visualization of lower extremity vasculature and interventional devices during complex peripheral arterial interventions and may be used to improve technical outcomes.

Disclosures: S. A. Arain *Nothing to disclose.* S. Napierkowski *Nothing to disclose.* M. Schechter *Nothing to disclose.* W. Aman *Nothing to disclose.* R. W. Smalling *Nothing to disclose.*

III-3 | Extracting Hypertrophic Cardiomyopathy Features from Cardiac Magnetic Resonance Reports by Natural Language Processing

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Background: Manual extraction of information from radiological reports for retrospective studies can be tedious and time consuming. Natural language processing (NLP) is an artificial intelligence method for automating the extraction of information from narrative text, such as that of electronic health records. In this study, we show the utility of using NLP for identification of patients with diagnosis of hypertrophic cardiomyopathy (HCM) by cardiac magnetic resonance imaging (CMR).

Methods: We identified 2,051 patients with at least one instance of ICD-9 or ICD-10 diagnostic codes for HCM who had any CMR report. Of these, 200 patients were randomly selected and allocated into training and testing sets (100 each), with 185 CMR reports in the training set and 206 reports in the test set. We manually reviewed the CMR reports to identify HCM status and 12 radiologic features (listed in Table) which are clinically relevant to HCM diagnosis and prognosis. 13 Rule-based NLP algorithms (1 for HCM diagnosis and 1 for each feature) were developed using MedTagger. We compared the NLP performance against the gold standard manual abstraction through standard metrics for detection.

Feature	Sensitivity	Specificity	PPV	F measure	NPV	Accuracy
HCM	0.98	1.00	1.00	0.99	0.98	0.99
HCM type	0.98	0.99	0.97	0.97	0.99	0.99
Systolic anterior motion of Mitral valve	0.97	0.95	0.98	0.97	0.91	0.96
Mitral regurgitation	0.95	0.87	0.95	0.95	0.87	0.93
Left ventricular obstruction/Turbulence	0.94	0.95	0.98	0.96	0.84	0.94
Apical pouch	1.00	0.97	0.78	0.88	1.00	0.98
Left ventricular delayed enhancement	0.93	0.88	0.95	0.94	0.85	0.92
Left atrial enlargement	0.98	1.00	1.00	0.98	0.97	0.99
Right atrial enlargement	0.94	0.99	0.94	0.94	0.99	0.98
LV mass	0.96	1.00	1.00	0.98	0.77	0.96
LV mass index	0.96	1.00	1.00	0.98	0.78	0.96
Left ventricular ejection fraction	0.98	1.00	1.00	0.99	0.71	0.98
Right ventricular ejection fraction	0.99	1.00	1.00	0.99	0.89	0.99

Results: All 13 NLP pipelines yielded high sensitivity, specificity, positive predictive value, and accuracy when compared to gold standard manual abstraction (Table).

Conclusions: We showed that NLP can be utilized to automatically detect occurrence of HCM and abstract its phenotypic characteristics with high performance.

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III-4 | Variability of Calcium Burden in Peripheral Arteries on Cardiac Computed Tomographic Angiography

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Background: Calcium Score is a strong predictor of future atherosclerotic events (ASE). However, few studies exist to quantify the burden of calcium in non-coronary vessels. This study catalogs and compares calcium burden in the iliac arteries (IA) and subclavian arteries (SA) in patients undergoing preprocedural CT angiography. The results may have future implications in ASE risk stratification models and endovascular procedural planning.

Methods: The burden of calcium in the SA and IA were cataloged and compared using an ordinal calcium quadrant score (CQS) in patients undergoing CT angiography for preprocedural TAVR work-up (Figure 1). Patient demographics and relevant medical conditions were

also documented. Statistical comparison between mean CQS was performed using paired and independent T-tests.

Results: CQS was significantly lower in the SA compared to the IA ($P < 0.0001$). However, there was no significant difference in CQS between the right and left SA ($p = 0.129$) or IA ($p = 0.296$). The calcium burden in the SA was greater in males ($p = 0.001$). Smokers showed increased calcium burden in all arteries ($p_{SA} = 0.018$; $p_{IA} = <0.0001$). The study included 55 participants with a mean age of 74 and 31.4 mean BMI. The participants were 96% white, 58% male, 40% smokers, 65% hypercholesterolemic, 47% diabetic, and 20% sedentary.

Conclusions: There is significantly less calcified atherosclerosis in the subclavian arteries. Future research is necessary to explore the implications of calcium burden on endovascular surgical procedures and as a predictor for ASE.

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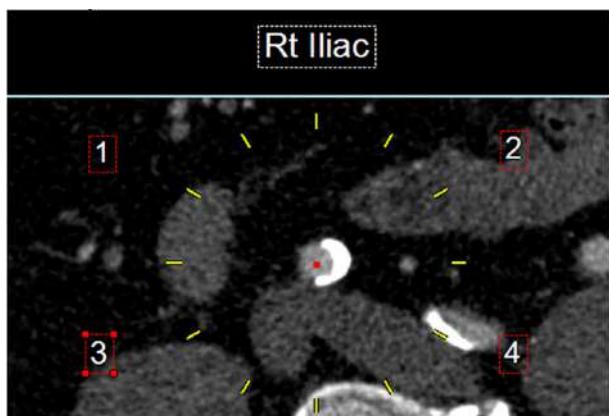
III-5 | Male Gender is the Most Powerful Predictor of CAD Severity in Older Patients Presenting to the Emergency Department with Cardiovascular Symptoms

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Background: Coronary CT Angiography (CCTA) is a powerful tool in the evaluation of coronary artery disease (CAD) in patients presenting to the Emergency Department (ED) with cardiovascular symptoms. We sought to evaluate the predictive capability of various risk factors to determine the incidence of underlying CAD in a 'real-world' patient population undergoing CCTA in the ED.

Methods: 542 patients (263 male, 279 female, age 50.1 ± 9.9) presenting to the ED with symptoms suspicious for CAD who were referred for a CCTA were evaluated. The primary outcomes were presence of any stenosis and presence of moderate to severe ($>50\%$) luminal stenosis in at least 1 epicardial coronary artery (LM, LAD, LCX, RCA, and major branches).

Results: As expected, sex, age, hypertension, hyperlipidemia and diabetes were all significant risk factors for presence of any stenosis and presence of moderate to severe stenosis on bivariate analysis ($p < 0.05$). On multivariate analysis, only sex and age were significant



independent predictors for presence of any stenosis (OR 2.12, 95%CI [1.31, 3.45] and 1.08 [1.05, 1.11] respectively). On subgroup multivariate analysis, male gender became a more powerful predictor of moderate or severe disease in patients over 55 years of age (OR 4.45, 95%CI [1.32, 15.99]). In patients under 55 years old, sex was nonsignificant, but hyperlipidemia and family history were independently significant predictors (OR 5.64, 95%CI [1.27, 25.13] and 5.08 [1.17, 22.00] respectively).

Conclusions: Traditional risk factors such as hypertension, hyperlipidemia and diabetes were strong predictors of coronary artery stenosis in our population but became nonsignificant after multivariate analysis. Sex and age remained as the strongest predictors of CAD after matching for other risk factors. While CAD is an increasingly recognized and often underappreciated cause of morbidity and mortality in females, the impact of male sex, particularly in patients over 55 years, should not be underestimated.

Disclosures: T. Dong *Nothing to disclose*. S. Cohen *Nothing to disclose*. B. S. Kim *Nothing to disclose*. M. Chopra *Nothing to disclose*. N. Chan *Nothing to disclose*. J. N. Makaryus *Nothing to disclose*.

III-6 | A Multicenter Evaluation of Coronary Artery Disease Severity in South Asian Patients Presenting to the Emergency Department With Chest Pain

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Background: South Asian patients have an increased incidence and prevalence of coronary artery disease (CAD) compared to other ethnicities. While the reason for this appears to be multifactorial and may be related to smaller coronary artery vessel caliber, the precise explanation for this tendency is uncertain. We sought to evaluate the difference in coronary calcium burden and severity of luminal stenosis on coronary computed tomography angiography (CCTA) between South Asians and Caucasians in a 'real-world' patient population presenting to the Emergency Department (ED) with symptoms suggestive of possible CAD.

Methods: 537 patients (69 South Asian, 468 Caucasian) presenting to the ED at two centers with symptoms suspicious for CAD who were referred for a CCTA were evaluated. The primary outcomes were total coronary calcium score and presence of moderate to severe (>50%) luminal stenosis in at least 1 epicardial coronary artery (LM, LAD, LCX, RCA, and major branches).

Results: At baseline, South Asians were more likely to have diabetes (27.5% vs 9.8%), and less likely to smoke (11.6% vs 37.0%) compared to Caucasians ($p<0.001$). There was no difference in other traditional risk factors such as sex, age, hypertension, and hyperlipidemia. South Asians also had lower HDL levels ($p<0.01$) compared to Caucasians, with no difference in total cholesterol, triglycerides, or LDL. There was no significant difference on bivariate analysis in total coronary calcium score or presence of moderate to severe luminal stenosis. On multivariate analysis accounting for traditional risk factors, Caucasian race was predictive of moderate to severe stenosis compared to South Asians (OR 4.29, 95%CI [1.01, 18.25]).

Conclusions: Despite the increased incidence of diabetes and lower HDL levels in South Asians, there was no difference in calcium scores or luminal stenosis on CCTA. Caucasians were actually more likely to have moderate to severe stenosis than South Asians when correcting for traditional CAD risk factors and lipid panel, contrary to prior studies. This suggests that behavioral risk factors may play an important role in the prevalence of CAD in the South Asian population and should be the target of study in the future.

Disclosures: T. Dong *Nothing to disclose*. K. Bulsara *Nothing to disclose*. A. N. Makaryus *Nothing to disclose*. B. S. Kim *Nothing to disclose*. J. N. Makaryus *Nothing to disclose*.

III-7 | Utility of ECG-Gated Computed Tomography Angiography for the Improved Diagnosis of Bicuspid Aortic Valve Disease prior to Transcatheter Aortic Valve Replacement

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Background: Diagnosis of a bicuspid aortic valve (BAV) morphology has important prognostic implications due to early valve degeneration and an associated aortopathy. Presence of a BAV also has technical implications for transcatheter aortic valve replacement (TAVR) procedural planning and implantation. BAV is often first identified on transthoracic echocardiography (TTE), but diagnosis may be limited by imaging windows, operator skill, and valve calcification. ECG-gated computed tomography angiography (CTA) may improve identification of BAV.

Methods: 335 patients who underwent TAVR between 5/1/18 and 12/20/18 were retrospectively evaluated. Routine pre-procedure planning retrospectively ECG-gated CTA studies were performed with reconstruction phases at 10% increments through the R-R cycle. 50% or greater commissural fusion was categorized as a BAV. Valve morphology from the preprocedural TTE reports was also abstracted. Of 335 patients, 17 patients had prosthetic valves. Of the remaining 318 patients, 267 (52.4% male, age 79 ± 27) had TTE grading of aortic valve morphology.

Results: BAV was identified by TTE in 23 patients (8.6% of cohort, age 75 ± 20 years) whereas CTA identified 26 patients (9.7% of cohort, age 74 ± 21 years) with a bicuspid valve. Direct correlation between CTA and TTE was modest (R-value = 0.38). With CTA as the reference standard, TTE had a sensitivity, specificity, positive predictive value and negative predictive value of 88.5%, 100%, 100% and 98.8% respectively. The age of patients with tricuspid vs BAV was 80 ± 28 years vs 74 ± 21 years, respectively. Aortic size in tricuspid vs BAV patients was 34.2 ± 15 vs 37.9 ± 30 mm ($p=0.001$). In BAV patients, 82% of the patients had no aortic dilation greater than 40mm.

Conclusions: In patients referred for TAVR, CTA is valuable tool for diagnosis of BAV and associated aortopathies, particularly when valve morphology cannot be characterized by TTE. In our cohort, BAV patients were older and rarely had significant aortopathy, suggesting an increased prevalence of degenerative valve fusion relative to congenital BAV disease. Further study is required to categorize and distinguish BAV sub-types and their effect on TAVR procedure results.

Disclosures: W. W. O'Neill: *Abiomed: Consulting; Boston Scientific Corp.: Consulting; Edwards Lifesciences: Consulting*; C. L. Hughes *Nothing to disclose*. J. Lee *Nothing to disclose*. N. Coriasso *Nothing to disclose*. Y. Alalwan *Nothing to disclose*. A. Aljamal *Nothing to disclose*. D. D. Wang *Nothing to disclose*. M. Pantelic *Nothing to disclose*. T. Song *Nothing to disclose*. M. H. Eng *Nothing to disclose*. T. Frisoli *Nothing to disclose*. P. Villablanca *Nothing to disclose*. J. F. Wyman *Nothing to disclose*. E. Abdelrahim *Nothing to disclose*.

III-8 | The ACC/AHA ASCVD Risk Estimator is a Powerful Tool for the Assessment of CAD in Patients Presenting to the Emergency Department with Chest Pain

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Background: The evaluation of chest pain in the Emergency Department is often time-consuming, resource-intensive, and costly. The aim of this study is to evaluate the utility of the ACC/AHA ASCVD risk calculator to identify patients at low risk for a cardiac event based on existing patient data and well known risk estimator.

Methods: Data from a total of 292 patients, who presented to the ED with cardiac symptoms and received 320-multidetector cardiac CT angiography using a Toshiba Aquilion One® scanner were reviewed. Demographic information and data to calculate ASCVD risk were obtained from patient records. ASCVD risk scores were correlated to CTA findings of moderate (50–70%) or severe (>70%) coronary artery stenosis.

Results: A total of 292 patients were analyzed (132 male, mean age 52.3 ± 7.78). For patients with ASCVD scores above 7.5%, the odds ratio (OR) of having moderate or severe CAD on CTA was 5.34 [95% CI 2.37-12.05, $p < 0.001$]. The positive and negative predictive values with ASCVD risk scores cut off of 7.5% were 0.23 and 0.95 respectively with positive and negative likelihood ratio of 2.54 and 0.46 respectively. When the ASCVD cutoff is optimized for sensitivity and specificity with the Youden index to 6.3, the area under the ROC curve was 0.746 with positive and negative predictive values of 0.21 and 0.96, respectively. For patients with risk scores above 6.3%, the OR of having severe CAD on CTA was 9.67 [95%CI 1.06-462.03, $p < 0.05$], while the OR of having a moderate to severe lesion was 5.86 [95%CI 2.37-15.96, $p < 0.001$].

Conclusions: The ASCVD risk score correlated very well with the presence or absence of significant CAD on CT angiography. Having a risk score above 7.5% or 6.3% was associated with a high likelihood of having moderate to severe CAD, yet more importantly, an ASCVD score below these cutoffs had a significant NPV of 95% and 96% respectively. This commonly used risk score can provide a rapid estimate of the likelihood of underlying CAD in patients presenting to the ED with symptoms suggestive of cardiovascular disease.

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III-9 | Male Gender Is the Most Powerful Predictor of the Degree of Coronary Arterial Calcification in Symptomatic Patients Presenting to the Emergency Department

Beom Soo Kim, Hofstra Northwell School of Medicine - North Shore University Hospital, United States; Nicholas Chan, Cleveland Clinic, United States; Stuart Cohen, Zucker School of Medicine at Hofstra/Northwell - North Shore University Hospital, United States; Maya Chopra, Vanderbilt University, United States; John N Makaryus, Zucker School of Medicine at Hofstra/Northwell - North Shore University Hospital, United States

Background: Gender is an important factor for the development of coronary atherosclerosis. CACS is a powerful risk stratification tool usually intended for asymptomatic patients. There is limited empirical data on the effect of sex on CACS, especially for patients who present to the ED with cardiac symptoms. We sought to assess the pattern of CAC on coronary CT in patients presenting to the ED with symptoms.

Methods: Data from a total of 542 patients (263 male, 279 female) who presented to the ED with cardiac symptoms were evaluated. CT angiography was performed using the Toshiba Aquilion One 320 scanner. Total CACS (Agatston score) and the distribution of calcification across four major coronary arteries were examined. Total CACS was coded as an ordinal variable with four categories (0, 1-99, 100-399, >400).

Results: There was no significant sex difference in most risk and protective factors for cardiovascular disease. However, women in the study cohort tended to be older (51.8 vs. 48.2, $p = 0.03$) with fewer cases of dyslipidemia and smoking history ($ps \leq 0.01$). Ordinal logistic regression showed that when controlling for traditional risk factors, male gender was the greatest predictor for having a higher CACS with an odds ratio of 3.04 ($p < .001$, 95% CI [2.01, 4.59]). Men also had a higher degree of coronary calcification in each of the four major arteries than women ($ps < 0.02$). In subgroup analyses focusing on subjects with CACS greater than zero, men showed calcification in a greater number of major arteries (i.e., more diffuse calcification) than women on average (2.23 vs. 1.86, $p=0.01$).

Conclusions: Not only did men have higher total CACS and degree of coronary calcification in individual epicardial vessels than women when matched on all traditional risk factors, but also being male was the strongest independent predictor for higher CACS in symptomatic patients presenting to ED with cardiac symptoms when compared to traditional atherosclerosis risk factors. Men also showed more diffuse calcification across major arteries than women. While there is increasing interest in the incidence of CAD in women, male gender remains one of the strongest predictors of underlying CAD.

Disclosures: B. S. Kim *Nothing to disclose*. N. Chan *Nothing to disclose*. S. Cohen *Nothing to disclose*. M. Chopra *Nothing to disclose*. J. N. Makaryus *Nothing to disclose*.

III-10 | Gender-Based Differences in the Contribution of Traditional Cardiovascular Risk Factors to the Development of Coronary Artery Calcification

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Background: Gender has been shown to be an independent predictor for the development of coronary atherosclerosis. Despite increased interest in the pathophysiology of CAD in women, there is limited data

on variations in how traditional atherosclerotic risk factors affect coronary artery calcification development differently based upon gender.

Methods: A total of 542 patients (263 male, 279 female) with cardiac symptoms who presented to the emergency department, who had undergone 320-slice CT were evaluated. Total Coronary Artery Calcium Score (CACS, Agatston score) and coronary artery stenosis lesion were examined. Total CACS was coded as an ordinal variable with four categories (0, 1-99, 100-399, >400). Ordinal logistic regression model was used to evaluate effects of traditional atherosclerotic risk factors on coronary artery calcification in each gender.

Results: There was no significant sex difference in most risk and protective factors for cardiovascular disease, including race, obesity, hypertension, diabetes, aspirin, and statin use. Subgroup analysis of men and women showed that for both genders, age was an independent predictor of higher CACS (OR 1.11, 95%CI[1.07, 1.14] and 1.12 [1.07,1.17] respectively). Interestingly, smoking status was not an independent predictor in men but in women, being a current smoker had a 2.97 higher odds of having higher CACS (95%CI[1.09,8.04]). For men, obesity was a significant predictor with odds ratio of 2.16 (95% CI[1.05, 4.44]) of higher CACS.

Conclusions: Gender plays a significant role as an independent risk factor for coronary atherosclerosis. Our data suggest that traditional risk factors play varying roles in the development of CAD in men and women. While age had similar effects on both genders, obesity was a far more significant risk factor for men and smoking was more significant for women for the development of coronary arterial calcification. These findings suggest that our understanding and classification of risk likely underestimates crucial gender-related differences that should be explored more thoroughly.

Disclosures: B. S. Kim *Nothing to disclose*. J. N. Makaryus *Nothing to disclose*.

III-11 | Novel Machine Learning Methods to Optimize Ultrasound-Derived Carotid Artery Stenosis Evaluation

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Background: Consensus agreements and internally-derived laboratory criteria are utilized in determining carotid artery stenosis severity by ultrasound. Currently employed SRUC criteria (ICA PSV, ICA EDV, ICA/CCA PSV Ratio) often do not correlate accurately with angiographically-derived degree of stenosis. We employ machine learning (ML) methods to test current prediction algorithms, attempt

to develop novel prediction criteria, and study the relationship between ultrasound variables and angiographic stenosis.

Methods: Ultrasound data was derived from 257 patients studied in the ACT-1 trial. The data set contained clinical, angiographic and core-lab validated duplex ultrasound data. Standard statistical methods, decision trees, random forests, and deep learning methods (Augmented Neural ODE) were used.

Results: Of the data set, 44.6% of patients had ultrasound characteristics meeting all three SRU criteria for categorization into a stenosis group. Of these patients, 36.8% had accurate correlation with angiographic stenosis. All combinations of SRU criteria were tested. ML-derived decision tree yielded training accuracy of 76.6526 $\pm$ 0.9954%, testing accuracy of 73.1373 $\pm$ 5.2375%. Random forest model had training accuracy of 77.0438 $\pm$ 0.8066%, testing accuracy of 74.7134 $\pm$ 2.7088%. Augmented Neural ODEs using both ReLU and sigmoid activation functions provided better performance than classical ML models with testing accuracy of 77%. All methods failed to discriminate effectively between the 50-69% and 70-99% groups. Incorporation of demographic and clinical variables had minimal impact on accuracy.

Conclusions: Currently utilized standards perform poorly in duplex ultrasound prediction of 50-69% versus 70-99% angiographic stenosis. The failure of multiple ML analytic mechanisms including Augmented Neural ODEs, which provide better performance than classical ML models, suggests that standard ultrasound criteria may be insufficient to accurately predict severity of carotid artery stenosis. Analysis of larger, validated data sets is needed to confirm these findings. Raw image analysis may improve deep learning yield and provide additional variables to improve accuracy.

Disclosures: P. Monteleone: *Medtronic: Consulting*; P. Kothapalli *Nothing to disclose*. S. A. Montano Jr. *Nothing to disclose*. Y. Diao *Nothing to disclose*. O. Zhao *Nothing to disclose*. M. Pirwitz *Nothing to disclose*. C. Bajaj *Nothing to disclose*.

III-12 | Association of Coronary Calcium Score and Aortic Valve Sclerosis - A single center study

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Background: Aortic valve sclerosis (AVS) is a process linked to atherosclerotic degeneration of the aortic valve. The purpose of this study is to analyze the association of AVS with coronary calcium score as an index of coronary atherosclerotic disease.

Methods: We evaluated patients who had transthoracic echocardiography (TTE) and coronary calcium score performed between February

Characteristic	Aortic valve sclerosis		p-value
	Present (N=1,766; 22.4%)	Not Present (N=6104; 77.6%)	
Age, years	64.92 $\pm$ 9	56.55 $\pm$ 10.27	<0.0001
Male (%)	51.9%	45.1%	<0.0001
BMI, kg/m ²	30.19 $\pm$ 5.7	30.27 $\pm$ 6.12	0.6625
Systolic BP mmHg	130 $\pm$ 15	126 $\pm$ 14	<0.0001
Total cholesterol	189 $\pm$ 45	190 $\pm$ 41	0.31
Total cholesterol/HDL ratio	4.3 $\pm$ 1.7	4.22 $\pm$ 1.6	0.054
Coronary calcium score	415 $\pm$ 666	185.8 $\pm$ 443	<0.001
Diabetes Mellitus	No 1547 (87.6%)	5557 (91%)	<0.0001
	Yes 219 (12.4%)	547 (9%)	
Stroke	No 1720 (97.4%)	6011 (98.5%)	0.0024
	Yes 46 (2.6%)	93 (1.5%)	

Comparison of Clinical Variables and Calcium Score with Presence or Absence of Aortic Valve Sclerosis (AVS)

AVS	CAC <300	CAC >300	p-value
Present	1118 (18.1%)	648 (38.4%)	<0.0001
Absent	5063 (81.9%)	1041 (61.6%)	

Chi-square Analysis Comparing Distribution of Aortic Valve Sclerosis and Coronary Calcium Score

2008 to February 2019. Data included demographic characteristics, coronary calcium score, and the presence of AVS by echocardiography. Simple linear regression was used to analyze continuous variables and chi-square test was used for categorical variables.

Results: A total of 7,870 patients had coronary calcium score during the study period, with 1,766 (22.4%) patients noted to have AVS on TTE. When compared to patients without AVS, patients with AVS were older (65 $\pm$ 9 vs. 57 $\pm$ 10 years), had higher mean CAC (415 $\pm$ 666 vs. 186 $\pm$ 443 AU), and were more likely to have diabetes (12.4% vs. 9%) or a stroke history (2.6% vs. 1.5%) (p-value <0.001 for all). AVS was significantly more frequent in patients with CAC > 300 compared to those with CAC < 300 (38.4% vs. 18.1%, p < 0.0001).

Conclusions: Higher coronary calcium score is strongly associated with the presence of aortic valve sclerosis. This may imply a clinical need for aggressive preventive care measures in patients with AVS.

Disclosures: S. Narayana Gowda *Nothing to disclose*. C. K. Desai *Nothing to disclose*. J. Orvarsson *Nothing to disclose*. P. Petrasko *Nothing to disclose*. T. Petrasko *Nothing to disclose*. V. Bares *Nothing to disclose*. T. Stys *Nothing to disclose*.

III-13 | Safety and Efficacy of Intracardiac Echocardiography versus Transesophageal Echocardiography for Implantation of Left Atrial Appendage Closure Devices : An Updated Systematic Review and Meta-Analysis

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States; Varunsiri Atti, Michigan State University, United States; Rahul Dhawan, University of Nebraska Medical Center, United States; Mohit Turagam, Icahn School of Medicine at Mount Sinai, United States; Poonam Velagapudi, University of Nebraska Medical Center, United States

Background: Intracardiac echocardiography (ICE) has emerged as an alternative to transesophageal echocardiography (TEE) to guide implantation of left atrial appendage closure (LAAC) devices in patients with atrial fibrillation and high bleeding risk. We reviewed the efficacy and safety of ICE compared to TEE in LAAC in this updated meta-analysis.

Methods: PubMed, EMBASE, Google Scholar and major national conference proceedings were systematically searched for studies comparing ICE and TEE in endocardial LAAC. Efficacy outcomes included procedural success, duration and fluoroscopy time. Safety outcomes included procedural complications. Risk Ratios (RR), standardized mean difference (SMD) and corresponding 95% confidence intervals (CI) were calculated. The analysis was performed using a random effect model.

Results: 8 observation studies comprising of 2468 patients (ICE: 600, TEE: 1868) met our inclusion criteria. Watchman device was implanted in 3 studies, Amplatzer Cardiac Plug/Amulet in 3 studies and all three devices in remaining 2 studies. Mean CHA₂DS₂-VASc (4.28 vs 4.32, $p = 0.71$) and HAS-BLED scores (3.20 vs 3.21, $p = 0.96$) were comparable between groups. There was no significant difference in procedure success rate (RR: 1.01, 95% CI: 0.99 – 1.02, $p = 0.41$) (figure 1), procedure duration, fluoroscopy time and incidence of overall complications (RR: 0.87, 95% CI: 0.60 – 1.26, $p = 0.46$).

Conclusions: Our updated meta-analysis shows ICE is as effective and safe as TEE for implantation of LAAC devices.

Disclosures: D. Shin *Nothing to disclose*. A. Jhand *Nothing to disclose*. V. Atti *Nothing to disclose*. R. Dhawan *Nothing to disclose*. M. Turagam *Nothing to disclose*. P. Velagapudi *Nothing to disclose*.

III-14 | Traditional Risk Assessments as Predictors of Progression of Atherosclerosis

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Background: This study aims to compare Framingham Risk Score (FRS) and the newer Pooled Cohort Risk Assessment (PCRA) for predicting rapid progression of coronary artery calcium score (CAC).

Methods: Data were retrospectively analyzed from the Sanford Cardiovascular Prevention Program for patients age > 18 who underwent at least two CAC screenings from 2/2008 to 2/2019. Patients were categorized as 'high risk progressors' (HRPs) if their CAC (1) went from zero to positive between scans, or (2) had a 15%/year increase, or (3) rose from < 300 to CAC $\geq$ 300. Remaining patients were categorized as 'non-progressors' (NPs). FRS and PCRA scores were calculated based on clinical information obtained in first screening. A chi-square test was used to compare categorical variables.

Results: 1,972 patients were analyzed, of which 395 were HRPs and 1,577 were NPs. Compared to NPs, HRPs were more likely to be male, be older, and have higher mean PCRA and FRS scores at first

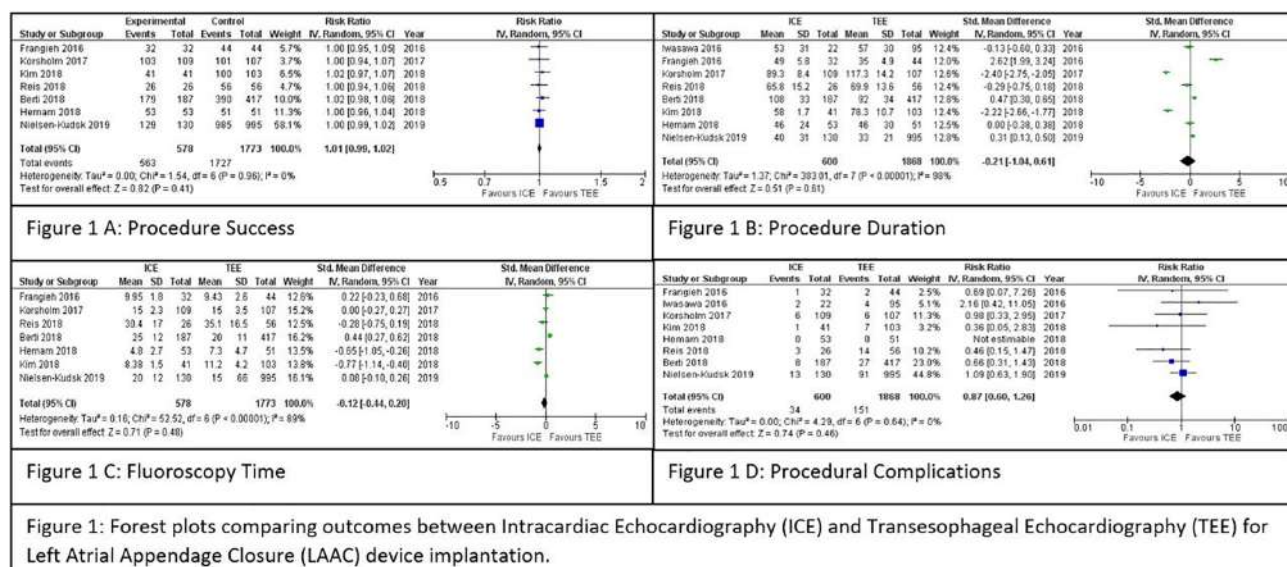


Table 1: Baseline clinical variables of 'High Risk Progressors' and 'Non-Progressors'

	High Risk Progressor	Non-Progressor	P value
Change in Calcium Score (Agatston units) (Mean±Standard error)	385 ± 438 AU	18 ± 42 AU	<0.0001
Male (%)	65%	38%	<0.0001
Age (Mean±SE)	56 ± 7 years	52 ± 9 years	<0.0001
Systolic Blood Pressure (Mean±SE)	127 ± 13 mmHg	122 ± 13 mmHg	<0.0001
HDL (Mean±SE)	47 ± 17	51 ± 16	<0.0001
Mean Initial PCRA (%)	9.4%	5.5%	<0.0001
Mean Initial FRS (%)	7.2%	3.6%	<0.0001

screening ($P < 0.0001$). While HRP had a mean PCRA of 9.4% (intermediate 10 year cardiovascular risk), they had a mean FRS of only 7.2% on enrollment (low risk).

Conclusions: Progression of atherosclerosis as measured by CAC is correlated strongly with higher initial PCRA and FRS scores. However, FRS may underestimate risk of future atherosclerotic progression.

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III-15 | Association of Progression of Coronary Calcium Score with Myocardial Infarction and Need for Revascularization in a Rural Cardiovascular Prevention Program

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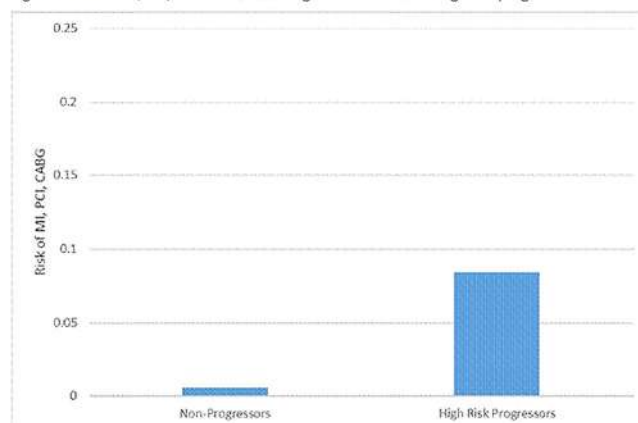
Background: This study examines the relationship between coronary artery calcium score (CAC) progression and incident myocardial infarction (MI) or need for revascularization by percutaneous coronary intervention (PCI) or coronary artery bypass (CABG).

Methods: Data were retrospectively analyzed for patients age > 18 who underwent at least two CAC screenings from 2/2008 to 2/2019. Patients were categorized as 'high risk progressors' (HRPs) if their CAC (1) went from zero to positive between scans, or (2) had a 15%/year increase, or (3) rose from < 300 to CAC ≥ 300. Remaining patients were categorized as 'non-progressors' (NPs). Patient charts

Table 1: Baseline characteristics and rate of MI/PCI/CABG

	High Risk Progressor	Non-Progressor	p value
Change in Calcium Score (Agatston units) (Mean±Standard error)	385 ± 438 AU	18 ± 42 AU	<0.0001
Male (%)	65%	38%	<0.0001
Age (Mean±SE)	56 ± 7 years	52 ± 9 years	<0.0001
Systolic Blood Pressure (Mean±SE)	127 ± 13 mmHg	122 ± 13 mmHg	<0.0001
BMI (Mean ±SE)	30.3 ± 5.3	29.1 ± 5.7	0.0003
Total Cholesterol (Mean ±SE)	194 ± 41	193 ± 40	0.86
HDL (Mean±SE)	47 ± 17	51 ± 16	<0.0001
MI (n)	1	5	0.62
PCI or CABG (n)	37	7	<0.0001
MI, PCI, or CABG (%)	9.4%	0.6%	<0.0001

Figure 1: Risk of MI, PCI, and CABG according to classification as high risk progressor



were searched for occurrence of MI or clinically indicated PCI or CABG during follow up. The Chi-square test was used for between group comparisons.

Results: 1,972 patients were analyzed who underwent two CAC scans on average 8.4 years apart. 395 were categorized as HRPs and 1,577 as NPs. Compared to NP patients, HRP patients had greater change in CAC, percent change/year, and were more likely to be male ($P < 0.0001$). The occurrence of MI, PCI, or CABG was significantly more frequent in HRPs compared to NPs (9.4% vs. 0.6%, $p < 0.0001$) (Table 1) with a relative risk of 14.8 (CI 7.4–29.2, $p < 0.0001$).

Conclusions: High rate of progression in calcium score may help predict higher incident MI and need for revascularization.

Disclosures: B. Simpson *Nothing to disclose*. C. K. Desai *Nothing to disclose*. R. Pham *Nothing to disclose*. T. Petraskova *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

III-16 | Rate of Increase in Calcium Score in General Population Over 8 years

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Background: Coronary artery calcium (CAC) scores are a proven means of estimating plaque burden as well as cardiovascular risk. It is an independent marker of risk for cardiac events, cardiac mortality, and all cause mortality. Studies have shown with an increase in age, the deposition of calcium increases. The purpose of this study is to assess the rate of change in calcium score in patients over a period of 8 years

Methods: Data were analyzed retrospectively of patients who underwent two calcium scans between February 2008 and February 2019 as part of comprehensive screening in the Sanford Health Cardiovascular Prevention. Total calcium score at each evaluation was recorded and analyzed.

Results: A total of 1972 patients was included in the analysis, mean patient age was 56.83 and 56.2% were female. The patients were followed for a mean period of 8.4 years. The average yearly change in calcium score was 11.08 ± 29.48 Agatston units (AU) per year.

Conclusions: Annual change in calcium score can be helpful in assessing the progression of coronary plaque burden.

Disclosures: A. Singh *Nothing to disclose*. C. K. Desai *Nothing to disclose*. G. Tiehen *Nothing to disclose*. T. Petraskova *Nothing to disclose*.

Variable	
Total number of patients screened	n = 1972
Mean Age	56.83 $\pm$ 9.49 years
Male	863 (43.8%)
Female	1109 (56.2%)
Screening years	8.41 $\pm$ 2.76 years
Absolute change in CAC score	93.24 $\pm$ 248.17 AU
Average yearly change in CAC score	11.08 $\pm$ 29.48 AU/year
Average Percent Change of CAC score per year	96.89 $\pm$ 284.44% AU/year

Table: Showing various population characteristics

P. Petrasko *Nothing to disclose*. V. Bares *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

III-17 | Utilization of pre-procedural multidetector cardiac computed tomography in Watchman device sizing: a single center experience

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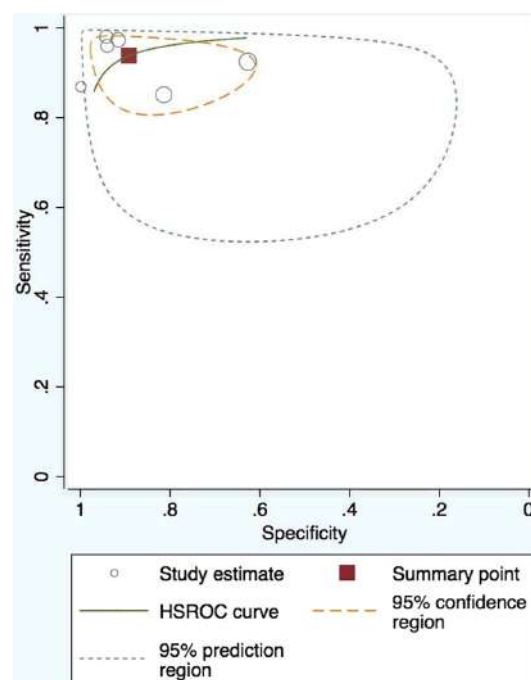
Background: Transesophageal echocardiography (TEE) is the recommended modality to define left atrial appendage (LAA) dimensions for device sizing in atrial fibrillation (AF) patients undergoing Watchman implantation. There is a paucity of data regarding the utilization of pre-procedural multi-detector computed tomography (MDCT) for device sizing.

Methods: Patients who underwent Watchman implantation at our hospital were identified, and patients who had pre-procedural MDCT were included. All patients had intraprocedural TEE. The maximum width of LAA ostium measured using MDCT (CT_{max}) and TEE (TEE_{max}) were correlated with final device size implanted.

Results: There were 62 patients (age 74 ± 8.2 years; CHA₂DS₂VASc 5 ± 1.7). CT_{max} better predicted the final device size implanted compared to TEE_{max} (46.8% vs 24.2%; $p = 0.01$). Watchman device comes in five different sizes - 21, 24, 27, 30 and 33mm. Mean difference between predicted device size and implanted device size was 0.7 sizes with CT_{max} compared to 1.2 sizes with TEE_{max} ($p = 0.002$). Implantation success was 98.2%. 2 patients had peri-procedural pericardial effusion requiring drainage. At 45 days, 1 peri-device leak >5mm was detected on TEE. No patients had device-related thrombosis or device related complications (device embolization, cardiac perforation or

	MDCT	TEE	N=62
LAA maximum width measurement (mm), mean	24.3	21.6	
sd	5	4.1	
LAA minimum width measurement (mm), mean	19.1		
sd	4.6		
Length of LAA (mm), mean	33.6		
sd	7.7		
Predicted device size using Max width (mm), median	27	24	
sd	3.75	3.75	
Implanted device size correlates with predicted device size	29	15	P = 0.01
%	46.8%	24.2%	
Size difference between predicted size and final implanted size, mean	0.7	1.2	P = 0.002
sd	0.8	0.9	
IQR	0-1	0.5-2.0	
Number of successful procedures	61		
%	98.2%		
Final deployed watchman size (mm), median	27		
sd	3.7		
range	21-33		

Table 1: A comparison of left atrial appendage (LAA) assessment using multidetector computed tomography (MDCT) and transesophageal echocardiography (TEE) in Watchman implantation. Sd: standard deviation; IQD: interquartile range.



comparative accuracy of non-invasive imaging techniques [(computed tomography (CT), magnetic resonance imaging (MRI), and echocardiography (Echo)] versus RHC.

Methods: Electronic databases were searched for relevant articles. Raw data were pooled using a bivariate model to calculate the diagnostic accuracy and to estimate Hierarchical Summary Receiver Operating Characteristic (HSROC) on Stata 13.

Results: A total of 61 articles (3294 patients) were selected, consisting of MRI (7), CT (27), and Echo (27) studies. The pooled sensitivity and specificity of MRI for diagnosing PH was 0.92 (95% confidence interval (CI) 0.88-0.96) and 0.86 (95% CI, 0.77-0.95), respectively. (Figure 1) The net sensitivities for CT scan and Echo were 0.79 (95% CI 0.72-0.89) and 0.85 (95% CI 0.83-0.91), respectively. (Figure 2,3) The overall specificity was 0.82 (0.76-0.92) for the CT scan and 0.71(95% CI 0.61-0.84) for Echo. The diagnostic odds ratio (DOR) for MRI was 124 (95% CI 36-433) compared to 30(95% CI 11-78) and 24(95% 11-38) for CT and Echo, respectively. These findings were consistent with the stratified analysis of varying PH diagnostic thresholds across the included studies. Chi-squared (χ^2) test showed moderate heterogeneity on the test for equality of sensitivities and specificities.

Conclusions: MRI has the highest sensitivity and specificity compared to CT and Echo. MRI can potentially serve as a safer alternative to RHC for the diagnosis of PH.

Disclosures: W. Ullah *Nothing to disclose*. S. Saleem *Nothing to disclose*. H. M. Abdullah *Nothing to disclose*. M. Khan *Nothing to disclose*. S. Collins *Nothing to disclose*. Y. Sattar *Nothing to disclose*. D. L. Fischman *Nothing to disclose*.

cardiac tamponade). 1 patient had ischemic stroke from paradoxical embolism related to iatrogenic atrial septal defect.

Conclusions: MDCT can more accurately assess the LAA size for Watchman device implantation compared to TEE. Procedural planning utilizing MDCT is associated with high implantation success and excellent procedural outcomes.

Disclosures: B. E. X. Tan *Nothing to disclose*. A. S. Abdullah *Nothing to disclose*. E. Alotaki *Nothing to disclose*. D. Chuprun *Nothing to disclose*. A. Shah *Nothing to disclose*. M. Rao *Nothing to disclose*. J. P. Depta *Nothing to disclose*.

III-18 | Comparative accuracy of non-invasive imaging versus right heart catheterization for the diagnosis of pulmonary hypertension: A meta-analysis

Waqas Ullah, Abington Jefferson Health, United States; Sameer Saleem, University of Kentucky, United States; Hafez Mohammad Abdullah, University of South Dakota, United States; Maria Khan, Ochsner Louisiana State University, United States; Sara Collins, Abington Jefferson Health, United States; Yasar Sattar, Icahn School of Medicine at Mount Sinai Elmhurst, United States; David Lee Fischman, Thomas Jefferson University Hospital, United States

Background: Right heart catheterization (RHC) is gold-standard for the diagnosis of pulmonary hypertension (PH) but at the cost of procedure-related complications. We sought to determine the

III-19 | Safety and Efficacy of Colchicine in Patients with Coronary Artery Disease: A systematic Review and Meta-Analysis

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Background: Given current evidence, the use of colchicine for the prevention of adverse cardiovascular events in patients with established coronary artery disease (CAD) remains disputed.

Methods: Multiple databases were queried to identify studies comparing the safety and efficacy of colchicine in patients with CAD (acute coronary syndrome (ACS) or stable angina). The primary efficacy endpoint was major adverse cardiovascular events (MACE), while major safety endpoint was gastrointestinal (GI) adverse events. Data were analyzed to calculate relative risk (RR) using a random-effects model.

Results: Six clinical trials comprising a total of 5820 patients were identified. The pooled RR of MACE (0.58, 95% confidence interval (CI) 0.31-1.10, $p=0.09$), and ACS (0.62, 95% CI 0.27-1.41, $p=0.25$) for colchicine was not significantly different from placebo or control groups. (Figure 1) The overall RR of stroke (0.26, 95% CI 0.11-0.62, $p=0.002$) was significantly lower while the net RR of GI adverse events was significantly higher (HR 2.66, 95% CI 1.21-5.87, $p=0.02$) in the colchicine group. (Figure 2) The overall number needed to treat (NNT) to prevent one MACE was 41 (95% CI, 27-91) while the number needed to harm (NNH) was 36 (95% CI, 21-120). The net clinical benefit (NCB), hence, favored the control group (-5). Propensity matched cohort, sensitivity and subgroup analysis; all mirrored the overall results.

Conclusions: In contrast to COLCOT trial, patients with established CAD, colchicine offers no significant reduction in major adverse cardiovascular events and could potentially be harmful due to a significantly higher risk of GI-related adverse events.

Disclosures: W. Ullah *Nothing to disclose*. S. N. Gowda *Nothing to disclose*. D. L. Fischman *Nothing to disclose*.

III-20 | The Usefulness of Computed Tomography Angiography Co-Registration with Real-Time Fluoroscopy in Chronic Total Occlusion Percutaneous Coronary Interventions

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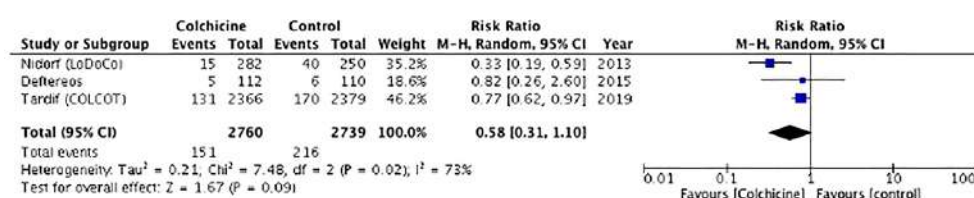


Figure 1: Forest Plot for MACE showing no significant difference of pooled RR for RCTs between colchicine and placebo or control.

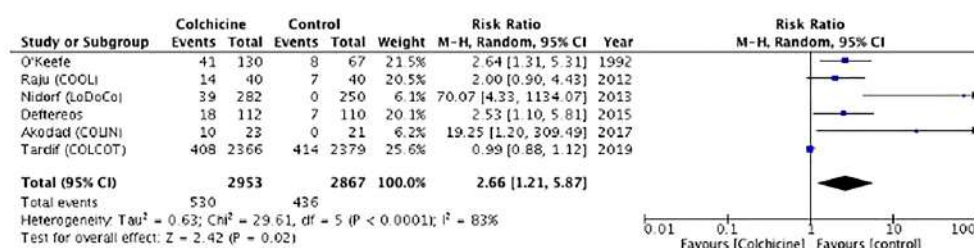


Figure 2: Forest Plot for gastrointestinal related adverse events showing significantly higher pooled RR for RCTs between colchicine and placebo or control.

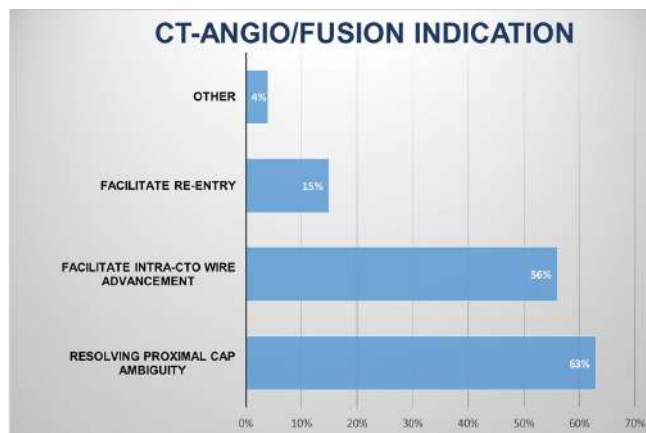
Background: Computed tomography angiography co-registration with real-time fluoroscopy (CT-angio/fluoroscopy fusion) may facilitate chronic total occlusion (CTO) percutaneous coronary intervention (PCI).

Methods: We reviewed 27 CTO PCIs performed under CT-angio/fluoroscopy fusion guidance between 2018 and 2019 (0.2% of all cases performed during the same period of time) at 2 centers using the Syngo coronary computed tomography angiography and coronary angiography co-registration system (Siemens).

Results: Mean patient age was 66 ± 9 years and 93% were men. The prevalence of cardiovascular risk factors such as dyslipidemia (96%), diabetes (44%), hypertension (85%) as well as prior PCI (77%) and prior coronary artery bypass graft surgery (33%) was high. The right coronary artery was the most common target vessel (56%) followed by the left anterior descending coronary artery (26%) and the circumflex (18%). The lesions were highly complex with J-CTO score being 3.3 ± 1.1 and PROGRESS-CTO score 1.5 ± 1.1 . The indications for CT-angio/fluoroscopy fusion are illustrated in the Figure. The antegrade/dissection re-entry approach was more frequently the successful crossing strategy (37%), followed by antegrade wiring (29%) and retrograde (19%). Technical success was 81% and no in-hospital major adverse events were noticed.

Conclusions: CT angio/fluoroscopy fusion is used mostly for resolving proximal cap ambiguity and facilitating intra-CTO wire advancement in highly complex CTO lesions with good results.

Disclosures: S. Garcia: Edwards Lifesciences: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; S. Banerjee: Medtronic: Consulting; AstrZeneca: Consulting; LIVMOR: Consulting and Spouse; E. S. Brilakis: Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study; I. Xenogiannis Nothing to disclose. A. R. Shah Nothing to disclose. M. A. Omer Nothing to disclose. M. S. Megaly Nothing to disclose. E. Vemmou



Nothing to disclose. I. Nikolakopoulos Nothing to disclose. L. Stanberry Nothing to disclose. B. V. Rangan Nothing to disclose. S. Abdullah Nothing to disclose. M. N. Burke Nothing to disclose.

INTRAVASCULAR IMAGING (IVUS/OCT/NIR/OTHER) AND PHYSIOLOGY (FFR/IFR/IMR/OTHER)

III-21 | Vascular Healing in Cancer Patients with Drug-Eluting Stents: An Optical Coherence Tomography Comparison to the Non-Cancer Population

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Background: Restenosis following percutaneous coronary intervention (PCI) has a complex pathophysiology, especially in cancer patients. We compared stent healing patterns between cancer and non-cancer patients with optical coherence tomography (OCT).

Methods: Cancer patients who underwent OCT <12 months post-PCI from 11/2009 to 11/2018 were retrospectively studied. Patients with a history of radiation therapy were excluded. Stent and strut coverage, apposition, expansion, in-stent restenosis, and neointimal hyperplasia were compared to literature values derived from non-cancer populations using exact Wilcoxon signed rank test. Comparisons of

Stent Parameter	Promus (1)			Stent Brand Resolute (2-4)			Xience (1,5,6)		
	Mean $\pm$ Standard Deviation	Literature Value	P-value	Mean $\pm$ Standard Deviation	Literature Value	P-value	Mean $\pm$ Standard Deviation	Literature Value	P-value
Mean Stent Coverage (%)	89.49 $\pm$ 12.38	97	0.313	79.09 $\pm$ 15.61	95.5	0.063	82.15 $\pm$ 3.15	73.3	0.5
Mean Stent Apposition (%)	96.28 $\pm$ 5.26	99.8	0.125	87.81 $\pm$ 12.94	98.1	0.125	99.24 $\pm$ 0.47	98.7	0.5
Mean Neointimal Hyperplasia (mm)	0.13 $\pm$ 0.12	0.105	1.0	0.06 $\pm$ 0.08	0.07	1.0	0.13 $\pm$ 0.04	0.091	0.5
Maximum In-Stent Restenosis (%)	NA	NA	NA	NA	NA	NA	33.37 $\pm$ 6.29	36.8	0.625

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parameters were adjusted for stent brand and time period between PCI and OCT evaluation to ensure valid comparisons. These parameters were also examined within the cancer population to assess differences among stent brands using linear mixed-effect models.

Results: Sixty-seven patients and 97 stents were analyzed for differences of stent healing among brands; 33 of the 67 patients (51 of the 97 stents) were compared to literature values. Patterns of stent healing were similar to the non-cancer population regardless of stent brand (Table). Stent brand did not significantly affect healing within the cancer population ($p \geq 0.2035$).

Conclusions: Cancer patients should not be precluded from receiving PCI with stent implantation since stent healing proceeds similarly to the non-cancer population.

Disclosures: M. K. Aziz *Nothing to disclose*. D. V. Balanescu *Nothing to disclose*. T. Donisan *Nothing to disclose*. B. Pushparaji *Nothing to disclose*. M. Hust *Nothing to disclose*. N. M. Ganim *Nothing to disclose*. J. Graham *Nothing to disclose*. T. Hoyt *Nothing to disclose*. H. Y. Lin *Nothing to disclose*. G. Tomakin *Nothing to disclose*. W. Ntim *Nothing to disclose*. N. Palaskas *Nothing to disclose*. J. C. Lopez-Mattei *Nothing to disclose*. P. Y. Kim *Nothing to disclose*. M. Cilingiroglu *Nothing to disclose*. K. Marmagkiolis *Nothing to disclose*. A. Deswal *Nothing to disclose*. M. D. Feldman *Nothing to disclose*. D. A. Molony *Nothing to disclose*. C. A. Iliescu *Nothing to disclose*.

III-22 | A meta-analysis of intra-coronary near-infrared spectroscopy for cardiovascular risk stratification

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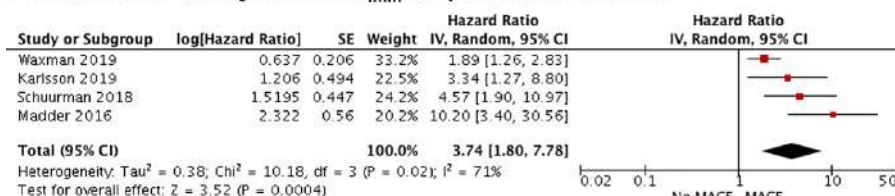
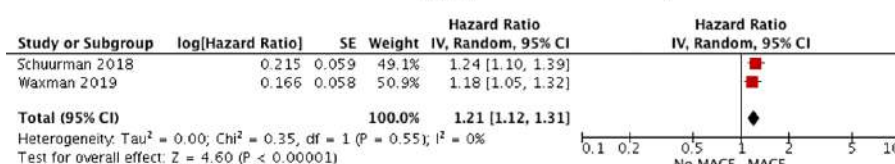
Background: Intracoronary near-infrared spectroscopy (NIRS) quantifies and localizes regions of coronary lipid deposition, allowing identification of lipid-rich plaques that could lead to major adverse cardiovascular events (MACE).

Methods: We performed a meta-analysis of five prospective studies that examined the association between coronary NIRS findings and subsequent incidence of cardiovascular events. Studies that reported coronary NIRS parameters including LCBI (lipid core burden index) and maxLCBI_{4mm} (maximum LCBI within a 4mm segment) in non-culprit vessel territories with at least one year of follow-up were analyzed.

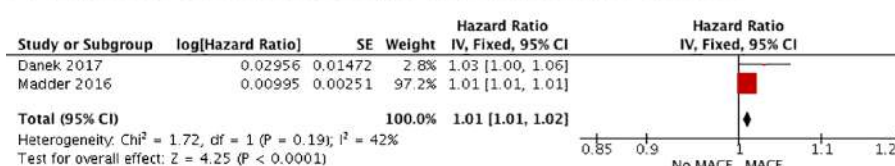
Results: The pooled patient cohort included 2,050 patients, 1,118 of whom (55%) had an acute coronary syndrome at the time of intravascular imaging. Mean age was 63.8 $\pm$ 10.3 years; 26% were women. Mean follow-up duration was 924 $\pm$ 474 days. Mean pooled LCBI was 51.3 $\pm$ 50.6. Mean pooled maxLCBI_{4mm} was 334.7 $\pm$ 180.8. LCBI as a continuous variable, maxLCBI_{4mm} as a continuous variable, and maxLCBI_{4mm} as a binary variable demonstrated association with future MACE during follow-up (Figure 1).

Conclusions: All intra-coronary NIRS parameters were associated with subsequent cardiovascular events. Intra-coronary NIRS is an emerging tool for identification of patients with high cardiovascular risk, which

Figure 1

Pooled HR for binary maxLCBI_{4mm} for prediction of MACEPooled HR for continuous maxLCBI_{4mm} per 100 units for prediction of MACE

Pooled HR for continuous LCBI per unit for prediction of MACE



could be used to guide patient-level primary and secondary prevention strategies.

Disclosures: J. E. Muller: *InfraRedx: Consulting*; E. S. Brilakis: *Abbott (St. Jude): Advisory Board/Board Member, Consulting and Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Biotronik: Speaker Bureau; CSI: Advisory Board/Board Member, Consulting and Speaker Bureau; Elsevier: Royalties; GE Healthcare: Advisory Board/Board Member, Consulting and Speaker Bureau; InfraRedx: Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; Teleflex: Speaker Bureau; Regeneron: Principal Investigator for a Research Study; Siemens: Principal Investigator for a Research Study*; B. A. Danek *Nothing to disclose*. A. Karatasakis *Nothing to disclose*. B. V. Rangan *Nothing to disclose*. T. Palecek *Nothing to disclose*.

III-23 | Using Machine Learning to Quantify the Three Mechanisms Causing Growth of Lesions in Coronary Arteries: Stagnant Flow, Reversal Flow and Collision of Antegrade and Retrograde Flow

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United States; Duy Doan, International SOS, Viet Nam; Gianluca Rigatelli, Cardiovascular Diagnosis And Endovascular Interventions, Italy

Background: Coronary artery disease is hypothesized to be caused by cavitation (explosion of air bubbles) which is seen frequently in domestic or industrial pipes. With distal negative suctioning in diastole, if the coronary dynamic pressure decreases below the vapor pressure (VP), bubbles will form. They implode when the coronary pressure recovers > the VP in systole and create jet waves weakening, rupturing the cap of plaques, triggering acute coronary syndrome (ACS). How could these events be located and tabulated by artificial intelligence (AI) program compared to human investigators?

Methods: Angiograms with culprit lesions (recorded at 15 frames/second) were reviewed frame by frame. The first frame was of the artery completely filled with contrast. The following frames showed the (white) blood moving in. The flow could be LAMINAR, TURBULENT (mixing of blood in white and contrast in black), STAGNANT (contrast standstill) or RETROGRADE (black column traveling backward). The turbulent flow reflects the collision between antegrade and retrograde flow. The investigations included the direction and duration of flows. The intensity of turbulence was measured by (1) length of coronary segment with turbulence (2) length of the stagnant flow and (3) retrograde flow. The AI programs were trained to Use the U-Net deep learning for medical image segmentation and then build the UNet model based on the previous dataset (Images, ImageMask)

Results: Angiograms of 20 patients showed laminar flow (85%) in diastole. The flow became turbulent in systole with diffuse coarse mixing of black (contrast) and white (blood) at the MID SEGMENT of the left

circumflex or the right coronary artery. The presence of stagnant flow and turbulence matched the location of 86% of ruptured plaques. The time of retrograde flow lasted more than 2 systoles. Special protocols were used successfully to train AI to recognize the lesions, antegrade, retrograde flow, turbulence and the persisting stagnant area.

Conclusions: This study showed that lesion was formed area with stagnant flow (smallest lesion), collision (ruptured plaques) observed by human investigators and recognized by AI. These results help to understand the genesis and offer precise prevention and treatment of ACS

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III-24 | Intravascular Ultrasound (IVUS) Use in Patients With Coronary Total Occlusion (CTO) Coronary Intervention

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Background: Chronic Total Occlusion (CTO) is defined as the occlusion of the coronary artery for 3 months of greater. CTO PCI has been associated with improvement in symptoms in patients with refractory symptoms. The purpose of this study was to assess the effect of IVUS on mortality and complications in these patients.

Methods: ICD 9 codes were used to extract the desired data points from NIS (national inpatient database). All patients who underwent percutaneous coronary intervention were isolated using the code 36.07. From this data the patients who underwent CTO intervention were identified using the code 414.2. The CTO interventions were divided into the ones with IVUS using the code 00.24 and the remaining without IVUS. Study population was matched for baseline characteristics and CCI (Charleston Comorbidity Index). All-cause mortality was compared between both the groups. Also complications such as vascular injury, hemopericardium, cardiac tamponade, pericardiocentesis, stroke and AKI were assessed between the groups.

Results: 4313 patients underwent CTO interventions with IVUS and 73504 patients underwent CTO interventions without IVUS. Mean age in the IVUS group was 64.6 years and in without IVUS group was 64.7 years. There was significant reduction in mortality with IVUS in the CTO population. Mortality was 1.69% in the group with IVUS vs

2.5% in the group without IVUS (adjusted OR 0.70, $p=0.006$). Interestingly the incidence of complications was slightly higher in the IVUS group such as vascular injury (2.1 vs 1.3%, $p=0.007$), AKI (9.3% vs 8.3%, $p=0.001$), cardiac tamponade (0.7 vs 0.25%, $p=0.001$), pericardiocentesis (0.3 vs 0.1%, $p=0.001$). Percentage of hemopericardium and stroke was higher in the IVUS group however was not statistically significant.

Conclusions: There was significant decrease in mortality with the use of IVUS in CTO intervention. Paradoxical increase in the complication rates was seen. Further well powered randomized controlled studies are needed to validate these findings.

Disclosures: U. Fatima *Nothing to disclose.* A. Awan *Nothing to disclose.* R. Ogunti *Nothing to disclose.* O. Olufajo *Nothing to disclose.* I. Okereke *Nothing to disclose.* P. Mehrotra *Nothing to disclose.* I. Opoku-Asare *Nothing to disclose.*

III-25 | Optical Coherence Tomography for the Assessment of Drug-Eluting Stent Healing in Radiation-Induced Coronary Artery Disease

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Background: Vascular inflammation induced by cancer pathophysiology and oncologic treatments, including radiation, may impair stent healing in cancer patients who underwent percutaneous coronary intervention (PCI). Optical coherence tomography (OCT) was utilized to compare stent healing parameters of those patients exposed to radiation therapy versus non-cancer patients.

Variation of Stent Healing Parameters Among Stent Brands as Compared to Published Literature Values

Stent Parameter	Promus (1)			Resolute (2-4)			Xience (1,5,6)		
	Mean $\pm$ SD	Literature Value	P-Value	Mean $\pm$ SD	Literature Value	P-Value	Mean $\pm$ SD	Literature Value	P-Value
Mean Stent Coverage (%)	91.35 $\pm$ 10.64	97	0.219	79.01 $\pm$ 15.61	95.5	0.063	83.47 $\pm$ 7.74	95.7	0.125
Mean Stent Apposition (%)	96.91 $\pm$ 4.43	99.8	0.031	87.81 $\pm$ 12.94	98.1	0.125	91.88 $\pm$ 5.71	93.2	0.875
Mean Neointimal Hyperplasia (mm)	0.14 $\pm$ 0.1	0.105	0.813	0.06 $\pm$ 0.08	0.07	1.0	0.07 $\pm$ 0.02	0.109	0.125
Maximum In-Stent Restenosis	NA	NA	NA	NA	NA	NA	32.7 $\pm$ 5.65	36.8	0.313

Methods: Cancer patients with history of radiation therapy who underwent OCT from 11/2009 to 11/2018 were retrospectively studied. OCT was performed within 12 months of intervention. Stent healing and pathologic parameters specifically stent coverage, apposition, expansion, neointimal hyperplasia and in-stent restenosis were compared to the published means in literature using Wilcoxon signed rank test.

Results: Differences in stent healing of target population versus published literature means were analyzed in 19 patients and 29 stents. Stent healing parameters were similar to non-cancer populations ($p \geq 0.5$). Stent healing within the radiation population was not significantly affected ($p \geq 0.125$, Table) when analyzed by stent brand.

Conclusions: Recent progress in stent design has modified the interventional cardiology field even for underrepresented cardio-oncology population. DES healing in RICAD is similar to the non-cancer population. These patients should not be precluded from receiving cardiovascular interventions based on the presumption of delayed healing and increased thrombotic risk with contemporary stents.

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III-26 | Relationship between the Severity of Physiological Stenosis and Long-term Clinical Outcome in Patients Who Underwent Percutaneous Coronary Intervention for Intermediate Coronary Lesions

Takashi Nagasaka, Gunma University Hospital, Japan

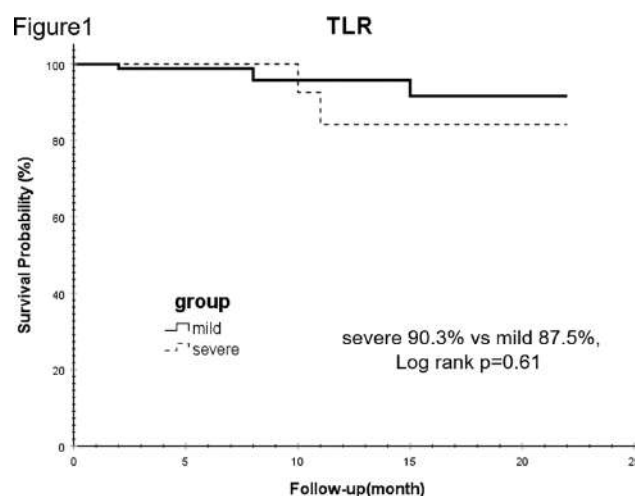
Background: Few studies have focused on the relationship between the severity of physiological stenosis based on FFR and clinical outcome in

patients who underwent PCI. Our aim in this study is to investigate the long-term clinical outcome of patients who underwent PCI after FFR and assessed the differences depending on the severity of FFR.

Methods: Between May 2016 and December 2018, a total of 148 intermediate coronary lesions evaluated by FFR and treated with PCI were enrolled. Lesions were divided into two groups as follows; mild group ($0.70 < \text{FFR} < 0.80$, $n=84$) and severe group ($\text{FFR} < 0.7$, $n=66$). The clinical outcomes and angiography findings were compared between the two groups during follow-up (mean 19.7 ± 4.3 months).

Results: There was no significant difference in age, gender, ejection fraction (EF) and medication at baseline between two groups. According to angiography finding, severe group had significantly lower mean FFR value (severe group; 0.61 ± 0.09 vs mild group; 0.76 ± 0.02 , $p < 0.01$) and longer lesion (severe group; 28.5 ± 10.1 mm vs mild group; 32.9 ± 12.9 mm, $p=0.029$). No significant difference was shown with respect to cardiac death, MI and TLR (Figure 1). Whereas, severe group was significantly associated with slow flow during PCI procedure (severe group; $18.2 \pm 9.6\%$ vs mild group; $10.7 \pm 7.1\%$, $p=0.039$).

Conclusions: This study showed clinical outcomes in patients who underwent PCI for intermediate coronary lesions were excellent



regardless of physiological stenosis severity based on FFR. However, it was revealed that physiological severity of coronary stenosis correlated with higher risks of slow flow during PCI procedure.

Disclosures: T. Nagasaka *Nothing to disclose.*

III-27 | External Elastic Lamina Stent Sizing by OCT – Safe and Effective?

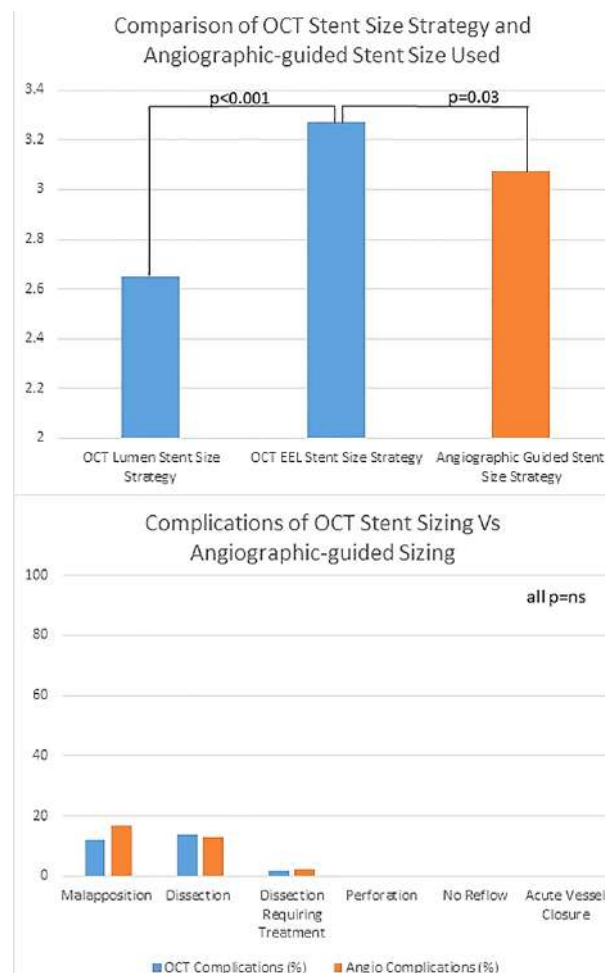
James Nguyen, St. Francis Hospital-The Heart Center, United States; Susan V. Thomas, St. Francis Hospital-The Heart Center, United States; Craig Porter, St. Francis Hospital-The Heart Center, United States; Evan Shlofmitz, MedStar Heart and Vascular Institute, MedStar Washington Hospital Center, United States; Yang Lu, St. Francis Hospital-The Heart Center, United States; Zhang Wei Chen, St. Francis Hospital-The Heart Center, United States; Akiko Maehara, Columbia University Medical Center, United States; Jeffrey W. Moses, Columbia University Medical Center, United States; Ziad A. Ali, Center for Interventional Vascular Therapy, Columbia University Medical Center, United States; Thomas W. Pappas, St. Francis Hospital-The Heart Center, United States; Richard A Shlofmitz, St. Francis Hospital-The Heart Center, United States; Allen Jeremias, St. Francis Hospital, United States

Background: Use of intracoronary imaging to aide stent sizing is associated with larger minimal stent area (MSA) when compared with angiographic guidance. There are two principle techniques for optical coherence tomography (OCT) guided percutaneous coronary intervention (PCI): a lumen based versus a more aggressive external elastic lamina (EEL) based strategy. However, there is concern that the EEL strategy can lead to an increase in acute procedural complications including coronary perforation and dissection.

Methods: We compared stent-sizing strategies in 227 patients; 179 with EEL-based sizing by OCT versus 48 with angiography guidance and final OCT only. EEL-based stent sizing is defined as the distal reference mean EEL diameter rounded down to the nearest 0.25mm stent size. A theoretical, lumen-based OCT strategy was calculated for comparison purposes.

Results: Mean age of the study population was 64 ± 17 years. In the OCT group, the mean EEL was 3.39 ± 0.7 , resulting in an actual mean stent diameter of 3.17 ± 0.52 ($p < 0.001$). The calculated OCT lumen strategy would have resulted in choosing a significant smaller stent size compared with a calculated EEL sizing (2.65 ± 0.51 vs 3.27 ± 0.57 , $p < 0.001$, Figure). A calculated EEL-based strategy was also superior to an angiographic-based approach (3.27 ± 0.57 vs 3.07 ± 0.52 , $p = 0.03$). No significant differences were noted in procedural complications between an OCT- versus angiographic-guided PCI (Figure).

Conclusions: An EEL-based stent sizing strategy resulted in larger stent diameters when compared with either OCT based luminal or angiographic approaches and appeared safe with respect to acute procedural outcomes.



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III-28 | Comparison of Culprit Plaque Morphology by Optical Coherence Tomography in Males and Females with acute Coronary Syndrome

Krishna Prasad Nevali, Post Graduate Institute of Medical Education and Research, India

Background: Cardiovascular disease has emerged as the leading cause of death all over India. Women fare worse after acute coronary syndrome than men. The differences in risk factors, comorbidities, hormonal profile, anatomical variation couldn't entirely establish the cause for increased severity of coronary artery disease in women. The aim of this study was to compare the culprit plaque characteristics in males and females presenting with acute coronary syndrome.

Methods: Fifty two patients were enrolled after screening 102 patients. All the patients undergoing coronary angiography after acute coronary syndrome (both STEMI and NSTEMI) were enrolled. All the patients underwent coronary angiography and the culprit vessel was identified followed by optical coherence tomography imaging in all the three vessels. Culprit plaque was identified as lipid rich, fibrous and fibrocalcific plaque. Then the culprit plaque is further identified as having plaque rupture, plaque erosion or calcific nodule. Vulnerable plaques are identified as presence of thin capped fibrous atheroma (< 65µm cap thickness) in a lipid rich plaque. Presence of Cholesterol crystals and Microvessels was also noted.

Results: Fifty-two patients, 29 males and 23 females were included in this study. Baseline characteristics were matched in both the groups. Majority of the patients had lipid rich (93.1 % vs 95.7 %) plaques without any significant gender based difference. Also, no significant differences were noted in minimum and maximum luminal diameters, spatial distribution of plaques and other plaques characteristics such as minimum fibrous cap thickness, thin-capped fibro-atheroma (TCFA) (65.5 % vs 73.9 %), plaque rupture (75.9 % vs 69.6 %), plaque erosion (20.6 % vs 26.08 %), calcific nodule (6.8 % vs 4.3 %), thrombus (31 % vs 52.1 %), Microvessels (44.8 % vs 52.2 %) and cholesterol crystals (48.3 % vs 52.2 %) presence in plaques. Lipid-rich plaque (94.2 %) is the predominant plaque variant and plaque rupture (72.4 %) is the predominant pathology in acute coronary syndrome patients. (males vs females)

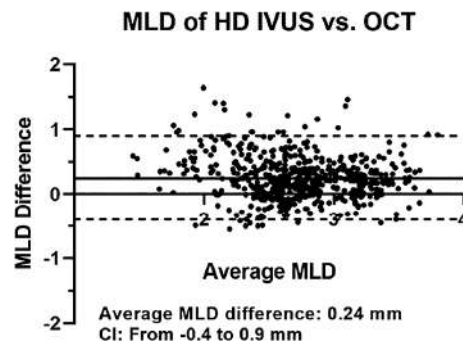
Conclusions: No significant gender based in-vivo differences were seen in plaque characteristics and spatial distribution of plaques in ACS patients by OCT imaging.

Disclosures: K. P. Nevali *Nothing to disclose.*

III-29 | Morphometric Comparison Between High-definition Intravascular Ultrasound and Optical Coherence Tomography

Saurabhi Samant, University of Nebraska Medical Center, United States; Majid Asawaer, University of Nebraska Medical Center, United States; Rahul Dhawan, University of Nebraska Medical Center, United States; Shijia Zhao, University of Nebraska Medical Center, United States; Wu Wei, University of Nebraska Medical Center, United States; Yiannis Chatzizisis, University of Nebraska Medical Center, United States

Background: Optimal stent sizing requires intracoronary imaging. HD IVUS (high-definition intravascular ultrasound) and OCT (optical



coherence tomography) are state-of-the-art in intracoronary imaging. Their morphometric agreement has never been studied. We sought to assess the differences in mean lumen diameter (MLD) and lumen area between HD IVUS and OCT.

Methods: 9 coronary arteries from 9 patients were imaged with both HD IVUS (60 MHz Opticross HD, Boston Scientific) and OCT (Dragonfly Optis, Abbott). HD IVUS and OCT pullbacks were performed at a speed of 1 mm/sec and 36 mm/sec, respectively. The pullbacks were co-registered using fiduciary points (e.g., branches) and segmented semi-automatically (Echoplague 4.0, INDEC). The MLD and lumen areas were compared at the same lumen cross-sections in HD IVUS and OCT pullbacks with Bland-Altman analysis.

Results: Analysis was performed on n = 564 cross-sections. Median MLD with HD IVUS was 2.8 (2.5, 3.1) mm and with OCT 2.6 (2.3, 2.9) mm. The median lumen area with HD IVUS was 6.1 (5.0, 7.7) mm² and with OCT was 5.3 (4.2, 6.6) mm². The average MLD and lumen area difference between HD IVUS vs. OCT was 0.24 (-0.4, 0.9) mm and 0.9 (-1.6, 3.6) mm², respectively (Figure).

Conclusions: MLD and lumen area assessed by HD IVUS is consistently higher than OCT by 0.24 mm and 0.9 mm², respectively. Interventionalists should be aware of this difference between these two modalities when it comes to optimal stent sizing.

Disclosures: Y. Chatzizisis: *Boston Scientific Corp.: Advisory Board/Board Member, Principal Investigator for a Research Study and Speaker Bureau; Medtronic: Principal Investigator for a Research Study;* S. Samant *Nothing to disclose.* M. Asawaer *Nothing to disclose.* R. Dhawan *Nothing to disclose.* S. Zhao *Nothing to disclose.* W. Wei *Nothing to disclose.*

III-30 | 3D Reconstruction of Coronary Artery Bifurcations Using Coronary Angiography and Optical Coherence Tomography: Validation and Feasibility

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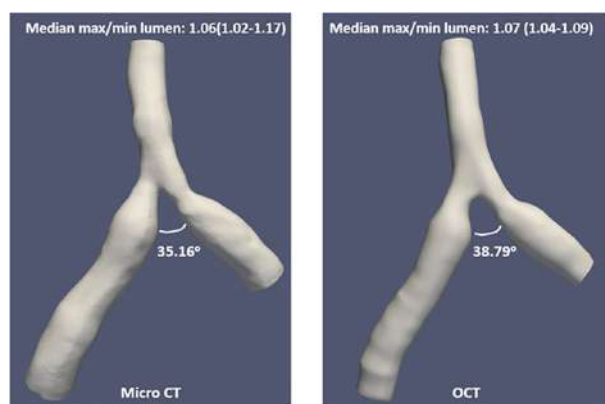
University of Nebraska Medical Center, United States; Claudio Chiastra, Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Italy; Marco Bologna, Department of Electronics, Information and Bioengineering, Politecnico di Milano, Italy, Italy; Francesco Migliavacca, Department of Chemistry, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Italy; Ghassan Kassab, California Medical Innovations Institute, United States; Yiannis Chatzizisis, University of Nebraska Medical Center, United States

Background: To describe and validate a novel methodology for 3D reconstruction of coronary bifurcations using Angiography and Optical Coherence Tomography (OCT).

Methods: We generated 5 silicone-based patient-specific coronary bifurcations, which were imaged with angiography, OCT, and contrast-enhanced μ CT of the main vessel and side branch. The 3D course of the bifurcation centerline was extracted from two angiographic planes. The OCT images were segmented, aligned along the centerline and interpolated with a custom-built algorithm to generate the bifurcation lumen. The lumen area, shape, and angle of the reconstructed bifurcations were compared to μ CT reference. To account for the inherent discrepancies of lumen areas between OCT and μ CT, they were normalized using the z-score. Bland-Altman and linear regression analysis were used to assess the agreement between methods. The reproducibility, feasibility and speed of the algorithm were tested in 7 human coronary bifurcations.

Results: There was significantly high agreement between the 3D OCT and μ CT in terms of lumen area ($r^2=0.94$, $y=0.97x+0$; $p<0.001$), lumen shape assessed as maximum/minimum lumen dimensions [OCT median=1.14 (1.08-1.35), μ CT median=1.13 (1.06-1.38)], and bifurcation angles ($r^2=0.98$, $y=0.98x+1.27$; $p<0.001$) **Figure**. The proposed method was highly reproducible with comparable lumen area ($r^2=0.98$, $y=0.95x+0.19$; $p<0.001$), shape and angles (average difference= 0.08° (-8.1° - 8.2°)). The average reconstruction time was 4 hours.

Conclusions: 3D reconstruction of coronary bifurcations using angiography and OCT is a feasible, accurate, reproducible, and fast approach.



Disclosures: Y. Chatzizisis: Boston Scientific Corp.: Advisory Board/ Board Member, Principal Investigator for a Research Study and Speaker Bureau; Medtronic: Principal Investigator for a Research Study; W. Wu Nothing to disclose. S. Samant Nothing to disclose. S. Zhao Nothing to disclose. G. D. Zwart Nothing to disclose. N. Georgantzoglou Nothing to disclose. C. Chiastra Nothing to disclose. M. Bologna Nothing to disclose. F. Migliavacca Nothing to disclose. G. Kassab Nothing to disclose.

III-31 | Resting Coronary Physiological Index (Pd/Pa) Correlates with FFR but not Angiographic Severity in Calcified Coronary Arteries

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Background: Fractional flow reserve (FFR) allows for more accurate assessment of the benefit of revascularization for intermediate coronary artery lesions than coronary angiography alone. Prior studies show a poor correlation between angiographic stenosis and FFR in arteries with significant calcification, but the utility of resting coronary physiological indices in calcified arteries is not well defined. The purpose of this study is to determine the impact of coronary calcification on the correlation between resting whole-cycle distal coronary artery pressure/aortic pressure ratio (Pd/Pa) and FFR.

Methods: This study included 200 consecutive patients undergoing FFR evaluation of a single obstructive lesion of intermediate severity (40-80%). Coronary calcium was quantified based upon radiopacities at the site of the stenosis on angiography using the method of Mintz *et al* (0 = none or mild calcium, 1 = moderate calcium, 2 = severe calcium).

Results: Mean age was 61 ± 11 years and 34% were female. The average degree of stenosis and length of the lesions evaluated with FFR were $60 \pm 12\%$ and 14.0 ± 8.5 mm, respectively with 51% of lesions being located in the left anterior descending. There were 109, 45, and 46 patients with calcium scores of 0, 1, and 2, respectively. The mean FFR was 0.83 ± 0.08 and mean Pd/Pa was 0.93 ± 0.05 . The correlation between angiographic severity and FFR decreased as lesion calcification increased [calcium score = 0 ($R^2 = 0.25$, $P < 0.005$); calcium score = 1 ($R^2 = 0.11$, $P < 0.005$); calcium score = 2 ($R^2 = 0.02$, $P = 0.35$)]. The same trend was found between angiographic severity and Pd/Pa [calcium score = 0 ($R^2 = 0.15$, $P < 0.005$); calcium score = 1 ($R^2 = 0.14$, $P < 0.01$); calcium score = 2 ($R^2 = 0.004$, $P = 0.69$)]. There was a significant positive correlation between FFR and Pd/Pa irrespective of lesion calcification [calcium score = 0 ($R^2 = 0.53$, $P < 0.005$); calcium score = 1 ($R^2 = 0.34$, $P < 0.005$); calcium score = 2 ($R^2 = 0.55$, $P < 0.005$)].

Conclusions: For severely calcified coronary lesions, there was positive correlation between Pd/Pa and FFR but no correlation between angiographic stenosis and either Pd/Pa or FFR. Pd/Pa is a more effective tool than angiographic stenosis alone in determining the hemodynamic significance of calcified coronary artery lesions.

Disclosures: M. Sattler *Nothing to disclose*. J. Moscona *Nothing to disclose*. P. Johnson *Nothing to disclose*. C. Madamanchi *Nothing to disclose*. G. A. Stouffer *Nothing to disclose*.

III-32 | Characteristics and Morphology of Culprit Lesions in Stemi and Nstemi by Optical Coherence Tomography – A Single Center, Real-World Experience

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Background: Our study sought to identify plaque characteristics and underlying morphology of culprit vessel lesions in ST Segment Elevation Myocardial Infarction (STEMI) and Non ST Segment Elevation Myocardial Infarction (NSTEMI) patients using optical coherence tomography (OCT) imaging.

Methods: We identified 116 patients who underwent OCT imaging during catheterization at University of Miami Hospital from 2011-2019. We selected cases that underwent cardiac catheterization in the setting of STEMI or NSTEMI. We then analyzed and interpreted each OCT image and assessed plaque morphology, lesion characteristics, presence of thrombus, and other lesions details. We used a Chi-Squared test for categorical variables, and a T-Test to compare the means.

Results: Among the 116 patients who underwent OCT imaging, 12 had STEMI and 11 had NSTEMI. The patients with NSTEMI tended to be older (64.4 vs 57.8 years old $p:0.88$) and have a larger BMI (33 vs 30 $p:0.80$). Overall, the culprit vessel for NSTEMI versus STEMI was the LAD (45% vs 58.9%) followed by the RCA (27% vs 33.3%) and LCX (18.2% vs 8.3%). Unstable plaque characteristics (82% vs 18% $p:0.037$) and presence of thrombus (73% vs 27% $p:0.059$) were more frequent in the STEMI group. The most common unstable plaque characteristic in the STEMI group was plaque rupture (63.6%) followed by plaque erosion (9%) and calcified nodule (9%). Fibroatheromatous plaque was the most common morphology in NSTEMI (54.5%). Among the culprit lesions that had <70% stenosis angiographically and underwent further evaluation with OCT, 67% underwent further PCI and 33% did not undergo further intervention

but were treated with medical management. The observed incidence of in-stent restenosis (ISR) in the entire myocardial infarction population studied was 43%, the most observed location for the ISR being intra-stent (50%), and the extent of disease was most frequently focal (70%).

Conclusions: We conclude that in STEMI and NSTEMI, using OCT in addition to angiographic assessment of culprit lesion may influence and optimize the treatment strategy with PCI.

Disclosures: D. Sharp Dimitri *Nothing to disclose*. A. W. Panakos *Nothing to disclose*. O. Olorunfemi *Nothing to disclose*. S. Perez *Nothing to disclose*. V. Karantalis *Nothing to disclose*. M. G. Cohen *Nothing to disclose*. C. E. Alfonso *Nothing to disclose*.

III-33 | Ninety-Day Outcomes in Patients Without Percutaneous Coronary Interventions after Fractional Flow Reserve: An Analysis of 2010-2014 National Readmission Database

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Background: Fractional Flow Reserve (FFR) interrogates the direct pressure difference across a coronary stenosis to determine a lesion's physiological and clinical significance. Across multiple randomized trials, FFR has been shown to improve outcomes over angiography-guided percutaneous coronary intervention (PCI). However, limited outcomes data exist in patients undergoing FFR without subsequent PCI.

Methods: We retrospectively analyzed all hospitalizations in the Nationwide Readmissions Database for FFR from 2010 to 2014 using ICD-9 CM procedure codes. We examined 90-day outcomes including readmission and revascularization rates in patients who were discharged without undergoing PCI after FFR. Multivariate logistic regression was used to identify independent predictors of readmission and the need for revascularization.

Results: A total of 32,607 patients underwent FFR between 2010 and 2014. Of those, 16,367 (50.2%) did not undergo PCI. Unrevascularized patients were more commonly female (41.6% vs

32.8%, $p < 0.001$) and had a higher rate of Elixhauser comorbidity score >4 (41.6% vs 24.5%, $p < 0.001$). The unrevascularized cohort had more 90-day readmissions (23.6% vs 21.6%, $p < 0.001$), and 6.5% of these patients underwent PCI during readmission. Angina and ischemic heart disease were the most common reasons for readmission (14.8%). Independent predictors of readmission among unrevascularized patients were chronic pulmonary disease (OR 1.42, CI 1.30-1.55, $p < 0.001$), peripheral vascular disease (PVD) (OR 1.43, CI 1.29-1.59, $p < 0.001$), and discharge disposition to a facility (OR 1.52, CI 1.33-1.75, $p < 0.001$). The strongest independent predictors of need for revascularization included diabetes mellitus (DM) (OR 1.42, CI 1.09-1.86, $p < 0.01$) and PVD (OR 1.95, CI 1.41-2.68, $p < 0.001$).

Conclusions: Readmission within 90-days is common in patients who are not revascularized after FFR. DM and PVD were independent predictors of 90-day readmission and PCI in patients who were medically managed during the index hospitalization. Further studies will need to clarify which patients would benefit from revascularization despite a reassuring FFR.

Disclosures: O. Unlu *Nothing to disclose*. S. A. McCullough *Nothing to disclose*. D. N. Feldman *Nothing to disclose*. J. W. Cheung *Nothing to disclose*. S. C. Wong *Nothing to disclose*. R. M. Minutello *Nothing to disclose*. H. S. Singh *Nothing to disclose*. G. W. Bergman *Nothing to disclose*. J. Spitz *Nothing to disclose*. L. K. Kim *Nothing to disclose*.

TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)

III-34 | Incidence, Predictors and Outcomes of Permanent Pacemaker Implantation Following Transcatheter Aortic Valve Replacement: A Single Center Experience

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Background: The need for permanent pacemaker (PPM) implantation after transcatheter aortic valve replacement (TAVR) remains a frequent barrier despite the continuous improvement in that field. As TAVR is moving towards lower-risk and younger patient population, it is crucial to understand the predictors and adverse outcomes of PPM implantation following TAVR

Methods: This is a retrospective chart review of 1,044 patients underwent TAVR in a single center between April 2012 and January 2019.

183 patients (17.5%) had pacemaker implanted pre-procedure were excluded. Baseline characteristics, preoperative data, operative characteristics and postoperative outcomes were collected. Comparison between proportions was made using either two-sample T-tests or ANOVA. For clinical outcomes of interest, both multivariate logistic regression analyses and propensity-scoring adjustments were employed. All the EKGs were reviewed by board-certified cardiologists

Results: PPM placement was required within 30 days of TAVR in 155 of 861 patients (18%). Among patients who received Medtronic valve, 23.4% had PPM compared to 17.2% among who received Edwards valve. These findings were not statistically significant ($P=0.13$). Positive predictors of PPM placement were peri-procedure EKG of right bundle branch block [RBBB] (odds ratio [OR]: 5.6; $p < 0.0001$), left anterior fascicular block [LAFB] (OR: 2.2; $p=0.004$) and Mobitz Type I atrioventricular block [AVB] (OR: 13.8; $p=0.02$). With multivariate analysis, statistical significance was lost for both LAFB ($p=0.8$) and Mobitz type I AVB ($p=0.17$). PPM implantation was associated with prolonged ventilator 24-hours use (9.8% vs 3.4%; $p=0.0006$) and new postoperative dialysis (7.8% vs 0.84%; $p < 0.0001$). PPM implantation was also associated with increased mortality (RR: 2.34; $p=0.03$) and prolonged mean hospital stay (8.7 days vs 6.6 days)

Conclusions: The need for PPM implantation early after TAVR is common. It is associated with longer hospital stay, prolonged ventilator use, new post TAVR dialysis and higher mortality. Peri-procedure baseline EKG with RBBB emerged as a predictor of PPM insertion following TAVR which can carry out an additional morbidity and mortality risk

Disclosures: A. K. Abdallah *Nothing to disclose*. M. Nores *Nothing to disclose*. T. James *Nothing to disclose*. E. Donath *Nothing to disclose*. A. Valdivia *Nothing to disclose*. S. Stamou *Nothing to disclose*.

III-35 | Safety and efficacy of MyVal transcatheter heart valve for treatment of severe symptomatic aortic stenosis at 30-days

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Background: Transcatheter aortic valve intervention (TAVI) is widely used less invasive procedure for management of severe symptomatic aortic stenosis in low, intermediate and high surgical risk patients. New generation balloon expandable valves are being used recently. Limited data about the new balloon expandable valve compared with currently established valves in the literature.

Methods: We retrospectively reviewed adult patients with severe aortic stenosis who had TAVI via trans-femoral access using MyVal THV at our center in November 2019. Demographic data, medical and surgical history, clinical presentation, periprocedural and

echocardiographic data were reviewed for each patient. Primary end-point was 30-day mortality, post-procedural major cardiovascular events and paravalvular leak. Secondary endpoints were functional status of patients and re-hospitalization at 30-day follow-up.

Results: Seven consecutive patients who underwent TAVI due to severe symptomatic aortic stenosis were included. Mean age was 72 ± 8 and 6(85.7%) were males. Frailty index was calculated and Society of thoracic surgeon risk score(STS) for mortality was 3.2 to 4.1 %. Procedural success was achieved in all patients with no intra-procedural complications. Post-TAVI, one patient had bifascicular block and junctional rhythm which needed permanent pacemaker implantation 10-days post-procedure. Another patient had left bundle branch block but was managed medically. At 30 days, all patients reported improvement in New York Heart Association functional status. Post-procedure echocardiography results revealed one patient had intrinsic mild aortic regurgitation and 2 patients had mild paravalvular leak. Mean aortic valve gradients decreased from 49.6 ± 12.6 at baseline to 10.6 ± 3.5 post-procedure. There were no mortality, myocardial infarction, stroke, major vascular access complications or any cause for re-hospitalization at 30 days

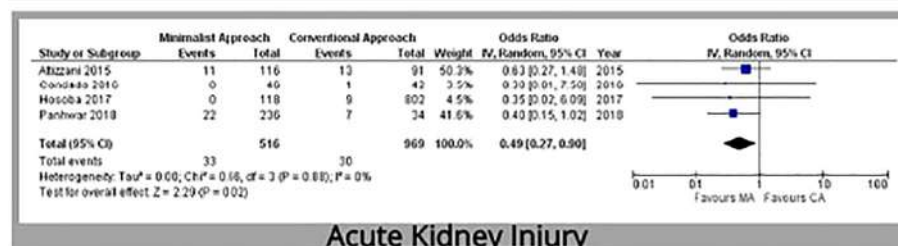
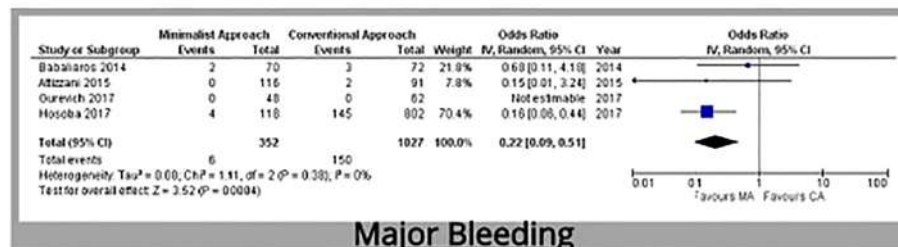
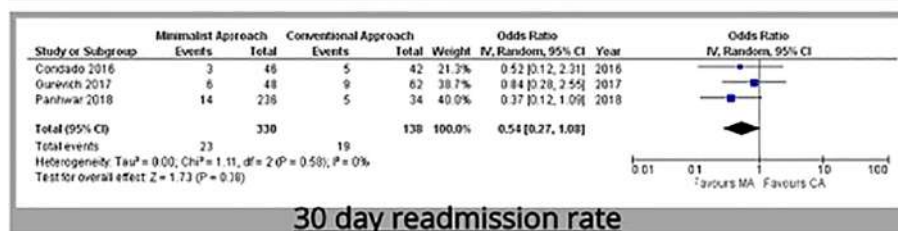
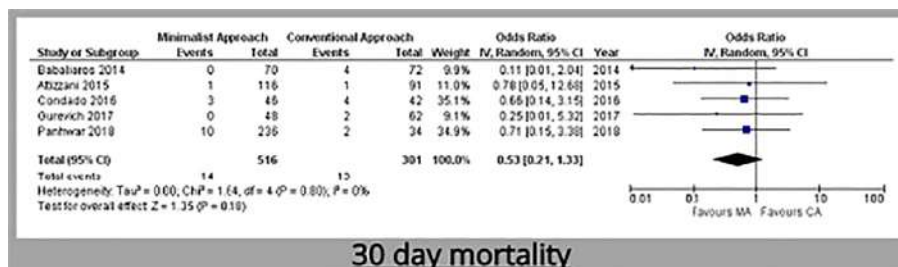
Conclusions: TAVI using MyVal THV was safe and achieved procedural success in all our patients with minimal adverse event at 30 days. Improvement in functional status and hemodynamic outcomes was reported at follow-up*.

*At five months those patients will have Cardiac CT for follow up and more data will be added.

Disclosures: N. A. Al-Asiri, MD *Nothing to disclose*. A. A. Al Asiri, MD *Nothing to disclose*. S. Samargandy *Nothing to disclose*. A. Al-Moghairi *Nothing to disclose*. H. Alamri *Nothing to disclose*.

III-36 | A meta-analysis on minimalist versus conventional standard approach comparing mortality and outcomes of transcatheter aortic valve replacement

Dinesh Reddy Apala, Creighton University, United States; Aravdeep Jhand, University of Nebraska Medical Center, United States; Ramya Reddy Ginugu, none, India; Bashar K Ramadan, Creighton University, United States; Jocelyn Taylor, Creighton University, United States



Background: Minimalist approach (MA) has been increasingly used for TAVR with studies showing comparable outcomes to conventional approach (CA). A minimalist approach includes • Local anesthesia +/- conscious sedation • Done in Catheterization lab • Percutaneous access • No intraoperative TEE • Immediate removal of temporary pacer wires post procedure • Peripheral IV line • No urinary catheter

Methods: PubMed, Cochrane and Web of Science databases were systematically searched for studies comparing two approaches. Outcomes of interest were success rate, mortality and complication rates. The analysis was performed using DerSimonian and Laird random effect model. OR and 95% CI were calculated.

Results: Six studies met out inclusion criteria with a total of 1,737 patients (634 in MA and 1103 in CA groups). There was no statistically significant difference in preoperative risk assessment between two groups as compared by STS. Device success rate was comparable between two groups.

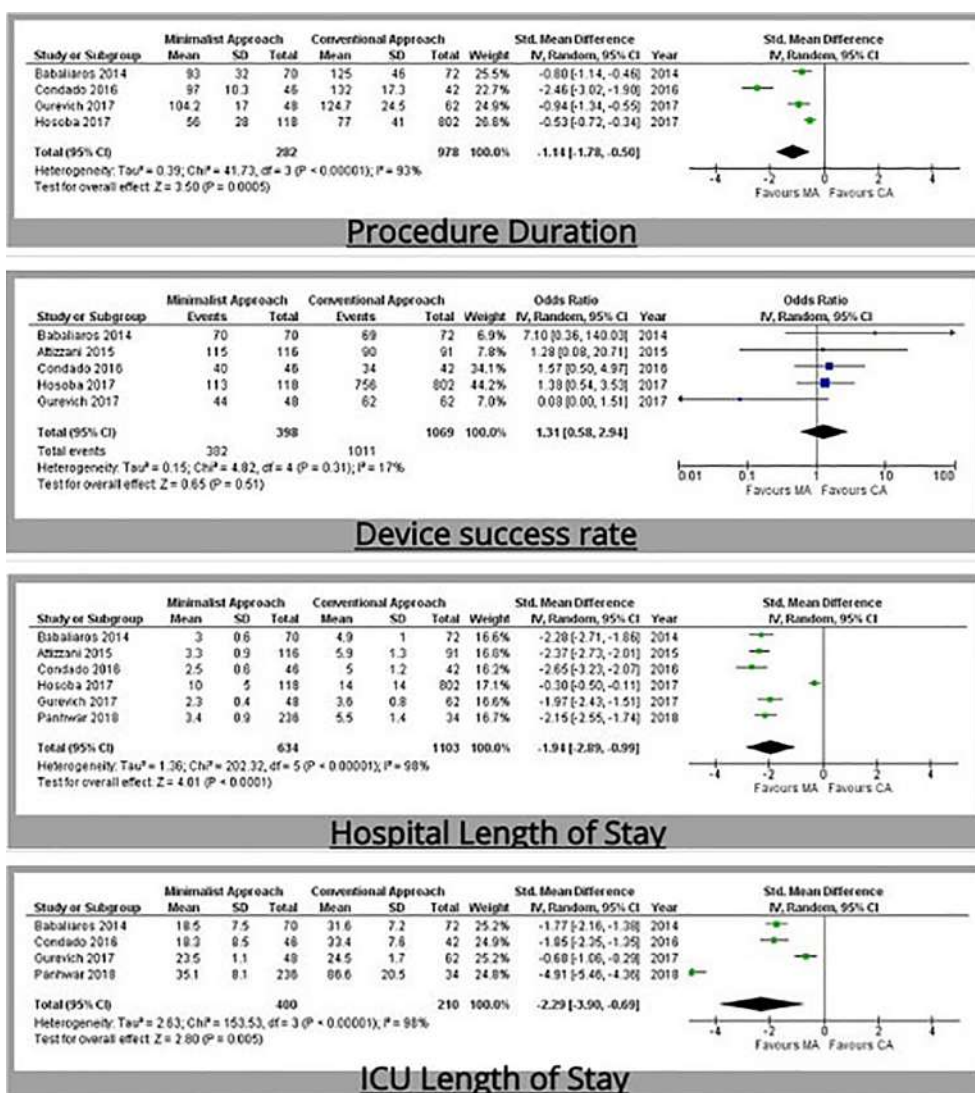
Minimalist approach had no difference in In-hospital & 30day mortality, 30day readmission rate, major vascular complications, para-

valvular leak, new pacemaker requirement or stroke incidence when compared to convention approach. The incidence of major bleeding and AKI were significantly lower in minimalist group. (See fig. below)
Conclusions: Our analysis shows that Minimalist approach for TAVR had better outcomes in terms of major bleeding, AKI and similar outcomes in other variables compared to conventional approach and can be safely used in routine practice.

Disclosures: D. R. Apala *Nothing to disclose*. A. Jhand *Nothing to disclose*. R. R. Ginugu *Nothing to disclose*. B. K. Ramadan *Nothing to disclose*. J. Taylor *Nothing to disclose*.

III-37 | A Meta-Analysis of the impact of Minimalist versus Conventional standard approach on ICU and Hospital length of stay for Transcatheter Aortic Valve Replacement

Dinesh Reddy Apala, Creighton University, United States; Aravdeep Jhand, University of Nebraska Medical Center, United States; Ramya



Reddy Ginugu, Mamata Medical College, India; Bashar K Ramadan, Creighton University, United States; Jocelyn Taylor, Creighton University, United States

Background: Minimalist approach (MA) has been increasingly used for TAVR with studies showing good outcomes as compared to conventional approach (CA). A minimalist approach includes • Local anesthesia +/- conscious sedation • Done in Catheterization lab • Percutaneous access • No intraoperative TEE • Immediate removal of temporary pacer wires post procedure • Peripheral IV line • No urinary catheter As opposed to Conventional approach requiring general anesthesia, operating room, intraoperative TEE, pacer wires for 1-2 days, central iv line and urinary catheter. We conducted this meta-analysis to evaluate for procedure duration, efficacy, ICU and hospital length of stay comparing two approaches.

Methods: PubMed, Cochrane and Web of Science databases were systematically searched for studies comparing two approaches. The analysis was performed using DerSimonian and Laird random effect model. OR and 95% CI were calculated.

Results: Six studies met out inclusion criteria with a total of 1,737 patients (634 in MA and 1103 in CA groups). There was no statistically significant difference in preoperative risk assessment between two groups as compared by STS score. Device success rate was comparable between two groups.

When compared to CA, MA not only had significantly lower procedure time, fluoroscopy time, contrast volume (see fig. below) but also had significantly shorter ICU length of stay and Hospital length of stay.

Conclusions: Our analysis shows that Minimalist approach for TAVR had significantly lesser ICU and Hospital length of stays with shorter procedure duration and similar efficacy profile as compared to conventional approach

Disclosures: D. R. Apala *Nothing to disclose*. A. Jhand *Nothing to disclose*. R. R. Ginugu *Nothing to disclose*. B. K. Ramadan *Nothing to disclose*. J. Taylor *Nothing to disclose*.

III-38 | Patient Satisfaction After Transcatheter Aortic Valve Replacement

Imran Baig, Geisinger Medical, United States; Amir Eslami, Geisinger Medical Center, United States; Tanawan Riangwiwat, Geisinger Medical Center, United States; Shikhar Agarwal, Geisinger Medical Center, United States

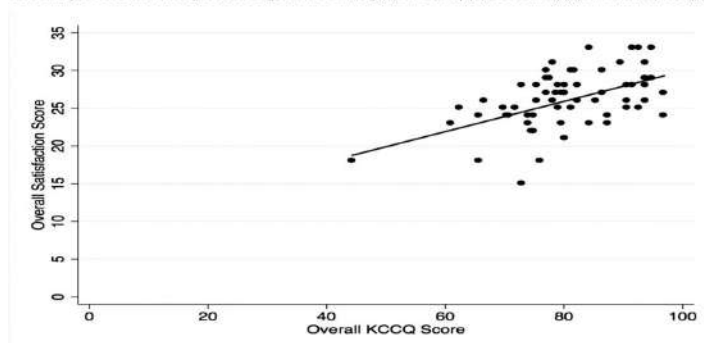
Background: Questionnaire (KCCQ) which is used to assess Quality of Life (QoL) after TAVR, is difficult for several elderly patients to comprehend. The aim of this study were to correlate our patient satisfaction questionnaire with the current KCCQ in patients undergoing TAVR.

Methods: The questionnaire was administered at one week and one month after TAVR. It had seven simple questions (Questionnaire 1.A). Score ranged from 7 to 33, higher scores indicating higher satisfaction. A categorical question, specific to TAVR – “Would you have this TAVR procedure again?” was included.

118 patients, including 63 males and 55 females, between May 2018 – June 2019. 95 patients completed the survey at both 1 week and 1 month.

Quality of Life Post TAVR Survey (Questionnaire; 1.A)

1. How much has your shortness of breath improved after the procedure? a. Significantly (4) b. Somewhat improved (3) c. Worsened (2) d. Unchanged (1)
2. On average, how frequently can perform activities of enjoyment/daily living without significant symptoms? a. Every day (5) b. Most days (>3 days) (4) c. Some days (< or equal to 3 days) (3) d. Infrequently (once per week) (2) e. Unable to perform ADL's consistently (1)
3. On average, how many days per week do you have chest pain or discomfort that limits your activity? a. Every day (5) b. Most days (>3 days) (4) c. Some days (< or equal to 3 days) (3) d. Infrequently (once per week) (2) e. None at all (1)
4. How would you rate your current satisfaction with ability to perform desires/activities at your discretion? a. Highly satisfied (Able to perform all activities without limitation) (5) b. Satisfied (Able to perform most activities without difficulty) (4) c. Not satisfied (Can perform activities but with non-limiting symptoms) (3) d. Dissatisfied (Have limitations in my desires due to physical symptoms) (2) e. Very dissatisfied (I have had to change the way I live life due to symptoms) (1)
5. My family would rate my current quality of life as? a. Excellent (5) b. Good (4) c. Fair (3) d. Poor (2) e. Debilitated (1)
6. On average, how many days per week do you feel limited by fatigue/lack of energy? a. Every day (5) b. Most days (>3 days) (4) c. Some days (< or equal to 3 days) (3) d. Infrequently (once per week) (2) e. None at all (1)
7. Would you have this TAVR procedure again? a. Definitely (4) b. Possibly (3) c. Less likely (2) d. Definitely Not (1)



(Figure 1.B)

Results: At 1 week, the proportion of patients indicating that they would definitely have TAVR again was 49.5% which increased to 68.4% at 1 month follow up ($p < 0.001$). Median (IQR) total satisfaction score increased from 24 (22-26) at one week to 26 (24-29) at one month ($p < 0.001$ using Wilcoxon sign rank test). Using pairwise correlation, a moderate degree of correlation between one month satisfaction scores and the one month KCCQ scores in our cohort of post TAVR patients (correlation coefficient: 0.51, $p < 0.001$) (Figure 1, B).

Conclusions: One can summarize that HRQoL assessed using KCCQ may not be completely applicable to the TAVR cohort due to differences between the heart failure and TAVR patients, with a moderate degree of correlation observed. In this prospective study, we have validated a simple 7-question survey evaluating patient satisfaction at 1-week and 1-month after TAVR, which may be applicable to a wide variety of settings.

Disclosures: I. Baig *Nothing to disclose*. A. Eslami *Nothing to disclose*. T. Rianguiwat *Nothing to disclose*. S. Agarwal *Nothing to disclose*.

III-39 | Alcohol May Not Be the Answer: Sequential Alcohol Septal Ablation and Transcatheter Aortic Valve Replacement

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Background: Severe aortic stenosis (AS) and hypertrophic obstructive cardiomyopathy (HOCM) pose diagnostic dilemmas for many practitioners. In patients who have these concomitant entities, it may be difficult to discern not only the cause of the patient's symptoms but also the management strategy to undertake. In patients who are high-risk for surgery, percutaneous transcatheter therapies have become reasonable treatment options.

Methods: We report a case of a 73 year old male with history of CAD status post multivessel coronary bypass surgery and HOCM with severe AS who presented with progressively worsening dyspnea on exertion & fatigue. On echocardiogram, he was found to have a heavily calcified aortic valve with a mean gradient of 40 mmHg, Aortic valve area (AVA) of 0.8 cm^2 , basal septal thickness of 24 mm and a left ventricular outflow tract (LVOT) peak gradient of 52 mmHg with systolic anterior motion of the mitral valve.

Results: Because patient was deemed high risk for surgery with re-sternotomy, he underwent successful septal alcohol ablation. Weeks later, patient continued to be symptomatic with repeat imaging revealing a significant mean aortic valve gradient of 42 mmHg and AVA of 0.6 cm^2 by 3D-Planimetry and basal septal thickness of

12 mm and an LVOT peak gradient of 8 mmHg. Patient underwent successful TAVR with 29 mm Edwards Sapien 3 resulting in immediate hemodynamic improvement with a reduction of peak-peak gradient from 60 mmHg to 3 mmHg. Patient reported significant improvement in symptoms and functional status.

Conclusions: Previous case reports of patients undergoing TAVR with unaddressed HOCM have resulted in poor outcomes. In patients undergoing TAVR, septal hypertrophy can result in malpositioning and migration of the valve. Relieving the afterload associated with AS with TAVR in a patient with uncorrected subvalvular obstruction with a hypertrophic septum can result in hemodynamic compromise and pulmonary edema. For this reason, our patient underwent alcohol septal ablation prior to TAVR in order to prevent these complications. This unique case not only highlights a novel approach in managing patients with combined HOCM and severe AS in high-surgical risk patients but also illustrates feasibility with favorable outcomes.

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III-40 | Evaluating The Predictability And Clinical Significance Of Patient-Prosthesis Mismatch In Transcatheter Aortic Valve Replacement

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Background: Poor outcomes associated with PPM in surgical AVR have been well-described. Our aim was to assess the correlation

Table 1. Patient outcomes, by actual PPM

	No Mismatch (EOAi > 0.85 cm^2/m^2) N = 302	Mismatch (EOAi ≤ 0.85 cm^2/m^2) N = 44	p-value
Mean AV Gradient (Median mmHg)	4.0	5.0	0.004
Length of Stay (Median, days)	2.0	3.5	0.108
One-Year All-Cause Mortality (Freq.)*	31 (10.1%)	6 (14.1%)	0.974
Total Complications (Freq.)	24 (8.0%)	4 (9.1%)	0.768
One-Month Change in KCCQ12 (Median)	20.8	28.1	0.200
One-Year Change in KCCQ12 (Median)	24.0	29.2	0.250

*Only patients with TAVR performed prior to 6/2018 were assessed for mortality to ensure availability of one-year follow-up data.

between predicted vs. actual PPM in TAVR patients and to assess the impact of PPM on outcomes.

Methods: A retrospective review of 346 TAVR patients from 1/2017 - 11/2018 was performed. Effective orifice area indexed to body surface area (EOAi) was predicted based on published tables using valve type, annulus diameter, and BSA. Actual EOA_i was calculated using intraoperative TEE measurements. PPM was defined by EOA_i ≤ 0.85 cm²/m². Accuracy of predicted PPM was assessed. Differences in outcomes, including mean gradient, length of stay, mortality, complications, and change in Kansas City Cardiomyopathy Questionnaire score (KCCQ-12), were evaluated based on actual PPM.

Results: Of the 346 patients, 45 (13.0%) were predicted to have PPM; 44 (12.7%) were found to have true PPM on TEE. However, the sensitivity of the prediction was 25.0%. Neither predicted PPM ($p=0.269$) nor valve type ($p=0.897$) were predictors of actual PPM. Patients with higher BMI were more likely to have PPM ($p=0.002$). There was no correlation between calcium score and PPM ($p=0.764$). Patients with PPM had a greater post-op mean AV gradient (5.0 vs. 4.0 mmHg, $p=0.004$). There was no association between PPM and length of stay, complication rate, change in quality of life, or one-year mortality (Table 1).

Conclusions: Pre-operative prediction of PPM in TAVR patients using tables of expected EOA demonstrates variation from actual PPM. There was also no association between valve type and actual PPM. Further, the clinical significance of PPM in TAVR patients remains to be determined.

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III-41 | Association Between Pre-operative Quantitative Measures Of Aortic Stenosis And Quality Of Life Improvement Outcomes After Transcatheter Aortic Valve Replacement

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Background: Assessment of the degree of aortic stenosis (AS) is vital for determining timing of intervention. However, up to 40% of patients present with discordant grading of AS on TTE measurements. Our aim was to evaluate the utility of TTE and multi-detector CT (MDCT) measurements in predicting symptomatic improvement after TAVR.

Methods: A retrospective review of 201 TAVR patients who completed 30-day follow-up from 1/2017 to 11/2018 was performed. Pre- and post-operative quality of life was measured using the Kansas City Cardiomyopathy Questionnaire (KCCQ-12). Pre-operative measurements including aortic valve dimensionless index (DI), stroke volume index (SVI), mean transaortic gradient (MG), peak transaortic velocity, aortic valve calcium score, indexed aortic valve area (AVA) based on TTE, and AVA based on hybrid MDCT-doppler calculations were obtained and correlated with change in 30-day postop KCCQ-12.

Results: Among the 201 patients, the median KCCQ-12 improved from 54.2 to 85.9. Patients with MG of >40 mmHg were found to have a greater improvement in KCCQ-12 than those with MG ≤40 mmHg (median 28.1 vs. 16.4, $p=0.015$). Patients with a hybrid MDCT-calculated AVA of ≤1.2 cm² had greater improvements in KCCQ-12 than those with MDCT-calculated AVA of >1.2 cm²

	n	Median	n	Median	p-value
Dimensionless Index (DI)					
		DI ≤0.25		DI >0.25	
	139	22.9	62	18.3	0.390
Stroke Volume Index (SVI)					
		SVI ≤35		SVI >35	
	16	31.8	185	20.8	0.342
Mean Transaortic Gradient					
		MG ≤40		MG >40	
	104	16.4	97	28.1	0.015
Peak Transaortic Velocity					
		Velocity ≤4		Velocity >4	
	98	21.4	103	22.9	0.230
Aortic Valve Calcium Score					
		Score ≤2000 (Men), Score ≤1200 (Women)		Score >2000 (Men), Score >1200 (Women)	
	64	16.4	133	22.9	0.230
MDCT Annulus Area (AVA)					
		AVA ≤1.2		AVA >1.2	
	165	23.4	36	14.1	0.049
Indexed AVA					
		AVAI <0.60		AVAI ≥0.60	
	187	22.6	14	16.5	0.407

(median 23.4 vs. 14.1, $p=0.049$). There was no association between other preoperative measurements and postoperative changes in KCCQ-12 (Table 1).

Conclusions: Pre-operative MG and hybrid MDCT-calculated AVA are most predictive of increased improvement in quality of life after TAVR in our study. This may suggest that such measurements should be given more weight when selecting patients for TAVR.

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III-42 | Recovery of Intrinsic Atrioventricular Conduction after Pacemaker Implantation in Transcatheter Aortic Valve Replacement

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Background: The permanency of high-grade atrioventricular block after TAVR is poorly understood. We sought to assess the percentage of TAVR patients who recovered intrinsic atrioventricular (AV) conduction after permanent pacemaker (PPM) implantation and identify potential EKG predictors of recovery.

Methods: Multi-center retrospective analysis of 533 patients who underwent TAVR procedures was conducted. Patients who required PPM implantation were identified. Baseline demographics, EKG characteristics, type of TAVR valve, size of TAVR, time to PPM, type of PPM, and subsequent device interrogations were collected. Underlying rhythms on EKG, device interrogations, and as indicated on outpatient clinic notes were reviewed to determine AV conduction recovery.

Results: 533 patients who underwent TAVR procedures from 2015 to 2019 at three centers were reviewed. 5.1% of patients required PPM implantation. 20 patients received Balloon Expandable Valves (BEV) and 7 patients received Self Expanding Valves (SEV). The average age of patients in the study were 84.5 ± 8.7 years. 7.8% of patients who received SEV and 4.5% of patients who received BEV required pacemakers. 11 patients had lead-less pacemakers and 16 patients had conventional pacemakers implanted (3 single chamber, 12 dual chamber, and 1 bi-ventricular ICD). The mean time to PPM implant was 3.3 ± 4.5 days. 50% of TAVR patients who had a PPM implanted had recovery of AV conduction at 6 months follow up. 65% of BEV patients had AV conduction recovery. One of SEV patients was lost to

follow up and of the remaining SEV patients 0% had AV conduction recovery at an average follow up of 14 ± 10 months. BEV patients who recovered AV conduction had significantly shorter PR lengths (169 ± 22 ms vs. 248 ± 85 ms; $p = 0.024$).

Conclusions: 65% of BEV patients who had a PPM implanted recovered intrinsic AV conduction while 0% of SEV patients did. Shorter PR interval at baseline was shown to be an EKG predictor of AV conduction recovery among BEV patients. Our results suggest that lead-less pacemakers may be a reasonable alternative to conventional pacemakers in patients who receive balloon expandable TAVR valves without evidence of first-degree AV block at baseline.

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III-43 | Feasibility of Ferumoxytol Enhanced MR Angiography Guided Transcatheter Aortic Valve Replacement in Patients with Chronic Kidney Disease

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Background: Ferumoxytol enhanced MR angiography (FE MRA) is an imaging modality that avoids the risk of contrast induced nephrotoxicity or nephrogenic systemic fibrosis. We sought to assess the accuracy, reliability, and safety of FE MRA for guiding TAVR procedures in patients with underlying chronic kidney disease (CKD).

Methods: 23 patients with underlying renal insufficiency underwent 3 Tesla (3T) FE MRA for pre-TAVR planning. Aortic root measurements, distance from aortic root to coronary ostia, and aorto-ilio-femoral vasculature measurements were obtained and utilized for TAVR procedural planning. Predicted TAVR valve size based on annular area obtained from FE MRA was compared to actual TAVR valve size implanted after angiographic confirmation using a paired t test. Creatinine levels before and after FE MRA acquisition were also compared using a paired t test. Annular and vascular complications peri-operatively were evaluated in each case. Para-valvular leak and prosthetic valve stenosis was evaluated at 30 days.

Results: 3T FE MRA was performed without complications in all 23 patients. The average age of patients in the study were 78.6 ± 13.1 years. 95.6% of patients had underlying renal insufficiency with at least CKD stage 3 (mean Cr 2.10, mean eGFR 33). There was excellent procedural success with a 96% successful TAVR implantation rate (22 patients). In one patient a TAVR valve was unable to be deployed due to severe aortic regurgitation. There were no statistically significant differences between predicted valve size based on annular area measured by FE MRA and final valve size implanted after angiographic confirmation ($p = 0.428$). There were no statistically significant differences between creatinine pre and post FE MRA acquisition ($p = 0.335$). There were no annular complications nor major/minor vascular complications in any of the cases. At 30 days post procedure, no patients had prosthetic valve stenosis and 95% of patients had no or mild para-valvular leak.

Conclusions: FE MRA is an accurate, reliable, and safe imaging modality for guiding successful TAVR procedures in patients with underlying chronic kidney disease without the risk of nephrotoxicity or nephrogenic systemic fibrosis.

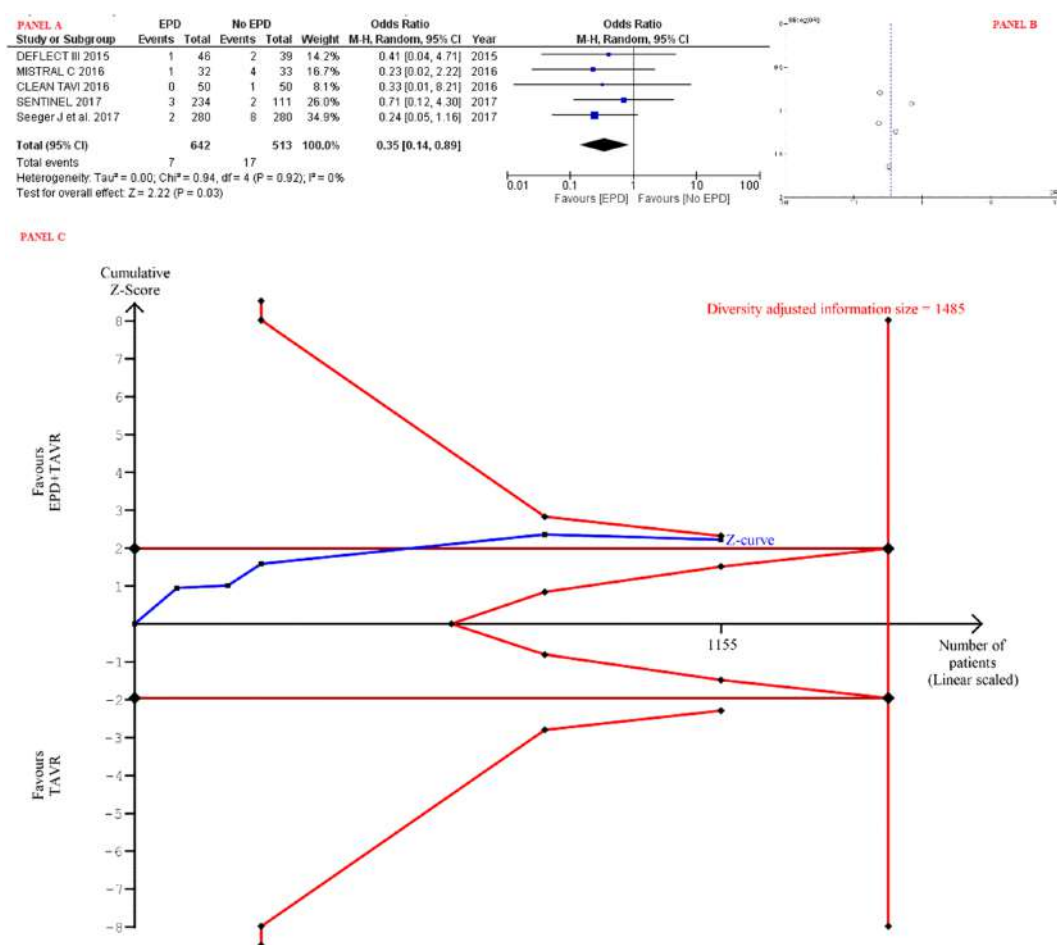
Disclosures: H. H. K. Choy *Nothing to disclose*. H. Agrawal *Nothing to disclose*. D. Melo *Nothing to disclose*. I. Mallawaarachchi *Nothing to disclose*. K. Ordovas *Nothing to disclose*. K. Kallianos *Nothing to disclose*. T. Scott *Nothing to disclose*. S. Lin *Nothing to disclose*. S. Sarwary

Nothing to disclose. M. Hope *Nothing to disclose*. K. A. Shunk *Nothing to disclose*. J. Zimmet *Nothing to disclose*. V. S. Mahadevan *Nothing to disclose*.

III-44 | Use of embolic protection device in transcatheter aortic valve replacement and its effect on all-cause mortality: A meta-analysis with trial sequential analysis

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Background: The role embolic protection device (EPD) in preventing stroke during transcatheter aortic valve replacement (TAVR) procedures is well established. The present meta-analysis with trial



sequential analysis focused on the effect of EPD on all-cause mortality. All results from randomized control trials (RCTs) and propensity score-matched (PSM) studies were pooled in the present meta-analysis.

Methods: A comprehensive systematic search of the PubMed and EMBASE database was performed to identify relevant articles. We used Mantel-Haenszel method with random effect model to calculate odds ratio (OR) with 95% confidence interval (CI). Trial sequential analysis (TSA) was performed to look for the possibility of a type II error in the pooled estimates.

Results: Four RCTs and 1 PSM study were included in the final analysis. Use of EPD with TAVR resulted in statistically significant reduction in the incidence of all-cause mortality [OR: 0.34, 95%CI: 0.14-0.82, P-value < 0.05, I²=0%, Chi-square P-value=0.92] [Figure 1, PANEL A]. Funnel plot did not indicate publication bias [Figure 1, PANEL B]. TSA indicated the possibility of type 2 error, and need for further randomization to reach an information size of 1485 for conclusive evidence [Figure 1, PANEL C].

Conclusions: EPD with TAVR reduced the incidence of all-cause mortality significantly as compared to TAVR alone. However as reported by TSA, further studies are required for conclusive evidence.

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III-45 | Automated Tracking of Potential TAVR Patients with EHR-Based Population Health Tools

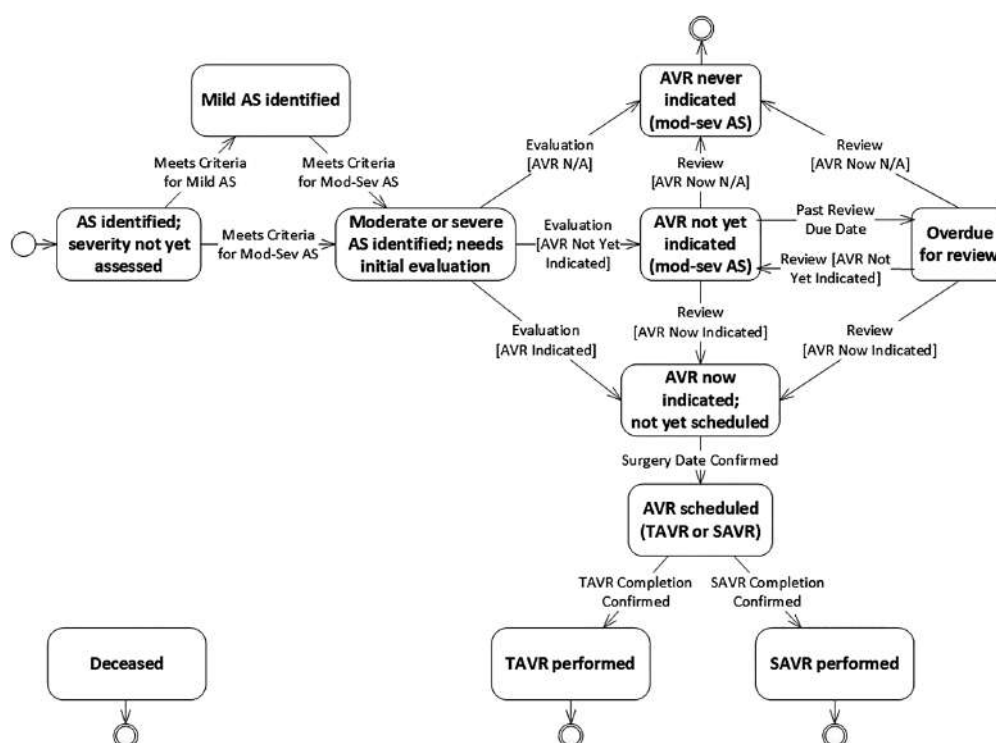
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Background: Given the proven benefits of properly-timed aortic valve replacement (TAVR or SAVR), patients with aortic stenosis constitute an important population worth managing well. The prevalence of AS patients who could benefit from an AVR procedure continues to increase. However, many patients still fail to be identified as potential intervention candidates. And even among those diagnosed with AS, a substantial percentage fail to consistently receive guideline-recommended evaluations and treatment.

Methods: We employed our EHR's (Epic) native Chronic Disease Registry and Care Path capabilities to track patients with AS through their treatment journey. The initial patient inclusion rule for the registry was broad, including patients with either a diagnosis or echo findings of AS.

The care path was modeled as a state diagram following steps in the patient's evaluation and management journey.

Results: 3,885 patients populated the Aortic Stenosis (AS) registry. Of those, 818 (21%) had digital cardiology reporting data. 273/818 (33%)



had severe AS and no prior aortic valve replacement (AVR). Of these 273 patients with unoperated severe AS, 45 had no record of a visit with a cardiologist or cardiothoracic surgeon in our institution, providing a potential care gap for further evaluation.

Conclusions: Data generated in EHR and related systems during the course of care for patients with the aortic stenosis can pragmatically populate a patient registry and Care Path bolstering the aims of a Structural Valve Program. Standard EHR features can be leveraged to create Registry and Care Path designs shareable across EHR instances.

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III-46 | Cardiac Hemodynamic and Remodeling Patterns Following Transcatheter Aortic Valve Replacement

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Background: Transcatheter aortic valve replacement (TAVR) is becoming the established and preferred intervention for aortic stenosis of all severities, compared to surgery. TAVR is linked to enhanced long-term cardiac hemodynamics, reversal of left ventricle (LV) hypertrophy and improved aortic valve gradients. We present a

retrospective observational study assessing cardiac remodeling and valvular flow patterns post-TAVR.

Methods: Retrospective echocardiographic data was collected, evaluating cardiac function and valvular flow patterns before and after TAVR. Date was compiled and statistically analyzed using a paired t-test evaluating variations at approximately 30 days and 1-year post-TAVR.

Results: Statistically significant changes were seen across aortic valve velocities and gradients, aortic root diameter, and doppler velocity index changes post-TAVR. Paradoxical increase LVOT (left ventricular outflow tract) peak velocity was observed at 1-year post-TAVR (Table 1).

Conclusions: TAVR clearly demonstrates improvement in valvular flow patterns and flow across the aortic valve, and trend towards reduction in LV mass. Large longitudinal studies are needed to further evaluate cardiac hemodynamic and remodeling patterns beyond 1 year.

Disclosures: J. Feghaly *Nothing to disclose*. Z. Oman *Nothing to disclose*. D. Das *Nothing to disclose*. S. Smart *Nothing to disclose*.

III-47 | Permanent Pacemaker Implantation Post-TAVR: Do Patient Characteristics Have an Impact on Pacemaker Requirement

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Table 1. Study Findings

	Pre-TAVR echocardiogram (n=76)			Post-TAVR first echocardiogram (mean: 33 days) (n=72)			Post-TAVR follow-up echocardiogram (mean: 327 days) (n=36)		
	Mean	95% CI		Mean	95% CI	p-value	Mean	95% CI	p-value
LV mass, g	247	(224, 270)		235	(209, 261)	0.32	232	(202, 261)	0.074
LV mass index, g/m ²	130	(118, 141)		116	(105, 128)	0.16	117	(103, 131)	0.06
LV ejection fraction, %	58	(55, 62)		58	(54, 61)	0.62	56	(52, 61)	0.28
AV mean gradient, mmHg	36	(33, 41)		8.8	(7.7, 10.1)	*2.55 x10 ⁻²⁰	10.9	(8.9, 12.9)	*1.90 x10 ⁻⁴
AV mean velocity, cm/s	282	(265, 299)		131	(101, 161)	*1.08 x10 ⁻¹	157	(138, 176)	*0.036
AV peak gradient, mmHg	62	(56, 69)		17	(15, 20)	*2.57 x10 ⁻¹⁷	19	(16, 23)	*5.27 x10 ⁻⁴
AV peak velocity, cm/s	374	(352, 397)		195	(179, 211)	*2.10 x10 ⁻¹⁸	219	(203, 236)	*5.03 x10 ⁻⁴
AV VTI, cm	91	(85, 98)		41	(35, 46)	*2.32 x10 ⁻⁵	49	(43, 55)	*8.10 x10 ⁻⁴
AV area, cm ²	0.77	(0.72, 0.82)		1.77	(1.61, 1.92)	*1.22 x10 ⁻¹¹	1.74	(1.56, 1.93)	*4.11 x10 ⁻⁴
AV area index, cm ² /m ²	0.40	(0.37, 0.43)		0.90	(0.81, 0.98)	*7.17 x10 ⁻¹⁴	0.87	(0.77, 0.97)	*2.48 x10 ⁻⁴
Aortic root diameter, cm	3.14	(3.03, 3.25)		3.13	(3.00, 3.26)	0.55	2.91	(2.70, 3.11)	*0.009
LVOT diameter, cm	2.10	(1.99, 2.21)		2.05	(2.01, 2.10)	0.75	2.11	(2.02, 2.19)	0.40
LVOT peak velocity, cm/s	95	(89, 102)		99	(92, 106)	0.40	113	(102, 124)	*0.010
LVOT peak gradient, mmHg	5.02	(3.47, 6.57)		4.74	(3.36, 6.13)	0.30	5.74	(4.26, 7.22)	0.075
LVOT mean velocity, cm/s	75	(66, 84)		77	(68, 87)	0.90	64	(51, 77)	0.38
LVOT mean gradient, mmHg	2.98	(1.90, 4.06)		2.54	(2.21, 3.67)	0.34	2.98	(2.26, 3.70)	*0.045
LVOT VTI, cm	22.6	(20.4, 24.9)		21.9	(19.0, 25.0)	0.66	24.4	(21.8, 27.0)	0.94
LVOT stroke volume, ml	78	(71, 86)		72	(52, 91)	0.86	80	(48, 112)	0.36
LVOT stroke volume index, ml/m ²	40.9	(37.1, 44.7)		35.6	(24.0, 47.2)	0.88	38.9	(24.5, 53.2)	0.38
LVOT cardiac output, ml/min	5900	(5265, 6535)		5364	(3442, 7285)	0.26	6250	(4352, 8150)	0.42
LVOT cardiac index, ml/min-m ²	3076	(2773, 3379)		2659	(1544, 3773)	0.24	3002	(2161, 3842)	0.18
DVI with LVOT VTI	0.24	(0.23, 0.26)		0.60	(0.49, 0.71)	*2.34 x10 ⁻⁵	0.55	(0.46, 0.63)	*2.62 x10 ⁻⁴

*statistically significant, p-value <0.05

AV: aortic valve, CI: confidence interval, DVI: doppler velocity index, LV: left ventricle, LVOT: left ventricular outflow tract, SD: standard deviation, TAVR: transcatheter aortic valve replacement, VTI: velocity time integral

/ Baylor Scott & White Health, United States; Michael DiMaio, Baylor Scott & White Health, United States; Molly Szerlip, Heart Hospital Baylor Plano, United States; Robert C. Stoler, Baylor Scott & White Heart and Vascular Hospital - Dallas, United States; Katherine Brooks Harrington, The Heart Hospital Baylor, United States; Anita Krueger, Baylor Scott & White Health, United States; Robert Hebel, Baylor Scott & White Health, United States; Michael J Mack, Baylor Scott&White Health, United States; R. Jay Widmer, Texas A&M HSC College of Medicine / Baylor Scott & White Health, United States

Background: Permanent pacemaker (PPM) implantation remains a frequent complication of transcatheter aortic valve replacement (TAVR). Initial studies with early generations of both balloon-expandable (BE) and self-expanding (SE) valves showed significantly higher PPM rates with a SE prosthesis and conduction abnormalities. Despite imaging and implantation technique improvements PPM rates remain significant. We sought to investigate valve type and patient characteristics that could be associated with PPM implant post-TAVR.

Methods: All patients undergoing commercial (non-research) TAVR in a single healthcare system were analyzed. Descriptive statistics using median and interquartile range (IQR) for continuous variables as well as percentages for dichotomous variables followed by one-way ANOVA to compare differences in patients that did and did not require PPM.

Results: A total of 2586 underwent TAVR implantation during the study duration with 2188 patients without prior PPM included in our study. In total, 265 (12.1%) underwent PPM implantation after TAVR either during the index hospitalization or within 1 year of TAVR. PPM rates with BE valves was 178/1562 (11.4%) while 84/591 (14.2%) patients had a SE valve ($p=0.13$). The median age of TAVR patients with PPM implant was 80.7 years (IQR 73.6, 86.7) vs 80.4 (IQR 73.6 vs 86.1), and 59.3% vs 52.7% male. There was no difference in PPM implant requirement regarding race, stroke, peripheral vascular disease, hypertension, smoking history, lung disease, or access site. PPM implantation was significantly increased in males (59.3% vs 40.8%, $p=0.04$) and those with a pre-existing conduction abnormality (53.4% vs 46.6%, $p<0.0001$). Valve in valve (2.5% vs 12.7%, $p=0.001$) and patients with diabetes (46.6% vs 53.4%, $p=0.03$) had significantly lower rates of PPM.

Conclusions: Our large, multicenter study demonstrates that male sex and pre-existing conduction abnormalities increase the probability of requiring PPM implant post-TAVR while there were no differences between BE and SE valves.

Disclosures: M. Szerlip: Edwards Lifesciences: Consulting; Boston Scientific Corp.: Principal Investigator for a Research Study and Speaker Bureau; M. J. Mack: Edwards Lifesciences: Principal Investigator for a Research Study; Abbott (St. Jude): Principal Investigator for a Research Study; Medtronic: Study Chair; E. J. Fidone: Nothing to disclose. S. Potluri: Nothing to disclose. M. E. Lawrence: Nothing to disclose. T. A. Mixon: Nothing to disclose. A. E. Caldera: Nothing to disclose. M. DiMaio: Nothing to disclose. R. C. Stoler: Nothing to disclose. K. B. Harrington

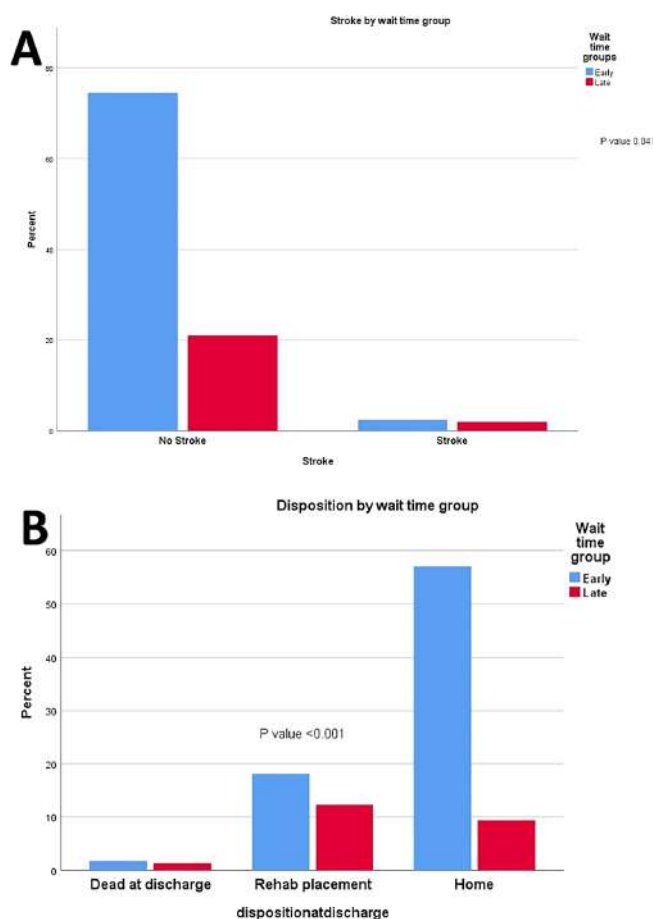
Nothing to disclose. A. Krueger: Nothing to disclose. R. Hebel: Nothing to disclose. R. J. Widmer: Nothing to disclose.

III-48 | Pre-Procedure Length of Hospital Stay for Transcatheter Aortic Valve Replacement and Post-Procedural Outcomes

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Background: Transcatheter aortic valve replacement (TAVR) has emerged as the mainline treatment for severe aortic stenosis. We did a study to evaluate relation of pre-TAVR length of hospital stay and its effect on post-TAVR outcomes.

Methods: This was a retrospective study of patients undergoing TAVR at a single high volume structural heart center ($n=447$). Patients were divided into two groups based on the length of hospital stay pre-TAVR: Early group (EG; ≤ 2 days) and late group (LG; > 2 days). Post-procedural outcomes were analyzed between the groups.



Results: EG (n= 344) and LG (n= 103) had similar baseline characteristics. The mean wait time was 1.9 ± 4.1 days. LG had statistically higher stroke rate (p-value 0.041), longer length of stay (LOS) post-TAVR (p-value < 0.001), longer five meter walk test (p-value 0.005), worse symptoms and quality of life as assessed by Kansas city cardiomyopathy questionnaire (p-value < 0.001), and more likely to be discharged to skilled nursing facilities (p-value < 0.001). No significant difference was seen in the groups at discharge in regards to cardiac arrest, all-cause mortality, major bleeding, TAVR procedure time or radiation dose.

Conclusions: Longer wait time from the hospital admission to TAVR procedure in index hospitalization is associated with higher incidence of stroke, longer LOS and worse quality of life. But it has no significant effect on all-cause mortality or major bleeding complications. Further studies are needed to validate this relation.

Disclosures: Y. Chatzizisis: *Boston Scientific Corp.: Advisory Board/ Board Member, Consulting and Principal Investigator for a Research Study;* G. Gajanan *Nothing to disclose.* M. Asawaer *Nothing to disclose.* R. Dhawan *Nothing to disclose.*

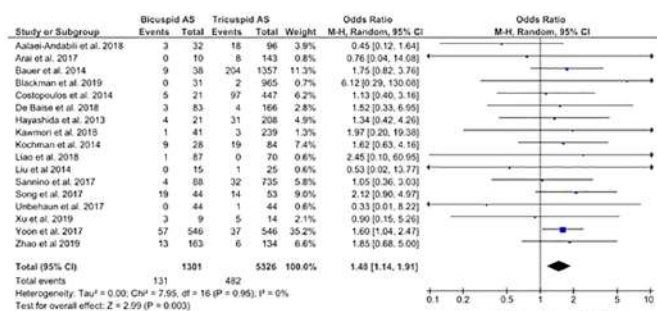
III-49 | Outcome of Transcatheter Aortic Valve Implantation in Tricuspid Aortic Stenosis vs Bicuspid Aortic Stenosis: A Systematic Review and Meta-Analysis

Hamza Hafeez, Wright Center for Graduate Medical Education, Scranton, PA., United States; Muhammad Saad Farooqi, King Edward

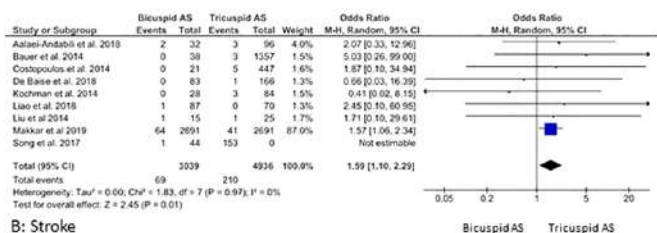
Medical University, Pakistan; Khawaja Hassan Akhtar, The University of Oklahoma Health Sciences Center, United States; Arafat Ali Farooqi, King Edward Medical University, Pakistan; Abdul Ghani Iqbal, The University of Oklahoma Health Sciences Center, United States; Syed Arqum Huda, SUNY Upstate Medical University, United States; Yasir Illahi, King Edward Medical University, Pakistan; Najam Saqib, The Wright Center for Graduate Medical Education, United States; Muhammad Siddique Pir, The Wright Center for Graduate Medical Education, United States; Raza Mian, Wright Center for Graduate Medical Education, Scranton, PA., United States; Abdul Haseeb, The Wright Center for Graduate Medical Education, United States; Mirza Mujadil Ahmad, Aurora Health Care, United States; Sharath Rajagopalan, The Wright Center for Graduate Medical Education, United States

Background: Transcatheter aortic valve implantation (TAVI) is a therapeutic modality for severe aortic stenosis. However, bicuspid aortic stenosis (BAS) has been excluded in most randomized clinical trials. Here we re-examine current evidence of clinical outcomes of TAVI in BAS versus Tricuspid aortic stenosis (TAS) patients.

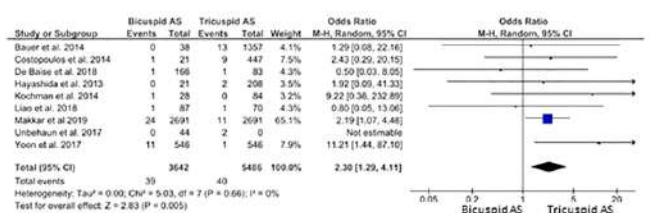
Methods: Extensive search was performed on PubMed and Google scholar using keywords TAVI, TAS and BAS, yielding 261 studies. 19 studies comparing outcome of TAVI in TAS and BAS were identified. A total of 12,125 patients across different centers were included. Study-level analysis was done with Review manager 5.3. $I^2 > 30\%$ was considered an indicator of statistical heterogeneity. A Mantel-Haenszel Random effects model was used to calculate pooled odds ratio (OR) for endpoints. The results are reported as OR, 95% confidence interval (CI) and $P < 0.05$.



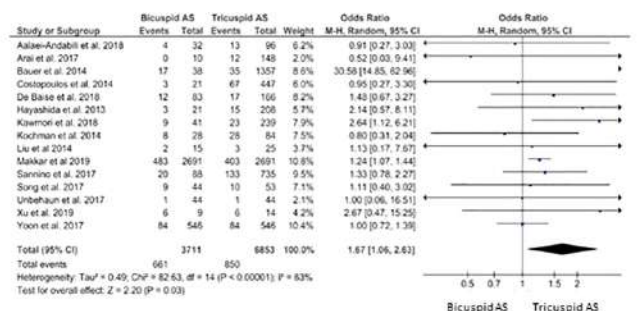
A: Para-valvular Leak



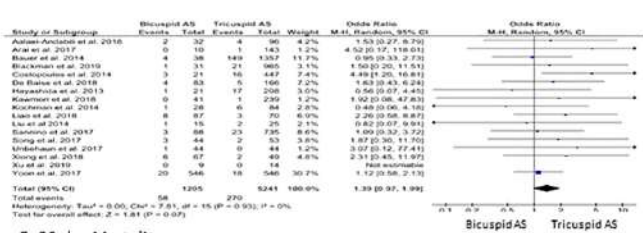
B: Stroke



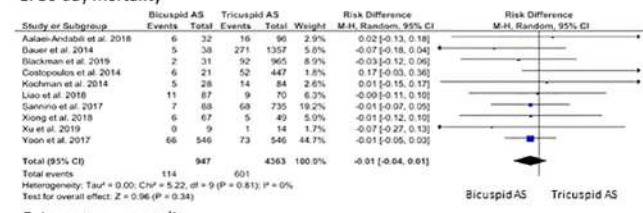
C: Conversion to surgery



D: Pacemaker implantation



E: 30 day Mortality



F: Long term mortality

Results: In 12,125 patients undergoing TAVI, TAS had significant increase in paravalvular leak (OR: 1.48; 95% CI: 1.14-1.91; $p = 0.003$), stroke (OR: 1.59; 95% CI: 1.10-2.29; $p = 0.01$), conversion to surgery (OR: 2.30; 95% CI: 1.29-4.1; $p = 0.005$) and pacemaker implantation (OR: 1.67; 95% CI: 1.06-2.63; $p = 0.03$) (Panel A, B, C, D). 30-day mortality (OR: 1.39; 95% CI: 0.97-1.99; $p = 0.07$), long term mortality (OR: -0.01; 95% CI: -0.04-0.01; $p = 0.34$) (Panel E,F) and myocardial Infarction (OR: 1.68; 95% CI: 0.76-3.73; $p = 0.20$) showed no difference.

Conclusions: TAVI can be offered to BAS patient as outcomes are similar and in some cases better than TAS.

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III-50 | Transcatheter Aortic Valve (TAVR) outcomes among hospitalizations for Coronary Artery Disease: An insight from National Inpatient Sample

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Background: Trans-catheter Aortic Valve Replacement (TAVR) is an increasingly sought option for aortic stenosis over the open-surgical treatment. Ongoing studies continue to investigate the outcomes of TAVR. However, the outcomes among Coronary Artery Disease (CAD) remain less explored.

Methods: The National Inpatient Sample (NIS) 2016 was used to evaluate the outcomes among hospitalizations related to TAVR. Adult hospitalizations (age ≥ 18) for TAVR was identified using the ICD 10 procedure code 02RF3. CAD was identified using the ICD 10 codes I25.10, I25.11, I25.110, I25.111, I25.118, I25.119, I25.2, I25.5, and I25.6. Demographics, In-hospital mortality, Length of stay were abstracted using the variables mentioned in the database. The presence of cardiac tamponade, stroke, acute kidney injury, arrhythmias (AV block,

Afib) was identified using Dx codes (ICD 10). All analysis was performed using SAS 9.4 software

Results: During the year 2016, there were a total of 40,000 TAVR related hospitalizations. CAD was present among 28200 hospitalizations. The mean age among both groups was almost identical to ~ 80 years. Among CAD, there were 39.91% females and among non-CAD females constituted 59.8%. No significant differences were noted for Length of stay among both groups (t-test $P = 0.0588$). In-hospital mortality was higher among non-CAD group (2.84% vs. 1.43%, $P < 0.0001$). The prevalence of third-degree AV block was similar in both groups (9.65% vs. 9.66%, $P = 0.9615$). Cardiac tamponade was higher among the non-CAD group (1.61% vs. 0.76%, $P > 0.0001$). Acute kidney injury was slightly higher in the CAD group (12.32% vs. 11.65%, $P = 0.0611$). Atrial fibrillation was higher among the CAD group (18.33% vs. 16.95%, $P = 0.0010$). Stroke was significantly higher among non-CAD group (0.13% vs. 0.04%, $P = 0.0008$)

Conclusions: CAD is present in about 70% of TAVR hospitalizations. Fewer females were present in the CAD group. Higher in-hospital mortality, stroke, and cardiac tamponade were noted in the non-CAD group, while AKI and AF were higher in the CAD group. Higher prevalence of death, stroke, and tamponade in the non-CAD group need further study.

Disclosures: S. Kalra: Abbott (St. Jude): Consulting; Abiomed: Speaker Bureau; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Philips (Volcano): Speaker Bureau; H. Hassan *Nothing to disclose*. D. Voruganti *Nothing to disclose*. S. Nazir *Nothing to disclose*. Y. Alhamshari *Nothing to disclose*. E. Patterson *Nothing to disclose*. J. Pelayo *Nothing to disclose*. A. R. Ghani *Nothing to disclose*. L. Tabaza *Nothing to disclose*. S. S. Banka *Nothing to disclose*. C. F. Witzke *Nothing to disclose*. J. C. George *Nothing to disclose*. S. F. Janzer *Nothing to disclose*.

III-51 | Comparison of Post-Implantation Hemodynamics in Valve-in-Valve Transcatheter Aortic Valve Replacement Between Balloon-Expandable and Self-Expanding Valves

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Background: Valve-in-Valve transcatheter aortic valve replacement (ViV-TAVR) for failing bioprosthetic surgical aortic valves (SAV), utilizing either balloon-expandable (BEV) or self-expanding transcatheter heart valves (SEV), has been shown in numerous registries to be effective. However, residual high post-ViV-TAVR gradients remain a challenge, particularly when implanting in smaller SAV (regardless of whether a ring-fracturing technique is employed) where the rigid sewing-ring may limit optimal TAVR expansion and/or function. The supra-annular nature of the SEV may offer superior valve hemodynamics in ViV-TAVR as compared to the BEV, particularly with smaller prostheses.

Methods: Consecutive patients undergoing ViV-TAVR at a single institution were included and divided into those receiving either BEV or SEV. Baseline clinical and anatomic variables and ViV-TAVR hemodynamics measured by echocardiography (30-days and 1-year) were compared between the groups.

Results: 63 patients undergoing ViV-TAVR were included (29 receiving BEV, and 34 SEV), with similar baseline characteristics, including Society of Thoracic Surgeons Risk Score (4.6 vs. 2.5), age of failing SAV (11.2 vs. 8.8 years), and median size of failing SAV (23 vs. 23 mm) with BEV vs. SEV, respectively ($p=NS$). The mode of SAV failure was predominantly stenosis, and baseline gradients were similar (mean gradient 38 vs. 43 mmHg, respectively, $p=0.2$). At 30 days post-procedure, the mean gradient across the ViV-TAVR for the BEV and SEV were similar [22 vs. 20 mmHg, respectively ($p=0.4$)]. When analyzing specifically implantation in smaller SAV (≤ 21 mm) in the BEV and SEV groups (8 and 15, respectively), there was a numerical trend towards higher 30-day post-ViV TAVR gradients in the BEV groups versus the SEV group, [28 versus 21 mmHg, respectively ($p=0.1$)]. Similar hemodynamics were observed at 1-year post-implantation between the BEV and SEV [21 versus 18 mmHg, respectively ($p=0.4$)] across the entire cohort.

Conclusions: The BEV and SEV were effective treatment for ViV-TAVR, with similar valve hemodynamics at 30 days, which persisted up to 1-year. However, there was a trend towards improved hemodynamics at 30 days in the SEV group in patients with small failing SAV.

Disclosures: S. C. Wong: *Boston Scientific Corp.: Advisory Board/Board Member; Medtronic: Advisory Board/Board Member; Boston Scientific Corp.: Advisory Board/Board Member*; R. Kalil *Nothing to disclose*. Y. Adejumo *Nothing to disclose*. G. W. Bergman *Nothing to disclose*. L. K. Kim *Nothing to disclose*. D. N. Feldman *Nothing to disclose*. H. S. Singh *Nothing to disclose*. S. L. Mick *Nothing to disclose*. E. Iannacone *Nothing to disclose*. R. M. Minutello *Nothing to disclose*.

III-52 | Impact of Hospital Procedural Experience on Transcatheter Aortic Valve Replacement of Bicuspid Aortic Valve

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Cleveland Clinic Foundation, United States; Toshiaki Isogai, Cleveland Clinic Foundation, United States; Shashank Shekhar, Cleveland Clinic Foundation, United States; Medhat Farwati, Cleveland Clinic Foundation, United States; Jean-Pierre Iskandar, Cleveland Clinic Foundation, United States; Essa Hariri, Cleveland Clinic Foundation, United States; Keerat Rai R Ahuja, Cleveland Clinic, United States; Mohamed M Gad, Cleveland Clinic Foundation, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States

Background: The use of transcatheter aortic valve replacement (TAVR) is rapidly expanding to younger, lower-risk patient populations in light of recent trials. However, these studies excluded those with bicuspid aortic valve (BAV), and there is a paucity of data defining the impact of hospital procedural volume on outcomes among this cohort.

Methods: Patients who underwent TAVR of the bicuspid aortic valve (BAV) between January 2012 and December 2016 were selected from the Nationwide Readmission Database (NRD). Groups were stratified into low-, medium-, and high-volume hospitals based on the total TAVR procedures performed irrespective of valve type.

Results: A total of 1,062 patients with BAV underwent TAVR and were included in the analysis, of which 26.2%, 24.7%, and 49.1% were performed at low-, medium-, and high-volume hospitals, respectively. Patients with BAV comprised 0.94%, 0.76%, and 1% of all TAVR procedures at low-, medium-, and high-volume hospitals, respectively. Compared to low- and medium-volume hospitals, patients in high-volume centers were older (median age 62 vs 65 vs 68 years, respectively) and more likely to have heart failure (48.9% vs. 56.1% vs 69.1%, respectively, $P<.001$), diabetes mellitus (22.3% vs. 22.9% vs. 29.1%, respectively, $P=.023$), and coronary atherosclerotic disease (37.1% vs. 53.2% vs. 56.3%, respectively, $P<.001$). No significant differences were found between unmatched patients at low-, medium-, and high-volume hospitals regarding in-hospital mortality (2.9% vs. 6.5% vs. 2.7%, respectively, $P=.579$), in-hospital stroke (2.9% vs. 1.5% vs. 2.3%, respectively, $P=.71$), and 30-day readmission rate (7.6% vs. 11.8% vs. 10.1%, respectively, $P=.394$).

Conclusions: Despite similar in-hospital and 30-day outcomes between hospitals with varying TAVR procedural volume, our analysis demonstrates that providers at high-volume centers intervened on BAV patients with greater comorbid risk. This may portend key implications on longer-term, matched outcomes among BAV patients as well as quality measures for providers and hospitals alike. Further defining this cohort and evaluating trends in utilization and patient selection is imperative as clinical practice around TAVR continues to shift.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; N. Kassis *Nothing to disclose*. A. M. Saad *Nothing to disclose*. O. Abdelfattah *Nothing to disclose*. T. Isogai *Nothing to disclose*. S. Shekhar *Nothing to disclose*. M. Farwati *Nothing to disclose*. J. P. Iskandar *Nothing to disclose*.

E. Hariri *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. M. M. Gad *Nothing to disclose*.

III-53 | Temporal Trends in The Incidence and Outcomes of Pacemaker Implantation after Transcatheter Aortic Valve Replacement in the United States (2012-2017)

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Background: Nationwide studies documenting the temporal trends in permanent pacemaker implantation (PPMI) following transcatheter aortic valve replacement (TAVR) are lacking.

Methods: We selected patients who underwent TAVR between 2012 and 2017 in the National-Readmission-Database. The primary endpoint was the 6-year trend in post-TAVR PPMI at index hospitalization, and within 30-, 90-, and 180-day post-discharge. Secondary endpoints were the associations between PPMI and in-hospital mortality, stroke, cost, length of stay and disposition.

Results: Among the 89,202 patients who underwent TAVR, 77,405 (86.8%) with no prior pacemaker and/or defibrillator were included. Patients who required PPMI had more atrial fibrillation (43.6% vs. 38.7%, $p < 0.001$) and baseline conduction abnormalities (57.6% vs. 18.6%, $p < 0.001$). The incidence of PPMI during index admission increased from 8.7% in 2012 to 13.2% in 2015, then decreased to 9.6% in 2017. The incidence of PPMI within 30-day post-discharge increased from 0.5% in 2012 to 1.25% in 2017 (Ptrend < 0.001). PPMI beyond 30-day was uncommon ($< 0.5\%$) across the study's years. After risk-adjustment, PPMI was not associated with in-hospital mortality or stroke. It was, however, associated with significantly higher odds of non-home discharges, longer hospitalizations, and higher costs. The incremental expenditure associated with post-TAVR PPMI during index admission increased from \$9.6 million to \$72.2 million between 2012-2017.

Conclusions: After significant initial increase, post-TAVR PPMI rates in the US stabilized at $\sim 10\%$, but there was a notable temporal increase in PPMI beyond the index TAVR admission. PPMI didn't increase in-hospital morbidity or mortality, but led to longer hospitalizations, higher cost, and more non-home discharges.

Disclosures: M. A. Kawsara *Nothing to disclose*. S. Sulaiman *Nothing to disclose*. F. Alqahtani *Nothing to disclose*. M. F. Eleid *Nothing to disclose*. A. Deshmukh *Nothing to disclose*. P. A. Friedman *Nothing to disclose*. C. S. Rihal *Nothing to disclose*. M. Alkhouli *Nothing to disclose*.

III-54 | New trends in comparing trans-catheter Aortic Valve Replacement (AVR) with surgical AVR in lower risk patients: A comprehensive met-analysis and literature review

Muhammad Khan, Mercy Health St. Vincent's Medical Center, United States; Tanveer Mir, DMC/Wayne State University, United States; Hemindermeet Singh, Mercy Health St. Vincent's Medical Center, United States; Owais M. Idris, Mercy Health St. Vincent's Medical Center, United States; Ghazal Khan, university of missouri kansas city program, United States; Waqas Ullah, Abington Jefferson Health, United States; Mamoon Rashid, Advent Health, United States; Jays Shah, Mercy Health St. Vincent's Medical Center, United States; Khalid HAMID Chngal, Mercy Health St. Vincent's Medical Center, United States; Sohail Ali, Mercy Health St. Vincent's Medical Center, United States

Background: Transcatheter aortic valve replacement (AVR) is a novel percutaneous procedure for severe aortic stenosis and has been recently approved by FDA in lower risk patients. We performed the first ever met-analysis and literature review of clinical trials comparing both short and long term outcomes in lower risk patients undergoing TAVR vs surgical AVR (Having Society of thoracic surgeons score [STSS] $< 4\%$ or equivalent).

Methods: Using predefined selection criteria as above, 68 articles were identified. 6 eligible articles were selected after extensive review. Primary effect outcomes were 30-day and 1 year all-cause mortality using Risk Ratio (RR) with significant p -value < 0.05 .

Results: A total of 4,670 subjects were included. Risk of 30-day all cause mortality was 40.1% less in TAVR group, RR 0.60 (95% Confidence Interval [CI] 0.38-0.93 $p: 0.02$) with no significant heterogeneity. 3 studies, Thyregod et al., Partner 3 trial and Evolut low risk trial also reported 1-year risk. This was also statistically significant with a 38.8% decrease in the TAVR group, RR 0.62 (95% CI 0.46-0.84 $p: 0.002$).

All studies reported 30-Day risk of secondary outcomes. The risk of stroke was 37% less in TAVR group, although this was not statistically significant, RR 0.73 (95% CI 0.48-1.1, $p: 0.22$). The risk of acute kidney injury stage 2 (AKI) and above was 54% less in post-TAVR patients, RR 0.43 (95% CI 0.35-0.54 $p < 0.001$) with no heterogeneity. For vascular complications, RR was high in TAVR group, 1.83 (95% CI: 1.22-2.755, $p: 0.003$) with significant heterogeneity. The risks for Permanent Pacemaker (PPM) were also higher in the TAVR group, RR 2.88 (95% CI: 2.33-3.56, $p < 0.001$) and significant heterogeneity was observed. After removing Thyregod et al. and Partner-3 trial from the analysis, heterogeneity was removed, but the relative risk was still high, RR 3.21 (95% CI 2.54 - 4.068 $p < 0.001$).

Conclusions: TAVR is superior both in short term and long-term mortality, a result that is statistically significant and not demonstrated before. TAVR patients were also less likely to have post-operative bleeding and AKI. However, the rates of PPM and vascular

complications are higher in TAVR patients and caution must be exercised while extending indications to young patients.

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III-55 | Adoption of a Strategy of Cerebral Embolic Protection During Transcatheter Aortic Valve Replacement is Associated with Fewer Neurologic Events in a Large Volume Center

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Background: The Sentinel Cerebral Embolic Protection (CEP) Device is approved for cerebral embolic protection during transcatheter aortic valve replacement (TAVR), and has been adopted by some centers in an attempt to reduce periprocedural neurologic events despite largely inconclusive and underpowered data from randomized clinical trials. Our high-volume TAVR program has chosen to use CEP in all transfemoral patients without an anatomic or clinical contraindication. We aimed to evaluate the real-world impact of this strategy.

Methods: We completed a retrospective analysis of all patients who underwent transfemoral TAVR for one year after CEP implementation on 10/15/2018, compared to an equal number of consecutive patients treated prior. We evaluated in-hospital stroke and transient ischemic attack (TIA). Univariate one-sided Fisher exact test was used to compare events pre- and post-CEP implementation.

Results: Among 294 procedures after CEP implementation, there was 1 minor stroke (0.3%) and 0 TIA events. Among 294 procedures prior to CEP implementation, there were 6 strokes (2.0%) and 1 TIA (0.3%; 2.4% total neurologic events). Neurologic events were significantly lower after CEP implementation (p -value=0.0342). Following programmatic adoption of CEP, 158 patients (53.7%) had complete device deployment, and in an additional 4 patients (1.4%), only the proximal filter was deployed for technical reasons. The single stroke in the post-CEP time frame occurred in the left sided circulation in a patient where only the innominate filter could be deployed.

Conclusions: In a single-center, high-volume TAVR program, fewer neurologic events occurred after CEP implementation (0.3% vs. 2.4%).

Disclosures: E. C. Korngold: R. Hodson: *Abbott (St. Jude): Consulting; Edwards Lifesciences: Consulting*; E. B. Kirker *Nothing to disclose*. K. Spinelli *Nothing to disclose*. S. T. Chiu *Nothing to disclose*. S. M. Verburg *Nothing to disclose*. V. Kumar *Nothing to disclose*. B. Jones *Nothing to disclose*.

III-56 | New Left Bundle Branch Block and Permanent Pacemaker Stratified by Sievers Type in Severe Bicuspid Aortic Stenosis After Transcatheter Aortic Valve Replacement

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Background: New left bundle branch block (LBBB) and high degree AV block requiring permanent pacemaker (PPM) are frequent complications of transcatheter aortic valve replacement (TAVR) in severe bicuspid aortic stenosis (AS). Limited data exists regarding these complications when stratified by Sievers Type. We aimed to identify the incidence of adverse conduction disease by Sievers Type in bicuspid AS undergoing TAVR.

Methods: A retrospective analysis was performed of patients with severe bicuspid AS who underwent TAVR from 1/1/2017 to 9/1/2019. ECGs were analyzed at baseline, post-procedure daily until hospital discharge and at 30 day follow-up. Variables were preexisting conduction disease, PR and QRS intervals. Outcomes assessed were rates of new LBBB and PPM.

Results: Cohort consisted of 67 patients with severe bicuspid AS, age 70.0 ± 9.9 years and STS risk $4.1 \pm 3.7\%$. Baseline EKG showed LBBB in 6%. 84% were Sievers Type 1 and 16% were Sievers Type 0. Prosthesis type was 18% Edwards Sapien 3 and 82% Medtronic Evolut. Immediately post TAVR, new onset LBBB developed in 24% of patients with 3 additional patients developing LBBB after hospital discharge. When assessed by Sievers classification, new LBBB developed in 18 patients (27%) with Type 1 while no patient with Type 0 developed new LBBB at 30 day follow up ($p=0.05$). Immediately post TAVR, need for PPM developed in only 5 patients (7.4%). When assessed by Sievers classification, PPM implantation was 4 in Type 1 (80%) and only 1 Type 0 (20%) patient. Of the 5 patients requiring PPM, pre-existing conduction disease was present in 2 of the 4 Type 1 patients, while the Type 0 patient had no preexisting conduction disease. Post TAVR there was no significant change in PR intervals but a significant

increase was noted in QRS interval (111 ± 25 ms vs 129 ± 32 ms, $p < 0.001$) with no differences between Sievers Types.

Conclusions: Following TAVR, rates of new LBBB and PPM implantation with preexisting conduction disease were increased in Sievers Type 1 vs Type 0 bicuspid AS. As TAVR moves toward implantation in lower risk individuals, Sievers classification and preexisting conduction disease are important variables in the understanding post TAVR adverse conduction events.

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III-57 | Comparison of next day discharge vs late discharge in minimalistic TAVR patients: Single Center Experience

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Background: Minimalistic TAVR approach has now become standard of care in most of the centers. However, there is no clear consensus on length of stay (LOS) on minimalistic TAVR patients. The aim of this study was to compare demographics, baseline co-morbidities and outcomes for next day discharge (NDD) vs late discharge (LD) in patients undergoing minimalistic TAVR.

Methods: Retrospective chart review was done for patients who underwent TAVR in our center from the year 2013 – 2019. Demographics (age > 74 and gender), baseline co-morbidities (diabetes mellitus (DM), Chronic kidney disease (CKD) stage III and above, heart failure with EF $< 40\%$ and anemia with hemoglobin < 11) and outcomes (immediate post procedure complication, 30-day readmission and mortality) were compared between the two groups using bivariate cross tabulation.

Results: A total of 280 patient underwent TAVR, of which 113 who underwent TAVR through standard approach requiring an average LOS of 4 days were excluded. 167 underwent minimalistic TAVR, of which, 123 were discharged the next day and 44 required more than 1 day stay. Out of 44 patients, 3 had intra-procedure and 1 had non-TAVR related complications prolonging the LOS and were excluded.

The two groups NDD ($n = 123$) and LD ($n = 40$) were compared. Demographics including male (60.2% NDD, 60% LD) and age > 74 (80% NDD, 82% LD) were similar among two groups. Baseline co-morbidities including CKD (35% NDD, 45% in LD), DM (22% NDD, 35% LD), anemia (48% NDD, 60% LD) and heart failure (14% NDD,

15% LD) were all observed to be higher in LD compared to NDD but results were not statically significant. In our study, patients with LOS > 1 were mostly due to pacemaker insertion or rhythm monitoring which seemed independent of demographics and co-morbidities. There was no statically significant difference in immediate post procedure complication (none in both groups), 30-day readmission (3% NDD, 10% LD) and 30-day mortality (none NDD, 2% LD).

Conclusions: NDD after minimalistic TAVR is safe and feasible even in older population and in those with co-morbidities, without affecting the outcomes. It offers faster recovery of patients to their baseline and has potential economic benefits. Larger studies are needed to further validate our study.

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III-58 | Elevated Baseline B-Type Natriuretic Peptide Predicts Mortality in Transcatheter Aortic Valve Replacement

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Background: B type natriuretic peptide (BNP) has been established as a predictor of outcomes in patients who undergo surgical aortic valve replacement (SAVR). Studies on the prognostic value of BNP in high-risk patients undergoing transcatheter aortic valve replacement (TAVR) have yielded conflicting results. Additionally, BNP has not been well studied in the low and intermediate-risk group of patients undergoing TAVR. The purpose of this study was to clarify the prognostic utility of baseline BNP in low, intermediate and high-risk patients with severe aortic stenosis (AS) undergoing TAVR.

Methods: This was a retrospective, observational study of 1544 low, intermediate and high-risk patients who underwent TAVR at our institution from 2012-2019. Included were patients who had a BNP < 7 days prior to TAVR. Patients were then trichotomized into those with a pre-TAVR BNP < 250 pg/mL (cohort 1), between 250-500pg/mL (cohort 2) and > 500 pg/mL (cohort 3). Outcomes of interest were inpatient and 30-day mortality. Statistical analyses of outcomes were performed using multivariate binary logistic regression.

Results: Of the 1544 patients screened, 1487 patients had a BNP level < 7 days prior to TAVR and thus were included in the study. Patients in cohort 3 with a baseline BNP > 500 pg/mL were 3.31 times more likely to have inpatient death (CI 0.142, 0.643, $P = 0.0019$), 2.70 times more likely to have death within 30-days (CI 0.192, 0.711, $P = 0.0029$) and 1.81 times more likely to have death within 1-year (CI 0.348, 0.880, $p = 0.0152$).

Conclusions: Our study of 1487 low, intermediate and high-risk patients demonstrates a baseline BNP greater than 500pg/mL is an independent predictor of inpatient, 30-day and 1-year mortality. BNP has prognostic implications in TAVR patients across all risk groups and can help identify the subset of patients who may warrant closer follow up following TAVR.

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III-59 | The Impact of Balloon Valvuloplasty on Short-term Outcomes in Transcatheter Aortic Valve Replacement

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Background: Despite advancements in transcatheter aortic valve replacement (TAVR), stroke remains one of the most feared complications contributing to morbidity and mortality. Early TAVR in high-risk patients was frequently performed with balloon aortic valvuloplasty (BAV). As TAVR has evolved and indications have expanded, there is more emphasis on post-BAV to reduce the amount of paravalvular leak (PVL). The purpose of this study was to investigate the association between pre/post-TAVR BAV and short-term outcomes following TAVR.

Methods: This was a retrospective, observational study from 2012-2019 in which we screened 1544 low, intermediate and high-risk patients who underwent TAVR at our institution. Excluded were 62 patients who underwent valve-in-valve TAVR. We examined baseline patient characteristics and whether or not patients underwent pre/post BAV. The primary outcomes of interest were inpatient and 30-day stroke. The secondary outcome of interest was 30-day readmission. Statistical analyses of outcomes were performed using binary logistic regression.

Results: Pre-TAVR BAV did not predict inpatient stroke ($p = 0.3877$) or 30-day stroke ($p = 0.4531$). Post-TAVR BAV did not predict inpatient stroke ($p = 0.0906$) or 30-day stroke ($p = 0.1245$). Additionally, there were no significant differences in 30-day readmissions in patients who received pre/post-TAVR BAV when compared to those who did not ($p = 0.2577$ and $p = 0.8432$).

Conclusions: Initial TAVR was frequently accompanied by pre-deployment BAV. The safety of omitting pre-TAVR BAV has been studied in high-risk patients undergoing TAVR. Our study of low,

intermediate and high-risk patients suggests that direct TAVR, results in comparable short-term outcomes. Additionally, post-deployment BAV did not predict short-term mortality or stroke.

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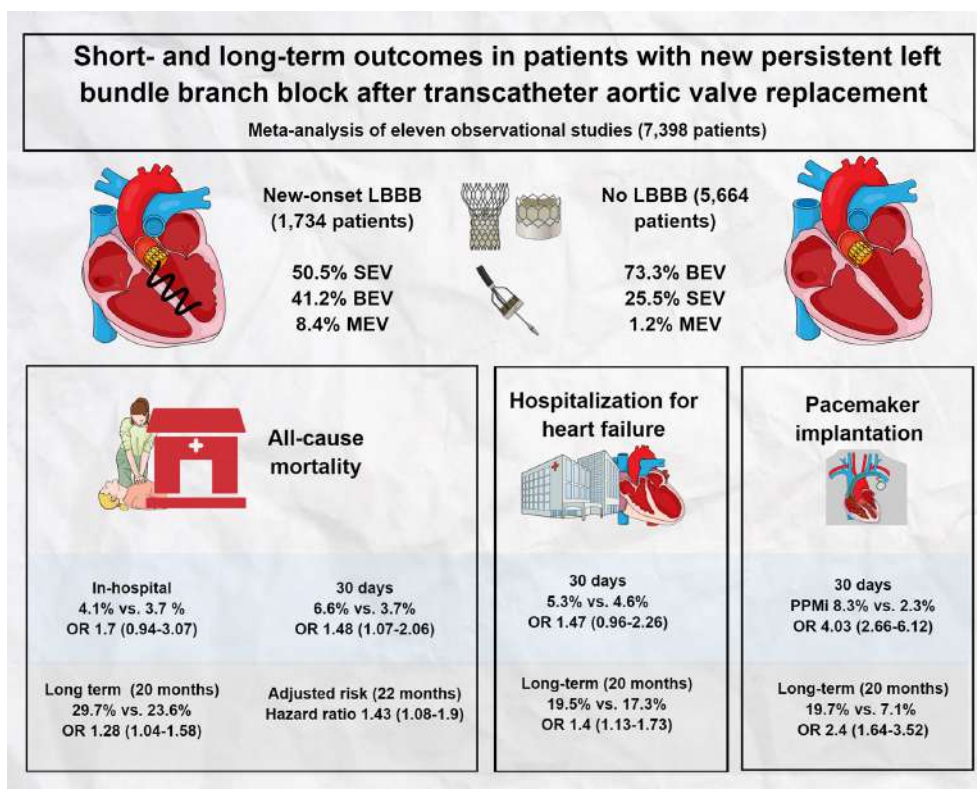
III-60 | Short- and Long-term Outcomes in Patients with New-onset Persistent Left Bundle Branch Block After Transcatheter Aortic Valve Replacement

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Background: The impact of new-onset persistent left bundle branch block (LBBB) after transcatheter aortic valve replacement (TAVR) on all-cause mortality has been controversial.

Methods: We conducted a systematic review and meta-analysis of eleven studies (7,398 patients) comparing the short- and long-term outcomes in patients who had new-onset LBBB after TAVR vs. those who did not.

Results: During a mean follow-up of 20.5 ± 14 months, patients who had new-onset persistent LBBB after TAVR had a higher incidence of all-cause mortality (29.7% vs. 23.6%, OR 1.28 (1.04-1.58), $p = 0.02$), rehospitalization for heart failure (HF) (19.5% vs. 17.3%, OR 1.4 (1.13-1.73), $p = 0.002$), and permanent pacemaker implantation (PPMi) (19.7% vs. 7.1%, OR 2.4 (1.64-3.52), $p < 0.001$) compared with those who did not. Five studies (4,180 patients) reported adjusted hazard ratios (HR) for all-cause mortality; new LBBB remained associated with a higher risk of mortality (Adjusted HR 1.43 (1.08-1.9), $p < 0.01$, $I^2 = 81\%$).



Conclusions: Post-TAVR persistent LBBB is associated with higher all-cause mortality and HF. While efforts to identify patients that need post-procedural PPMi are warranted, more studies are required to evaluate the best follow-up and treatment strategies to improve long-term outcomes in these patients.

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III-61 | Utility of Transcatheter Aortic Valve Replacement in Morbidly Obese Patients: A National Perspective

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Background: Transcatheter aortic valve replacement (TAVR) has evolved as an acceptable treatment option for severe aortic stenosis. Outcomes in morbidly obese patients undergoing TAVR are unknown. We aimed to describe clinical outcomes from a national registry on morbidly obese patients who had TAVR.

Methods: Using the nationwide inpatient sample for years 2016-2017, we identified all adults with BMI ≥ 40 kg/m², who underwent TAVR. Baseline demographics and in-hospital outcomes including complications,

resource use and mortality were investigated. Logistic regression analysis was used to identify independent predictors of in-patient mortality.

Results: A total of 4579 morbidly obese patients, with a mean age of 72 years, who received TAVR were identified. Baseline comorbidities were; Congestive Heart failure (HF) 75.98% (n=3480), Diabetes Mellitus (DM), 64.96% (n=2974), Chronic Kidney Disease, 41.16% (n=1884), Chronic Lung Disease, 41.7% (n=1909) and Obstructive Sleep Apnea (OSA), 45.2% (n=2069). Post-operatively, rates of arrhythmias requiring PPM implantation were 6.6% (n=302), acute kidney injury (AKI) was noted in 14.3% (n=654) and 7.3% (n=334) ended up with respiratory failure. In patient mortality was 1.42% (n=65), and 83.08% (n=3804) patients were discharged home after the procedure, after a mean length of hospital stay of 5 days. On multivariable logistic regression analysis, independent predictors of in-hospital mortality were DM (p=0.03), AKI (p=0.03), Cardiogenic Shock (p=0.009), Blood transfusion, (p = 0.008) and Cardiac Tamponade (p = 0.04).

Conclusions: We show for the first time from a nationwide registry that, TAVR in morbidly obese patients is safe and feasible with acceptable peri-operative outcomes albeit their high burden of comorbidities.

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III-62 | Impact of Baseline Anemia on Short and Long-Term Mortality Among Females Undergoing Transcatheter Aortic Valve Implantation (from the Win-TAVI Registry)

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Background: Females constitute more than 50% of patients undergoing transcatheter aortic valve implantation (TAVI). Anemia is a well-established risk factor for adverse outcomes following percutaneous coronary intervention and cardiac surgery. However, its impact on outcomes in female patients undergoing TAVI is not well defined.

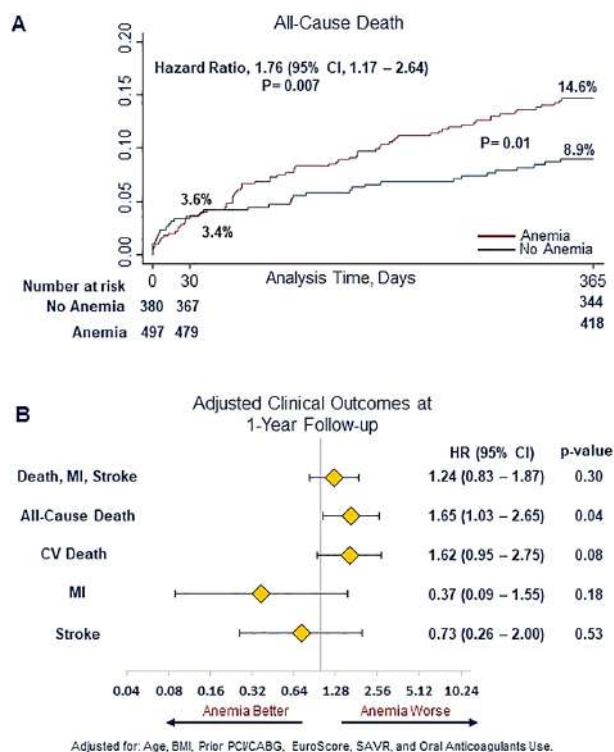
Methods: The WIN-TAVI is a multinational, prospective, observational registry of females undergoing TAVI. We grouped patients into

2 groups: anemic (with a baseline Hgb ≤ 12 g/dl as per WHO definition) and non-anemic. The outcome of interest was all-cause mortality at 30-days and 1-year follow-up.

Results: A total of 877 female patients were included in this analysis: 497 (56.7%) anemic and 380 (43.3%) non-anemic. The mean age of all patients was 82.4 ± 6.3 years. The mean Hgb level was 10.7 ± 1.1 g/dl in anemic Vs. 13.3 ± 1.1 g/dl in non-anemic patients (P < 0.001). The prevalence of Chronic Kidney Disease was 36.9% in anemic and 22.9% in non-anemic patients. All-cause mortality was similar in the two groups (3.6% Vs. 3.4%) at 30-days, but was higher in anemic patients at 1-year (14.6% Vs. 8.9%, HR 1.76, 95% CI [1.17-2.64], P = 0.007). Cardiovascular mortality was also concordant at 1-year (12.0% Vs. 7.7%, respectively, HR 1.62, 95% CI [0.95-2.75], P = 0.08) (Figure 1).

Conclusions: Baseline anemia in female patients undergoing TAVI was associated with increased all-cause and cardiovascular mortality at one year follow-up.

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to Institution; Claret Medical: Ownership Interests: Stocks, Stock Options; Elixir Medical: Ownership Interests: Stocks, Stock Options; Watermark Research Partners: DSMB Membership Paid to Institution; Orbus Neich: Research Funding to Institution; Novartis: Research Funding to Institution; CSL Behring: Research Funding to Institution; DSI: Research Funding to Institution; BMS: Research Funding to Institution; Beth Israel Deaconess: Research Funding to Institution; Bayer: Research Funding to Institution; Astra Zeneca: Research Funding to Institution; Roivant Sciences Inc: Consulting; Volcano Corporation: Consulting; Sanofi: Consulting; Janssen: Consulting; PLx Pharma: Consulting; Siemens Medical Solutions: Consulting; Medscape: Consulting; S. K. Sharma: Boston Scientific Corp.: Advisory Board/Board Member; Cardiovascular Systems Inc: Advisory Board/Board Member; TriReme: Advisory Board/Board Member; J. Nicolas Nothing to disclose. B. Claessen Nothing to disclose. D. Cao Nothing to disclose. R. Chandiramani Nothing to disclose. R. Goel Nothing to disclose. A. Roumeliotis Nothing to disclose. D. A. Power Nothing to disclose. S. Sartori Nothing to disclose.

III-63 | Clinical Outcomes after Urgent Transcatheter Aortic Valve Replacement for Acute Decompensated Heart Failure in Patients with Severe Aortic Stenosis

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Background: Transcatheter aortic valve replacement (TAVR) during in-hospital stay is associated with suboptimal outcomes, leading TAVR teams to exclude inpatients until they are stabilized and discharged. We examined outcomes to identify independent predictors of mortality among patients at high risk for clinical deterioration undergoing urgent TAVR.

Methods: Patients admitted for acute decompensated heart failure (ADHF) who had TAVR during their index admission or on transfer from satellite facilities were retrospectively reviewed from a prospectively maintained database. Patients in cardiogenic shock were excluded. Clinical outcomes investigated were, procedural success, complications, length of stay (LOS), in-hospital and 1-year mortality. Logistic regression analysis was used to identify independent predictors of one-year mortality.

Results: Between 2012 and 2018, 192 (17%) of 1,160 patients had urgent TAVR at a high-volume center. 59% patients (n=113) were transferred from satellite facilities. The (mean $\pm$ SD) age and STS

scores were 82 ± 9 years and $8.1 \pm 8\%$, respectively. Average LOS was 8 days before 6 days after TAVR. Pretreatment LOS was shorter when patients were admitted to treating hospital vis-s-vis transferred patients (6 vs. 10 days; $p=0.001$). Procedural success was 95% with a 5% periprocedural complication rate. Major postoperative complications were pacemaker need: 14%, acute kidney injury: 7% and Stroke: 5%. In-patient, 30-day, and 1-year survival rates were 98%, 94%, and 79% respectively. At a median follow-up of 31 months, independent predictors of 1-year mortality were baseline serum albumin ($p<0.001$), history of diabetes ($p=0.03$), and peripheral vascular disease ($p=0.02$).

Conclusions: Urgent inpatient TAVR for ADHF with high risk indicators is safe and feasible with favorable postoperative outcomes, albeit with prolonged length of stay. Inpatient status should, therefore, not be an exclusion criterion for TAVR. Early referral and satellite preoperative imaging may help mitigate limitations for TAVR access in this unique cohort.

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III-64 | Late Intracranial Bleeding After Transcatheter Aortic Valve Replacement: A Single Center Analysis of Incidence and Risk Factors

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Background: Intracranial bleeding (IB) is associated with significant morbidity and mortality. To date, there are limited data on the incidence and risk factors associated with late (post-hospital discharge) IB after transcatheter aortic valve replacement (TAVR).

Methods: This study is a retrospective, single center analysis of a cohort of all TAVR cases from 7/2015-12/2017. All patients were discharged on two antiplatelet (AP) agents, or one AP and one anticoagulant (AC) medication. The primary endpoint was IB, defined as either subdural hematoma (SDH), subarachnoid hemorrhage (SAH) or intracerebral hemorrhage (ICH) after hospital discharge. Risk factors for IB were identified using univariate analysis.

Table: Factors Associated with Late Intracranial Bleed After Transcatheter Aortic Valve Replacement

	No Intracranial Hemorrhage (n=419)	Intracranial Hemorrhage (n=17)	P
Demographics			
Male	244 (58.2%)	13 (76.5%)	0.13
Age (years)	82.2 ± 8.0	78.5 ± 10.0	0.13
Non-White Race	56 (13.4%)	6 (35.3%)	0.011*
Body Surface Area (m ²)	2.0 ± 2.1	1.8 ± 1.8	0.70
Comorbidities			
Diabetes	155 (37.0%)	7 (41.2%)	0.73
Hypertension	331 (79.0%)	17 (100%)	0.034*
Hyperlipidemia	287 (68.5%)	16 (94.1%)	0.024*
Atrial Fibrillation	165 (39.4%)	7 (41.2%)	0.88
Chronic Kidney Disease	119 (28.4%)	7 (41.2%)	0.26
End Stage Renal Disease	18 (4.3%)	2 (11.8%)	0.15
Prior Myocardial Infarction	56 (13.4%)	3 (17.6%)	0.61
Prior Coronary Artery Bypass Grafting	74 (17.7%)	6 (35.3%)	0.07
Prior Cerebrovascular Accident	41 (9.8%)	1 (5.9%)	0.59
Cirrhosis	14 (3.3%)	1 (5.9%)	0.57
Frail	209 (49.4%)	9 (52.9%)	0.81
NY Heart Association Score	2.7 ± 0.56	2.9 ± 0.59	0.07
NY Heart Association Score = 4	12 (2.9%)	2 (11.8%)	0.041*
Society of Thoracic Surgeons Score Mortality (%)	5.4 ± 3.7	7.0 ± 4.1	0.08
Pre-Operative Hemoglobin (g/dl)	12.2 ± 2.3	12.7 ± 2.1	0.39
Pre-Operative Platelet Count (10 ³ /uL)	220 ± 80	199 ± 59	0.28
Pre-TAVR Echocardiogram Measurements			
Left Ventricular Ejection Fraction (%)	58.6 ± 13.0	49.4 ± 14.1	<0.01*
Peak Velocity Across Aortic Valve (m/s)	4.2 ± 0.67	4.1 ± 0.76	0.47
Mean Gradient Across Aortic Valve (mmHg)	42.9 ± 13.7	39.4 ± 17.9	0.31
Stroke Volume (mL)	75.1 ± 39.9	67.5 ± 35.6	0.42
Aortic Valve Area (cm ²)	0.77 ± 0.25	0.72 ± 0.26	0.37
Aortic Valve Hemodynamics 30 days Post-TAVR			
Peak Velocity Across Aortic Valve (m/s)	2.4 ± 0.54	2.2 ± 0.25	0.31
Mean Gradient Across Aortic Valve (mmHg)	12.2 ± 6.0	10.9 ± 3.2	0.42
Aortic Valve Area (cm ²)	1.6 ± 0.52	1.5 ± 0.52	0.59
Aortic Valve Hemodynamics 1 Year Post-TAVR			
Peak Velocity Across Aortic Valve (m/s)	2.4 ± 0.75	2.2 ± 0.47	0.38
Mean Gradient Across Aortic Valve (mmHg)	12.6 ± 6.6	10.8 ± 4.4	0.30
Aortic Valve Area (cm ²)	1.5 ± 0.57	1.7 ± 0.96	0.32
Procedure Characteristics			
Balloon Expandable Valve	360 (85.9%)	14 (82.4%)	0.68
Valve Size (mm)	25.7 ± 2.8	26.1 ± 3.4	0.60
Discharge Medications			
Aspirin+P2Y12 Inhibitor	265 (63.2%)	9 (52.9%)	0.39
Aspirin+P2Y12 Inhibitor + Anticoagulant	6 (1.4%)	1 (5.9%)	0.15
Aspirin + Anticoagulant	117 (27.9%)	5 (29.4%)	0.89
P2Y12 Inhibitor + Anticoagulant	14 (3.3%)	1 (5.9%)	0.57

*Denotes P < 0.05

Results: 436 patients (58.9% male, 78.6 ± 10.1 years-old) underwent TAVR. Of these, 41 patients (9.4%) had a history of CVA, and 172 patients (39.4%) had atrial fibrillation (AF). 17 (3.9%) patients experienced IB (7 SDH, 6 ICH, 2 SDH and ICH, 2 SDH and SAH) after hospital discharge. Median (IQR) time to IB after TAVR was 20.3 (12.9-21.1) months. Of the patients with late IB, 13 (76.5%) were male, average age was 82.3 ± 8.2 years, left ventricular ejection fraction (LVEF) was 49.4% ± 14.1%, and 7 (41.2%) had AF. Risk factors for late IB include non-white race, hypertension, hyperlipidemia, low pre-TAVR LVEF, and low day 30 LVEF (Table).

Conclusions: Patient comorbidities and preoperative echocardiogram parameters may predict late IB after TAVR. Given the high 1-year mortality rate after TAVR, the true incidence of IB may be underestimated. Patients at high risk for IB may be considered for single drug AP or AC following TAVR.

Disclosures: D. T. Pham: *Abiomed: Consulting; Medtronic: Consulting; Abbott (St. Jude): Consulting; S. C. Malaisrie: Abbott (St. Jude): Consulting; Edwards Lifesciences: Consulting; Baxter Healthcare Corporation: Consulting; CryoLife, Inc: Consulting; Meetings & Incentives Worldwide,*

Inc.: Consulting; J. D. Flaherty: Noble Insights: Consulting; G. Peigh Nothing to disclose. E. P. Cantey Nothing to disclose. R. N. Sweis Nothing to disclose. L. J. Davidson Nothing to disclose. A. Churyla Nothing to disclose. C. J. Davidson Nothing to disclose.

III-65 | Delayed Onset Left Bundle Branch Block After Transcatheter Aortic Valve Replacement

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Background: There is a trend towards early discharge after transcatheter aortic valve replacement (TAVR). Recent studies show there is occurrence of delayed high-grade atrioventricular block post TAVR, which may complicate early discharge. New left bundle branch block (LBBB) post-TAVR has been associated with need for permanent pacemaker (PPM). We sought to evaluate the occurrence of new onset delayed LBBB after TAVR and its association with need for PPM.

Methods: Patients without baseline bundle branch blocks or prior PPM undergoing TAVR at Kaiser Permanente Los Angeles Medical Center between June 2011 and February 2019 were included. Serial electrocardiograms (ECG) after TAVR were reviewed to evaluate for new onset delayed LBBB (defined as new LBBB occurring ≥ 2 days after TAVR). Clinical data and outcomes were compared between those with no-LBBB and immediate new-LBBB (occurring < 2 days) after TAVR.

Results: There were 419 patients (average age 81.7 ± 7.9 years, 53% female) included in the study. Of these, 21 (5%) developed delayed-LBBB and 208 (49.6%) had immediate new-LBBB after TAVR. Median time to delayed-LBBB was 3 days (Interquartile range [IQR] 2-6 days). Compared to those with no-LBBB ($n=190$), delayed-LBBB were less likely to have history of myocardial infarction (4.8% vs 24.7%, $p=0.038$), and more likely to have diabetes (76.2% vs 46.4%, $p=0.012$). Patients who developed delayed-LBBB had a higher rate of 30-day new PPM rate (28.6% vs 1.1%, $p<0.001$) compared to those with no-LBBB. There were no differences in all-cause mortality or heart failure hospitalization. No difference in use of self-expanding valves (71.4% vs 67.9%, $p=0.74$) was found between groups either. When comparing delayed-LBBB vs immediate new-LBBB, there were no differences in 30-day PPM rate, or other outcomes. Use of self-expanding valves (delayed vs immediate; 71.4% vs 87%, $p=0.053$) was similar as well.

Conclusions: Delayed LBBB can occur after TAVR at a median of 3 days (upper quartile of 6 days) and is associated with need for PPM within 30-days. Mechanism and risk factors remain unclear. Further studies are warranted to better identify and risk stratify patients developing delayed conduction disturbances.

Disclosures: V. J. Aharonian: *Medtronic: Consulting and Principal Investigator for a Research Study*; D. Q. Phan *Nothing to disclose*. J. Goitia *Nothing to disclose*. M. S. Lee *Nothing to disclose*. N. A. Moore *Nothing to disclose*. P. W. Mansukhani *Nothing to disclose*. S. S. Brar *Nothing to disclose*. R. Zadehan *Nothing to disclose*.

III-66 | Tale of 3 Valves TAVR or SAVR Diagnostic Dilemma

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Background: TAVR has become the treatment of choice with aortic stenosis (decreasing the rates of mortality and morbidity). We present

a usual case of a 60-year-old female patient with aortic stenosis who was originally misdiagnosed (she was seen at 6 different TAVR centers). On physical exam there was SOB with exertion, clear S1/S2, but no JVD. The patient presented a 4/6 murmur of aortic stenosis that radiated to the carotids (with a good carotid upstroke). There was no murmur of aortic insufficiency. The catheterization procedure showed no CAD and the aortic valves were not crossed by the TAVR team (given known AS on echo). At the final evaluation of the patient for TAVR, a CTA and a TEE were conducted. After careful analysis of the CTA and the TEE, it was found the patient not only had aortic stenosis but also a subaortic membrane and a pseudoaneurism at the base of the ventricular septum. The findings of the CTA and the TEE caused the TAVR procedure to be aborted and the patient to be scheduled for SAVR.

Methods: A cardiac catheterization, a TEE and a CTA were conducted

Results: The CTA study suggests SAS, pseudoaneurism at the base of the ventricular septum, and thickened leaflets with reasonable opening. TEE shows high mean aortic gradients and subaortic stenosis. The catheterization procedure showed no CAD.

Conclusions: First, the clinical findings are the same for AS, subaortic membrane stenosis, and fibromuscular stenosis. Second, there was a need for a complete cardiac catheterization to evaluate the site of the aortic and subaortic gradients. Third, careful investigation was needed because there was no detectable ejection click, which indicated non-valvular stenosis. Fourth, there was a need to carefully evaluate the CTA and the TEE for finding a subaortic stenosis and a pseudoaneurism at the base of the ventricular septum. Finally, lack of this analysis would have led to the wrong diagnosis and a TAVR procedure instead of an SAVR procedure, thereby increasing patient complications.

Disclosures: B. Brewer *Nothing to disclose*. B. Behrman *Nothing to disclose*. J. Insel *Nothing to disclose*.

STRUCTURAL HEART DISEASE (EXCLUDING VALVULAR INTERVENTIONS)

III-67 | Incremental value of Novel Automated Machine Learning Platforms for Risk Stratification beyond STS risk scores in Patients Undergoing Transcatheter Aortic Valve Replacement

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Raybuck, West Virginia University Heart Institute, United States; Vinay Badhwar, West Virginia University Heart Institute, United States; Partho P. Sengupta, West Virginia University School Of Medicine, United States

Background: Using single site Transcatheter Valve Therapy (TVT) registry data, we illustrate the potential use of novel automated machine learning (AutoML) platforms for integrating complex preprocedural conditions with ease and efficiency for developing rapid risk stratification for patients undergoing Transcatheter Aortic Valve Replacement (TAVR).

Methods: Using TVT registry data, a training set of 211 (median age 80 [52–93] years, 45% males) patients was created utilizing the similarity network to identify patient phenogroups with similar incidence of postprocedural and 30 day adverse events as defined according to Valve Academic Research Consortium-2 (VARC-2) criteria. We developed supervised AutoML models for training and validating their ability to identify these groups. These AutoML models were then used to

create phenogroups in a separate validation set of 143 patients (median age 79 [75 – 84, 45% males].

Results: The patient similarity network identified 5 patient groups. Although the patients were quantified by the Society of Thoracic Surgeons score as intermediate risk for all the groups, substantial variation in adverse postprocedural and 30-day events were noted, with higher number of TAVR composite events noted in the Group 3 while lower in the Group 1. The supervised AutoML model predicted patients at the lowest risk (Group 1) with an AUC of 0.94 and the performance of the classifier was confirmed in the external hold out cohort.

Conclusions: In this pilot study, we illustrate that AutoML platforms may simplify steps for clinicians to use ML methods for identifying patient phenogroups who have similar 30-day adverse outcomes following TAVR.

Disclosures: V. Badhwar: *Abbott (St. Jude): Consulting*; P. P. Sengupta: *Heart Sciences, Ultramics: Consulting*; Y. Abdul Ghaffar *Nothing to disclose*. S. Shrestha *Nothing to disclose*. F. Shaukat *Nothing to disclose*.

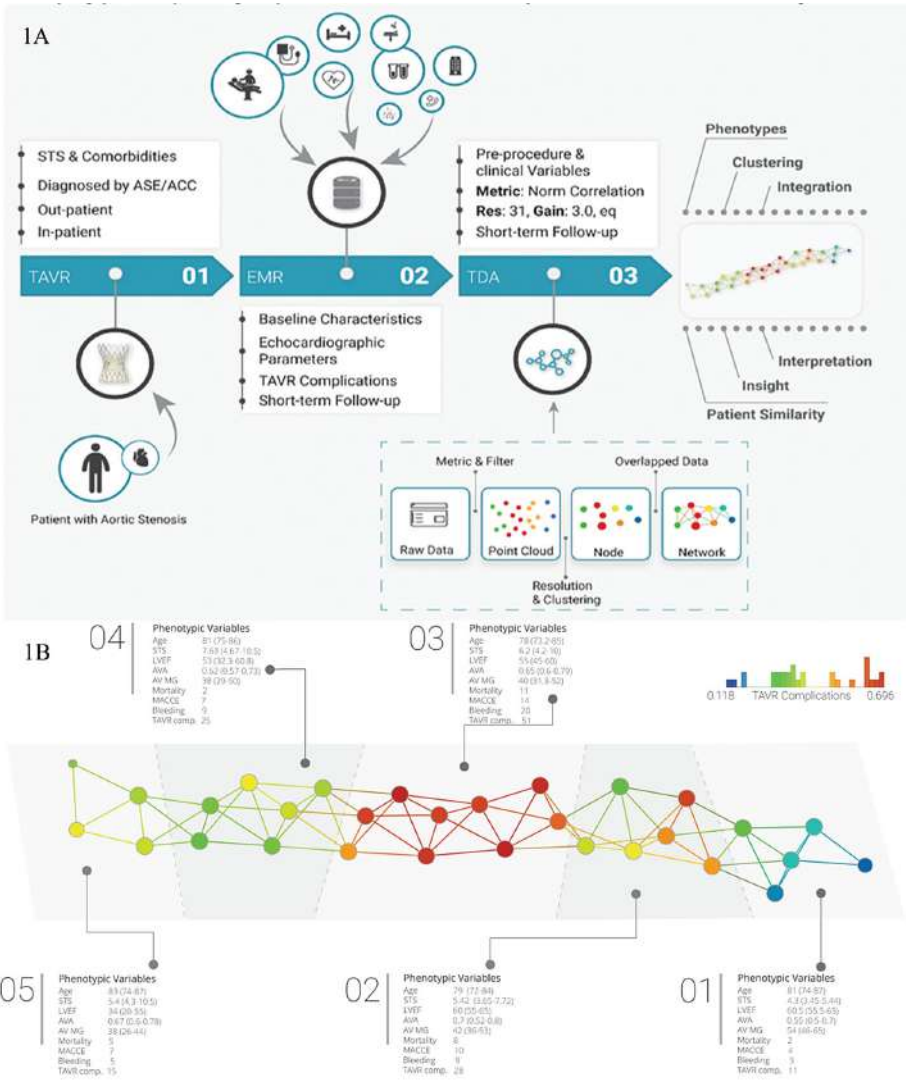


Figure 1A: Study Flow Diagram
Figure 1B: TDA network of phenotypic groups with key clinical variables and post-TAVR outcomes

M. Osman *Nothing to disclose*. N. Kagiya *Nothing to disclose*.
M. Alkhouli *Nothing to disclose*. B. D. Raybuck *Nothing to disclose*.

III-68 | Impact of Atrial Fibrillation on the Outcomes of Hypertrophic Obstructive Cardiomyopathy- A National Inpatient Sample Based Study

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Background: Atrial fibrillation (AF) adversely affect the outcomes in the patients with hypertrophic obstructive cardiomyopathy (HOCM), however there are limited studies exploring such an association. We sought to study the outcomes of HOCM in patients with AF in National Inpatient Sample (NIS) database.

Methods: We included all the patients with the primary diagnosis of HOCM from the NIS database (2012-2014) using ICD-9 codes. Exposure of interest was AF. Primary outcome was in-hospital mortality and secondary outcomes were rates of congestive heart failure (CHF), sudden cardiac death (SCD), embolic stroke, acute myocardial infarction (AMI), ventricular assist device (VAD) placement, AICD, cardiac resynchronization therapy (CRT) and permanent pacemaker implantation. Length of stay and total cost of hospitalization were also assessed.

Outcome	HOCM with AF (n=34,405)	HOCM without AF (n >56,165)	Adjusted OR (95%CI)	p-value
	% (95% CI)	% (95% CI)		
Primary Outcome				
In-Hospital Mortality	3.7 (3.4-4.2)	2.7 (2.3-3.1)	1.24 (0.97-1.59)	0.08
Secondary Outcomes				
CHF	50.3 (48.5-52.1)	32.1 (30.7-33.5)	2.34 (2.1-2.61)	<0.001
Sudden Cardiac Death	2.57 (2.1-3.1)	2.17 (1.8-2.5)	1.35 (1.01-1.82)	0.04
Embolic Stroke	1.16 (0.86-1.55)	0.64 (0.48-0.87)	1.64 (1.05-2.56)	0.02
Acute Myocardial Infarction	5.9 (5.1-6.7)	6.4 (5.7-7)	0.79 (0.66-0.96)	0.01
Procedures				
Permanent Pacemaker Implantation	3.32 (2.8-3.9)	2.38 (2.02-2.8)	1.23 (0.93-1.61)	0.13
AICD Implantation	2.6 (2.1-3.2)	3.6 (3.1-4.2)	0.85 (0.64-1.13)	0.27
CRT Implantation	0.5 (0.3-0.8)	0.2 (0.1-0.4)	2.02 (1.03-3.98)	0.04
VAD placement	0.7 (0.5-1)	0.4 (0.2-0.6)	1.75 (1.0-3.0)	<0.04
Hospital Outcomes			Adjusted mean difference	
Length of stay, mean (SE), d	6.2±0.12	5.58±0.09	0.55 (0.25-0.85)	<0.001
Total Cost of Hospitalization, mean \$	20176±611	18752±449	1312 (83-2541)	0.03

Abbreviations: CHF: Congestive Heart Failure; AICD: Automated Implantable Cardioverter-defibrillator; CRT: Cardiac Resynchronization Therapy; VAD: Ventricular Assist Device

Table 1: Outcomes of the study population

Results: Out of 90570 patients with HOCM, 34405 patients had AF. AF cohort had less numbers of females and more number of older patients. There was no difference in terms of in-hospital mortality in study cohorts based on AF. The odds of CHF, SCD, embolic stroke, CRT implantation and VAD placement were higher in the AF cohort. Non AF cohort had more odds of AMI. AF cohort also had higher length and total cost of hospitalization (Table 1).

Conclusions: HOCM patients with AF have increased odds of CHF, SCD, embolic stroke with increased health care expenditure. AF should be aggressively managed in HOCM patients and more research is needed to determine the optimal AF management strategy to improve the outcomes.

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III-69 | Watchman Endocarditis: A Novel Complication

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Background: The WATCHMAN device (WD) is the most commonly implanted LAA occlusion device used in patients with atrial fibrillation (AF) that can not tolerate long term anticoagulation. It has been shown to significantly reduce thromboembolic events and has a Grade 2B recommendation for this indication. The complications of this procedure that have been identified to date include device related thrombosis, bleeding complications, occlusions/perforations of the pulmonary artery and coronary sinus. This case reports a novel complication of the WD that has not been previously described in the literature: endocarditis.

Methods: An 88 year old female with paroxysmal non-valvular AF was evaluated for WD after suffering a significant gastrointestinal bleed requiring multiple transfusions. Patient's CHADSVASc score was 5, putting her at a 7.2% yearly risk of stroke. The HAS-BLED score was 3 with a bleeding risk of 5.8% per year and 3.72 bleeds per 100 patient-years. Patient underwent LAA occlusion with 21 mm WD without any complications. A month later, the patient presented with presyncope. TEE revealed an echodensity in the aortic valve, posterior leaflet of the mitral valve and a possible echodensity on the WD. Cardiac CTA demonstrated a small crescentic leak along the left posterior aspect of the WD. Blood cultures grew Staphylococcus epidermidis.

Results: The WD was thought to be the source of the endocarditis as post implantation imaging did not show any echodensities on the WD or the valves. The patient was deemed a poor surgical candidate by Cardiothoracic surgery for device removal and the decision was made to continue intravenous antibiotics for 6 weeks and then re-evaluate

for device removal. Unfortunately, a few weeks later the patient presented with septic shock and expired shortly thereafter.

Conclusions: This case illustrates endocarditis as a possible complication of WD implantation. Review of the literature including the WD registries reveals no previous reports of endocarditis of the WD or the valves occurring after implantation. Currently there are no guidelines or data on how to manage these novel complications.

Disclosures: A. Chaus *Nothing to disclose*. F. Masood *Nothing to disclose*. N. Sawlani *Nothing to disclose*.

III-70 | Utilization and Outcomes of Implantable Left Atrial Appendage Occlusion Device: Analysis of the National Inpatient Sample Database

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Background: Left atrial appendage occlusion (LAAO) devices are an increasingly popular alternative to anti-coagulation in patients with atrial fibrillation and elevated risk of stroke. However, data regarding utilization, cost, and outcomes of implantable LAAO devices in the United States are limited. We aim to report this data.

Methods: The National Inpatient Sample/Health Care Utilization Project database was queried from the years 2010 to 2014. The procedure and related complications were calculated using the International Classification of disease-Ninth edition. Continuous variables presented as mean $\pm$ SD, and categorical as a percent.

Results: A total of 552 (Weighted for national estimated=2733) procedures were analyzed. The mean age was 71.09 ± 9.98 years, 60.4% were male, predominantly white (84.7%), followed by Hispanic (6.5%) and Black (4.3%). Most procedures were elective (79%), and performed in large- (69.7%), medium- (18.5%) and small-size hospitals (11.8%). The majority (78.4%) were done in urban teaching hospitals, (20.6%) in urban non-teaching hospital and (1%) in rural hospitals. The mortality rate during admission was 1.9%, with an average length of stay of 5.97 ± 7.54 days, and a hospitalization cost of $128,261.06 \pm 142,249$ American dollars. Costs were covered predominantly by Medicare (76%), followed by private insurance (17.1%), Medicaid (2.4%), and self-paid (1.9%). Following the procedure, 3.9% (107) of patients required pericardiocentesis, 0.5% (15) pericardial window. Post procedure stroke was 0.9% (26), device complications 0.4% (10), acute respiratory failure 4.2% (114), iatrogenic cardiac complications 5.4% (149), and post-operative bleeding and hematoma 3.1% (85).

Conclusions: The Implantable LAAO device in the US was associated with low in-hospital mortality and admissible complications. This

analysis showed a similar safety profile to the one described in FDA's manufacturer and user facility device experience database, as well as large randomized trial data.

Disclosures: J. Del Cid Fratti *Nothing to disclose*. L. H. Paz Rios *Nothing to disclose*. J. Gomez *Nothing to disclose*. J. Nazari *Nothing to disclose*.

III-71 | Clinical and procedural outcomes of percutaneous closure of septum secundum ASD

Mohammad M. Ansari, Texas Tech University Health Sciences Center-University Medical Center, United States; Daniel Garcia, Ochsner Heart And Vascular Institute, United States

Background: The secundum ASD is one of the most common adult congenital heart disease. Percutaneous or surgical closures can be used for treatment but clinical benefit of one modality over the other might exist. We aimed to evaluate the clinical and procedural outcomes between percutaneous closure of secundum ASD versus surgical repair.

Methods: Methods Pub Med, Cochrane and Embase were systematically searched for all the clinical data that directly compared percutaneous device closure to surgery. Primary outcomes included death and closure success. Secondary outcomes were supraventricular tachycardias (SVT), major complications, wound infection, requirement of blood transfusion and length of hospital stay. We used Fixed or Random Effect analysis using the Cochrane Handbook of Systematic Reviews and RevMan 5.2 for statistical analysis.

Results: Eighteen all retrospective studies provided 3,950 patients; 2,166 in the percutaneous closure and 1,828 in the surgical group. ASD diameters were significantly 2.53 mm (1.31-3.74) smaller in the percutaneous group. There were deaths reports in none of the studies. ASD closure success tended to be higher in the surgical group (98% vs. 97, $p=0.1$). Secondary outcomes analysis showed significant fewer major complications in the percutaneous device group (8% vs. 31%, $p < 0.01$) and hospital stay 3.37 (2.37- 4.38) days shorter ($p < 0.01$). There was significant less SVT in the percutaneous group (1.8% vs. 5%, $p < 0.01$) as well as wound infection (2% vs. 0.1%, $p < 0.01$). Blood transfusion rates were higher in the surgical group (8% vs. 0.1, $p < 0.01$).

Conclusions: Our analysis suggests that percutaneous closure of ASD seems comparable to surgery when the anatomy of the ASD is suitable. There is mortality difference. Surgical closure is possible for larger sizes but carries higher complications rates including atrial arrhythmias, infection, blood transfusion, longer hospital stay and other major complications. In-deep analysis by randomized studies should be pursued comparing similar ASD sizes.

Disclosures: M. M. Ansari *Nothing to disclose*. D. Garcia *Nothing to disclose*.

III-72 | Short-term Outcomes after Transcatheter Aortic Valve Replacement in Patients with Preexisting Pacemaker versus Newly Implanted Pacemaker

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Background: Permanent pacemaker (PPM) implantation following transcatheter aortic valve replacement (TAVR) is a major concern because patients who require PPM after TAVR reportedly have worse prognosis than those without PPM. However, limited data are available regarding whether patients with newly implanted PPM after TAVR have different prognosis compared with patients with preexisting PPM.

Methods: Using the Nationwide Readmissions Database, we identified patients who underwent endovascular TAVR and were discharged alive between 2014 and 2016. In this post-TAVR cohort, we selected patients with preexisting PPM and those who received new PPM during hospitalization. We compared 30-day outcomes after discharge between the two groups.

Results: Of 38,664 post-TAVR patients, 3,925 had preexisting PPM and 4,453 had new PPM. The preexisting PPM group, as compared with the new PPM group, was older (83.5 ± 6.4 years vs. 81.9 ± 7.3 years, $p < .001$) and had higher prevalence of prior cardiac intervention/surgery history, mitral valve disease (5.0% vs. 3.8%, $p = .005$), tricuspid valve disease (6.5% vs. 4.0%, $p < .001$), and atrial fibrillation (50.0% vs. 37.6%, $p < .001$). However, 30-day readmission rate (16.1% vs. 13.7%, $p = .002$), cardiac-cause readmission rate (5.8% vs. 4.7%, $p = .017$), and mortality rate during the first readmission (1.0% vs. 0.5%, $p = .004$) were significantly higher in the new PPM than preexisting PPM group. After adjustment for patient demographic and comorbidities, new PPM, compared with preexisting PPM, was still associated with higher risk of 30-day readmission (OR=1.18, 95% CI=1.04-1.34, $p = .010$), cardiac-cause readmission (OR=1.26, 95% CI=1.03-1.54, $p = .023$), and death during the first readmission (OR=1.88, 95% CI=1.37-2.59, $p < .001$).

Conclusions: This study suggests that new PPM after TAVR is associated with worse short-term outcomes than preexisting PPM. Further efforts are required to reduce the periprocedural risk of PPM implantation related to TAVR.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; T. Isogai *Nothing to disclose*. A. M. Saad *Nothing to disclose*. S. Shekhar *Nothing to disclose*. O. Abdelfattah *Nothing to disclose*. K. R. R. Ahuja

Nothing to disclose. M. Kaur *Nothing to disclose*. M. M. Gad *Nothing to disclose*.

III-73 | Comparison of Surgical and Percutaneous Interventions for Hypertrophic Cardiomyopathy: Insights from Nationwide Inpatient Sample

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Background: Mitral valve regurgitation (MR) and left ventricular outflow tract obstruction play a key role in symptomatic hypertrophic cardiomyopathy (HCM). Alcohol septal ablation or surgical myomectomy are the septal reduction procedures performed in these patients, with recent use of Mitraclip in patients with prohibitive surgical risk

Methods: Nationwide Inpatient Sample (NIS) database from January 2016 to December 2016 was analyzed to identify all the admissions with an associated diagnosis of HCM who underwent alcohol septal ablation, septal myectomy or Mitraclip using appropriate ICD-10-CM codes. Clinical profile, hospital characteristics, in-hospital outcomes including mortality and need for pacemaker were described.

Results: We identified 48,509 HCM related admissions in the year 2016 of which 56.4% were females. Mean age was 65.81 ± 0.22 years. Expectantly 73.49% of admissions occurred in urban teaching hospital and 58.91% in large hospitals. The mean LOS in patients with HCM was 5.6 ± 0.07 days. Pacemaker was placed in 1085 (2.23%) cases and overall in hospital mortality occurred in 1465 (3.02%) cases. Alcohol ablation had least mortality, which was followed by septal myectomy and MitraClip (Table 1)

Conclusions: Septal myectomy is the most commonly performed septal reduction procedure in HCM followed by alcohol ablation and MitraClip. Higher mortality rate was observed with MitraClip procedure, further investigations are needed prior to recommending MitraClip in patients with HCM.

Disclosures: S. Kaur *Nothing to disclose*. J. Sreenivasan *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. M. M. Gad *Nothing to disclose*. A. Krishnaswamy *Nothing to disclose*. S. R. Kapadia *Nothing to disclose*.

	Alcohol ablation	Septal Myectomy	MitraClip
Total number of admissions	395	1980	50
Female	50.6%(p=0.9)	56.3%(p=0.9)	40%(p=0.3)
Age	65.08 ± 1.42 (p=0.6)	57.03 $\pm$ 0.91(p<0.001)	64.49 $\pm$ 4.17(p=0.7)
LOS	5.41 $\pm$ 0.82(p=0.7)	9.22 $\pm$ 0.66(p<0.001)	6.49 $\pm$ 1.81(p=0.6)
Death	0	4.24%(p=0.2)	10%(p=0.2)
Pacemaker	50 (p<0.001)	110(p<0.001)	0

Table 1 – Baseline characteristics and procedural outcomes in HCM patients undergoing percutaneous or surgical interventions

III-74 | Contemporary trends in outcomes and safety in patients undergoing Percutaneous Left Atrial Appendage Closure

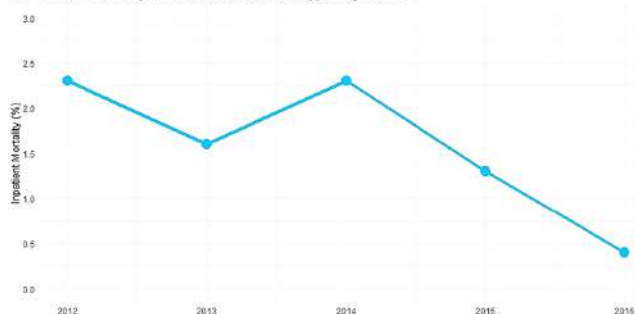
Muhammad Z Khan, West Virginia University School Of Medicine, United States; Muhammad U Khan, West Virginia University School Of Medicine, United States; Safi U Khan, West Virginia University School Of Medicine, United States; Shahul Valavoor, West Virginia University School Of Medicine, United States; Muhammad B Munir, West Virginia University School Of Medicine, United States

Background: Percutaneous left atrial appendage closure (LAAC) use is increasingly becoming popular especially as a non-pharmacologic alternative for patients with non-valvular AF who are at high risk for bleeding and/or stroke. We sought to estimate recent trends and safety of LAAC in the US.

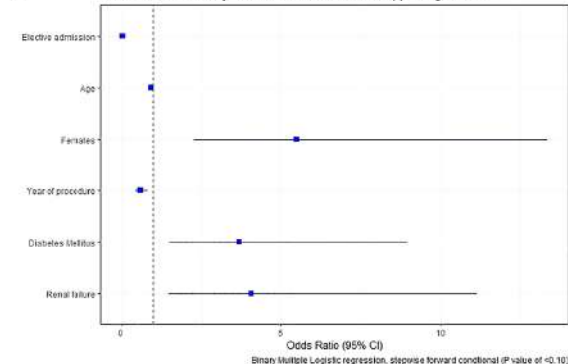
Methods: National Inpatient Sample data from January 2012 to December 2016 using ICD-9-CM codes and ICD-10-CM codes was used for analysis. Pearson χ^2 test and Analysis of variance (ANOVA) test were used where applicable. Multiple Logistic regression was performed to estimate odds ratios (ORs) to determine predictors for mortality. P value of < 0.05 was considered significant.

Results: 9,785 patients underwent LAAC from 2012 to 2016. Mean age was 73.6 (SD, 9.4) yrs.). 4,990 (84.6%) were elective admission. Mortality was low at 80(0.8%). Over the years the mortality has decreased (2.3%[10] to 0.4%[25], $P < 0.01$)(figure). Mean length of stay for hospital has decreased (8.0 to 2.1 days, $P < 0.01$), but the number of LAAC performed have increased many folds (425 to 6570).

A. Trends in Mortality in Percutaneous Left Atrial Appendage Closure



B. Predictors for Mortality in Percutaneous Left Atrial Appendage Closure



Complications associated with LAAC were low. 690 (7.1%) patients suffered from at least one complication. Common complications were NSTEMI (205, 2.1%), procedure related bleeding (135 1.4%), vascular complication (90,0.9%), cardiogenic shock (100, 1.0%), post op stroke (20, 0.2%), pneumothorax (55, 0.6%), hemopericardium (30, 0.3%), cardiac tamponade (80,0.8%), septic shock (25, 0.3%) and Post OP respiratory failure (125, 1.3%).

Conclusions: LAAC is a safe procedure, mortality is low and has been improving over the years.

Disclosures: M. Z. Khan *Nothing to disclose*. M. U. Khan *Nothing to disclose*. S. U. Khan *Nothing to disclose*. S. Valavoor *Nothing to disclose*. M. B. Munir *Nothing to disclose*.

III-75 | Prognostic Markers for the Progression of Advanced Chronic Kidney Disease Requiring Hemodialysis in Transcatheter Aortic Valve Replacement

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Background: Progression of chronic kidney disease (CKD) to requiring hemodialysis (HD) remains a complication of transcatheter aortic valve replacement (TAVR) associated with increased morbidity and mortality. Patients with advanced CKD are the most vulnerable population. Identifying clinical markers within this group at highest risk for progression to HD post-TAVR carries significant clinical implications.

Methods: In a retrospective, observational study from 2012-2019, we reviewed 1512 patients who underwent TAVR at our institution. Included were HD naïve patients with a glomerular filtration rate (GFR) <45mL/min pre-TAVR. We examined clinical characteristics (age, sex, hypertension, diabetes, GFR, atrial fibrillation (AF), peripheral artery disease (PAD), tobacco use), contrast dose and procedure time. The primary outcome of interest was new requirement for HD during the TAVR hospitalization post-TAVR and defined our cohorts. Statistical analyses of outcomes were performed using multivariate binary logistic regression.

Results: Included were 385 HD naïve patients with a pre-TAVR GFR <45mL/min. Cohort 1 included 17 patients with a pre-TAVR GFR <45mL/min who went on to require HD post-TAVR. Cohort 2 included 368 patients with a pre-TAVR GFR <45mL/min who did not require HD post-TAVR. Patients with pre-existing AF were 3.52 times more likely to require HD post-TAVR (CI 0.083, 0.964, $p = 0.0435$). Additionally a lower baseline GFR was associated with a higher risk for requiring HD post-TAVR ($p < 0.0001$). The remaining variables examined were not found to correlate with requiring HD post-TAVR.

Conclusions: Patients with moderate to severely reduced renal function represent the group at highest risk for progression to require HD

post-TAVR. Our study demonstrates that within this group, pre-existing AF was independent predictor of requiring HD during the TAVR hospitalization post-TAVR. This group of patients may warrant hydration or pre-TAVR contrast reduction by utilizing non-contrast imaging to minimize the risk of requiring HD post-TAVR.

Disclosures: G. A. Medranda *Nothing to disclose*. K. Salhab *Nothing to disclose*. R. K. Schwartz *Nothing to disclose*. S. J. Green *Nothing to disclose*.

III-76 | The Safety of Moderate Sedation in Contemporary Transcatheter Aortic Valve Replacement with Transesophageal Echocardiography

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Background: Initial experience with transcatheter aortic valve replacement (TAVR) routinely utilized general anesthesia (GA) and transesophageal echocardiography (TEE). Over the last decade, the increased use of moderate sedation (MS) and transthoracic echocardiography (TTE) have been associated with better short-term outcomes in moderate to high-risk patients undergoing TAVR using early generation valves. The purpose of this study was to investigate the safety of MS compared to GA in patients undergoing TAVR with TEE across all risk groups using contemporary TAVR valves.

Methods: This was a retrospective, observational study from 2015-2019 of 850 patients who underwent TAVR using third generation valves at our institution. Patients were separated into cohorts depending on the type of anesthesia received. All patients underwent intra-procedural TEE. The outcomes of interest were intensive care unit (ICU) LOS, post-TAVR LOS, inpatient and 30-day death. Statistical analyses of outcomes were performed two-sample t-test, chi-squared test and multivariate binary logistic regression.

Results: Cohort 1 included 156 patients who received GA and cohort 2 included 694 patients who received MS. Baseline characteristics were compared between the two cohorts. Characteristics that differed between the two cohorts were included in our multivariate analysis. There were no interactions between any of the baseline characteristics and type of anesthesia for our outcomes of interest. Patients who received GA were 1.780 times more likely to have an ICU LOS > 48 hours (CI 1.070, 2.960, $p=0.0264$), 1.647 times more likely to have a post-TAVR LOS > 3 days (CI 1.060, 2.560, $p=0.0266$), 27.252 times more likely to have inpatient death (CI 5.747, 129.221, $p<0.0001$) and 5.728 times more likely to have death at 30-days (CI 2.094, 15.670, $p=0.0007$) when compared to those who received MS.

Conclusions: There exists literature to support the use of MS and intra-procedure TTE using older generation valves in higher risk patients. Our study suggests that MS is safe with intra-procedural TEE and can result in improved short-term outcomes when compared to GA across all risk groups using third generation TAVR valves.

Disclosures: G. A. Medranda *Nothing to disclose*. K. Salhab *Nothing to disclose*. R. K. Schwartz *Nothing to disclose*. S. J. Green *Nothing to disclose*. H. Hussain *Nothing to disclose*.

III-77 | Transcatheter vs. Surgical Aortic Valve Replacement in Renal Transplant Patients : A meta-analysis

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Background: Transcatheter aortic valve replacement (TAVR) is approved in high risk surgical patients. Its use in kidney transplant patients is still debated. We are comparing TAVR vs surgical aortic valve replacement (SAVR) mortality outcome, in severe aortic valve stenosis patients with kidney transplant

Methods: Data search was done by two independent persons from PubMed, google scholar, Cochrane with key words "TAVR", "SAVR", "outcome" and "kidney transplant". Only three trials were available with direct comparison of TAVR vs SAVR in kidney transplant patients. We compared mortality outcome in kidney transplant patients who had TAVR vs SAVR.

Results: Total of 369 studies, TAVR- 109 and SAVR-260. Both 30-day mortality and 1-year mortality was studied in both groups in all 3 studies. TAVR was associated with lower mortality as compared with SAVR at 30-days and hospital discharge time (OR [odds ratio] of 0.72; CI 95% [Confidence interval] of 0.27-1.91). However, TAVR mortality was higher as compared to SAVR at 1-year (OR-1.62; CI 95% is 1.06-2.50) Fig. 1.3.

Conclusions: although TAVR is associated with lower mortality at 30 days, SAVR had lower mortality at 1 year in patients with renal transplant.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Name	Number SAVR	Number TAVR	AOR TAVR	AOR SAVR	TAVR 30-day mortality	SAVR 30-day mortality	TAVR 1-year mortality	SAVR 1-year mortality
Henrik	18	8	70+ ₇	67+ ₈				
Fox					0	2	0	3
Stefan	20	20	69	65.5	2	2	2	6
Charles	222	81	72.9	66.7	3	12	24	28

Fig. 1.1 Table with 30-day and 1-year outcome in patients and age distribution

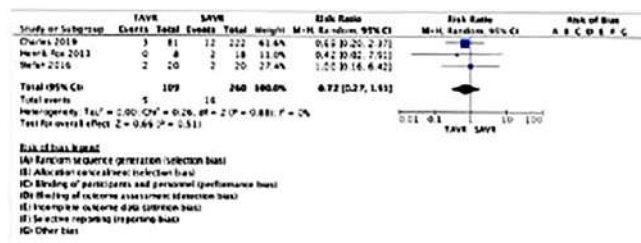


Fig. 1.2 Statistical analysis of TAVR vs SAVR at 30-days



Fig. 1.3 Statistical analysis TAVR vs SAVR at 1-year.

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III-78 | Low intensity warfarin (INR goal 1.8 - 2.5) post Watchman implantation: results from a single center retrospective registry

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Background: Warfarin anticoagulation post-Watchman is recommended for 45 days to allow for device endothelialization. However, the optimal INR goal post-implant has not been studied. Atrial fibrillation literature suggests lower intensity (LI) warfarin dosing (INR goal 1.8-2.5) may provide similar protection against thromboembolic events with reduced bleeding risk when compared to standard intensity (SI) dosing (INR goal 2.0-3.0). We sought to compare SI vs LI warfarin treatment following Watchman procedure.

Methods: In a retrospective single center registry, 128 patients underwent successful Watchman implantation from 2015 to 2019. 12 patients were excluded for non-warfarin based post implant regimen. Baseline demographics, intra-procedural characteristics, and 6-week outcomes were compared in those patients receiving SI vs LI warfarin. Major bleeding was defined as overt bleeding with one of the following features: an associated hemoglobin drop of at least 3.0 g/dL, requiring surgery or transfusion of 2-3 units of blood, or causing hospitalization or permanent injury. Minor bleeding was defined as any clinically significant bleeding not meeting criteria for major bleed.

Results: 45 patients were in the SI group vs 67 in the LI group. The average INR during the study period was 2.35 ± 0.56 vs 2.08 ± 0.67, p = 0.03 (SI vs LI). There was no difference in baseline demographics (i.e. age, CHADS2VASc, HAS-BLED). Patients in the LI group were more likely to have a history of major bleed prior to Watchman implantation (72% vs 47%, p = 0.008). At six-week follow up, there was 1 CVA/TIA and 1 device-related thrombus in the LI group vs 0 events in the SI group (p = 0.41); there were 6 total bleeding events (3 major) in the LI group vs 4 total events (1 major) in the SI group (p = 0.99, p = 0.53).

Conclusions: History of a major bleeding prior to Watchman implantation was associated with selection of a LI warfarin regimen post implant. There were no statistical differences in the rates of thromboembolic or bleeding events between the two regimens. Further prospective validating studies are needed to determine the safety and efficacy of LI regimen post Watchman implant, particularly in patients with history of major bleed.

Disclosures: G. Singh: Boston Scientific Corp.: Consulting and Speaker Bureau; E. Mullins Nothing to disclose. W. Wung Nothing to disclose. T. Smith Nothing to disclose. E. Aman Nothing to disclose. J. H. Rogers Nothing to disclose.

III-79 | Sentinel Use in Transcatheter Aortic Valve Replacement: Evaluation of Radiation Exposure

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Background: Transcatheter aortic valve replacement (TAVR) provides a feasible alternative to surgical aortic valve replacement (SAVR) for patients with severe aortic stenosis. Despite numerous advancements, the risk of stroke remains 2-5% with TAVR and is a significant contributor to morbidity and mortality. Recently, the FDA approved the Sentinel cerebral embolic protection device for stroke risk reduction during TAVR. However, adoption has been limited by multiple factors including a concern for increased fluoroscopy time along with radiation exposure. We sought to compare fluoroscopy time and radiation dose in patients undergoing TAVR with and without Sentinel.

Methods: Data from all patients undergoing TAVR between February 2018 and August 2019 was collected and analyzed retrospectively. We examined differences based on demographics (sex, age, and body surface area), Society of Thoracic Surgery (STS) mortality risk, fluoroscopy time, radiation dose, and length of stay between TAVR with Sentinel and TAVR without. The valve type was determined during the Heart Team Conference between the latest generation Medtronic Evolut and Edwards Sapien valves.

Results: Overall, we analyzed 113 total patients of which 46 (41%) underwent Sentinel placement. Comparison of baseline demographics yielded no significant difference in age (79 vs 78), gender (67% male vs 55% male), body surface area (1.90 m^2 vs 1.89 m^2), and STS risk (4.41% vs 5.12%) between the Sentinel and non-Sentinel arm respectively. In the Sentinel group, 54% of TAVR were performed using the Edwards Sapien 3 valve compared to 85% in the non-Sentinel group. Both fluoroscopy time (21.8 ± 6.9 minutes vs. 20.8 ± 11.2 minutes) and radiation dose were statistically insignificant (741 vs. 923 mGy) with $p > 0.05$. Lastly, mean length of stay at 2.7 vs 2.5 days was also statistically insignificant with an overall major vascular complication rate of $< 1\%$ in each arm.

Conclusions: The Sentinel cerebral embolic protection system is currently the only FDA approved device to help mitigate stroke risk in TAVR. This study is the largest retrospective cohort to demonstrate that the use of Sentinel during TAVR was not associated with an increase in fluoroscopy time, radiation dose, or mean length of stay.

Disclosures: D. S. Parikh *Nothing to disclose*. S. Sarwary *Nothing to disclose*. H. Agrawal *Nothing to disclose*. V. S. Mahadevan *Nothing to disclose*.

III-80 | Transesophageal Echocardiography Guided WATCHMAN Implantation Without Contrast Use: A Three Year Single-Center Experience

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Background: It is unclear if WATCHMAN devices can be implanted without contrast to reduce complications in patients with advanced CKD or contrast allergy. Efficiency and safety of WATCHMAN implantation under TEE-guidance and fluoroscopy without contrast use was evaluated

Methods: A single center case-series study was performed. Consecutive WATCHMAN device implantations between June 2016 and June 2019 were screened to identify patients who did not receive contrast. Patients lacking complete demographic information and reason(s) precluding safe contrast use were excluded. Efficiency was measured as i) accuracy of device size estimation based on TEE-measured LAA dimensions was determined by need to change the size of the device initially selected, ii) number of implantation attempts, irrespective of

change in device size, iii) whether more than one device was used secondary to inaccurate initial size estimation or other procedural complexities, and iv) successful LAA seal on TEE immediately and 45-days post-implantation (peri-device leak of $< 5\text{mm}$ by color Doppler). Procedure-related complications, immediate and delayed (0-45 days) were recorded.

Results: Twelve patients received WATCHMAN without contrast. Mean age was 79.2 years, with male predominance ($n=8$). Mean CHA2DS2VASc and HASBLED scores were $5.50 (+/-1.24)$ and $4.08 (+/-1.08)$, respectively. Contrast was avoided because of a history of CKD stage IV ($n=5$), rapidly progressive CKD stage III ($n=1$) and contrast allergy ($n=6$). In 11 out of 12 patients, initial TEE-based device size estimation was accurate with successful implantation on first attempt. One patient required a change in initial device size and therefore required a second attempt for successful implantation. There was no peri-device leak immediately post-implantation in any patient; only one patient had significant device leak on day-45 TEE requiring continuation of anticoagulation for four months until successful device seal. There were no immediate or late complications up to 45-days post-implantation.

Conclusions: Our experience shows no significant compromise in the efficacy and safety of the WATCHMAN implantation without contrast in patients with advanced CKD or contrast allergy.

Disclosures: H. Patel *Nothing to disclose*. M. H. S. Shaukat *Nothing to disclose*. R. Alimohammad *Nothing to disclose*. A. J. Delago *Nothing to disclose*.

III-81 | Coagulopathies' Influence on Length of Stay, Total Charges and In-Hospital Mortality for Patients Undergoing Pericardiectomy

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Background: Constrictive pericarditis refractory to medical therapy can be treated via pericardiectomy. Many comorbidities influence pericardiectomy outcomes, including coagulopathies. Coagulopathy disorders can complicate surgical procedures; however, the impact of concomitant coagulopathy diagnoses on patients who had a pericardiectomy has yet to be established. This study begins to elucidate the short-term in-hospital outcomes for those patients

Methods: This retrospective cohort study used the Nationwide Inpatient Sample to identify patients from 2012-2015 who had undergone

a pericardiectomy procedure as coded for by ICD-9. ICD-9 codes were then used to identify those patients with a coagulopathy. Chi-square and independent sample t-tests were utilized to analyze the length of stay (LOS), total hospital charges, and mortality while omitting any patients missing data for these variables or under the age of 18 at admission.

Results: A total of 2023 patients were identified who underwent a pericardiectomy within 2012-2015. Of those patient encounters, 237 also had a coagulopathy diagnosis. This subset of patients had statistically significant increases in mortality (13.9% vs 3.9%, $p < 0.0001$), LOS (16.35 days vs 10.16 days, $p < 0.0001$), and total charges (\$334,861.24 vs \$150,800.22, $p < 0.0001$ when compared to those who had a pericardiectomy without a comorbid coagulopathy diagnosis.

Conclusions: To our knowledge, this analysis is the first to measure the influence of coagulopathies on LOS, in-hospital mortality, and total charges for patients who underwent a pericardiectomy and carried a coagulopathy diagnosis. When considering pericardiectomy for coagulopathic patients with constrictive pericarditis, clinicians should prepare for more complex post-procedural management. Future studies should consider evaluating the impact of etiology or surgical approach for patients with constrictive pericarditis and a concomitant coagulopathy in order to design the most effective treatment plans.

Disclosures: J. Rowe *Nothing to disclose*. K. Johnson *Nothing to disclose*. C. Marolt *Nothing to disclose*. V. Gordon *Nothing to disclose*. A. Lewis *Nothing to disclose*. K. Hans *Nothing to disclose*. B. Wright *Nothing to disclose*.

III-82 | Safety of Same-Day Discharge Post Transcatheter Patent Foramen Ovale-Device Closure

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Background: Transcatheter closure of patent foramen ovale (PFO) has been shown to decrease the risk of recurrent stroke compared to optimal medical therapy in patients with cryptogenic stroke, including stroke, with no increased risk of adverse events. However, increasing length of stay can lead to increased hospital costs and acquired complications.

Methods: We performed a retrospective analysis for patients who underwent percutaneous PFO closure between September 2014 and June 2019 at our institution. Identified patients were divided into two groups; Group 1: discharged from the hospital the same day of PFO

device closure, Group 2: not discharged the same day of PFO device closure. We compared differences in demographics, recurrent stroke, arrhythmia, and major cardiac events between the two groups during hospitalization for PFO closure and at short-term follow up (30-90 days). We compared the type of medications the patients were prescribed, namely antiplatelet, warfarin/novel anticoagulants.

Results: 64 patients (52% male) underwent device closure of PFO. Of these, 40 (63%) were discharged the same day. The same-day discharge group were younger (45 ± 13 yrs. vs. 52 ± 15 yrs.) and less likely to be male (50% vs. 65%). Majority of device closure was performed using an Amplatzer PFO Occluder 31 (48%). There were no major vascular access site complications in the same day discharge group. There were no stroke or occurrence/reoccurrence of stroke at short-term follow-up in the same day discharge group. There was no difference in the rate of arrhythmia post procedure, or at short-term follow-up ($p > 0.05$). In addition, no difference was noted in outcomes in patients on NOAC vs antiplatelet therapy between the two groups. Of the 49 patients (75%) with short-term follow up data, there was no difference in the rate of adverse events between the two groups ($p > 0.05$). Greater than 30 day follow-up data was only missing from one patient in the same day discharge cohort.

Conclusions: There is no difference in the rate of adverse events post PFO closure in patients discharged the same day of the procedure, compared to those with delayed discharge. Same day discharge of patients who undergo PFO device closure is safe and avoids the risks of overnight hospital stay.

Disclosures: S. Sarwary *Nothing to disclose*. A. Kheiwā *Nothing to disclose*. H. Agrawal *Nothing to disclose*. D. S. Parikh *Nothing to disclose*. S. Blissett *Nothing to disclose*. L. Zier *Nothing to disclose*. V. S. Mahadevan *Nothing to disclose*.

III-83 | Postprocedural anticoagulation using direct oral anticoagulants versus warfarin in atrial fibrillation patients undergoing Watchman implantation: a single center experience

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Background: In atrial fibrillation (AF) patients undergoing percutaneous left atrial appendage occlusion (LAAO), anticoagulation with warfarin for 45 days after the procedure is well studied. Data is lacking on the safety and efficacy of direct oral anticoagulants (DOACs) in this setting.

Methods: This is a single-center retrospective study of 209 patients who underwent Watchman implantation and receiving either DOACs

	DOAC (N = 155)	Warfarin (N = 44)	P value
45-day events	Peri-procedural complication	3	1
	%	1.9%	2.3%
	Composite of any bleeding or thromboembolic events or mortality	9	4
	%	5.8%	9.1%
	Any Bleeding	7	4
	%	4.5%	9.1%
	TIMI major bleeding	0	0
	%	0	0
	TIMI minor bleeding	4	3
	%	2.6%	6.8%
	TIMI minimal bleeding	5	1
	%	3.2%	2.3%
45-day TEE	Intracranial bleeding	0	0
	%	0	0
	Thromboembolic events	2	0
	%	1.3%	0.0%
	Mortality	0	0
	%	0	0
	All-cause readmission	17	8
	%	10.9%	18.2%
	45 day TEE - device related thrombosis	0	0
	%	0	0
	45 day TEE - peri-device leak 5mm or more	1	2
	%	0.6%	4.5%

Table 1: A comparison of peri-procedural complications, 45-day events and 45-day transesophageal echocardiography (TEE) findings of patients receiving direct oral anticoagulant (DOAC) versus warfarin after Watchman device implantation. TIMI: Thrombolysis in myocardial infarction criteria.

or warfarin for 45 days. Peri-procedural complications and clinical outcomes at 45 days were evaluated.

Results: Of 209 patients, 200 underwent a successful Watchman implantation. 199 patients received DOAC or warfarin for 45 days post-procedure, where 77.9% of patients received DOACs (n = 155) and 22.1% received warfarin (n=44). Patients receiving DOACs were less likely to have chronic kidney disease (8.4% vs 36.4%, p = 0.01) and diabetes mellitus (31% vs 50%, p = 0.02), and more likely to have lower HASBLED score (mean: 2.6 vs 3.2, p = 0.009). Peri-procedural complications occurred in 1.9% (n = 3) of patients in DOAC group compared with 2.3% (n = 1) in warfarin group (p = 1.0). At 45 days, there were no difference in bleeding (4.5% vs 9.1%, p = 0.42) or thromboembolic events (1.3% vs 0%, p = 1.0). There was also no difference in all-cause readmission (10.9% vs 18.2%, p=0.21). On follow-up TEE, the detection of significant peri-device leak was similar (0.6% vs 4.5%, p =0.12). Death, intracranial bleeding, device-related thrombosis or device embolization was absent in both groups at 45 days.

Conclusions: Our study suggests that DOACs are potentially safe and effective for short-term anticoagulation following Watchman implantation in AF patients.

Disclosures: B. E. X. Tan *Nothing to disclose*. A. S. Abdullah *Nothing to disclose*. E. Alotaki *Nothing to disclose*. D. Chuprun *Nothing to disclose*.

A. Shah *Nothing to disclose*. J. P. Depta *Nothing to disclose*. M. Rao *Nothing to disclose*.

III-84 | Takotsubo Cardiomyopathy Precipitated by Direct Current Cardioversion: A Systematic Review

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Background: Takotsubo cardiomyopathy is a transient regional wall dysfunction predominantly in elderly females, believed to be provoked by a catecholamine stressor, including sudden physical or emotional events or supraphysiologic doses of catecholamine. We reviewed the literature for descriptions of takotsubo cardiomyopathy associated with the stress of cardioversion, to better understand its risks.

Methods: We queried Medline, Embase and Cochrane for cases of takotsubo cardiomyopathy secondary to synchronized cardioversion as defined by Mayo clinic criteria.

Results: We identified 12 cases of cardioversion-induced takotsubo cardiomyopathy. Average age was 73.9 years (range: 47-87 years) and most (11/12, 91%) were female. Diagnosis was made soon after cardioversion (average: 17 hours, range: 0-48 hours). Only 2 of 12 had ST elevations noted, while apical ballooning was noted in most (11/12). Takotsubo was complicated in 8 cases, with heart failure in 7 and shock developing in 3 patients. Most recovered quickly (average recovery: 17 days, range: 3-120), however one died.

Conclusions: Demographics and outcomes for takotsubo cardiomyopathy associated with cardioversion are very similar to those precipitated by emotional and physical stress. Physicians performing cardioversion on elderly female patients should suspect this in patients with new EKG changes, heart failure or shock.

Disclosures: T. A. Waheed *Nothing to disclose*. A. Aziz *Nothing to disclose*. S. Nazir *Nothing to disclose*. A. Donato *Nothing to disclose*.

VASCULAR ACCESS AND ARTERIAL CLOSURE DEVICES

III-85 | Proglide perclose device breakage, embolization and snare retrieval post EVAR

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Background: Closure devices are widely used for femoral access in cardiovascular procedures. We report a case embolization of the perclose sheath post EVAR requiring retrieval by snaring device.

Methods: We report a 87 year old male with past medical history of hypertension, hyperlipidemia, coronary artery disease (prior stenting) infrarenal aortic aneurysm) presented for elective endovascular aortic repair. Percutaneous access using ProGlide preclose technique using ultrasound guidance in both common femoral arteries with micropuncture sheath were performed.

Results: Endograft AFX sheath was inserted on the right side and 7 French (Pinnacle Precision) sheath was inserted on the left side. Left radial artery access established for hemodynamic monitoring. The graft and its limbs were positioned and deployed sequentially. All wires and catheters were removed from the right side and the pre-placed ProGlide sutures were cinched up and manual pressure was held on the groin until good hemostasis was achieved. From the left side, a ProGlide was used to achieve hemostasis. However, the ProGlide device became separated at its junction with the footplate and migrated to the descending aorta. The left radial access was then utilized to snare (Amplatz Goose neck snare 35/6) the tip of the separated closure device and removed from the radial artery. He was discharged without any further complications.

Conclusions: We report a rare but significant complication of this device. This is thought to be due to a weak point at the sheath junction. We all should be aware of this possible complication from the ProGlide device.

Disclosures: B. K. J. Hanumanthu *Nothing to disclose.* D. Chan *Nothing to disclose.* T. W. Kwan *Nothing to disclose.*

III-86 | Transradial vs. Transfemoral Secondary Access for Transfemoral Transcatheter Aortic Valve Replacement: A Meta-Analysis

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Background: Transradial access (TRA) is increasingly used as an alternative to transfemoral access (TFA) for secondary access in transfemoral transcatheter aortic valve replacement (TF-TAVR). We performed a meta-analysis to compare outcomes between TRA and TFA.

Methods: PubMed, EMBASE, Scopus and CINAHL were systematically searched for studies comparing TRA and TFA as secondary access sites for TF-TAVR. Data collected included procedural characteristics, contrast volume, fluoroscopy time and radiation dose. In-hospital outcomes included all-cause mortality, stroke, vascular complications and major bleeding. Risk ratio (RR), standardized mean difference (SMD) and corresponding 95% confidence interval (CI) was calculated using a random effect model.

Results: Five observational studies comprising 1183 patients (TRA: 572, TFA: 611) met inclusion criteria. Secondary access was utilized for aortography during valve deployment and management of primary access site complications. There were no significant differences in contrast volume used, fluoroscopy time or radiation dose (Figure 1). The incidence of death and vascular complications was similar in both groups. However, the incidence of stroke (RR: 0.29, 95% CI:

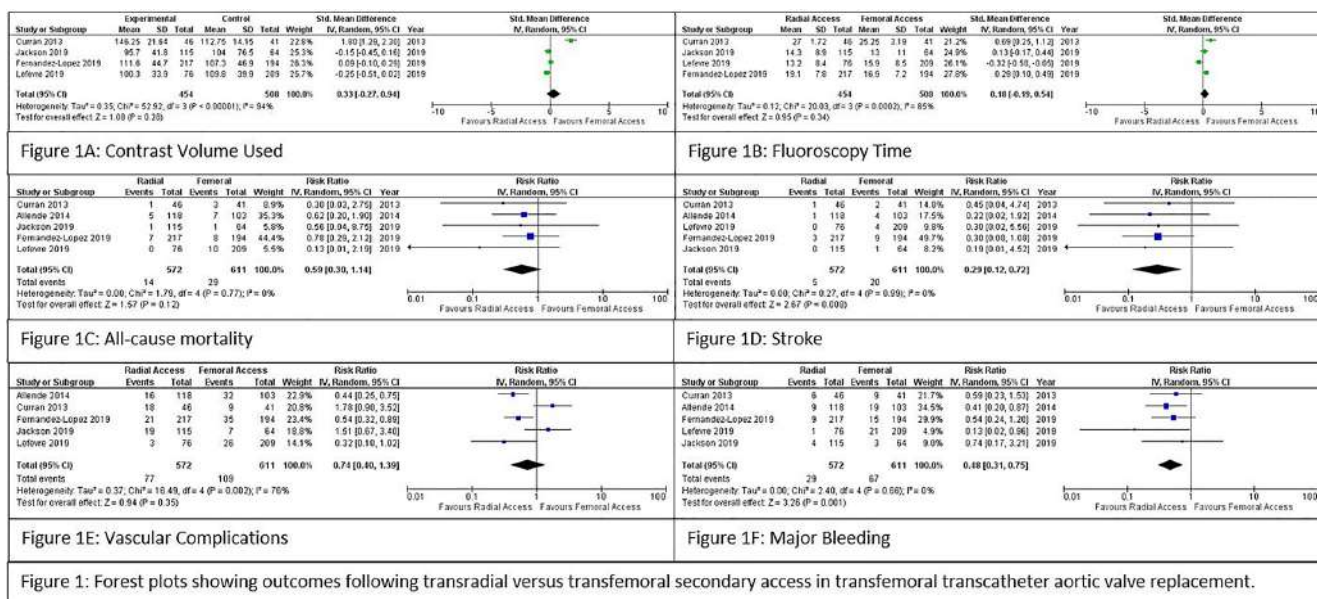


Figure 1: Forest plots showing outcomes following transradial versus transfemoral secondary access in transfemoral transcatheter aortic valve replacement.

0.12-0.72, $p=0.008$) and major bleeding (RR: 0.48, 95% CI: 0.31-0.75, $p=0.001$) were lower in TRA.

Conclusions: Our meta analysis favors TRA over TFA as a safer secondary access approach for TF-TAVR.

Disclosures: A. Jhand *Nothing to disclose*. D. R. Apala *Nothing to disclose*. R. Dhawan *Nothing to disclose*. N. Katta *Nothing to disclose*. A. M. Goldsweig *Nothing to disclose*.

III-87 | Distal radial artery approach to prevent radial artery occlusion

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Background: The main complication of transradial intervention is radial artery occlusion (RAO). This is relevant because it limits the radial approach for future interventions and disables this conduit for coronary bypass grafts and arteriovenous fistula. Observational studies suggest that distal radial access could reduce RAO incidence.

The primary endpoint of our study was to compare the efficacy of the distal and proximal transradial approaches in terms of RAO incidence. The safety endpoint was the incidence of complications between these two methods.

Methods: From May to December 2019, 205 consecutive patients at a single university center (National Institute of Cardiology Ignacio Chavez) who underwent cardiac catheterization and were suitable for both radial accesses, were randomized by 1:1 fashion to either distal radial artery approach (DR) ($n = 100$) or proximal (conventional) radial artery approach (PR) ($n = 105$). In both cases, a 20-gauge catheter needle with the through-and-through technique were used. Hydrophilic introducer sheaths were utilized in every case. The arterial access was obtained by interventional cardiology fellows with experience in proximal radial approach. Hemostasis was achieved with a pneumatic compression device (TR band, Terumo®; Japan) with patent hemostasis technique. The RAO was evaluated 24 hours after the procedure by ultrasound examination and was defined as the absence of both color pattern and pulsed wave registry.

Results: There were no differences between baseline characteristics in both groups. The median transradial access time was 2.77 minutes (IQR 1.42 – 4.45 minutes) for DR and 1.32 (IQR 1.05 – 2.30 minutes) for PR ($p < 0.01$). The primary endpoint was reached in 2.0% ($n = 2$) and in 10.5% ($n = 11$) in DR and PR groups respectively ($p = 0.013$). The safety endpoint was reached in 10% ($n = 10$) in the DR group and

9.5% ($n = 10$) in the PR group ($p = 0.90$), all of them were EASY < 1 hematoma.

Conclusions: The use of the distal radial artery approach significantly reduced the incidence of RAO at 24h confirmed by ultrasound with no differences in safety endpoints compared to proximal (conventional) approach but with longer time to access.

Disclosures: G. Eid-Lidt Sr. *Nothing to disclose*. J. Jimenez *Nothing to disclose*. A. Rivera *Nothing to disclose*. K. Estrada *Nothing to disclose*. J. Gaspar *Nothing to disclose*.

III-88 | Percutaneous Coronary Intervention: Radial vs Femoral Access for ST-Elevation Myocardial Infarction- A Meta-analysis

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Background: Transradial (TR) is a relatively novel technique for vascular access used in percutaneous coronary intervention (PCI). The purpose of this study is to evaluate the safety, feasibility, and efficacy of the TR approach compared with the traditional transfemoral (TF) access in a standard population of patients undergoing PCI.

Methods: MEDLINE (PubMed, Ovid), and Cochrane databases were searched for relevant articles. Data regarding major bleeding, stroke, mortality and major adverse cardiovascular and cerebrovascular events (MACCE); a composite of an acute coronary syndrome (ACS), stroke and death were analyzed using a random-effects model to calculate an unadjusted odds ratio (OR).

Results: A total of 59 studies and 71,069 patients, were included. At 30-days follow up, the odds of major bleeding events (OR 0.47, 95% CI 0.40-0.56, $p<0.00001$), MACCE (OR 0.67, 95% CI 0.57-0.80, $p<0.0001$), and mortality (OR 0.66, 95% CI 0.53-0.82, $p=0.0002$) were significantly lower in the TR group compared to TF arm. (Figure 1-2) There was no significant difference in the odds of stroke (OR 1.27, 95% 0.97-1.68, $p=0.09$) between the two groups. Subgroup analysis based on the study design showed consistent results across both the randomized control trials and observational studies.

Conclusions: Radial vascular access for ACS is associated with less bleeding, MACCE, and mortality events compared with transfemoral access.

Disclosures: M. C. Alraies: *Abiomed: Royalties*; Y. Sattar *Nothing to disclose*. W. Ullah *Nothing to disclose*. D. Umaira *Nothing to disclose*. S. Robinson *Nothing to disclose*. M. Khan *Nothing to disclose*.

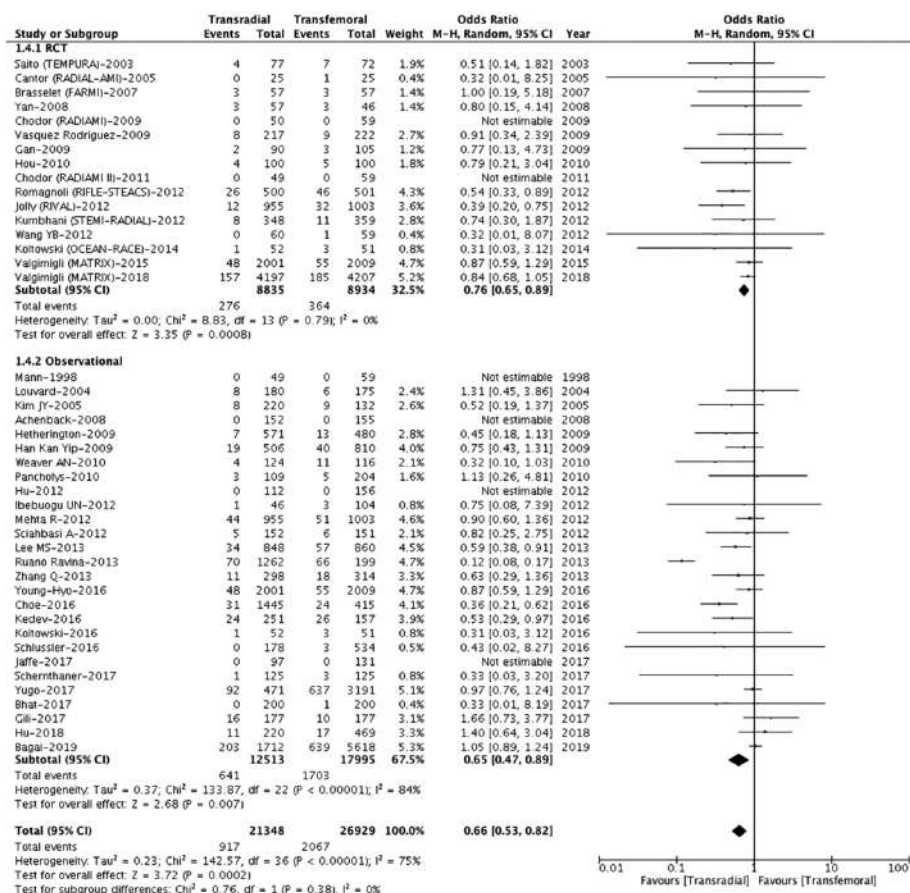


Figure 1: Forest plot showing the mortality difference between trans-radial and trans-femoral approaches

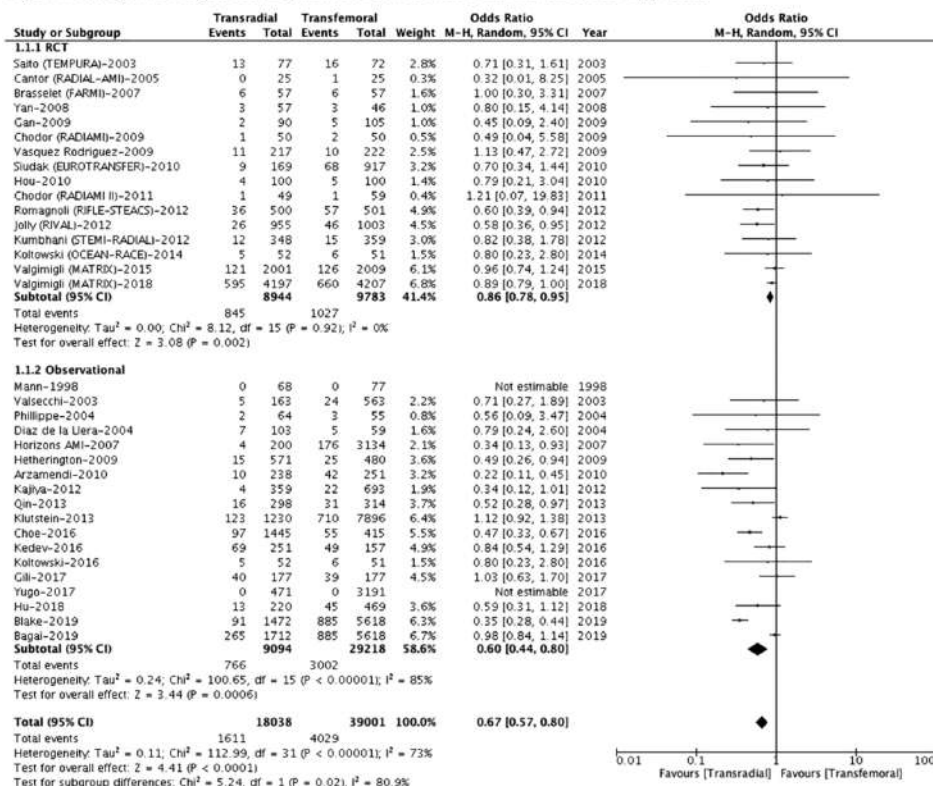


Figure 2: Comparison between radial and femoral access based on the rate of MACCE

CARDIOGENIC SHOCK AND HEMODYNAMIC SUPPORT

IV-1 | Impella CP Use in Acute Myocardial Infarction Complicated by Cardiogenic Shock: A community Hospital Experience

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Background: Acute myocardial infarction complicated by cardiogenic shock (AMICS) is associated with a high mortality rate exceeding 50%. The use of the Impella device (Abiomed, Inc., Danvers, MA, USA), a microaxial left ventricular assist device, has been approved for cardiogenic shock. We aim to evaluate the feasibility and clinical results of this device in a community hospital setting.

Methods: A retrospective chart review of 38 patients who underwent left ventricle unloading with the Impella CP device through femoral artery access for AMICS at Saint Joseph Mercy Oakland Hospital in Pontiac, Michigan from June 1st 2016 to October 3rd 2019. Data were evaluated with regard to baseline and procedural characteristics as well as an assessment of clinical outcomes.

Results: 38 patients who presented with AMICS were included in the analysis. Impella CP device was used in all of these patients. The majority of patients had STEMI (81.59%). All patients received Impella device during the initial coronary intervention. Pre-PCI placement was performed in 22 patients (57.8%), 2 patients had intra-procedural placement and the remainder had Post-PCI placement. The mean time from AMI to shock onset was 158.5 minutes. Door to balloon and door to unload times were 83.6 minutes and 86.2 minutes respectively. The mean time of shock onset to device placement was 90.66 minutes. The infarct related artery was LAD in 65.8%, RCA in 43.2%, LCx in 26.3% and LM in 15.8% of patients. The mean duration of Impella use was 67.54 hours and the mean ICU stay was 5.875 days. One patient was transferred for ECMO support and two patients required additional RV support using the RP Impella device. One patient had ischemic stroke and one patient had hemolysis requiring device explanation. Two patients had limb ischemia requiring external femoral-femoral bypass during the same intervention. The in-hospital mortality was 31.57%, with a 30-day survival rate of 68.3%. One year follow up was available for 23 patients and the 1 year survival rate was 60.8%.

Conclusions: Left ventricular unloading with the use of Impella CP device in AMICS is feasible and provides beneficial hemodynamic support. Survival to discharge was better than historic data in these critically ill patients.

Disclosures: O. Abdel-Hafez *Nothing to disclose*. M. Salih *Nothing to disclose*. M. Degregorio *Nothing to disclose*. A. R. Halabi *Nothing to disclose*. K. Patel *Nothing to disclose*.

IV-2 | Comparison of Demographic parameters of Intra-Aortic Balloon Pump and Impella procedures: Analysis of the Nationwide Inpatient Sample Database

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Background: Recently, the utilization of Mechanical Circulatory Support (MCS) in the form of Intra-Aortic Balloon Pump (IABP) and Impella has progressively increased. Their use has been primarily useful in the resuscitation of patients presenting with cardiogenic shock. This study was performed to compare the demographic features of patients who needed IABP versus Impella support for the year 2016 utilizing the NIS database.

Methods: Nationwide Inpatient Sample (NIS) data was used to extract data of patients undergoing IABP and Impella implantation during index admission for year 2016. IABP procedures were identified by ICD-10 PCS code - 5A02210 which represents assistance with cardiac output using balloon pump, continuous and Impella procedures with ICD-10 PCS code - 5A0221D which represents assistance with cardiac output using Impeller Pump, continuous. Demographic parameters between these MCS were then analyzed.

Results: Total of 42,245 indexed procedures of IABP versus 10,575 Impella procedures were performed in year 2016. Majority of IABP and Impella procedures were performed in males (70.3% vs 71.1%). Most IABP were inserted in patients aged 65-84 years (50.5%) followed by 45-64 years age (39.5%) which was consistent in Impella patients (51.5%) and (35.9%) for the same age groups respectively. Main insurance was Medicare paying for 55.2% and 60.6% for IABP and Impella procedures respectively. Vast majority of implantations were performed at urban teaching institutions (74.4% vs 77.6%) with large bed-size (63.3% vs 66.1%) for both procedures. Majority of the procedures were performed in the Southern region of the US (38% vs 42%).

Conclusions: Our data has shown IABP utilization about 4-fold more than the use of Impella for the year 2016. Majority of procedures were performed in males aged 65-84 years at large bed-sized, urban teaching institutions. Given the increasingly positive outcome published from the National Cardiogenic Shock Initiative in the utilization of Impella support for patients presenting with STEMI and cardiogenic

shock, an increasing trend in Impella use can be anticipated. Further studies including large randomized trials are needed for IABP versus Impella application.

Disclosures: Y. Agrawal *Nothing to disclose*. D. M. Zoltowska *Nothing to disclose*. N. Jena *Nothing to disclose*. J. R. Nazroo *Nothing to disclose*. J. K. Kalavakunta *Nothing to disclose*. V. Gupta *Nothing to disclose*. A. R. Halabi *Nothing to disclose*. K. Patel *Nothing to disclose*.

IV-3 | Transcatheter Aortic Valve Replacement In Cardiogenic Shock With Percutaneous Tandemheart Support

Muhammad Ajmal, University of Arizona Medical Center, United States; Bishnu Dhakal, University of Arizona Sarver Heart Center, United States; Ranjith Shetty, University of Arizona Medical Center, United States; Deepak Acharya, University Of Arizona College Of Medicine, United States; Kapildeo Lotun, University of Arizona Sarver Heart Center, United States

Background: Management of severe aortic stenosis (AS) in presence of cardiogenic shock (CS) is very challenging and can be associated with high morbidity and mortality. We report a case of 67 year old male who presented with newly diagnosed CS and required TandemHeart support which improved with transcatheter aortic valve replacement (TAVR) on Tandemheart.

Methods: N/A

Results: 67 yrs male who was diagnosed with AS 6 months ago but did not undergo any further intervention presented with shortness of breath. He was found to have severe AS with a valve area of 0.6 cm², mean aortic valve gradient of 54 mmHg and reduced left ventricular function with an ejection fraction of 20-25%. He was started on diuretics and inotropes but had worsening CS which required endotracheal intubation in emergency department followed by emergent percutaneous balloon aortic valvuloplasty (BAV). BAV reduced mean gradient from 54 mmHg to 32 mmHg. Patient continued to require multiple inotropic support, high dose IV diuretics followed by renal replacement therapy, we planned for a Tandemheart placement. On day 4, patient developed melena and underwent cauterization of duodenal ulcers and then embolization of gastroduodenal artery and transfusion of 8 units of packed red blood cells for acute blood loss anemia. On day 5, patient underwent successful transfemoral TAVR with 29 mm Medtronic CoreValve Evolut R Pro+. He developed complete heart block during the procedure and received temporary transvenous pacemaker and ICD before discharge from the hospital. On day 7, Tandem heart support was discontinued and patient was extubated the following next day. He required low dose inotropic support with dobutamine 5 mcg/kg/min while weaning of Tandemheart which was weaned off quickly. His kidney function improved and did not have recurrence of bleeding despite of anticoagulation use for atrial fibrillation. On day 18, patient was discharged in stable condition and was doing well during his 6 weeks follow up.

Conclusions: Mechanical circulatory support with Tandemheart can be used as a bridge to TAVR in the presence of severe CS in patients with severe AS. Our case demonstrates the successful TAVR procedure with Tandemheart support and bridging percutaneous balloon aortic valvuloplasty.

Disclosures: M. Ajmal *Nothing to disclose*. B. Dhakal *Nothing to disclose*. R. Shetty *Nothing to disclose*. D. Acharya *Nothing to disclose*. K. Lotun *Nothing to disclose*.

IV-4 | Comparison of outcomes with the use of Impella versus Intraaortic balloon pump for hemodynamic support in patients with Acute myocardial infarction complicated by cardiogenic shock- An updated Metanalysis

Moses Ashukem, Banner University Medical Center Phoenix, United States; Byomesh K Tripathi, University of Arizona College of Medicine, United States; Nathanael Adjei-Kyeremeh, University of Arizona College of Medicine, United States; Purnima Sharma, University of Arizona College of Medicine, United States; Marium Muzaffar, University of Arizona College of Medicine, United States; Victor A Karikari, University of Arizona College of Medicine, United States; Luke Seibolt, University of Arizona College of Medicine, United States; Parvir Aujla, Nova Southeastern University, United States; Divya Ratan Verma, University of Arizona College of Medicine, United States

Background: -Impella is being increasingly utilized for hemodynamic support in patient with Acute myocardial infarction complicated by cardiogenic shock (AMI-CS) in recent years but data related to its efficacy and safety in these patients is limited.

Methods: -A comprehensive search in clinicalTrials.gov, PubMed, EBSCO, Web of Science, google scholar and Ovid was performed for RCTs and observational studies comparing Impella and Intraaortic balloon pump (IABP) in patients with AMI-CS. A meta-analysis was performed using a random-effects model. Outcomes of interest were 30-day mortality, significant bleeding, stroke and limb ischemia.

Results: -Six studies met the study criteria and included a total of 10,723 patients with AMI-CS. Impella use was associated with increased risk of significant bleeding (RR: 1.63; 95%CI: 1.17-2.28; p=0.004) and limb ischemia RR: 3.65; 95%CI: 1.50-8.89; p=0.004), compared to IABP(Figure 1). There was no difference in risk of 30-day mortality (RR: 1.07; 95%CI: 0.82-1.39; p=0.63) or stroke (RR: 0.84; 95%CI: 0.49-1.44;p=0.52) between Impella and IABP arm.

Conclusions: -Impella use was associated with high complication rate without any clear mortality benefit in AMI-CS patients compared to IABP.

Disclosures: M. Ashukem *Nothing to disclose*. B. K. Tripathi *Nothing to disclose*. N. Adjei-Kyeremeh *Nothing to disclose*. P. Sharma *Nothing to disclose*. M. Muzaffar *Nothing to disclose*. V. A. Karikari *Nothing to disclose*.

Figure 1A- Forest plot showing risk estimates for significant post-procedural bleeding

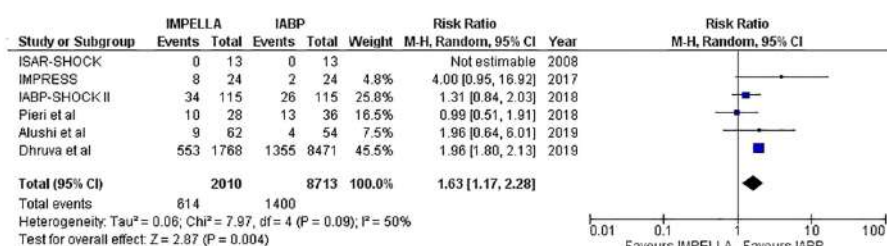


Figure 1B- Forest plot showing risk estimates for limb ischemia

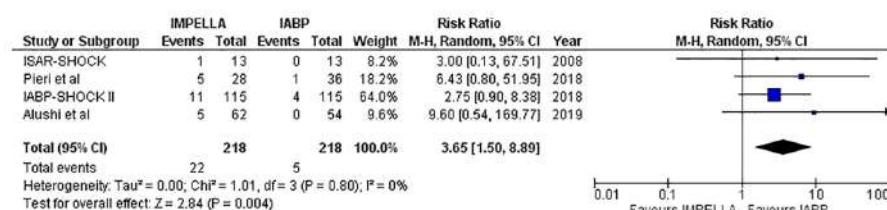


Figure 1C- Forest plot showing risk estimates for 30-day mortality

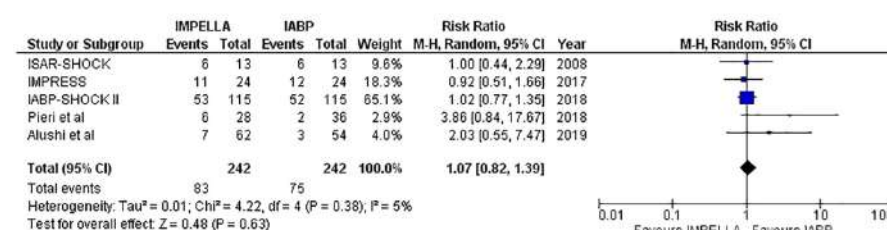
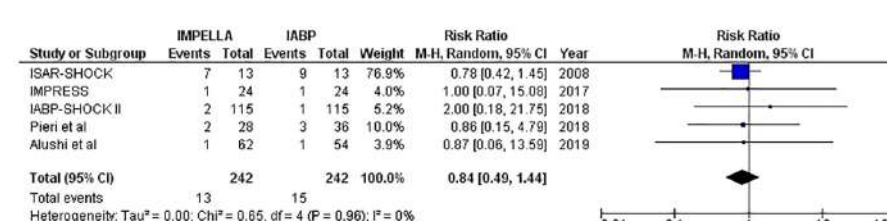


Figure 1D- Forest plot showing risk estimates for stroke



disclose. L. Seibolt Nothing to disclose. P. Aujla Nothing to disclose. D. R. Verma Nothing to disclose.

IV-5 | Arrhythmia Burden with Mechanical Circulatory Support

Sindhu Avula, Mercy Saint Vincent Medical Center, United States; Bhanu Harshitha Settipalle, SUNY Upstate medical University, United States; Ma'en Al-Dabbas, Mercy St Vincent medical center, United States; Jay Shah, Mercy Saint Vincent Medical Center, United States; Karthik Gangu, University of Missouri, United States; Mohammed Taleb, Mercy Health St. Vincent's Medical Center, United States; Sohail Ali, Mercy Health St. Vincent's Medical Center, United States

Background: With no definite data suggesting superiority of Impella over Intra-aortic balloon pump, we conducted an analysis to assess the frequency of various arrhythmias associated with the two devices.

Methods: The study Cohort was derived from the National Inpatient Sample database, and included years 2009 to 2014. Hospitalizations with admitting diagnosis as either acute myocardial infarction, cardiogenic shock, valve surgery, cardiac bypass or percutaneous coronary intervention, and received Impella or Intra-aortic balloon pump (IABP) on the day of admission were identified using ICD codes. Analysis was performed using 'R'. Propensity matching was done for baseline demographic characteristics and admitting diagnoses. The difference-in-differences (DD) statistic was used to assess difference in arrhythmia outcomes among the two groups.

Impella vs IABP outcomes	Estimate	AI SE	Odds Ratio	LowerBound	UpperBound	P-value
Any cardiac arrhythmia	0.03	0.01	1.17	1.15	1.18	0.05
Ventricular Tachycardia	0.07	0.01	1.92	1.8	1.96	<0.01
Ventricular Fibrillation	0.02	0.009	1.468841896	1.43	1.5	0.02
Atrial Fibrillation	0.005	0.014	1.05	1.03	1.06	0.68
Supraventricular Tachycardia	-0.02	0.009	0.8	0.78	0.82	0.01
Peripheral vascular complications	-0.002	0.005	1.27	1.18	1.36	0.66
Hematoma	0.03	0.008	1.8	1.73	1.872	<0.01
Bleeding	0.03	0.007	2.63	2.53	2.74	<0.01
Iatrogenic cardiac complications	-0.03	0.007	0.57	0.56	0.59	<0.01
LVAD	0.008	0.003	3.23	2.95	3.54	0.03
Hospice	0.009	0.007	1.9	1.83	1.97	0.21
Stroke	0.005	0.008	1.25	1.2	1.29	0.47
Gastrointestinal hemorrhage	-0.0007	0.006	1.27	1.22	1.32	0.91
Inhospital Cardiac arrest	0.0002	0.006	1.29	1.25	1.34	0.97
ECMO	0.008	0.004	4.33	3.96	4.72	0.03
Palliative care consult	0.009	0.007	1.9	1.83	1.97	0.21

Results: The unmatched data included 5053 hospitalizations that received Impella on the day of admission and 133042 hospitalizations who received IABP on the day of admission. A 1:1 ratio propensity matching yielded 1017 matched pairs of the Impella and IABP groups. Ventricular fibrillation cardiac arrest (p value 0.02) and Ventricular tachycardia (p value <<0.001) were significantly higher in the Impella group, whereas IABP was associated with a higher percentage of SVT.

Conclusions: Our study showed a greater association of ventricular tachycardia and ventricular fibrillation with Impella and SVT with IABP. Further evaluation is required to assess the effect of these outcomes on morbidity and mortality and to determine a possible cause-effect relationship.

Disclosures: S. Avula *Nothing to disclose*. B. H. Settipalle *Nothing to disclose*. M. Al-Dabbas *Nothing to disclose*. J. Shah *Nothing to disclose*. K. Gangu *Nothing to disclose*. M. Taleb *Nothing to disclose*. S. Ali *Nothing to disclose*.

IV-6 | Association of various arrhythmias with Mechanical circulatory support

Sindhu Avula, Mercy St Vincent Medical Center, United States; Bhanu Harshitha Settipalle, Sunny upstate Medical University, United States; Ma'en Al-Dabbas, Mercy St Vincent medical center, United States; Jay Shah, Mercy Health St. Vincent's Medical Center, United States; Karthik Gangu, University of Missouri, United States; Mohammed Taleb, Mercy Health St. Vincent's Medical Center, United States; Sohail Ali, Mercy Health St. Vincent's Medical Center, United States

Background: With no robust data suggesting mortality benefit of impella over intra-aortic balloon pump, we conducted an analysis to assess the frequency of various arrhythmias associated with the two devices.

Methods: The study Cohort was derived from the National Inpatient Sample database, and included years 2009 to 2014. Hospitalizations

	Estimate	AI SE	Odds Ratio	LowerBound	UpperBound	p-value
Any cardiac arrhythmia	0.03	0.01	1.17	1.15	1.18	0.05
Ventricular Tachycardia	0.07	0.01	1.92	1.8	1.96	<0.01
Ventricular Fibrillation	0.02	0.009	1.46	1.43	1.50	0.02
Atrial Fibrillation	0.005	0.014	1.05	1.03	1.069	0.68
Supraventricular Tachycardia	-0.02	0.009	0.8	0.78	0.82	0.01
Peripheral vascular complications	-0.002	0.005	1.27	1.18	1.36	0.66
Hematoma	0.03	0.008	1.8	1.73	1.87	<0.01
Bleeding	0.03	0.007	2.63	2.53	2.74	<0.01
Iatrogenic cardiac complications	-0.03	0.007	0.57	0.56	0.59	<0.01
LVAD	0.008	0.003	3.23	2.95	3.54	0.03
Hospice	0.009	0.007	1.9	1.83	1.97	0.21
Stroke	0.005	0.008	1.25	1.20	1.29	0.47
Gastrointestinal hemorrhage	-0.0007	0.006	1.27	1.22	1.32	0.91
Inhospital Cardiac arrest	0.0002	0.006	1.29	1.25	1.34	0.97
ECMO	0.008	0.004	4.33	3.96	4.72	0.03
Palliative care consult	0.009	0.007	1.9	1.83	1.97	0.21

with admitting diagnosis as either acute myocardial infarction, cardiogenic shock, valve surgery, cardiac bypass or percutaneous coronary intervention, and received Impella or Intra-aortic balloon pump (IABP) on the day of admission were identified using ICD codes. Analysis was performed using 'R'. Propensity matching was done for baseline demographic characteristics and admitting diagnoses. The difference-in-differences statistic was used to assess difference in arrhythmia outcomes among the two groups.

Results: The unmatched data included 5053 hospitalizations that received Impella on the day of admission and 133042 hospitalizations who received IABP on the day of admission. A 1:1 ratio propensity matching yielded 5053 matched pairs of the Impella and IABP groups. Ventricular fibrillation cardiac arrest (p value 0.02) and Ventricular tachycardia (p value <0.001) were significantly higher in the Impella group, where as IABP was associated with a higher percentage of SVT.

Conclusions: Our study showed a greater association of ventricular tachycardia and ventricular fibrillation with Impella and SVT with IABP. Further evaluation is required to assess the effect of these outcomes on morbidity and mortality and to determine a possible cause-effect relationship.

Disclosures: S. Avula *Nothing to disclose*. B. H. Settipalle *Nothing to disclose*. M. Al-Dabbas *Nothing to disclose*. J. Shah *Nothing to disclose*. K. Gangu *Nothing to disclose*. M. Taleb *Nothing to disclose*. S. Ali *Nothing to disclose*.

IV-7 | Role of Mechanical Circulatory Support in Cardiac Arrest

Ahmad Awan, Howard University Hospital, United States; Urooj Fatima, Howard University Hospital, United States; Richard Ogunti, Howard University Hospital, United States; Hilda Bonilla, Howard University Hospital, United States; Mohammad Munawwar, Howard University Hospital, United States; Prafulla Mehrotra, Howard University Hospital, United States; Isaac Opoku, Howard University Hospital, United States

Background: Cardiac arrest is one of the leading cause of death in United States. However, the role of mechanical circulatory support devices (Impella, LVAD, ECMO and IABP) is less well studied.

Methods: National Inpatient sample between 2009 – 2014 was analyzed for patient who presented with cardiac arrest. They were divided into two groups, patients who received MCS and patients who didn't. Appropriate ICD-9 codes were used to capture co-morbidities and device use. Propensity matched analysis was performed to balance baseline characteristics and post-matched regression analysis performed. Odds ratio (OR) were adjusted based on the propensity score. A subgroup analysis was performed in patients with cardiogenic shock, STEMI and NSTEMI. Primary outcomes were inpatient mortality. Secondary outcomes were stroke, acute kidney injury, length of stay and GI bleeding.

Results: There were 10220 patient encounters in the matched cohort for both MCS and Non-MCS group. There is no difference in mortality between the groups 46.6% vs 48.9% (OR 0.98, CI 0.93-1.03, p=0.557). Similarly, there was no difference in Acute kidney injury (OR 1.06, CI 0.98-1.15, p=0.101), and acute ischemic stroke (OR 0.907, 0.80-1.02, p=1.114), whereas length of stay was increased 11.5 day vs 9.1 days, (p <0.01). In our sub-group analysis the mortality was similar in patients with STEMI 46.8% vs 49.9% (OR 1.00 CI 0.93-1.08, p=0.903) and NSTEMI 42.8% vs 43.3% (OR 1.10 CI 0.98-1.27, p=0.102), however, in patients with cardiogenic shock, there is mortality reduction mortality in MCS group 46.9% vs 58.0% (OR 0.77 CI 0.72-0.84, p=0.001).

Conclusions: In patients with cardiac arrest, use of MCS doesn't lead to improvement in mortality. However, in patients with cardiogenic shock, the use of MCS leads to decrease in mortality. Further studies are needed to validate these findings.

Disclosures: A. Awan *Nothing to disclose*. U. Fatima *Nothing to disclose*. R. Ogunti *Nothing to disclose*. H. Bonilla *Nothing to disclose*. M. Munawwar *Nothing to disclose*. P. Mehrotra *Nothing to disclose*. I. Opoku *Nothing to disclose*.

IV-8 | Timing of Mechanical Circulatory Support in Patients with Cardiac Arrest

Ahmad Awan, Howard University Hospital, United States; Urooj Fatima, Howard University Hospital, United States; Mohammad Munawwar, Howard University Hospital, United States; Richard Ogunti, Howard University Hospital, United States; Hilda Bonilla, Howard University Hospital, United States; Isaac Opoku, Howard University Hospital, United States

Background: Cardiac arrest is one of the leading cause of death in United States. The timing of Mechanical Circulatory Support devices and its impact on survival is unknown.

Methods: National Inpatient sample was analyzed for patient who presented with cardiac arrest and underwent MCS placement. Appropriate ICD-9 codes were used to capture co-morbidities and device use. Early MCS was defined as placement of MCS within 24 hours and Late MCS group defined as placement after 24 hours. A subgroup analysis was performed in patients with cardiogenic shock, STEMI and NSTEMI. Primary outcomes were inpatient mortality and length of stay (LOS). Secondary outcomes were stroke, acute kidney injury and bleeding.

Results: There were 8321 patients in Early MCS group and 6746 in delayed MCS group. Early placement of MCS leads to increase in mortality 47.7% vs 44.9% (adj OR 1.13, CI 1.06-1.22, p=0.01), whereas length of stay is improved 8.7 days vs 15.3 days. For secondary outcomes, early placement of MCS leads to decrease in AKI 37.6% vs 45.8% (adj OR 0.76 CI 0.70-0.82, p=0.001, acute ischemic stroke 2.87% vs 3.70% (adj OR 0.78 CI 0.99-1.00, p=0.017). In our sub-group

analysis, the mortality was similar in patients with STEMI 46.9% vs 44.9% (adj ratio 1.04 0.92-1.65, $p=0.493$) and NSTEMI 43.6% vs 43.4% (adj ratio 1.03 CI 0.88-1.22, $p=0.644$), while in patients with cardiogenic shock increased mortality is seen with Early MCS initiation 49.2% vs 44.9% (adj ratio 1.18 CI 1.09-1.28, $p=0.001$).

Conclusions: In patients with cardiac arrest, early initiation of MCS leads to increased mortality while decreasing the incidence of AKI, Ischemic Stroke and length of stay. In subgroup analysis, whereas in patient with cardiogenic shock, early initiation of MCS leads to increased mortality, there was no difference in mortality in NSTEMI and STEMI group. Further studies are needed to validate these findings

Disclosures: A. Awan *Nothing to disclose*. U. Fatima *Nothing to disclose*. M. Munawwar *Nothing to disclose*. R. Ogunti *Nothing to disclose*. H. Bonilla *Nothing to disclose*. I. Opoku *Nothing to disclose*.

IV-9 | Safety and outcomes of hemodynamic support with impella at rural community hospital

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Background: Impella 2.5 and Impella CP (Abiomed) are percutaneous left ventricular assist devices which approved for acute myocardial infarction complicated by cardiogenic shock (AMI-CS) and high risk percutaneous coronary intervention (PCI). Analysis of 15,259 U.S. patients in the IQ Database demonstrated an improvement in survival to explant from 52% to 59% when Impella was placed pre-PCI. National Abiomed Q Database on nearly 5,000 patients treated between April 2018 and March 2019 showed an increase in survival rate from 51% to 67%, a relative increase of 34% in survival.

Methods: We reviewed all patients retrospectively who underwent percutaneous coronary intervention (PCI) with Impella support for AMI-CS or high-risk PCI indications between 2018 and 2019 at our rural Colorado community hospital. We assessed the Survival rate and in-hospital complications.

Results: A total of 31 patients with mean age of 70 had Impella support between 2018 and 2019. 13 patients for AMI-CS and 18 patients for high risk PCI. Survival rate was 77% for AMI-CS group and 94.5% for the high risk PCI group. In AMI-CS group the survival rate was better for the patients who had the impella placed before the PCI 86% compare to the patients who had impella placed after PCI 67%. 4 patients had minor hematoma and 1 had nondisabling stroke in the AMI-CS group and 2 patients had minor hematoma and 1 pseudoaneurysm in the high risk PCI group.

Conclusions: We found implantation of Impella for hemodynamic support for AMI-CS or for High risk PCI is relatively safe procedure at rural community hospital when performed by experienced operator

and has good survival rates comparable to the national data. We also found that placing the impella pre-PCI is associated with improved survival to discharge in the setting of AMI cardiogenic shock.

Disclosures: M. F. Barbour *Nothing to disclose*. A. Rasim Reddy *Nothing to disclose*. A. Dong *Nothing to disclose*. B. B. Aruni *Nothing to disclose*.

IV-10 | Impella versus medical management reduces mortality preferentially by primary malignancy without affecting cost: Propensity score and machine learning augmented nationally representative case-control study of over 30 million hospitalizations

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Background: We sought to produce the first nationally representative analysis of mortality, length of stay (LOS), and cost for cardiogenic shock patients with Impella (percutaneously inserted ventricular assist device) versus medical management by cancer versus non-cancer.

Methods: Propensity score adjusted and backward propagation neural network machine learning augmented multivariable regression was conducted for the above outcomes in this case-control study of the United States' largest and most current all-payer hospitalized dataset, the 2016 National Inpatient Sample. Regression models were fully adjusted for age, race, income, geographic region, cancer metastases, NIS-calculated mortality risk by Diagnosis Related Group (DRG), and the likelihood of undergoing Impella (in addition to length of stay [LOS] for cost). To produce nationally representative estimates, analyses were also adjusted for the complex survey design.

Results: Of the 30,195,722 adult hospitalized patients, 0.48% experienced cardiogenic shock of whom 11,260 (7.50%) received an Impella. Of these, 9.64% had cancer (with 26.03% of them having active malignancy), and 0.98% specifically had metastatic cancer. The most common cancer types by primary malignancy for cardiogenic shock were prostate (16.52%), breast (12.78%), lung (11.15%), skin (10.08%), and colon (7.30%). In propensity score adjusted multivariable regression among patients with cardiogenic shock, Impella versus medical

management was significantly associated with increased mortality (OR 2.78, 95%CI 2.42-3.18; $p<0.001$) but not for cancer patients overall (OR 0.70, 95%CI 0.44-1.09; $p=0.115$) and neither was LOS or cost. But Impella was associated with significantly lower mortality when specifically used in patients with male genitourinary cancer (OR 0.47, 95%CI 0.23-0.99; $p=0.048$) and prostate (OR 0.28, 95%CI 0.10-0.79; $p=0.016$).

Conclusions: This large nationally representative study suggests Impella can safely be used for cancer patients and may have preferential mortality benefit based upon the primary malignancy site without increasing LOS or hospital costs.

Disclosures: D. J. Monlezun *Nothing to disclose*. C. Grable *Nothing to disclose*. K. Hoang *Nothing to disclose*. R. Gaiba *Nothing to disclose*. S. Chauhan *Nothing to disclose*. L. Hostetter *Nothing to disclose*. N. Thomason *Nothing to disclose*. R. Jacob *Nothing to disclose*. N. Palaskas *Nothing to disclose*. C. A. Iliescu *Nothing to disclose*.

IV-11 | Escalation of Temporary Mechanical Circulatory Support in the Setting of Deteriorating Cardiogenic Shock

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Background: Cardiogenic shock (CS) is a deadly condition and mechanical circulatory support (MCS) is frequently utilized. We evaluated the characteristics of CS patients who required escalation of MCS due to deteriorating shock.

Methods: From 07/2016–07/2018 we identified consecutive CS patients with deteriorating shock requiring escalation of MCS. Deteriorating shock was defined as worsening hypotension, escalating doses of vasopressors or worsening end-organ hypoperfusion. MCS escalation was defined as adding or exchanging a MCS device to existing MCS. All statistical tests were performed with a two-sided P value=.05.

Results: 81 CS patients ($61 \pm 14.2y$, 73% men) had deteriorating shock requiring MCS escalation. 23% presented with acute myocardial infarction, 72% with decompensated heart failure (non-ischemic cardiomyopathy 26% and ischemic cardiomyopathy 46%) and 5% undifferentiated. Distribution of CS per SCAI classification was stage C 7%, D 82% and E 11%. Survival to discharge was 32%. Survivors were younger (55 vs 65y, $P=0.002$) and had lower BMI (29 vs 34, $P=0.031$). Initial MCS was IABP ($n=32$), Impella 2.5 ($n=4$), CP ($n=32$), 5.0 ($n=2$), TandemHeart ($n=3$), ProtekDuo ($n=3$), VVECMO ($n=2$), VAECMO ($n=2$) and ProtekDuo+Impella CP ($n=1$). Patients were escalated to Impella 2.5 ($n=1$), CP ($n=16$), 5.0 ($n=10$), TandemHeart ($n=6$), VAECMO ($n=8$), VAECMO+(IABP, 2.5 or CP) ($n=20$), ProtekDuo+(IABP, CP, 5.0 or

TandemHeart) ($n=13$), Impella CP+RP ($n=2$), TandemHeart+Impella RP ($n=1$), central VAECMO ($n=3$) and LVAD ($n=1$). Lactate levels pre and post escalation were lower in survivors compared to non-survivors (3.3 vs 6.9, $P=0.02$) and (2 vs 4.4, $P=0.01$). Non-survivor lactate levels did not significantly improve post escalation (6.9 vs 4.4, $P=0.06$) and mean arterial pressure decreased (77.1 vs 66.8, $P=0.002$) despite significant improvement in cardiac index (1.9 vs 3.4, $P<0.001$) and cardiac power output (0.6 vs 1.1, $P=0.0001$). Utilization of a PA catheter pre-escalation was associated with improved survival (40% vs 18%, $P=0.04$).

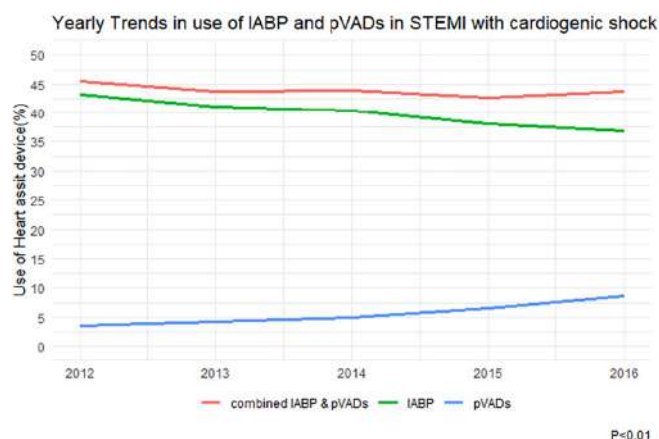
Conclusions: CS patients requiring escalation of MCS due to deteriorating shock have low hospital survival (32%). Younger age, lower BMI, lower lactate levels and utilization of PA catheter pre-escalation were associated with increased survival.

Disclosures: M. B. Basir: Abbott (St. Jude): Consulting; Abiomed: Advisory Board/Board Member, Consulting and Principal Investigator for a Research Study; Cardiovascular Systems, Inc.: Consulting; Chiesi: Consulting and Principal Investigator for a Research Study; Zoll: Consulting and Speaker Bureau; I. N. Isseh *Nothing to disclose*. C. Dagher *Nothing to disclose*. S. Sharma *Nothing to disclose*. S. Parikh *Nothing to disclose*.

IV-12 | Contemporary trends in use of Percutaneous Ventricular assist devices and Intra-aortic balloon pump in ST Segment Myocardial Infarction, Insight from national inpatient sample

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Background: Currently, the most frequently used mechanical assist device for cardiogenic shock is intra-aortic balloon pump (IABP). IABP-SHOCK II trial in 2012 failed to show any benefits, therefore, use of an IABP was downgraded to a Class IIA recommendation in the 2013 AHA/ACC guidelines. Recent innovation has led to development



of per cutaneous ventricular assist devices (pVADs). We have looked at the recent trends in use of pVADS and IABP.

Methods: We analyzed National inpatient sample data from January 2012 to December 2016 using ICD-9-CM and ICD-10-CM codes. Pearson χ^2 was used for statistical testing. Multiple logistic regression was performed to estimate odds ratios (ORs) with 95% confidence intervals (CIs) for predictors of pVADs use in patients of STEMI and cardiogenic shock.

Results: 127,535 patients with STEMI and cardiogenic shock were identified. IABP was used in 50,865(39.9%) patients while pVADs was used in 7,190(5.6%) patients. There was an increase trend in use of pVADS while the use of IABP decreased. The use of mechanical assist devices decreased in 2013 (45.4% to 43.7%) but since then has remained unchanged (Figure). Female gender (OR, 0.74 [CI, 0.69-0.78], $P<0.01$), Valvular heart disease (OR, 0.76 [CI, 0.61-0.95], $P<0.01$) and age (OR, 0.98[CI, 0.97-0.98], $P<0.01$) was associated with decrease use of pVADs while coagulopathy (OR, 1.95[CI, 1.83-2.07], $P<0.01$), peripheral vascular disease (OR, 1.19[CI, 1.11-1.29], $P<0.01$) and anemia (OR, 1.43[CI, 1.14-1.81], $P<0.01$) was associated with increase use of pVADs.

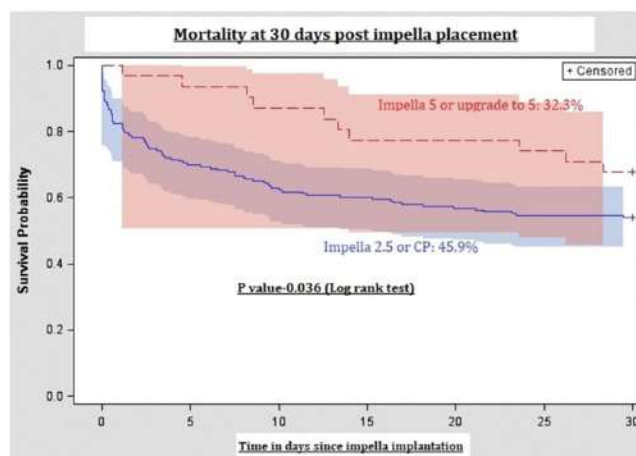
Conclusions: There was a decrease in use of mechanical assist devices in 2013. Use of pVADS has increased recently while IABP has decreased.

Disclosures: M. Z. Khan *Nothing to disclose*. M. U. Khan *Nothing to disclose*. S. U. Khan *Nothing to disclose*. M. B. Munir *Nothing to disclose*.

IV-13 | Use of Impella 5.0 is Associated with Improved Outcome in Patients with Cardiogenic Shock: Single Center Experience

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Background: The management of cardiogenic shock (CS) is complex and often requires the use of percutaneous mechanical circulatory support (MCS) devices that can provide adequate hemodynamic support, such as the Impella devices. Various Impella devices are currently clinically available which can provide different levels of circulatory



support (2.5, cardiac power or CP, and 5.0). We sought to evaluate the impact of using Impella 5.0 device (which provides maximal circulatory support) on patient outcome and survival.

Methods: We retrospectively identified 360 patients who received Impella device at our tertiary care center between 2015 and 2019. We included a cohort of 214 patients who reviewed Impella (2.5, CP and 5.0) for the indication of CS. A total of 183 patients received either an Impella 2.5 or Impella CP device and a total of 31 patients received an Impella 5.0 (either upfront or as upgrade from another Impella device). Acute coronary syndrome (ACS) accounted for 74.8 percent of all cases of CS. Primary endpoint was 30-day survival.

Results: The 30-day mortality for the Impella 5.0 group was 32.3% compared to 45.9% for the Impella 2.5/CP group ($p=0.04$) [Figure 1].

Conclusions: The use of the more robust Impella 5.0 MCS device is associated with better survival at 30 days compared to the Impella 2.5 and Impella CP, which provide a lower level of support. Further future studies are needed to evaluate this finding in larger cohort prospectively. Figure 1: Mortality at 30 days post Impella placement.

Disclosures: H. G. Bezerra: *Abiomed: Consulting and Speaker Bureau*; H. Mously *Nothing to disclose*. A. Alaiti *Nothing to disclose*. N. Tashtish *Nothing to disclose*. K. Lang *Nothing to disclose*. S. Arora *Nothing to disclose*. C. A. Igwe *Nothing to disclose*. T. Chami *Nothing to disclose*. C. ElAmm *Nothing to disclose*. B. Medalion *Nothing to disclose*. M. Zacharias *Nothing to disclose*. T. Lytle *Nothing to disclose*.

IV-14 | Predictive Value of Mean Platelet Volume/Platelet Count for Prognosis in Percutaneous Coronary Intervention with Short-Term Mechanical Support

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Background: Previous literature has shown that increases in absolute MPV in the CABG population predicted major adverse cardiovascular events (MACE). No studies to date have evaluated the effect of short term mechanical support (MCS) on MPV in the percutaneous coronary intervention population. Our goal was to evaluate the relation of platelet count and MPV with patients who underwent PCI with or without MCS.

Methods: 289 patients who received MCS devices for high risk PCI were retrospectively collected. Average MPV (aMPV), percentage change from admission (% Δ MPV), average platelet (aPLT) were calculated from pre-PCI, 1, and 7 days post-PCI. 33 consecutive patients treated with PCI without MCS support that had complete platelet data served as the control.

Results: Absolute values of aMPV were similar pre-PCI in all arms. A significant elevation in aMPV 1 day post-PCI ($p=0.0391$) and 7 days post-PCI ($p=0.0011$) occurred in all arms. There was a significant increase in adverse outcomes in patients who experienced an increase in aMPV ($p<0.0001$). % Δ MPV increased in the MCS arms 1-day and 7 day post-PCI. A significant increase in % Δ MPV was found in patients who had expired in comparison to patients who are alive ($p=0.0049$). aPLT was shown to decrease in the MCS arms 1, and 7 days post-PCI in comparison to the control arm where aPLT remained relatively unchanged ($p<0.0001$). There was a significant decrease in aPLT in patients who expired ($p=0.0003$).

Conclusions: Our findings suggest that an increase in aMPV/% Δ MPV in concurrence with a decrease in aPLT occur with the use of short-term MCS and correlate with MACE. MPV is an important, simple, readily available, and cost effective tool and shows promise in predicting post-PCI MACE in patients undergoing insertion of MCS for high risk PCI.

Disclosures: R. Murphy *Nothing to disclose*. H. Nazeer *Nothing to disclose*. D. Belov *Nothing to disclose*. M. Torosoff *Nothing to disclose*.

IV-15 | Inter-Hospital Transfers in Acute Myocardial Infarction and Cardiogenic Shock

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Background: Limited data exist on the use of "hub and spoke" models to transfer patients who present in cardiogenic shock. We sought to assess outcomes of patients transferred to our shock center within our network to those who presents from institutions out of our network.

Methods: From January 2014 to June 2017, 110 patients transferred to our shock center with an admission diagnosis of acute myocardial infarction and cardiogenic shock (AMICS) based on ICD coding. Demographics, admission, procedural and clinical outcomes were obtained for all patients and compared. Statistical analysis was performed using two-sample t-tests, Wilcoxon rank sum tests, chi-square tests and Fisher exact tests.

Results: 35 patients were transferred within our network and 75 patients presented out of our network. The average age of the cohort was 66.4 years. In-network patients were less likely to present with in-hospital cardiac arrest (12.1% vs. 35.7%, $p=0.013$). In-network patients presented with lower cardiac output (CO) ($3.2 \text{ L/m} \pm 0.7$ vs $4.5 \text{ L/m} \pm 1.0$; $p=0.019$) but were less likely to be on vasopressors (42.3% vs 72.2%, $p=0.018$) upon transfer. Similarly, in-network patients had a lower cardiac output following initiation of mechanical circulatory support ($3.9 \text{ L/m} \pm 0.9$ vs. $5.7 \text{ L/m} \pm 2.3$, $p=0.010$), but higher SBP after initiation of MCS ($124.7 \text{ mmHg} \pm 28.2$ vs. $105.5 \text{ mmHg} \pm 25.2$, $p=0.006$). Overall, in-network patients had shorter delays from AMI onset to MCS when compared to out of network patients. In-network patients had improved survival to hospital discharge (62.9% vs 41.3%, $p=0.035$).

Conclusions: Patients who presented to our shock center from an in-network hospital had improved survival to hospital discharge when compared to patients who presented from outside our network. Further system based processes are needed to best optimize care of patients transferred with acute myocardial and cardiogenic shock.

Disclosures: J. Cowger: Abbott (St. Jude): Consulting and Speaker Bureau; Medtronic: Consulting and Speaker Bureau; Procyron: Advisory Board/Board Member; K. Alaswad: Boston Scientific Corp.: Consulting; Terumo: Consulting; Abbott (St. Jude): Consultant, not financial; W. W. O'Neill: Abiomed: Consulting; Boston Scientific Corp.: Consulting; Edwards Lifesciences: Consulting; M. B. Basir: Abbott (St. Jude): Consulting; Abiomed: Advisory Board/Board Member, Consulting and Principal Investigator for a Research Study; Cardiovascular Systems, Inc.: Consulting; Chiesi: Consulting and Principal Investigator for a Research Study; Zoll: Consulting and Speaker Bureau; P. Nona *Nothing to disclose*. D. Dhillon *Nothing to disclose*. S. Mawri *Nothing to disclose*. A. K. Khandelwal *Nothing to disclose*.

IV-16 | Trends in Incidences and Outcomes of Cardiogenic Shock Over Last Two Decades-Insights from Nationwide Inpatient Sample database

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United States; Haidar Yassin, University of Arizona College of Medicine, United States

Background: Limited information is available on the contemporary and potentially changing trends in the incidence and outcomes of hospitalization due to cardiogenic shock (CS).

Methods: We sought to analyze the reported data of patients hospitalized with CS from a diverse, multicentric, nationwide cohort using Nationwide Inpatient Sample database to understand the trends in incidences and outcomes of such patients.

Results: 16137 hospitalizations involving adult patients with the primary discharge diagnosis of CS from years 1997 through 2016 were identified. CS were reported more commonly in men than women (55.89% vs 44.11%, $p < 0.0001$) with no difference in mortality among the two genders (males; 53.01% vs female; 56.32%, p -value = 0.2295). Analysis of trends showed a constant decreasing trend in number of hospitalizations with diagnosis of CS. Age of presentation has decreased over the study period from 70.54 (± 0.41) to 66.29 (± 0.33) (p -value < 0.0001) years in patients hospitalized from 1997-2000 and. There has been a consistent increase in the LOS from 4.87 (± 0.34) to 6.0 (± 0.25) days in patients hospitalized from 1997-2000 and 2010-2016, respectively (p -value < 0.0074). Mean inpatient mortality has significantly decreased from 61.47% to 45.87% (p -value < 0.0001) in patient hospitalized form 1997 -2000 and 2010-2016, respectively (Figure 1).

Conclusions: A consistent downward trend in the incidence of CS related hospitalizations during last two decades with a significant decrease in CS related inpatient mortality is observed. CS related

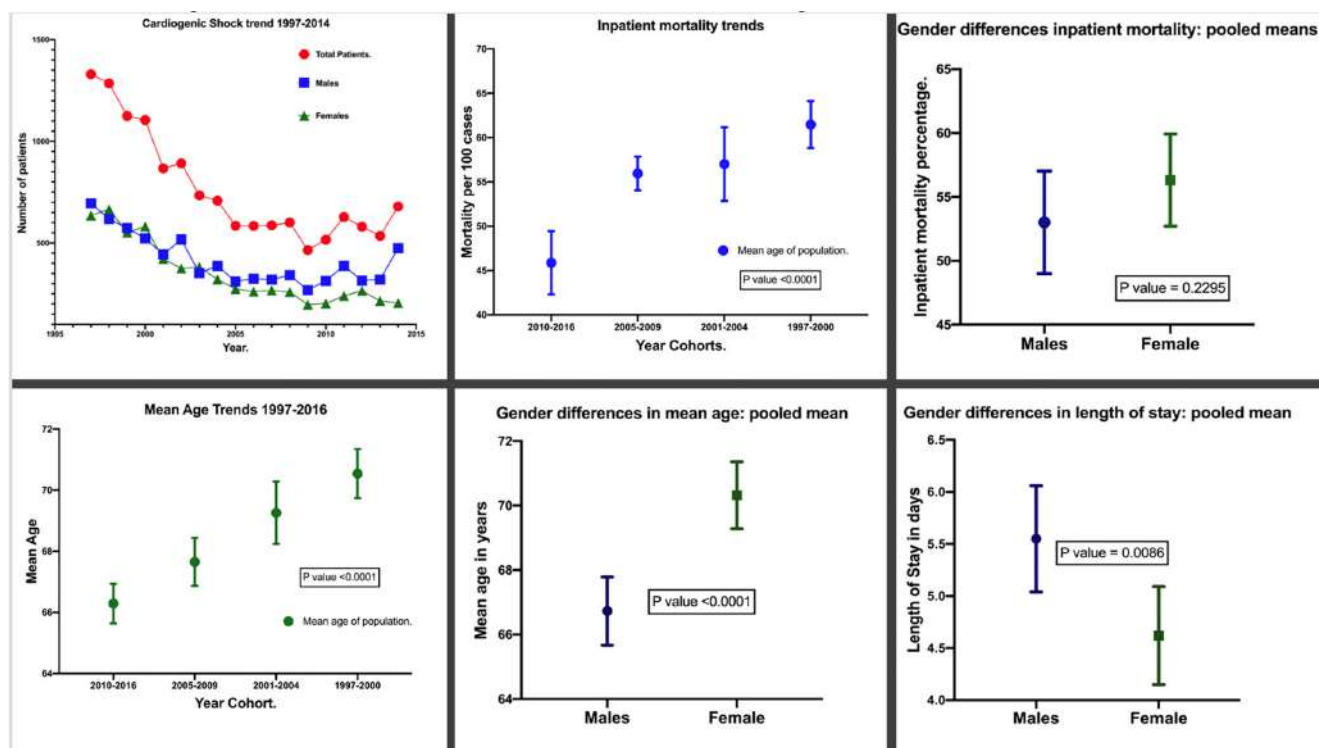
hospitalization were more commonly reported in men with no significant difference in outcomes between the two genders.

Disclosures: F. Sibghat Tul Llah *Nothing to disclose*. S. Sharif *Nothing to disclose*. S. Ullah *Nothing to disclose*. T. Dar *Nothing to disclose*. A. Banday *Nothing to disclose*. M. Adil *Nothing to disclose*. T. Abbasi *Nothing to disclose*. H. Yassin *Nothing to disclose*.

IV-17 | Improved Cardiogenic Shock Patient Survival with Implementation of a Multidisciplinary Cardiogenic Shock Team

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Background: Mortality in cardiogenic shock has remained unchanged at ~50% over the past two decades. The incidence of cardiogenic shock continues to increase every year. While the reasoning for increasing incidence is not clear, improved diagnosis and better access



to healthcare are likely contributing factors. The implementation of a multidisciplinary cardiogenic shock team at Deborah Heart and Lung Center stemmed from the poor outcomes in cardiogenic shock from the years 2016-2018. As a result, our hospital implemented a multidisciplinary cardiogenic shock team to improve management and outcomes.

Methods: A single-center, retrospective study was performed on patients who presented with cardiogenic shock secondary to acute/chronic decompensated heart failure or acute myocardial infarction between 2016-2018. Use of mechanical support including impella and intra-aortic balloon pump as well as the use of Swan Ganz catheters were examined. Endpoints of survival to discharge were also examined.

Results: A total of 111 patients presented with cardiogenic shock over a 3.5 year period. Data analysis showed that compared to baseline 2016 survival data of 37% (10/27), survival rates increased every year to 43%(12/28) in 2017, 54%(14/26) in 2018, and 71%(22/31) in 2019 ($p=0.001$; OR 25.22; CI 3.55 to 179.23), facilitated by the implementation of a multidisciplinary cardiogenic shock team. In addition, the use of Swan-Ganz catheters substantially increased from 0% in 2016 to 100% in 2019. Specifically between 2018 and 2019, Swan-Ganz catheter usage increased from 43% in 2018 to 100% in 2019 as did survival percentage (54% to 71%) ($p=0.06$). The use of mechanical support increased from 3 patients in 2016 to 19 patients in 2019. The survival to discharge of patients requiring impella support increased from 17% in 2018 to 58% in 2019.

Conclusions: The results of this study demonstrate that a multidisciplinary team approach to the treatment of cardiogenic shock resulted in better clinical outcomes. Survival to discharge improved substantially from 2016 to 2019. These improved outcomes were driven by a combination of a multidisciplinary team approach, utilization of Swan-Ganz catheters, and effective use of mechanical support devices.

Disclosures: C. Sineri *Nothing to disclose*. S. Sookhu *Nothing to disclose*. M. Moshikhov *Nothing to disclose*. J. Szalewicz *Nothing to disclose*. D. S. Ice *Nothing to disclose*. R. C. Kovach *Nothing to disclose*. K. A. Sanghvi *Nothing to disclose*. V. Varghese *Nothing to disclose*. P. Burns *Nothing to disclose*. R. Ross *Nothing to disclose*. P. Kazemian *Nothing to disclose*. K. Barn *Nothing to disclose*.

IV-18 | Left Ventricular Assist Device Implantation as a Bridge to Decision in a Patient with Biventricular Heart Failure Complicated with Cardiogenic Shock and INTERMACS Profile 1

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Background: In patients with end-stage CHF, LVAD implantation can be done as a bridge to decision (BTD) in cases of decision uncertainty.

Case: Methods: A 35-year-old female with BiVHF [EF of 5-10% with RV dysfunction] (figure 1 A), depression, and medication noncompliance presented with SOB on minimal exertion.

RHC: RA 25, RV 63/14, PA 62/37, PCWP 29/33 mmHg, and CI of 1.9 L/min/m². Milrinone 0.375 mcg/kg/min and IV diuresis were started with placing IABP. The patient clinically worsened. Cr increased to 1.36 mg/dL. Milrinone increased to 0.75 mcg/kg/min along with adding dobutamine 5 mcg/kg/min and replacing IABP with Impella CP (figure 1 B). She continued to worsen. Labs: Cr 1.59 and lactic acid of 3.38 mmol/L. Impella was removed and the patient had LVAD as BTD with speed optimization (figure 1 C-D). She slowly improved then was discharged on milrinone for RV support.

Discussion: Results: Our patient's critical illness with a history of medication noncompliance, and psychiatric conditions were prohibitive to proceed with HT and worrisome to proceed with LVAD. Due to her refractory clinical course, the decision was made to implant LVAD as BTD with milrinone for RV support. She continued to follow up in clinic with decreasing milrinone and a plan to re-consider HT in the future.

Conclusions: LVAD implantation as BTD in critically-ill CHF patients with advanced INTERMACS profile can be life-saving. A multidisciplinary evaluation should always be sought in such patients.

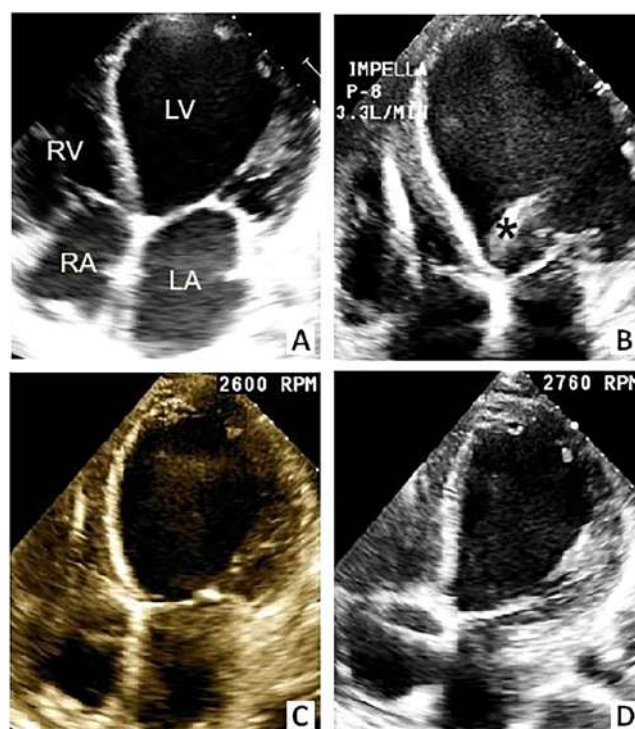


Figure 1: Apical 4-chamber views A: At baseline echocardiogram. B: After Impella CP placement (asterisk). C: After LVAD, at speed of 2600 rpm with septum pointing toward the right ventricle. D: After LVAD, at speed of 2760 rpm with septum at midline. Abbreviations: LA: Left Atrium, LV: Left Ventricle, RA: Right Atrium, RV: Right Ventricle.

Disclosures: M. K. Soufi *Nothing to disclose.* K. F. Chatila *Nothing to disclose.*

IV-19 | National Trends in Incidence, Revascularization, Mechanical Circulatory Support and Outcomes of Cardiogenic Shock Complicating Non-ST Elevation Myocardial Infarction Compared to ST Elevation Myocardial Infarction in the United States

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Background: Acute myocardial infarction (AMI) complicated by cardiogenic shock (CS) has high mortality despite rapid revascularization and advances in mechanical circulatory support (MCS). As most reports have focused on CS in the setting of ST elevation MI (STEMI-CS), there is a paucity of data on CS due to Non-ST elevation MI (NSTEMI-CS).

Methods: We analyzed the National Inpatient Sample from 2011 to 2015 for admissions with a primary diagnosis of NSTEMI-CS or STEMI-CS. Incidence rates, revascularization, use of MCS and in-hospital mortality were extracted. Trends across years were analyzed using Mantel-Haenszel test and linear regression test for categorical and continuous variables respectively.

Results: During the 5-year period, there were 3,015,918 admissions for AMI: 2,118,747 for NSTEMI (70.3%), and 897,172 for STEMI (29.7%). The incidence of CS was lower among NSTEMI compared to STEMI patients (3.1% vs 11.3%, $p < 0.001$). When compared to STEMI-CS patients, NSTEMI-CS patients were older (70.7 vs 66.6 years, $p < 0.001$) and more likely to be women (38% vs 35%, $p < 0.001$). Patients with NSTEMI-CS were less likely to receive percutaneous coronary intervention (PCI) (30.5% vs 68.1%, $p < 0.001$) and MCS (intra-aortic balloon pump 33.7% vs 47.0%, Impella/Tandem Heart 3.5% vs 4.6%, extracorporeal membrane oxygenation 0.9% vs 1.5%, all $p < 0.001$) but more likely to undergo coronary artery bypass grafting (CABG) (25.1% vs 12.1%, $p < 0.001$). There was a significant temporal increase in PCI for STEMI-CS patients (66.1% to 69.8%, $ptrend < 0.001$) but not in NSTEMI-CS patients (28.4% to 31.1%, $p = 0.07$). In-hospital mortality was lower in NSTEMI-CS than STEMI-CS (30% vs 33.4%, $p < 0.001$), but did not change in either group over the study period (NSTEMI-CS 28.9% to 31%, $ptrend = 0.16$, STEMI-CS 32.6% to 32.9%, $ptrend = 0.93$).

Conclusions: CS occurred less frequently in the setting of NSTEMI than STEMI. Patients with NSTEMI-CS were less likely to receive PCI and MCS than patients with STEMI-CS, but were more likely to undergo CABG. Contrary to previous reports, in-hospital mortality from NSTEMI-CS was lower than STEMI-CS. There was no improvement in mortality in either group during the period of study.

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IV-20 | Complications from Percutaneous-Left Ventricular Assist Devices versus Intra-Aortic Balloon Pump in Acute Myocardial Infarction-Cardiogenic Shock

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Background: There are limited data regarding the rates of complications in patients requiring a percutaneous left ventricular assist device (pLVAD) versus an intra-aortic balloon pump (IABP) in acute myocardial infarction-cardiogenic shock (AMI-CS).

Methods: During 2005-2016, AMI-CS admissions from the National Inpatient Sample receiving a pLVAD or IABP were included. Outcomes of interest included rates, temporal trends, and predictors of complications. In-hospital mortality, hospitalization costs and length of stay in pLVAD and IABP cohorts with complications was studied.

Results: In the study period, 168,645 admissions met the inclusion criteria, with 7,855 (4.7%) receiving pLVAD support. The pLVAD cohort was on average younger, male, White, with higher comorbidity, rates of cardiac arrest (36.1% vs. 29.7%) and non-cardiac organ failure (74.7% vs. 56.9%). Complications were noted in 93,317 (55.3%) admissions, with higher rates in the pLVAD cohort compared to the IABP – overall 69.0% vs. 54.7%; vascular 3.8% vs. 2.1%; lower limb amputation 0.3% vs. 0.3%; hematologic 36.0% vs. 27.7%; neurologic 4.9% vs. 3.5% and acute kidney injury 55.4% vs. 39.1% (all $p < 0.001$ except for amputation). Non-White race, higher comorbidity, acute organ failure, and utilization of extracorporeal membrane oxygen were predictors of complications for both cohorts. Among admissions with complications, the pLVAD cohort had higher in-hospital mortality (45.5% vs. 33.1%; adjusted odds ratio 1.65 [95% confidence interval 1.55-1.75]), shorter duration of hospital stay (12.6±15.1 vs. 13.5

± 12.9 days) and higher hospitalization costs (\$375,629 $\pm$ 383,914 vs. 236,654 $\pm$ 217,805) compared to the IABP cohort (all $p < 0.001$). In 2,838 propensity-matched admissions, the pLVAD cohort with complications had higher in-hospital mortality compared the IABP cohort with complications (28.4% vs. 26.7%; $p = 0.04$) compared to the IABP.

Conclusions: AMI-CS admissions receiving pLVAD had higher rates of complications compared to the IABP. The pLVAD cohort with complications had worse outcomes compared to the IABP cohort with complications in this large observational study.

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IV-21 | Complications in Patients with Acute Myocardial Infarction Supported with Extracorporeal Membrane Oxygenation

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Background: There are limited data on the complications in patients requiring extracorporeal membrane oxygenation (ECMO) support in acute myocardial infarction (AMI). This study sought to evaluate rates, trends and outcomes of complications of ECMO in AMI.

Methods: During 2000-2016, adult (> 18 years) AMI admissions from the National Inpatient Sample receiving ECMO support were included. Complications were classified as vascular, lower limb amputation, hematologic, and neurologic. Outcomes of interest included temporal trends, in-hospital mortality, hospitalization costs and length of stay.

Results: In this 17-year period, in ~ 10 million AMI admissions, ECMO support was used in 4,608 ($< 0.01\%$) – mean age 59.5 $\pm$ 11.0 years, 75.7% men, 58.9% white race. Median time to ECMO placement was 1 day (interquartile range [IQR] 0-3). Complications were noted in 2,571 (55.8%) admissions – vascular 6.1%, lower limb amputations 1.1%, hematologic 49.3%, and neurologic 9.9%. Thrombocytopenia (265.8%), need for blood transfusion (25.3%) and post-operative hemorrhage (18.8%) were the most common complications. Neurological complications included ischemic (8.7%) and hemorrhagic (2.1%) strokes. There was a steady increase in overall complications during the study period (21.1% in 2000 versus 70.5% in 2016). The cohort with complications had comparable adjusted in-hospital mortality (60.7% vs. 54.0%; adjusted odds ratio 0.89 [95% confidence interval 0.77-1.02]; $p = 0.10$) but longer median hospital stay (12 [IQR 5-24] vs. 7 [IQR 3-21] days), higher median hospitalization costs (\$458,954

[IQR 260,522-737,871] vs. 302,255 [IQR 173,033-623,660]), fewer discharges to home (14.7% vs. 17.9%), and higher discharges to skilled nursing facilities (44.1% vs. 33.9%) (all $p < 0.001$).

Conclusions: Over half of all AMI admissions receiving ECMO support develop one or more complications. Complications were associated with higher resource utilization during and after the index hospitalization. The cost and complications associated with ECMO have to be considered when selecting candidates for advanced hemodynamic support in AMI.

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IV-22 | Outcomes of Cardiogenic Shock in LVAD versus non-LVAD Centers

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Background: Cardiogenic shock historically has had high mortality rates, which has persisted for several decades. However, recent evidence from small studies has suggested that the implementation of multidisciplinary shock teams consisting of advanced heart failure specialists, interventional cardiologists, critical care specialists, and cardiothoracic surgeons along with mechanical circulatory support capabilities may be changing the paradigm in management of cardiogenic shock. The infrastructure of shock teams is likely represented already in hospitals that implant durable left-ventricular assist devices (LVADs). Therefore, evaluation of LVAD centers as a surrogate for shock centers may provide early insights into differences in outcomes.

Methods: Patients with cardiogenic shock were identified in the 2010-2014 National Inpatient Sample database. Hospitals were determined be LVAD centers if they implanted a durable LVAD within that year. Clinical characteristics and in-hospital mortality in LVAD and non-LVAD centers were analyzed.

Results: Patients with cardiogenic shock had a lower in-hospital mortality in LVAD centers (37.5% vs. 42.6%, $p < 0.001$). In multivariate analysis, patients with cardiogenic shock in LVAD centers were less likely to die (OR: 0.87, 95% CI: 0.84-0.91, $p < 0.001$). In subgroup analysis, patients with acute coronary syndrome (ACS) complicated by cardiogenic shock had a similar risk of death in LVAD and non-LVAD centers (OR: 0.95, 95% CI 0.89-1.01, $p = 0.10$). Non-ACS patients with cardiogenic shock were less likely to die when managed in LVAD centers (OR: 0.82, 95% CI: 0.78-0.87, $p < 0.001$).

Conclusions: Risk-adjusted mortality is lower in patients with cardiogenic shock who were treated at LVAD centers. The differences in outcomes in patients with ACS complicated by cardiogenic shock may be negated by revascularization, whereas management of non-ACS cardiogenic shock in LVAD centers resulted in significant reductions in mortality. LVAD centers appear to be reasonable surrogates for the evaluation of shock centers on a nationwide level.

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IV-23 | Safety and Efficacy of Left Atrial Venous-Arterial (LAVA) Extracorporeal Membrane Oxygenation for the Management of Cardiogenic Shock

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Background: Veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is capable of providing biventricular support in cardiogenic shock, but has a negative impact on left-sided loading parameters in patients with systolic dysfunction. We present a single center experience utilizing a left atrial veno-arterial (LAVA) cannulation strategy for left ventricular unloading.

Methods: We retrospectively identified twenty consecutive patients with severe left ventricular systolic dysfunction supported with VA-ECMO for the management of cardiogenic shock using a left atrial veno-arterial (LAVA) cannulation strategy. All patients were peripherally cannulated in the catheterization laboratory with the venous cannula placed in a transeptal position allowing for bi-atrial drainage. A distal perfusion cannula was placed in all cases.

Results: Procedural and clinical characteristics, pre-cannulation invasive hemodynamics, and safety outcomes are provided in Table 1. Nine patients (45%) survived to hospital discharge of which three

	Full Cohort (N=20)	Survivors (N=9)	Non-Survivors (N=11)	P-Value
Procedural				
Venous cannula (Fr)	24.4 ± 1.4	24.2 ± 1.6	24.5 ± 1.2	0.72
Arterial cannula (Fr)	18.2 ± 1.3	17.9 ± 1.1	18.4 ± 1.5	0.42
Reperfusion cannula	20 (100)	9 (100)	11 (100)	1
Duration of run (d)	5.5 ± 3.2	4.2 ± 2.1	6.6 ± 3.6	0.09
Anticoagulant				
Heparin	7 (35)	4 (44.4)	3 (27.3)	0.46
Bivalirudin	13 (65)	5 (55.6)	8 (72.7)	0.46
Antiplatelet				
ASA	15 (75)	8 (88.9)	7 (63.6)	0.20
P2Y12	10 (50)	6 (66.7)	4 (36.4)	0.20
Clinical data				
Cardiac arrest	6 (30)	2 (22.2)	4 (36.4)	0.51
Post-acute MI	11 (55)	6 (66.7)	5 (45.5)	0.37
Lactic acid	4.4 ± 4.6	3.3 ± 3.5	5.3 ± 5.3	0.33
pH	7.33 ± 0.14	7.33 ± 0.12	7.33 ± 0.16	0.91
Hematocrit	30.1 ± 4.5	29.9 ± 5.1	30.3 ± 4.3	0.87
Echo				
LVEF (%)	19.4 ± 4.9	20.9 ± 5.8	18.2 ± 4.1	0.26
LVIDD (cm)	5.6 ± 1.0	5.5 ± 1.3	5.7 ± 0.9	0.71
Severe RV dilation	2 (10)	0 (0)	2 (18.2)	0.17
Severe RV dysfunction	6 (30)	0 (0)	6 (54.5)	0.006
Severe TR	1 (5)	0 (0)	1 (9.1)	0.34
Severe MR	4 (20)	2 (22.2)	2 (18.2)	0.84
Severe AI	0 (0)	0 (0)	0 (0)	-

*Of the 9 survivors, 6 were bridged to recovery and 3 bridged to destination therapy with LVAD.

RHC				
MAP (mmHg)	66.9 ± 10.9	66.3 ± 11.3	67.4 ± 11.4	0.85
PCWP (mmHg)	21.7 ± 9.1	24.9 ± 8.4	18.6 ± 9.2	0.21
sPAP (mmHg)	40.5 ± 15.4	50.1 ± 12.4	30.9 ± 11.9	0.01
dPAP (mmHg)	24.9 ± 8.6	28.7 ± 7.6	21.0 ± 8.2	0.09
mPAP (mmHg)	30.4 ± 10.3	36.1 ± 8.4	24.7 ± 9.1	0.03
RAP (mmHg)	13.8 ± 6.2	14.6 ± 6.7	13.0 ± 6.2	0.66
PAPi	1.30 ± 0.78	1.74 ± 0.82	0.86 ± 0.44	0.03
PA sat (%)	49.2 ± 10.8	49.7 ± 13.5	48.7 ± 8.4	0.87
CO [Fick] (L/min)	3.80 ± 1.22	3.77 ± 0.86	3.83 ± 1.53	0.94
CI [Fick] (L/min/m ²)	1.66 ± 0.65	1.56 ± 0.81	1.76 ± 0.51	0.60
CPO [Fick] (W)	0.42 ± 0.29	0.36 ± 0.29	0.49 ± 0.29	0.33
SVI (mL/m ² /beat)	17.9 ± 5.8	19.3 ± 6.9	16.8 ± 4.7	0.49
RVSWi (g/m ² /beat)	4.61 ± 3.60	6.56 ± 3.87	2.93 ± 2.54	0.08
Outcomes				
*Survival to discharge	9 (45)			
Stroke	3 (15)	1 (11.1)	2 (18.2)	0.67
AKI	18 (90)	7 (77.8)	11 (100)	0.17
Non-oliguric	11 (55)	6 (66.7)	5 (45.5)	0.37
Oligoanuric	7 (35)	1 (11.1)	6 (54.5)	0.04
Renal Replacement Therapy	5 (25)	1 (11.1)	4 (36.4)	0.20
Cannulated limb ischemia	1 (5)	1 (11.1)	0 (0)	0.35
Access site complication	2 (10)	1 (11.1)	1 (9.1)	0.89
Bleeding complication	4 (20)	1 (11.1)	3 (27.3)	0.38
Blood transfusion	14 (70)	5 (55.6)	9 (81.8)	0.24
Units of pRBCs	3.5 ± 3.2	3.7 ± 3.9	3.4 ± 2.7	0.85

(15%) were bridged to left ventricular assist device and six (30%) bridged to recovery. Access site complications occurred in 10% of cases. Similar rates of blood products were used amongst survivors and non-survivors. Within this cohort, severe RV dysfunction ($P=0.006$) and reduced pulmonary artery pulsatility index ($P=0.03$) were more prevalent in non-survivors.

Conclusions: Extracorporeal life support using peripherally cannulated LAVA ECMO is a safe and viable option to provide simultaneous systemic hemodynamic support and adequate left ventricular unloading.

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LEFT MAIN & MULTI-VESSEL INTERVENTION

IV-24 | One year clinical outcomes of ultrathin biodegradable polymer coated sirolimus eluting stents for multi-vessel treatment

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Background: The aim of this analysis was to present the safety and clinical performance of ultrathin-strut (60 μ m) biodegradable polymer-coated Supraflex Cruz (Sahajanand Medical Technologies Pvt Ltd, Surat, India) sirolimus-eluting stents (SES) in patients with multi-vessel disease at one year follow-up.

Methods: Two real-world, multicentre, all-comer registries conducted between May 2016 and March 2018, comprising 2472 patients, were retrospectively analysed for patients who underwent multi-vessel treatment. Both the registries included patients who underwent PCI with only Supraflex Cruz SES in India. Patients with at least two lesions located in two or more major epicardial vessels were included. The primary endpoint was target lesion failure (TLF), a composite of cardiac death, target vessel related myocardial infarction (TV-MI) and target lesion revascularization (TLR) at one year. Safety endpoint was stent thrombosis, defined as per the Academic Research Consortium.

Results: A total of 406 patients with multi-vessel treatment were included. The mean age of the population was 58.01 ± 10.30 years

and 288 (70.9 %) were male. Of the total population, 193 (47.5 %) were hypertensive, 155 (38.2 %) were diabetic and 129 (31.8 %) had hyperlipidaemia. A total of 94 (23.2 %) patients had STEMI. Of the 824 lesions, 326 (39.6 %) were in left anterior descending artery, 265 (32.2 %) were in right coronary artery, 229 (27.8 %) were in left circumflex and 4 (0.5 %) in left main artery. Of the total lesions, 627 (76.1 %) were type B2/C lesions, and 71 (8.6 %) were total occlusions. A total of 855 stents were deployed in 406 patients (824 lesions). Stents deployed per patients was 2.11 ± 0.46 . The mean stent length and diameter were 25.94 ± 9.20 mm and 2.84 ± 0.30 mm, respectively. At one year, details of 391 (96.3 %) patients were followed-up. TLF at one year occurred in 25 (6.4 %) patients, which consisted of 3 (0.8 %) cardiac deaths, 9 (2.3 %) TV-MI, and 13 (3.3 %) TLR. There were 3 (0.8 %) incidences of stent thrombosis; 2 (0.5 %) definite and 1 (0.3 %) probable stent thrombosis.

Conclusions: In patients with multi-vessel disease, Supraflex Cruz SES was safe and possesses higher clinical safety at one year follow up.

Disclosures: D. P. Ajmera *Nothing to disclose*. R. B. Pothineni *Nothing to disclose*. K. K. Chawla *Nothing to disclose*. S. S. Mantravadi *Nothing to disclose*. P. Jariwala *Nothing to disclose*. V. M. Vijan *Nothing to disclose*. V. Vijan *Nothing to disclose*. A. M. Potdar *Nothing to disclose*. M. K. Inamdar *Nothing to disclose*. P. A. Purushottam *Nothing to disclose*.

IV-25 | The Canadian Distal Bed Score to predict coronary graftability in patient undergoing coronary artery bypass grafting surgery: a new scoring system

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Background: Coronary artery bypass grafting remains preferable in patients with extensive CAD, especially with multi-vessel or left main. While interventional cardiologists depend on their ability to alleviate stenoses, surgeons rather assess their capacity to bypass lesions and attach grafts distal to coronary lesions. No tool is currently available to help assess the quality of the distal bed of the vessel to be bypassed.

Methods: We did a single-center retrospective cohort study aiming at evaluating the predictive value of a simple, original and newly developed score, the Canadian Distal Bed Score (CDBS), for the prediction of graft placement by individual vessels targeted to receive a bypass graft (table). We also wanted to assess if the average per-patient (PP-CDBS) would predict in hospital outcomes. The primary outcome was the ability to graft the stenosed vessel. Secondary outcomes included in-hospital outcomes such as death or type 5 myocardial infarction (MI).

The Canadian Distal Bed Score (CDBS)

Score	Interpretation
CDBS 0	Not visualized: Distal vessel not visualized despite adequate bilateral selective coronary contrast injection
CDBS 1	Poor: Severely diseased potential target and/or lesion distal to a potential graft and/or severe calcification at potential site and/or judged "small" (<2.0 mm)
CDBS 2	Fair: Mildly diseased potential target without lesion distal to a potential graft and/or mild calcification at potential site and/or judged "intermediate size" (2.0-2.5 mm)
CDBS 3	Good: Absence of disease, non-calcified and large (>2.5 mm)

Table 1

Proportion of grafted vessels by CDBS groups

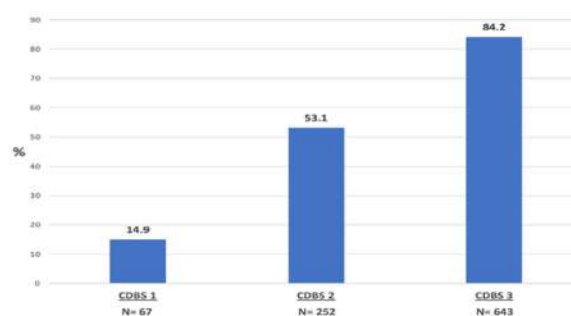


Figure 1

Results: A total of 962 diseased distal bed data was obtained from 200 patients. Of all the potentially grafted distal segments, 643 (66.8%) had a CDBS of 3, 252 (26.2%) of 2, 67 (7%) of 1 and none had a score of 0. The SYNTAX score was 26 ± 4.4 . The percentage of grafted arteries per CDBS is shown in figure (P value <0.0001). Of all lesions, 91 were CTOs (9.5%) and 69 were grafted (75.8%). 3 in-hospital events were reported; 1 death (PP-CDBS 2.2) and 2 MI type 5 (PP-CDBS <2).

Conclusions: The novel CDBS score was strongly associated with subsequent grafting of the vessel or not. The CDBS could be easily assessed by invasive cardiologist or surgeons when assessing best revascularization option, beyond the SYNTAX score.

Disclosures: Y. Alansari *Nothing to disclose*. R. Alsobhi *Nothing to disclose*. S. Rinfret *Nothing to disclose*.

IV-26 | All-Cause Mortality after Percutaneous Coronary Intervention versus Coronary Artery Bypass Grafting for Unprotected Left Main Coronary Artery at 5-years: Meta-analysis of Randomized Controlled Trials

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Background: Long-term outcomes after unprotected left main (ULM) revascularization with drug eluting stents (DES) compared

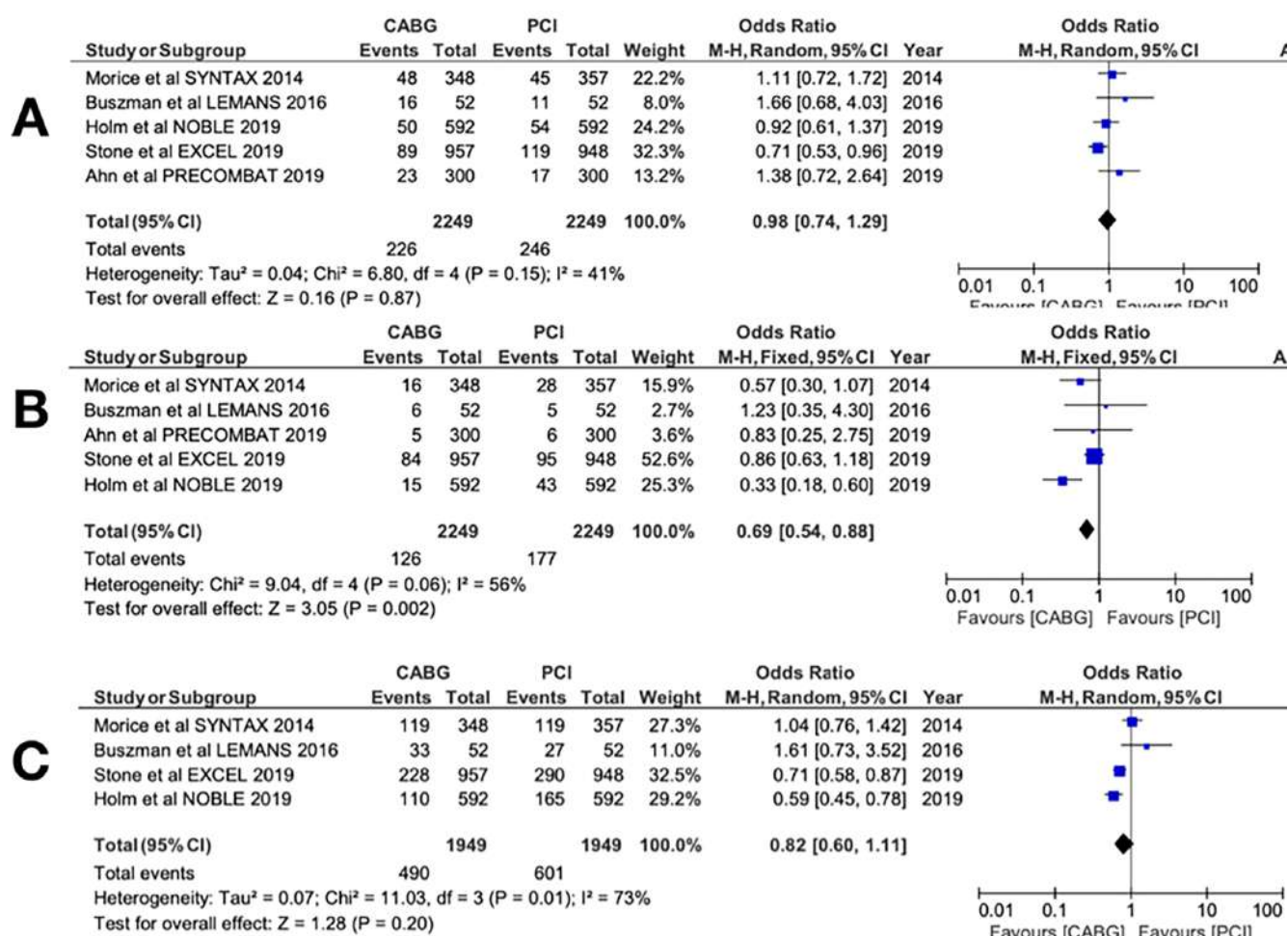
to coronary artery bypass grafting (CABG) continue to be defined as longer term follow up from randomized controlled trials (RCTs) is reported. However, these RCTs report smaller number of patients individually. We attempt to explore these longer-term outcomes from RCTs in aggregate to better define clinical outcomes.

Methods: An aggregate data meta-analysis of RCTs comparing CABG with PCI for ULM was performed using random effects model. Only RCTs reporting a long-term (5-year) follow-up were included in our analysis. A literature search identified 5 studies and 4498 patients. The primary outcome of interest was all-cause mortality, secondary outcomes included myocardial infarction (MI), stroke, repeat revascularization and a composite outcome of major adverse cardiac and cerebrovascular events (MACCE). Data were reported as odds ratio (OR) and 95% confidence intervals.

Results: Baseline demographic and clinical characteristics were comparable. At 5-years, there was no difference between CABG and PCI in terms of all-cause mortality (PCI: 10%, CABG: 10.9%, OR 0.98 [0.74- 1.29]), stroke (OR 1.19 [0.66- 2.14]) and MACCE (OR 0.82 [0.60- 1.11]). However, CABG, compared to PCI was associated with a significantly lower incidence of repeat revascularization (OR 0.54 [0.44- 0.67]) and myocardial infarction (OR 0.69 [0.54- 0.88]) (figure 1).

Conclusions: PCI is a reasonable alternative to CABG for ULM disease in select patient populations, but there is a need for even longer-term follow-up.

Disclosures: M. R. Khan *Nothing to disclose*. M. Manan *Nothing to disclose*. W. Ahmad *Nothing to disclose*. M. Khalid *Nothing to disclose*. W. Kayani *Nothing to disclose*. I. Hamzeh *Nothing to disclose*. S. S. Virani *Nothing to disclose*. H. Jneid *Nothing to disclose*. M. Alam *Nothing to disclose*.



IV-27 | Long Term Outcomes In Patients of Multivessel Disease Undergoing PCI and The Impact Of Completeness Of Revascularisation

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Background: Long term outcomes in multivessel coronary artery disease (MVD) could relate to the completeness of revascularization, an issue which still remains unresolved.

Methods: Consecutive patients with MVD taken up for PCI between Jan 2008 to Dec 2017 were included in the study. Complete Revascularization (CR) was defined as no vessel with a jeopardy score (Green Lane system) of >1.5 (>10% of total myocardial weight) and a diameter stenosis of >70% being left non revascularized. Clinical, procedural and follow up details were recorded in a pre-specified customized software. Primary endpoint of the study was survival free of major adverse event which include all-cause mortality, myocardial infarction (MI), repeat

revascularisation, and recurrent angina. Each individual MACE component was considered as the secondary endpoints.

Results: A total of 2960 patients were enrolled in study with follow up data being available in 2598 patients (87%). CR was obtained in 1854 (71.4%) and incomplete revascularisation (IR) in 744 (28.6%) patients. Median follow-up period was 4.5 years inter-quartile range 31-84 months). Kaplan Meier survival analysis showed a better EFS (event free survival) with CR versus IR (89.6% vs 80.9%; $p < 0.0001$). Secondary endpoints of all-cause mortality (1.9% vs 4.97%; $p < 0.0001$), repeat revascularization (5.2% vs 8.1%; $p = 0.022$) and angina (6.7% vs 11%; $p = 0.000$) were significantly better with CR. However, there was no difference among the two groups with respect to MI. Furthermore, better EFS in CR was seen irrespective of sex, diabetes, hypertension, acute coronary syndrome or stable CAD except for patients having underlying renal dysfunction (OR 0.20; 95% CI: 0.02-2.02) or LVEF < 30% (OR 0.66; 95% CI: 0.29-1.49) in which EFS was found to be similar irrespective of the degree of completeness of revascularization.

Conclusions: Complete revascularisation results in a better long-term event free survival and also better outcome with respect to death, angina and repeat revascularisation. On the contrary, baseline renal

dysfunction and severe LV dysfunction do not confer better survival with complete revascularization.

Disclosures: P. K. Goel *Nothing to disclose*. M. Layek *Nothing to disclose*. A. Sahu *Nothing to disclose*. R. R. Dandu *Nothing to disclose*. M. Mishra *Nothing to disclose*.

IV-28 | In-Hospital Outcomes for Patients with a Diagnosis of a Chronic Liver Disease Who Undergo a Percutaneous Transluminal Coronary Angioplasty (PTCA)

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Background: It is known that chronic liver diseases (CLD) are associated with numerous complications for patient health and that, specifically, cirrhosis can negatively impact in-hospital outcomes in those undergoing cardiac surgery. Additionally, patients with advanced liver disease may have issues with clotting (which can impact surgical outcomes) due to the liver's role in this process. These patients may also have issues processing the medications used during surgical procedures. Therefore, the aim of this study was to investigate short-term in-hospital outcomes for patients with a diagnosis of a CLD who also underwent a PTCA procedure.

Methods: This retrospective cohort study utilized the Nationwide Inpatient Sample (NIS) to identify patients from 2012-2015 who had undergone a PTCA as coded for by ICD-9. ICD-9 codes were then used to identify those patients with any form of chronic liver disease. Data analyses assessed the length of stay (LOS), total hospital charges, and mortality. Patients missing data for any of these variables or under the age of 18 at admission were excluded.

Results: We identified a total of 361,845 patients from the sample years who underwent a PTCA. Of those patients, 3,522 also carried a diagnosis of a CLD. Those with a CLD had statistically significant increases in mortality (3.4% vs 2.3%, $p < .0005$), LOS (5.30 days vs 3.90 days, $p < .0005$), and total charges (\$94,814.35 vs \$79,012.83 $p < .0005$) as compared to the control group of patients who underwent a PTCA without also having a diagnosis of a CLD. Patients with a CLD were also admitted for the procedure at a statistically significantly younger age (58.46 vs 61.88 years, $p = .009$).

Conclusions: Patients with a CLD had statistically significant increases in LOS, mortality, and hospital charges as compared to patients with underwent PTCA without a CLD. Those patients were also admitted

for the procedures at younger ages. Due to these results, physicians may want to consider treating the CLD before performing non-emergent PTCA procedures or ensure extra precautions are taken in these patients including replenishing Vitamin K and administering fresh frozen plasma. These patients should also be monitored closely before, during, and after the PTCA for any changes in status.

Disclosures: V. Gordon *Nothing to disclose*. C. Marolt *Nothing to disclose*. J. Rowe *Nothing to disclose*. A. Lewis *Nothing to disclose*. K. Johnson *Nothing to disclose*. K. Hans *Nothing to disclose*. S. A. Keim *Nothing to disclose*.

IV-29 | Chronic Liver Diseases' Impact on Short-Term, In-Hospital Outcomes for Patients Who Underwent a Coronary Artery Bypass Graft (CABG) from 2012-2015

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Background: It is known that chronic liver diseases (CLD) are associated with numerous complications for patient health and that cirrhosis can negatively impact in-hospital outcomes in those undergoing cardiac surgery. Additionally, patients with advanced liver disease may have issues with clotting which can impact outcomes. Patients with a CLD may also have issues processing the medications used during surgical procedures. Therefore, the aim of this study was to investigate short-term in-hospital outcomes for patients with a diagnosis of a CLD who also underwent a CABG during the time period of 2012-2015.

Methods: This retrospective cohort study utilized the Nationwide Inpatient Sample (NIS) to identify patients from 2012-2015 who had undergone a CABG as coded for by ICD-9. ICD-9 codes were then used to identify those patients with any form of CLD. Data analyses assessed the length of stay (LOS), total hospital charges, age, and mortality. Patients missing data for any of these variables or under the age of 18 at admission were excluded.

Results: We identified a total of 148,342 patients from the sample years who underwent a CABG. Of those patient encounters, 1,679 also carried a diagnosis of a CLD. Those with a CLD had statistically significant increases in mortality (3.8% vs 2.4%, $p < .0005$), LOS (9.88 days vs 8.79 days, $p < .0005$), and total charges (\$167,762.17 vs \$150,903.61 $p < .0005$) as compared to the control group of patients who underwent a CABG without also having a diagnosis of a CLD.

Patients who underwent a CABG with a CLD also came into the hospital at a statistically significant younger age than those without a CLD (59.81 vs 62.97 years, $p < .0005$).

Conclusions: When compared to patients who underwent a CABG without CLD, patients with a CLD had statistically significant increases in LOS, mortality, and hospital charges. Patients with a CLD also had statistically significant decreases in admission age. Due to these results, physicians may want to consider treating the CLD before performing non-emergent CABG procedures or ensure extra precautions are taken in these patients like replenishing Vitamin K and administering fresh frozen plasma. These patients should also be monitored closely for any changes in status.

Disclosures: V. Gordon *Nothing to disclose*. K. Johnson *Nothing to disclose*. C. Marolt *Nothing to disclose*. J. Rowe *Nothing to disclose*. A. Lewis *Nothing to disclose*. K. Hans *Nothing to disclose*. S. A. Keim *Nothing to disclose*.

IV-30 | The Impact that a Coagulopathy Disorder has on Length of Stay, Mortality, and Total Hospital Charges for Patients Who Underwent a Coronary Artery Bypass Graft

Victoria Gordon, Kansas City University of Medicine and Biosciences, United States; Adam Lewis, Kansas City University of Medicine and Biosciences, United States; Joanna Rowe, Kansas City University of Medicine and Biosciences, United States; Kenneth Johnson, Kansas City University of Medicine and Biosciences, United States; Clayton Marolt, Kansas City University of Medicine and Biosciences, United States; Kanwalgeet Hans, Kansas City University of Medicine and Biosciences, United States; Sarah A Keim, Kansas City University of Medicine and Biosciences, United States

Background: It is known that coagulopathies are associated with numerous complications for patient health, especially those undergoing surgery due to issues with clotting. Therefore, the aim of this study was to investigate short-term in-hospital outcomes for patients with a diagnosis of a coagulopathy disorder who also underwent a coronary artery bypass graft (CABG).

Methods: This retrospective cohort study utilized the Nationwide Inpatient Sample (NIS) to identify patients from 2012-2015 who had undergone a CABG as coded for by ICD-9. ICD-9 codes were then used to identify those patients with any form of coagulopathy. Data analyses assessed the length of stay (LOS), total hospital charges, and mortality. Patients missing data for any of these variables or under the age of 18 at admission were excluded.

Results: We identified a total of 148,342 patients from the sample years who underwent a CABG. Of those patient encounters, 27,246 also carried a diagnosis of a coagulopathy. Those with a coagulopathy had statistically significant increases in mortality (4.5% vs 2.0%, $p < .0005$), LOS (9.87 days vs 8.57 days, $p < .0005$), and total charges

(\$177,839.74 vs \$145,074.16 $p < .0005$) as compared to the control group of patients who underwent a CABG without also having a diagnosis of a coagulopathy disorder.

Conclusions: When compared to patients who underwent a CABG without a coagulopathy disorder, patients with a coagulopathy disorder had statistically significant increases in LOS, mortality, and hospital charges. Due to these results, physicians may want to consider taking special care when performing a CABG on a patient with a coagulopathy disorder. Extra preparation before surgery with these patients will lead to better outcomes.

Disclosures: V. Gordon *Nothing to disclose*. A. Lewis *Nothing to disclose*. J. Rowe *Nothing to disclose*. K. Johnson *Nothing to disclose*. C. Marolt *Nothing to disclose*. K. Hans *Nothing to disclose*. S. A. Keim *Nothing to disclose*.

IV-31 | Culprit versus multi-vessel PCI preferentially reduces mortality while increasing cost by primary malignancy for STEMI: Propensity score and machine learning supported nationally representative case-control study of 30 million+ hospitalizations

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Background: We sought to produce the first nationally representative analysis of mortality and cost for culprit versus multi-vessel PCI for STEMI patients by cancer versus non-cancer, which has not been previously explored given the widespread exclusion of cancer patients from such clinical trials.

Methods: Propensity score adjusted and backward propagation neural network machine learning augmented multivariable regression was conducted for the above outcomes in this case-control study of the United States' largest and most current all-payer hospitalized dataset, the 2016 National Inpatient Sample. Regression models were fully adjusted for

age, race, income, geographic region, cancer metastases, NIS-calculated mortality risk by Diagnosis Related Group (DRG), and the likelihood of undergoing culprit versus multi-vessel PCI (in addition to length of stay [LOS] for cost). To produce nationally representative estimates, analyses were also adjusted for the complex survey design.

Results: Of the 30,195,722 adult hospitalized patients, 0.58% experienced a STEMI and underwent PCI of whom 8.12% were done in cancer patients (23.67% with active malignancy and 0.62% with metastatic cancer), and 69.74% underwent PCI to the culprit lesion only. Cancer patients were significantly more likely to undergo culprit lesion versus multi-vessel PCI (67.36% versus 32.64%, $p=0.004$). In propensity score adjusted multivariable regression of STEMI patients undergoing PCI, mortality was not significantly increased for cancer patients undergoing culprit lesion versus multi-vessel PCI (OR 1.15, 95%CI 0.86-1.55; $p=0.337$), but cost was increased (beta US dollars \$11,489.81; 95%CI 5,715.79-17,263.82; $p<0.001$). When separately assessing each of the 36 primary malignancy sites, culprit versus multi-vessel PCI was associated with significantly different mortality only for breast cancer in which it was significantly reduced (OR 0.37, 95%CI 0.18-0.78; $p=0.009$).

Conclusions: This large nationally representative study suggests culprit versus multi-vessel PCI is safe for cancer patients yet with increased cost, with preferential mortality reduction by particular primary malignancy.

Disclosures: D. J. Monlezun *Nothing to disclose*. C. Grable *Nothing to disclose*. K. Hoang *Nothing to disclose*. R. Gaiba *Nothing to disclose*. S. Chauhan *Nothing to disclose*. L. Hostetter *Nothing to disclose*. N. Thomason *Nothing to disclose*. R. Jacob *Nothing to disclose*. N. Palaskas *Nothing to disclose*. M. Cilingiroglu *Nothing to disclose*. K. Marmagkiolis *Nothing to disclose*. C. A. Iliescu *Nothing to disclose*.

IV-32 | Feasibility of left radial approach for left main interventions

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Background: left main interventions traditionally are done trans femoral or right radial route. Here we explore the feasibility and success of left radial approach.

Methods: we analysed the data of patients with left main disease treated trans radially in our institute from Feb 2012 to July 2019. Patients who underwent primarily femoral approach were excluded. A minimum follow up of 6 months and maximum of 7 years was done.

Results: A total of 321 patients underwent left main interventions through radial or ulnar route. 270(85%) were trans radial or ulnar of the left side, whereas 51(15%) were done from right side. 12 of these Right

radial patients had to cross-over to femoral route whereas only 2 the patients in the left group required. In the left side group, 145 (53.7%) patients had single vessel along with left main, 56 (20.7%) had double vessel and 69(25.5%) had triple vessel disease. 192(71%) had simple crossover technique and rest had two stent techniques. 32 (11.8%) had rotablation in addition. Bifurcation stenting was done using 6F or 7F guides. Simple crossover was done with 5F guides. There were no intra procedural deaths. 95 (35%) had interventions in setting of ACS. Major complications included strut fractures in 2 patients, difficult rewiring (12 patients) and acute stent thrombosis in 2 patients.

Conclusions: Left main interventions through left radial or ulnar artery seems highly feasible with a lower rate of access failure rates compared to right radial route.

Disclosures: R. Jambunathan *Nothing to disclose*. B. Yathish *Nothing to disclose*. T. Shridhar *Nothing to disclose*.

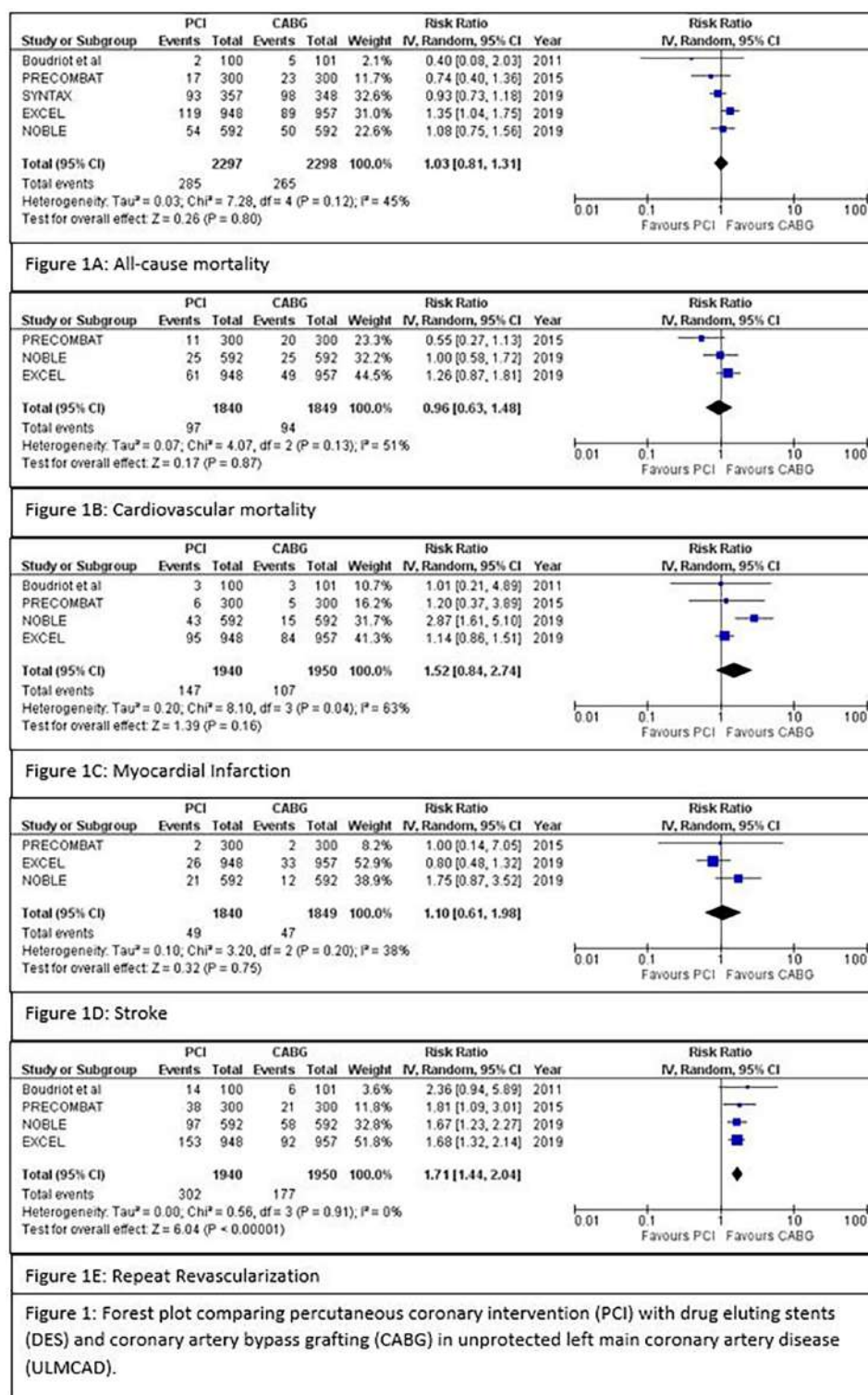
IV-33 | Long Term Outcomes of Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting in Unprotected Left Main Coronary Artery Disease : A Meta-Analysis of Randomized Controlled Trials

Aravdeep Jhand, University of Nebraska Medical Center, United States; Ganesh Gajanan, University of Nebraska Medical Center, United States; Brett Van Briggel, University of Nebraska Medical Center, United States; Rahul Dhawan, University of Nebraska Medical Center, United States; Aleem Siddique, University of Nebraska Medical Center, United States; Yiannis Chatzizisis, University of Nebraska Medical Center, United States

Background: Percutaneous coronary intervention (PCI) is an alternative to coronary artery bypass grafting (CABG) in patients with unprotected left main coronary artery disease (ULMCAD) and a favorable anatomy. We performed a meta-analysis of randomized controlled trials (RCT) to evaluate the outcomes of PCI versus CABG in ULMCAD.

Methods: Pubmed, EMBASE and google scholar were systematically searched for RCT's comparing the long term outcomes following PCI with drug eluting stents (DES) and CABG in ULMCAD patients undergoing revascularization. Outcomes of interest included all-cause mortality, cardiovascular mortality, myocardial infarction (MI), stroke and repeat revascularization. Risk Ratios (RR) and corresponding 95% confidence intervals (CI) were calculated using a random-effect model.

Results: 5 RCT's met our inclusion criteria with a total of 4595 patients (PCI: 2297 and CABG: 2298). Mean SYNTAX score was comparable in the two groups (22.8 vs 22.6, $p = 0.92$). At a mean follow-up of 5.2 ± 3.2 years, no statistically significant difference was observed in the incidence of all-cause mortality, cardiovascular mortality, MI and stroke



(figure1). However, incidence of repeat revascularization was higher in the PCI group (RR: 1.71, 95% CI: 1.44 – 2.04, $p < 0.00001$).

Conclusions: Our analysis shows that PCI with DES is associated with similar long term outcomes except for repeat revascularization when compared to CABG in ULMCAD.

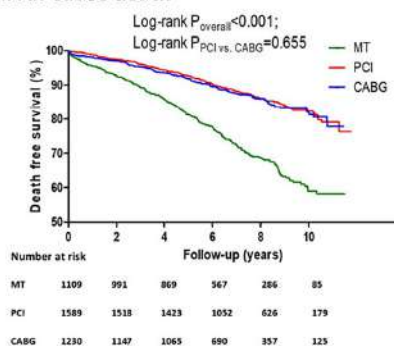
Disclosures: Y. Chatzizisis: Boston Scientific Corp.: Consulting, Research Grant and Speaker Bureau; Medtronic: Research Grant; A. Jhand Nothing to disclose. G. Gajanan Nothing to disclose. B. Van Briggel Nothing to disclose. R. Dhawan Nothing to disclose. A. Siddique Nothing to disclose.

IV-34 | Comparison of Percutaneous Coronary Intervention, Coronary Artery Bypass Grafting and Medical Therapy in NSTEMI-ACS patients with Three-vessel Disease

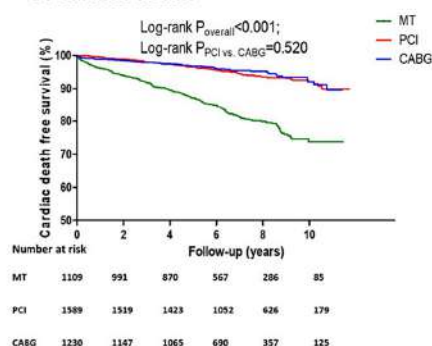
Sida Jia, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China; Ce Zhang, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China; Lin Jiang, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of

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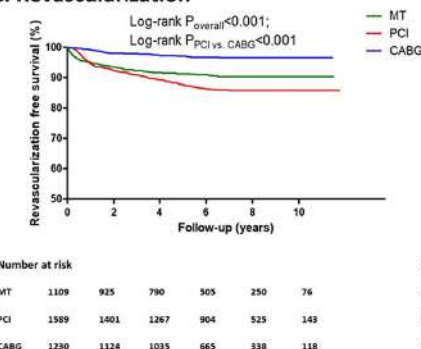
A. All-cause death



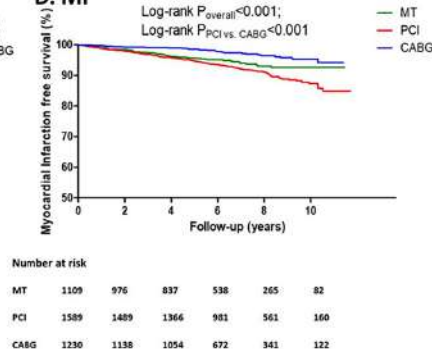
B. Cardiac death



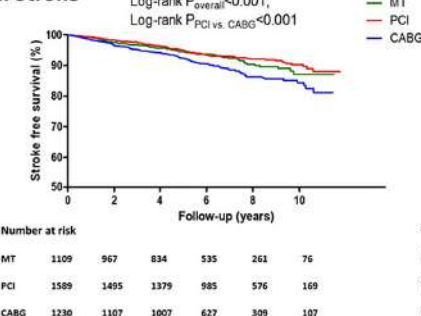
C. Revascularization



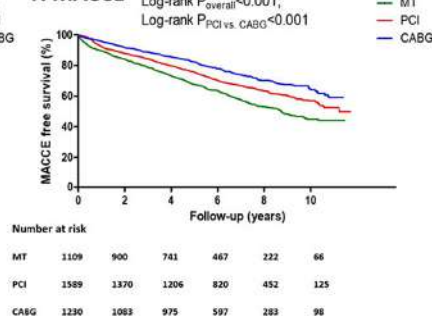
D. MI



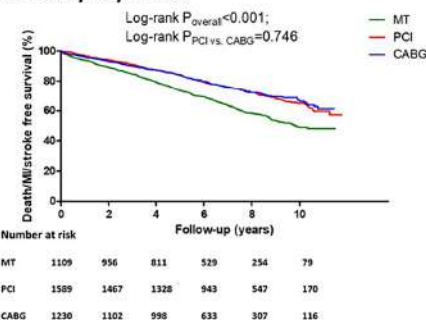
E. Stroke



F. MACCE



G. Death/MI/stroke



Academy of Medical Sciences & Peking Union Medical College, China; Jinjing Yuan, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China; Lei Song, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China

Background: The optimal therapeutic strategy for Non-ST Elevation-Acute Coronary Syndrome (NSTEMI-ACS) patients with three-vessel disease (3VD) is unclear. We aimed to compare the long-term prognosis of NSTEMI-ACS patients with 3VD who underwent Percutaneous Coronary Intervention (PCI), Coronary Artery Bypass Grafting (CABG) or Medical Therapy (MT).

Methods: A total of 3,928 NSTEMI-ACS patients with 3VD were consecutively enrolled from April 2004 to February 2011 in Fuwai hospital. Patients were followed up for a median of 7.5 years, and were divided into PCI, CABG or MT groups according to the treatment they received. The primary endpoint was all-cause death.

Results: Compared with patients in PCI group, CABG patients had lower rates of Myocardial Infarction (MI), unplanned revascularization, Major Adverse Cardiovascular and Cerebrovascular Events (MACCE) and higher rate of stroke (all $P < 0.05$). Compared with MT group, PCI and CABG group had lower incidences of all adverse outcomes (all $P < 0.05$), except for similar rate of stroke between PCI and MT group. Kaplan-Meier survival analysis showed similar results. After adjusting for confounding factors using multivariable Cox regression, CABG was independently associated with lower risk of unplanned revascularization (HR 0.256, 95% CI: 0.076 – 0.863), MI (HR 0.151, 95% CI: 0.035 – 0.646) and MACCE (HR 0.526, 95% CI: 0.314 – 0.882) compared with PCI group.

Conclusions: In NSTEMI-ACS patients with 3VD, CABG is independently associated with lower risk of long-term unplanned revascularization, MI and MACCE in comparison with PCI. Patients who received MT alone had highest risk of long-term MACCE.

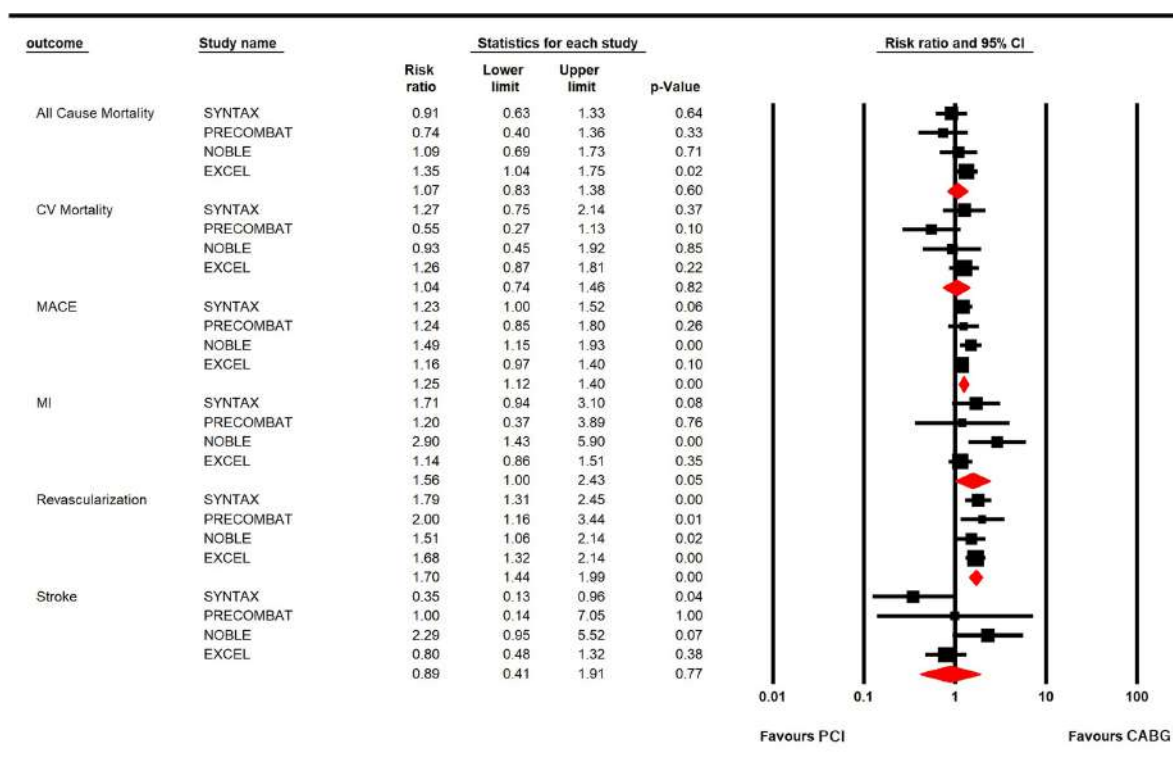
Disclosures: S. Jia Nothing to disclose. C. Zhang Nothing to disclose. L. Jiang Nothing to disclose. R. Liu Nothing to disclose. B. Xu Nothing to disclose. R. Hui Nothing to disclose. R. Gao Nothing to disclose. Z. Gao Nothing to disclose. J. Yuan Nothing to disclose. L. Song Nothing to disclose.

IV-35 | Five years outcomes of left main unprotected percutaneous coronary intervention versus coronary artery bypass surgery; a meta-analysis of randomized trials

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Background: Randomized trials for left main coronary artery disease lesions have shown encouraging results for patients undergoing PCI. There is paucity of data for long term outcomes. Our study aims to investigate long-term efficacy of PCI vs CABG

Methods: Four randomized controlled trials reporting long term outcomes of unprotected left main coronary artery disease undergoing revascularization comparing PCI with CABG were included. Outcomes



were pooled using random effects model. The primary summary measure was risk ratio (RR) with 95 % confidence interval (CI)

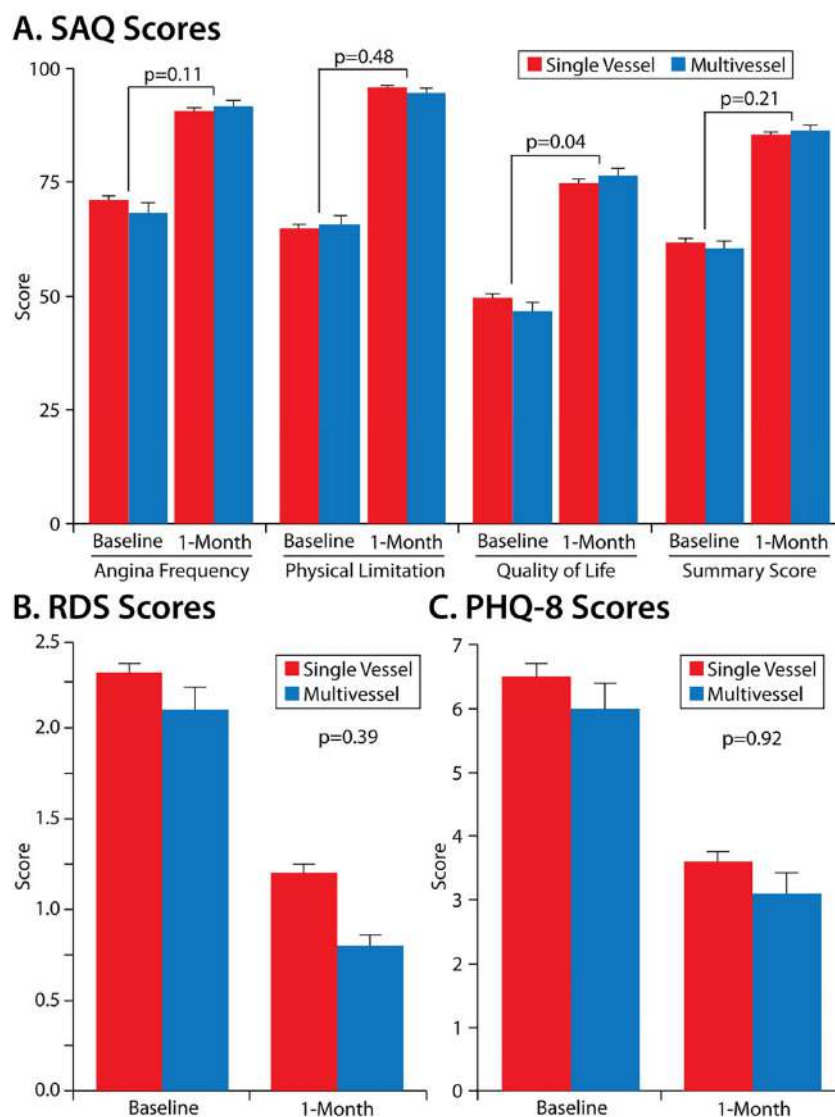
Results: Four trials included a total 4394 patients with left main coronary artery disease were randomly assigned to PCI or CABG arm. As compared to PCI, patients treated with CABG had reduced risk of MACE (RR:1.25; 95%CI 1.12-1.40, $p=0.0001$), MI(RR:1.56; 95%CI 1.002-2.43, $p=0.05$), and revascularization(RR:1.70; 95%CI 1.44-1.99, $p<0.0001$) at 5 years. There was no significant difference in all-cause mortality (RR:1.07; 95%CI 0.83-1.38, $p=0.6$), cardiovascular mortality(RR:1.04; 95%CI 0.74-1.46, $p=0.8$) and risk of stroke(RR:0.89; 95%CI 0.41-1.91, $p=0.7$).

Conclusions: PCI was non inferior to CABG at 5 years for all-cause mortality, cardiovascular mortality and stroke. Long term outcomes at 5 years for MI, MACE and revascularization were significantly better in CABG patients.

Disclosures: M. U. Khan *Nothing to disclose*. M. Z. Khan *Nothing to disclose*. A. N. Lone *Nothing to disclose*. S. Valavoor *Nothing to disclose*. S. U. Khan *Nothing to disclose*.

IV-36 | Clinical and Health Status Outcomes Among Patients Treated with Single as Compared to Multivessel Angioplasty during Chronic Total Occlusion Percutaneous Coronary Interventions:A Report from the OPEN CTO Registry

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Background: Patients with coronary CTOs often have multivessel CAD. Best practices for revascularization strategies in this patient group have not been well studied. We utilized the OPEN CTO study to evaluate patients that underwent single vessel versus multivessel CTO PCI.

Methods: Patients were considered to have undergone single-vessel CTO PCI if they underwent target-vessel only CTO PCI. Patients with more than one CTO PCI lesion attempted in separate vessels or those with one CTO PCI attempted plus PCI of any non-CTO stenosis during the same index procedure were considered to have undergone multivessel CTO PCI.

Results: 821 patients underwent single-vessel CTO PCI while 179 underwent multivessel PCI. Baseline comorbidities, lesion complexity, and successful crossing strategies used were similar between the two groups, though use of retrograde recanalization techniques were more frequent in the single-vessel CTO PCI group (53.5% versus 42.5%, $p < 0.01$). Total procedural time (142.6 vs 115.9 minutes, $p < 0.01$) and contrast administered (293.8 vs 255.0 cc, $p < 0.01$) were increased in the multivessel CTO PCI group. Health status outcomes at baseline and 30-day follow-up were similar, as shown in **Figure 1**. Single vessel versus multivessel PCI during these cases did not affect the likelihood of achieving technical success (OR 1.05, 95% CI 0.63, 1.75) nor the risk for MACCE (OR 1.23, 95% CI 0.72, 2.11).

Conclusions: There were no significant differences in technical success, MACCE, or quality of life metrics at 30-day follow-up for patients undergoing single-vessel versus multivessel CTO PCI.

Disclosures: R. F. Riley: Abbott (St. Jude): Advisory Board/Board Member and Speaker Bureau; Abiomed: Advisory Board/Board Member; Boston Scientific Corp.: Advisory Board/Board Member, Consulting and Speaker Bureau; Medtronic: Advisory Board/Board Member, Consulting and Speaker Bureau; D. Karpalotis: Abbott (St. Jude): Speaker Honoraria; Boston Scientific Corp.: Speaker Honoraria; Medtronic: Speaker Honoraria; Vascular Solutions: Speaker Honoraria; W. J. Nicholson: Abbott (St. Jude): Consulting and Speaker Bureau; Abiomed: Consulting; Boston Scientific Corp.: Consulting and Speaker Bureau; Medtronic: Consulting and Speaker Bureau; J. W. Moses: Boston Scientific Corp.: Consulting; Abiomed: Consulting; W. L. Lombardi: Boston Scientific Corp.: Advisory Board/Board Member and Consulting; asahi intec: Consulting and Royalties; teleflex: Consulting; Philips (Volcano): Employed or Salary and wife employee; J. Sapontis Nothing to disclose. T. J. DeMartini Nothing to disclose. K. Gosch Nothing to disclose. A. C. Salisbury Nothing to disclose. J. M. McCabe Nothing to disclose. J. A. Grantham Nothing to disclose.

IV-37 | The Outcomes of Patients with Severely Calcified Left Coronary Artery Disease Undergoing Coronary Intravascular Lithotripsy (IVL)

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States; Irfan Ullah, Ghandara University, Pakistan; Suman Biswas, Mayo Clinic, United States; M. Chadi Alraies, Detroit Medical Center Heart Hospital, United States

Background: Coronary Intravascular Lithotripsy (IVL) is designed to facilitate waves induced destruction of circumferential calcification to ensure vessel patency, and to pass drug eluting stent (DES). IVL involves multiple sonic wave emitters that selectively damage the focused calcification in vessels ensuring high compliance and patency.

Methods: Using PubMed, Ovid (MEDLINE) and Cochrane database we searched using the MeSH terms including "intravascular shockwave lithotripsy," "shockwave lithotripsy," "coronary calcification," "calcified coronary lesions," and "left coronary artery calcification". The primary outcomes were mortality, and secondary outcomes include mean number of stents able to pass after IVL and complications.

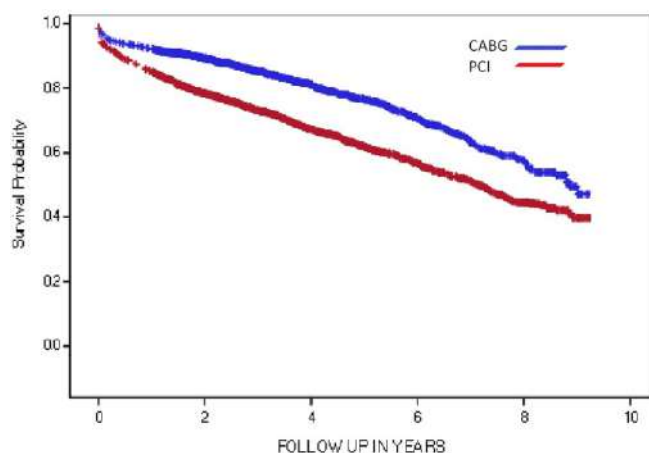
Results: Total of 19 case reports and 2 case series were found (mean age 70 years, 74% males). Four IVL cases were performed using trans-radial routes, four cases through transfemoral route, and the rest of the cases vascular access wasn't reported. The mean catheter size was 6 French (Fr), balloon size was 3.5 x 12 mm, and pressure was 4.7 mm. The pre-procedural catheterization showed calcified left main coronary artery (LMC) 63 % (n=12), severe left anterior descending artery (LAD) calcification in 69% (n=13), severe left circumflex artery calcification (LCX) in 15% (n=2), and severe diagonal artery calcification in 7% (n=1). The mean number of DES able to pass in any vessel was 2 after a mean of 6.5 IVL sessions. Post-procedural outcomes included successful recovery in 100% of the cases with successful DES after IVL. Only 7% (n=1) have complication including balloon rupture. The mortality in LMC, LAD, LCX obstruction was 16%, 23% and 15%, respectively. The corresponding mortalities in patients with no LMC, LAD and LCX obstructions were not significantly different ($p=0.89$, $p=0.2$, $p=0.1$, respectively).

Conclusions: Coronary Intravascular Lithotripsy is a novel technique for severely calcified circumferential coronary artery disease which helps the delivery of DES.

Disclosures: M. C. Alraies: Abiomed: Royalties; Y. Sattar Nothing to disclose. W. Ullah Nothing to disclose. I. Ullah Nothing to disclose. S. Biswas Nothing to disclose.

IV-38 | Comparative Effectiveness of Coronary Revascularization Strategies on Mortality for Acute Coronary Syndrome in Older Adults

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Kaplan Meier curves showing survival probability between CABG and PCI

Permanente, United States; Ashok Krishnaswami, Kaiser Permanente, United States

Background: Contemporaneous data is needed on the comparative effectiveness of coronary artery bypass grafting (CABG) and multi-vessel percutaneous coronary intervention (PCI) in older patients presenting with acute coronary syndrome (ACS).

Methods: Observational cohort study of patients ≥ 65 years admitted for ACS and referred for coronary angiogram between 2010-2018 in a large integrated healthcare delivery system in Northern California. Patients with significant Left Main disease and/or multi-vessel coronary disease undergoing CABG or PCI were included. Patients with a prior CABG history or cardiac arrest within 24 hours were excluded. Baseline demographics, comorbidities (Elixhauser index) and angiographic details were obtained using validated algorithms from health plan databases. Primary outcome was all-cause mortality. Multivariable Cox models were used to estimate adjusted hazard ratios (HR) for the primary exposure.

Results: In 4,336 patients (32% female), CABG patients ($n=1,849$) were younger (73.4 ± 5.9 vs 75.6 ± 7.3 , $p < .001$) with a higher comorbidity burden (Elixhauser Index 7.0 ± 3.3 vs 6.5 ± 3.6 , $p = < .001$) than PCI ($n=2,487$) patients. Over a mean follow-up time of 3.8 years (± 2.4 years), the risk-adjusted HR for mortality was 0.60 (95% CI 0.5-0.7, $p < 0.0001$) for patients who underwent CABG.

Conclusions: In this observational study of older ACS patients with Left Main or multi vessel coronary disease, CABG was associated with reduced mortality when compared to contemporary PCI. Randomized trials are needed in this older population to determine the optimum revascularization strategy.

Disclosures: A. I. Shah *Nothing to disclose*. M. Donsi *Nothing to disclose*. J. S. Rana *Nothing to disclose*. M. D. Solomon *Nothing to disclose*. A. Krishnaswami *Nothing to disclose*.

MISCELLANEOUS

IV-39 | Multiple arterial grafts versus single arterial graft for multi-vessel coronary artery bypass graft surgery; a systematic review and meta-analysis of randomized controlled trials

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Background: Observational studies have shown long term mortality benefit with multiple arterial graft (MAG) coronary artery bypass graft surgery (CABG) compared to single arterial grafts (SAGs) in multi-vessel coronary artery disease. However, randomized controlled trials (RCTs) have not shown a survival advantage of MAGs compared to SAG. A recent meta-analysis of observational studies concluded that unmeasured confounders, rather than biological superiority, may explain the survival advantage of MAGs in observational series. The aim of our study is to perform a meta-analysis of the RCTs to compare outcomes following MAGs and SAGs.

Methods: We searched PUBMED, MEDLINE, EMBASE, and Clinicaltrials.gov for RCTs comparing MAG versus SAG CABG. The clinical outcomes were studied at maximum follow up and included all-cause mortality, cardiac mortality, myocardial infarction (MI), revascularization, sternal wound complications, and major bleeding. We used odds ratio (OR) and corresponding 95% confidence interval (CI) for measuring outcomes.

Results: A total of 10 RCTs (6392 patients) were included. The average follow-up in the studies was 4.2 years (range 1-10 years). Average age of patients was 67.2 years. Women formed 25% of the study population. No statistically significant difference was seen between MAG and SAG groups for all-cause mortality (11.8% vs. 12.7%, OR 0.93, 95% CI 0.67-1.16, P 0.37), cardiac mortality (1.8% vs. 2.8%, OR 0.61 95% CI 0.34-1.09, P 0.09), MI (3.4% vs. 4.9%, OR 0.84 95% CI 0.65-1.09, P 0.14), repeat revascularization (7.3% vs. 9%, OR 0.63 95% CI 0.38-1.02, P 0.06), and major bleeding (3.4% vs. 4.8%, OR 0.77 95% CI 0.46-1.29, P 0.20). MAG group showed a higher incidence of sternal wound complication compared to SAG (3% vs. 1.7%, OR 1.71 95% CI 1.15-2.55, P 0.008).

Conclusions: MAGs and SAGs for CABG have similar all-cause mortality, cardiac mortality, revascularization rates, MI and bleeding complications. Sternal wound complications are more in MAG group. Although, prior non-randomized data has suggested MAGs to be better than SAGs and resulted in MAG being a class IIa

recommendation in the Society of Thoracic Surgeons guidelines for CABG. Our meta-analysis of data from RCTs challenges this.

Disclosures: K. H. Changal *Nothing to disclose*. T. Mir *Nothing to disclose*. A. M. Elzanaty *Nothing to disclose*. M. Patel *Nothing to disclose*. S. Nazir *Nothing to disclose*. M. Syed *Nothing to disclose*. S. Masroor *Nothing to disclose*. E. A. Eltahawy *Nothing to disclose*.

IV-40 | Long Term Outcomes of Sinus Node Modification in Young Patients with Severely Symptomatic Drug Refractory Inappropriate Sinus Tachycardia; A Single Center Experience

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Background: Inappropriate sinus tachycardia (IST) is a chronic syndrome characterized by a resting heart rate greater than 100 beats per minute (BPM) with a mean heart rate greater than 90 BPM in a 24-hour period in the absence of any known contributing condition. IST is associated with significant morbidity. Symptoms including weakness, lightheadedness, pre-syncope, syncope, palpitations, chest pain, decreased exercise tolerance and fatigue are essential to its diagnosis and often lead to debilitating psycho-social distress and poor quality of life. The pathophysiology of IST is poorly understood which makes it challenging to find an effective treatment. To date, there are no proven therapies that have demonstrated a clear long-term benefit and the treatment options remain limited. Positive short-term outcomes have been previously reported with sinus node modification (SNM) procedures, but long-term outcome and efficacy are yet to be determined.

Methods: The study included 39 patients with symptomatic drug refractory IST who have undergone SNM at Saint Louis University hospital. Long-term outcomes and recurrence of symptoms were retrospectively reviewed at 3-6 months follow-up intervals.

Results: The mean age of our cohort was 31.5 ± 11 . 37 of the 39 patients were females. The mean HR at diagnosis was 135 ± 25.4 BPM. 37 of 39 (94.8%) patients had complete resolution of symptoms. Of these 37 patients, 16 required 1 SNM, 17 patients required 2 SNM, and 4 patients required 3 SNM in order to achieve complete symptom resolution. Mean HR post-procedure was 78.6 ± 12.3 BPM. Patients were followed every 3 to 6 months with a mean follow-up duration of 62.3 ± 42.9 months from the patient's last SNM procedure. 13 of those 37 patients (35.1%) developed intermittent symptomatic bradycardia post-procedure and required permanent

pacemaker implantation. 2 of the 39 patients had phrenic nerve injury and 6 patients had post-procedure pericarditis.

Conclusions: IST mainly affects young females and is often a debilitating disease. This study has not only shown, as in previous studies, that SNM can be of significant success acutely, but it can also provide patients with long-term symptomatic relief as well as improvement in their psycho-social status and well-being.

Disclosures: G. Daher *Nothing to disclose*. I. Hassanieh *Nothing to disclose*. N. Malhotra *Nothing to disclose*. P. Horbal *Nothing to disclose*. F. Bteich *Nothing to disclose*. K. Diab *Nothing to disclose*. A. Mehdirad *Nothing to disclose*.

IV-41 | Co-prevalence and the prognostic influence of frailty, quality of life, depression and cognition among older adults undergoing percutaneous coronary interventions

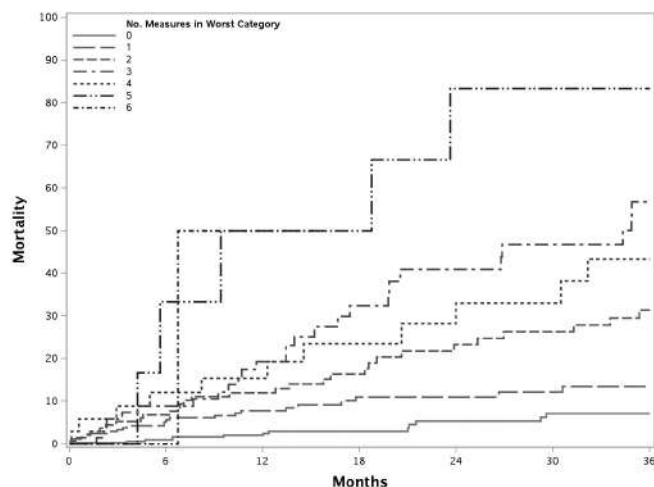
Michael Michael Gharacholou, Mayo Clinic Jacksonville, United States; Amrit Kanwawr, Loma Linda University Medical Center, United States; Rajiv Gulati, Mayo Clinic, United States; Amir Lerman, Mayo Clinic, United States; Mohamad Alkhoul, Mayo Clinic - School of Medicine, United States; Abdallah El Sabbagh, Mayo Clinic, United States; Mohammed al-Hijji, Mayo Clinic, United States; Bradley R Lewis, Mayo Clinic Rochester, United States; R. Jay Widmer, Texas A&M HSC College of Medicine / Baylor Scott & White Health, United States; Mandeep Singh, Mayo Clinic Rochester, United States

Background: The prognostic influence of individual components included in geriatric syndromes is known, however, co-prevalence and the influence on prognosis is unknown.

Methods: We prospectively studied prevalence and prognostic influence of frailty (Rockwood criteria), functional reach, timed up-and-go, quality of life (QOL), depression (PHQ-2) and cognition (MMSE) among 921 patients undergoing percutaneous coronary intervention. For each variable, subjects were classified into 1 of 4 groups rated from best to worst condition.

Results: Of 483 patients (≥ 55 y), 11 died (median follow-up 12 months). Forty seven percent did not have any variable in the worst category, 28.7% had one, 12.5% had 2, 7.2% had 3, 3.7% had 4, 0.7% had 5, and 0.2% had 6. The age- and sex-adjusted multivariable models showed significant associations with PHQ-2 score 3+ (HR: 4.9; 95% CI 1.3-18.8; $p=0.02$), MMSE <25 (HR: 7.7; 95% CI 2.0-28.8; $p=0.003$), frailty index >0.30 (HR: 8.4; 95% CI 2.2-31.7; $p=0.002$), and Timed Up and Go ≥ 15 (HR: 9.7; 95% CI 2.4-39.1; $p=0.001$). Furthermore, for those with 0 to 3 in the worst category, each additional worst category tripled the mortality risk.

Conclusions: Components (singly or in combination) of geriatric syndromes are highly prevalent, determine prognosis and should be routinely evaluated among older adults undergoing PCI.

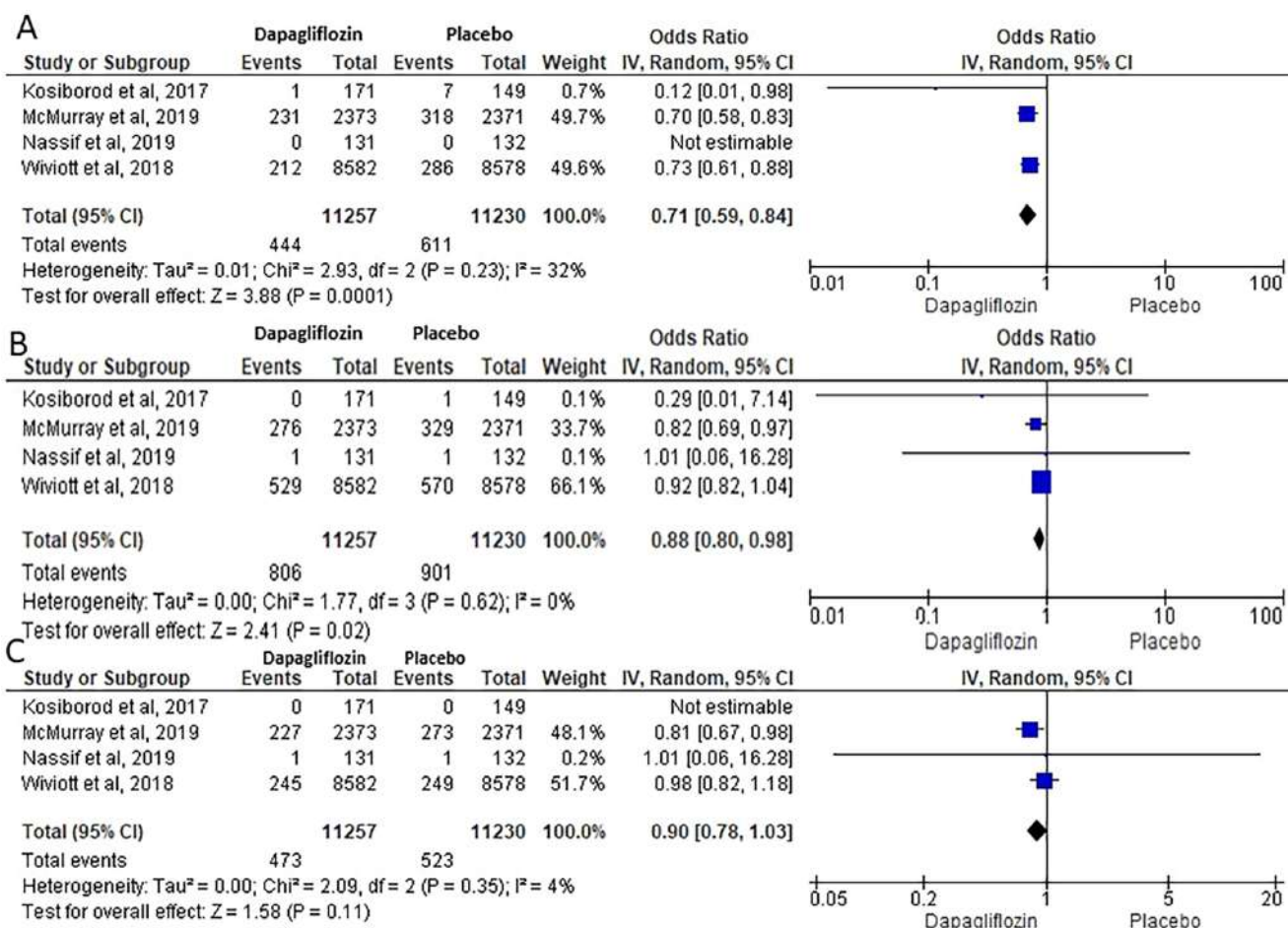


Disclosures: M. M. Gharacholou *Nothing to disclose.* A. Kanwawr *Nothing to disclose.* R. Gulati *Nothing to disclose.* A. Lerman *Nothing to disclose.* M. Alkhouli *Nothing to disclose.* A. El Sabbagh *Nothing to disclose.* M. al-Hijji *Nothing to disclose.* B. R. Lewis *Nothing to disclose.* R. J. Widmer *Nothing to disclose.* M. Singh *Nothing to disclose.*

IV-42 | Cardiovascular Outcomes of Dapagliflozin (Sodium-Glucose Cotransporter-2 Inhibitor): A Systematic Review and Meta-Analysis

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Background: Recent advances in diabetic management has led to discovery of novel agent such as sodium-glucose cotransporter-2



Panel A: Hospitalization from heart failure. Panel B: All cause mortality. Panel C: Cardiovascular mortality

inhibitor (SGLT2i). Here we re-examine the recent evidence on Dapagliflozin and its cardiovascular outcomes.

Methods: Extensive search was performed by two independent researchers on PubMed and Google scholar using key words Dapagliflozin and cardiovascular outcome yielding 7390 studies. Review articles and abstracts were excluded and search was refined using heart failure, mortality and hospitalization leading to selection of 4 studies comparing outcomes of Dapagliflozin with placebo. A total of 22,487 patients across different centers were included. Study-level analysis was done with Review manager 5.3. I² > 30% was considered an indicator of statistical heterogeneity. An inverse variance (IV) and random effects model were used to calculate pooled odds ratio (OR) for endpoints. The results are reported as OR, 95% confidence interval (CI) and P < 0.05.

Results: In 11, 257 patients using Dapagliflozin, there was significant decrease in hospitalization from heart failure (OR: 0.71; 95% CI: 0.59-0.84; p = 0.0001) (Panel A) and all-cause mortality (OR: 0.88; 95% CI: 0.80-0.98; p = 0.02) (Panel B) as compared to placebo. Cardiac mortality (OR: 0.90; 95% CI: 0.78-1.03; p = 0.11) (Panel C) did not show significant difference.

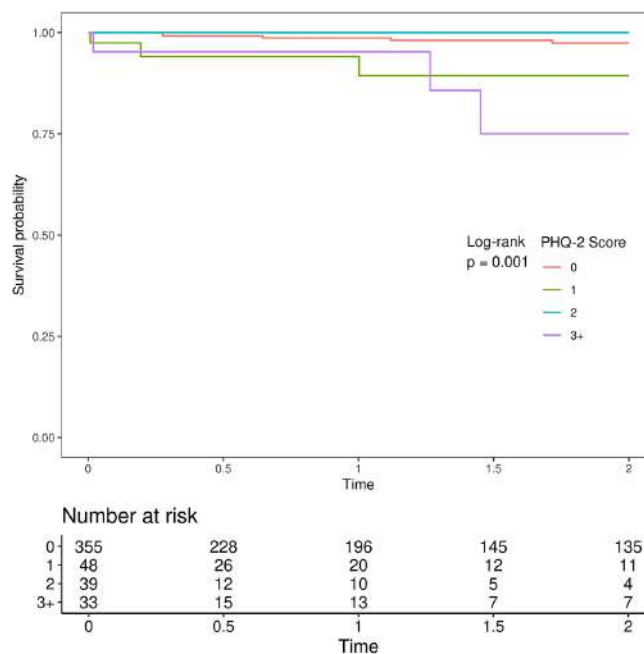
Conclusions: Dapagliflozin is associated with significant decrease in hospitalization from heart failure and all-cause mortality with positive trend towards improvement in cardiovascular mortality.

Disclosures: K. H. Akhtar *Nothing to disclose*. H. Hafeez *Nothing to disclose*. M. S. Farooqi *Nothing to disclose*. H. Khalil *Nothing to disclose*. A. H. Jafry *Nothing to disclose*. K. J. Akhtar *Nothing to disclose*. A. Haseeb *Nothing to disclose*. U. A. Bhatti *Nothing to disclose*. A. G. Iqbal *Nothing to disclose*. S. A. Huda *Nothing to disclose*. C. Murray *Nothing to disclose*.

IV-43 | Depression and two-year mortality in older adults undergoing percutaneous coronary interventions

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Background: Older adults have high prevalence of depression and cardiovascular disease (CVD). The precise association of depressive symptoms in CVD patients, especially as it relates to their long-term survival is not well reported from contemporary cohort. We, herein, report 2-year mortality among patients receiving percutaneous coronary intervention (PCI) from 2016-2018 at Mayo Clinic, Rochester and stratified them according to presence and severity of depression as assessed by Patient Health Questionnaire (PHQ-2).



Methods: We determined depression by administering PHQ-2 survey in 475 patients ≥55 years who underwent PCI. Depression was defined if the patient scored 3 or higher on the questionnaire. We also determined frailty (Rockwood criteria), cognition (MMSE), single-item question for self-reported health.

Results: Depression in 475 patients ≥55 years was determined using PHQ-2 survey and was stratified into 0 (n=355), 1 (n=48), 2 (n=39) and 3+ (n=33). Mean age was similar across various groups (72 years) however, more women scored higher on the survey. Depressed patients (3+ vs. 0, all comparisons significant) also had poor health rating (52% vs. 19%), and higher frailty index [0.30+: 55% vs. 10%]. Patients with PHQ 3+ had higher mortality on follow-up [HR 6.5 (1.7, 24.6 p=0.006) which remained significant following adjustment for age and gender.

Conclusions: Simple, self-reported PHQ-2 instrument for depression predicts mid-term mortality among older adults receiving PCI.

Disclosures: A. Kanwawr *Nothing to disclose*. M. Alkhouli *Nothing to disclose*. A. El Sabbagh *Nothing to disclose*. M. al-Hijji *Nothing to disclose*. A. Lerman *Nothing to disclose*. R. Gulati *Nothing to disclose*. M. Singh *Nothing to disclose*. M. M. Gharacholou *Nothing to disclose*.

IV-44 | Comparison of Coronary Artery Bypass Grafting with Percutaneous Coronary Intervention in Patients with Left Ventricular Systolic Dysfunction

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Texas Heart Institute/Baylor, United States; Mirza Khalid, Baylor College of Medicine, United States; Ali E Denktas, Baylor College of Medicine and Michael E. DeBakey Veterans Affairs Medical Center, United States; Hameem U. Changezi, Regional Cardiology Associates, PLC, United States; Ahmad Munir, Hurley Medical Center, United States; Mahboob Alam, Baylor College of Medicine, United States; Hani Jneid, Baylor College of Medicine and Michael E. DeBakey Veterans Affairs Medical Center, United States

Background: There is a paucity of data on the optimal strategy of revascularization for patients with coronary artery disease (CAD) and left ventricular dysfunction (LVD) (ejection fraction (EF) $\leq 50\%$).

Methods: We performed an aggregate data meta-analysis of clinical outcomes (all-cause mortality, stroke, myocardial infarction (MI), revascularization and a composite outcome of death, MI, stroke and revascularization (MACCE)) and included studies on data comparing coronary artery bypass (CABG) with percutaneous coronary intervention (PCI) for CAD in LVD. An extensive literature search identified 20 studies (3 randomized, 17 observational) and 17,889 patients. Effect size was estimated using a random-effects model.

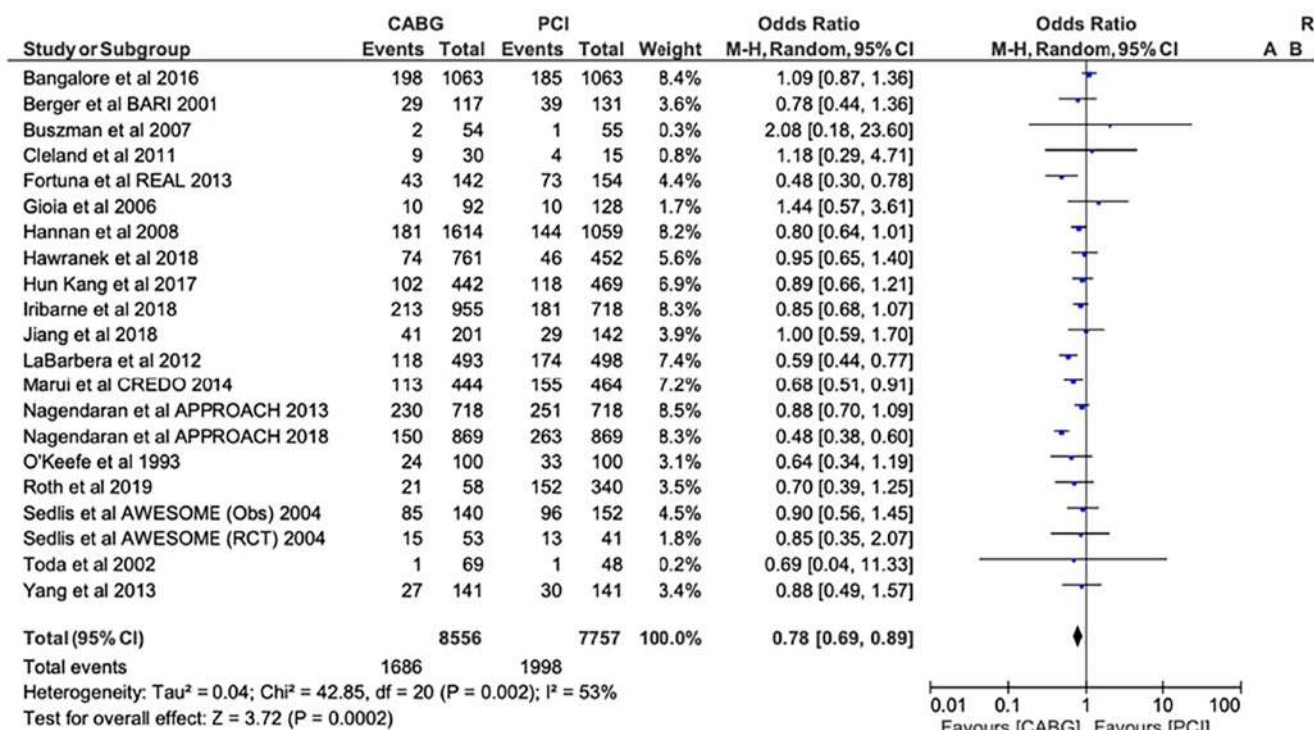
Results: Baseline characteristics were comparable. At 30-days follow-up, CABG had comparable all-cause mortality with PCI but a significantly higher odds of stroke (odds ratio (OR) 4.73 [1.66- 13.48]). At a weighted mean follow-up of 5-years, CABG had lower risk of all-cause

mortality compared to PCI (CABG: 19.7%, PCI: 25.8% (OR 0.78 [0.69- 0.89]), a trend which was consistent in patients with EF $\leq 35\%$ (OR 0.59 [0.44- 0.79]). PCI and CABG had comparable rates of stroke at long-term follow-up while CABG had a decreased risk of repeat revascularization (OR 0.26 [0.16- 0.42]). (Figure 1. Forest plot of all-cause mortality at long-term follow-up)**Conclusions:** Compared to PCI, CABG was associated with lower risk of long-term mortality and revascularization but increased risk of upfront stroke in patients with LVD. However, the data included comprised of predominantly observational studies, highlighting the paucity and need for randomized trials.

Disclosures: M. R. Khan *Nothing to disclose.* W. Kayani *Nothing to disclose.* J. T. Pelton *Nothing to disclose.* A. Ansari *Nothing to disclose.* D. Paniagua *Nothing to disclose.* M. Khalid *Nothing to disclose.* A. E. Denktas *Nothing to disclose.* H. U. Changezi *Nothing to disclose.* A. Munir *Nothing to disclose.* M. Alam *Nothing to disclose.* H. Jneid *Nothing to disclose.*

IV-45 | Effect of Green Tea on Flow Mediated Dilation of Arterial Vasculature, A Comprehensive Meta-Analysis and Literature Review

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States; Rachel O Mailey, University Of Findlay, United States; Waqas Ullah, Abington Jefferson Health, United States; Jay Shah, Mercy Health St. Vincent's Medical Center, United States; Ghazal Khan, university of missouri kansas city program, United States; Mamoon Rashid, Advent Health, United States; Hemindermeet Singh, Mercy Health St. Vincent's Medical Center, United States; Sohail Ali, Mercy Health St. Vincent's Medical Center, United States

Background: Tea consumption benefits cardiovascular disease (CVD) mortality due to its effects on endothelial cells. We attempt to

perform the first ever met-analysis of clinical trials involving effect of green tea consumption on Flow mediated dilation (FMD) of brachial arteries. Objectives were to estimate the effect size and end-comparison to overall effects of tea.

Methods: Using predefined selection criteria involving human intervention studies, 40 articles were identified. 6 eligible articles were selected, out of which 2 studies were excluded due to absence of control group and were mentioned in literature review. As a primary effect estimate, standard difference in means across studies was used, with significant p-value<0.05.

Subject Characteristics							Treatment Characteristics				
Author & Year	Design	No. Of Subjects	Age (yr)*	Gender	Health Status	Dose /Day	Duration of Exposure	Mean FMD % at Baseline Pre-Tea.	Mean FMD % at end Post-Tea	Δ in FMD	Standard Difference in Mean**
Kim Weon 2006 [1]***	Single Group. No Control	20	27.6±3.6	20 Male	Healthy; chronic smokers	8 g	2 weeks	7.25±2.8	9.3±2.4	2.01 p<0.001	
Tinahones 2008 [2]***	Single Group. No Control	14	34.9±9.7	14 Female	Healthy	8.43 g	5 weeks	5.68±3.80	11.98±6.0	6.3 P=0.02	
Jochmann 2008 [3]	Cross-over	21	58.7±4.5	21 Female	Healthy	5 g	2 hours	5.4±2.3	10.2±3	4.8 P value Not reported	1.344 (0.674-2.014), p<0.001
Alexopoulos 2008 [4]	Cross-Over	14	30±3	9 Male 5 Female	Healthy; 7 smokers	6 g	120 minutes	4.38±0.76	8.07±0.76	3.69 P=0.02	5.051 (3.534-6.567) p<0.001
Park 2009 [5]	Parallel	40	N/A	N/A	ESRD	5 g	4 weeks	5.68±2.67	8.66±3.46	2.98 P<0.05	0.954 (0.272-1.636) p=0.006
Lorenz 2017 [6]	Cross-over	50	33.9±7.6	N/A	Healthy	0.5 L	2 hours	4.49 ± .77	5.85±3.61	1.36 p=0.004	0.695 (0.291-1.098) p<0.001
Overall											1.051 (0.749-1.353) p<0.001

Table 1: Overview and characteristics of Included studies.

Legend: Yrs (Years). N/A (Not Available). Δ (Change). No. (Number). FMD (Flow Mediated Dilation)

*Age group with standard deviation in Years

**Standard Difference in Means shown with Upper and lower limits with P-values.

***Excluded from met-analysis due to absence of control group

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Results: 4 studies with 105 healthy, fasting non-obese subjects were included. Number of subjects ranged from 14 to 50 across studies. Mean age was 30 to 58 years. Exposure to green tea was 2 hours to 4 weeks across studies. Each study showed a statistically significant positive effect of green tea on FMD. Net standard difference in means was positive 1.051 ($p < 0.001$, Table 1). In all studies, consumption of green tea increased FMD by 3.35%. Between study heterogeneity was significant with I-statistic 90.177%, $p < 0.01$. Funnel plot of effect of FMD against respective precisions showed no publication bias.

Conclusions: Green tea results in substantial improvement in FMD in vascular endothelium. This might explain the effect of tea in reducing CVD risks. This effect is comparable to black tea and might be due to catechins however, any dose response relationship and the active ingredient responsible yet remains to be elucidated.

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IV-46 | Assessment of post-operative cardiac risk using Computed Tomographic Coronary Angiography in patients undergoing High risk Non Cardiac Surgery

Mehul Ishwar Rathod, Interventional Cardiologist, India

Background: This study evaluated if the degree of stenosis and coronary calcium score, that were measured with computed tomographic coronary angiography predict post-operative cardiovascular events in patients who were undergoing high risk noncardiac surgery.

Methods: A total of 213 patients underwent CTCA before high risk noncardiac surgeries. Revised cardiac risk index (RCRI) were calculated for every patient as clinical variable and was compared with the extent and severity of coronary artery disease which was assessed by CTCA. Post-operative cardiovascular events were defined as cardiac death, acute coronary syndrome, ventricular arrhythmia with hemodynamic compromise, acute pulmonary edema and heart failure.

Results: Postoperative major adverse cardiac events (PMACE) occurred in 17 patients (8.5%). The clinical variable, RCRI correlated with the occurrence of cardiac events ($p < 0.0001$). The CTCA variables with occurrence of cardiac events were, high coronary artery calcium score (CACS) ($p < 0.001$), the presence of significant coronary artery stenosis ($p < 0.02$), and multivessel coronary artery disease ($p < 0.009$). Receiver-operating characteristic (ROC) curve analysis of CACS for prediction of cardiac events, the cutoff value was ≥ 113 (sensitivity 94%, specificity 79%, area under the curve 0.912, $p < 0.0001$). The risk of PMACE was 14% in patients with significant CTCA findings and 19% in patients without significant CTCA findings, regardless of RCRI score. ROC curves of the combination models of RCRI with CTCA (Significant and non significant stenosis), High CACS (≥ 113), and RCRI with CTCA and CACS

were compared. The AUC for RCRI alone, RCRI with CTCA and RCRI with CACS (≥ 113) and CTCA was 0.681, 0.714, 0.855 respectively.

Conclusions: CTCA provides a comprehensive cardiac examination in the risk assessment before high risk non cardiac surgery, it offers assessment of coronary artery calcification, coronary artery stenosis and cardiac morphology. Compared with RCRI alone, findings on pre-operative CTCA improve risk estimation among patients who will experience PMACE. CTCA findings provide additive value to the already established RCRI in estimation of PMACE.

Disclosures: M. I. Rathod *Nothing to disclose*.

IV-47 | Preferential Use of Guide Extension Catheters in Patients with Renal Insufficiency for the Purpose of Contrast Preservation – A Real World Experience

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Background: Guide extension catheter devices such as GuideLiner® allow for increased support and deep seating for distal delivery of intracoronary devices. We analyzed the rate of use of extension catheters for the purpose of better engagement and facilitation of selective delivery of contrast.

Methods: Data was obtained for all percutaneous coronary interventions (PCI) performed at the Sanford Cardiovascular Institute between January 2011 and June 2019. Contrast volume and pre-procedure creatinine were compared for patients who required use of a guide extension catheter against those who did not. GuideLiner was utilized per provider preference. Cases were performed using the Acist™ contrast delivery systems and utilized either single or bi-plane fluoroscopic systems, depending on provider judgement. Comparisons were made by linear regression, and p-values of < 0.05 were considered significant

Results: A total of 9,526 PCIs performed with a total of 6,757 unique patients. The mean age was 67.5 years, and 68.9 % were males. A total of 3113 (32.68%) of these cases required use of a guide extension catheter (GuideLiner®) per provider preference. Patients who required use of guideline had a higher baseline creatinine prior to the

TABLE 1: GUIDE EXTENSION CATHETER USE WITH RENAL INSUFFICIENCY

GUIDELINER	Yes	No	P-Value
TOTAL CASES	N = 3113	N = 6413	N = 9526
TOTAL CONTRAST (ML)	101.70 ± 72.23	104.94 ± 61.01	0.0393
PRE-PROCEDURE CREATININE MG / DL (N = 9090)	1.28 ± 1.25	1.13 ± 0.94	<0.0001

procedure (1.28 mg / dL ± 1.25 vs. 1.13 mg / dL ± 0.94, $p < 0.0001$). The amount of contrast used among two groups was relatively similar.

Conclusions: Patients with renal insufficiency underwent a contrast preservation approach preferentially. Patients with GuideLiner® use in general have more complex anatomy. However, the amount of contrast used for PCI was similar to the non-GuideLiner® use group.

Disclosures: A. Singh *Nothing to disclose*. A. Thorp *Nothing to disclose*. C. K. Desai *Nothing to disclose*. J. P. Wilson *Nothing to disclose*. M. Gedela *Nothing to disclose*. B. Simpson *Nothing to disclose*. Z. Varga *Nothing to disclose*. P. Petrasko *Nothing to disclose*. A. Kremer *Nothing to disclose*. A. T. Stys *Nothing to disclose*. T. Stys *Nothing to disclose*.

PHARMACOTHERAPY

IV-48 | Prognosis of Claims- vs. Trial-Based Ischemic and Bleeding Events Occurring Beyond 1 Year After Coronary Stenting: Findings from the EXTEND-DAPT Study

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Background: The use of administrative claims to ascertain outcomes in cardiovascular clinical trials offers opportunity to improve data collection and reduce trial costs. However, it is unknown whether events identified with claims have similar prognosis compared to trial-adjudicated events.

Methods: We matched 1,336 patients ≥65 years old who received percutaneous coronary intervention (PCI) in the Dual Antiplatelet Therapy (DAPT) Study with the National Cardiovascular Data Registry CathPCI Registry linked to Medicare claims. We compared death at 21 months post-randomization among patients with ischemic (myocardial infarction or stroke) events and bleeding events identified with both trial adjudication and claims, with trial adjudication only, and with claims only using Cox proportional hazards models.

Results: A total of 50 patients had ischemic events identified with both trial adjudication and claims, 22 had trial-adjudicated ischemic events only, 14 had ischemic events in claims only, and 1250 had no ischemic events, with annualized mortality rates of 13.6%, 6.1%, 10.1%, and 1.26%, respectively. The hazard ratios for mortality following an ischemic event were 22.5 (95% Confidence Interval (CI): 10.3-49.0) when identified with trial adjudication and claims, 10.5 (95% CI: 2.45- 44.7) when identified with trial adjudication only, and 22.6 (95% CI: 4.91-95.0) when identified with claims only. A total of

51 patients had bleeding events identified with both trial adjudication and claims, 12 had trial-adjudicated bleeding events only, 59 had bleeding events in claims only, and 1214 had no bleeding events, with annualized mortality rates of 15.6%, 11.4%, 8.1%, and 0.95%, respectively. The hazard ratios for mortality following a bleeding event were 21.5 (95% CI: 14.7- 67.8) when identified with trial adjudication and claims, 40.6 (95% CI: 9.19-179.2) when identified with trial adjudication only, and 21.8 (95% CI: 8.8-53.4) when identified with claims only.

Conclusions: In addition to trial-adjudicated events, ischemic and bleeding events ascertained using claims were prognostically significant for death. Claims may help identify additional clinically meaningful outcomes in future cardiovascular clinical trials.

Disclosures: N. Butala: *HiLabs: Consulting*;

IV-49 | Outcomes of Anti-inflammatory Agents in Coronary Artery Disease

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Background: Growing evidence suggests a role of inflammation in the pathogenesis of atherosclerotic plaque in coronary artery disease (CAD). There are conflicting results in the literature on the effect of anti-inflammatory agents on the clinical outcomes of CAD.

Methods: Medline and the Cochrane Central Register of Controlled Trials (CENTRAL) were queried from inception through December 2019. Studies comparing the clinical outcomes of anti-inflammatory to placebo in CAD were included. Random-effects meta-analysis was used to pool outcomes across studies. Study endpoints included: major adverse cardiac events (MACE), all-cause mortality, cardiovascular mortality, myocardial infarction, and the need for coronary intervention.

Results: A total of 7 randomized trials (4 Cyclosporin, 1 Methotrexate, 1 Colchicine, and 1 Canakinumab), involving 21,131 patients (12,236 in anti-inflammatory group and 8,895 in placebo group) were included in this meta-analysis. There was no significant difference between the two groups in terms of MACE (OR 0.92, 95% CI 0.79-1.08, $p=0.31$), all-cause mortality (OR 0.87, 95% CI 0.36-2.13, $p=0.76$), cardiovascular mortality (OR 0.85, 95% CI 0.36-1.99, $p=0.70$), myocardial infarction (OR 0.66, 95% CI 0.29-1.52, $p=0.33$), or need for coronary intervention (OR 0.91, 95% CI 0.81-1.02, $p=0.11$) (Figure 1).

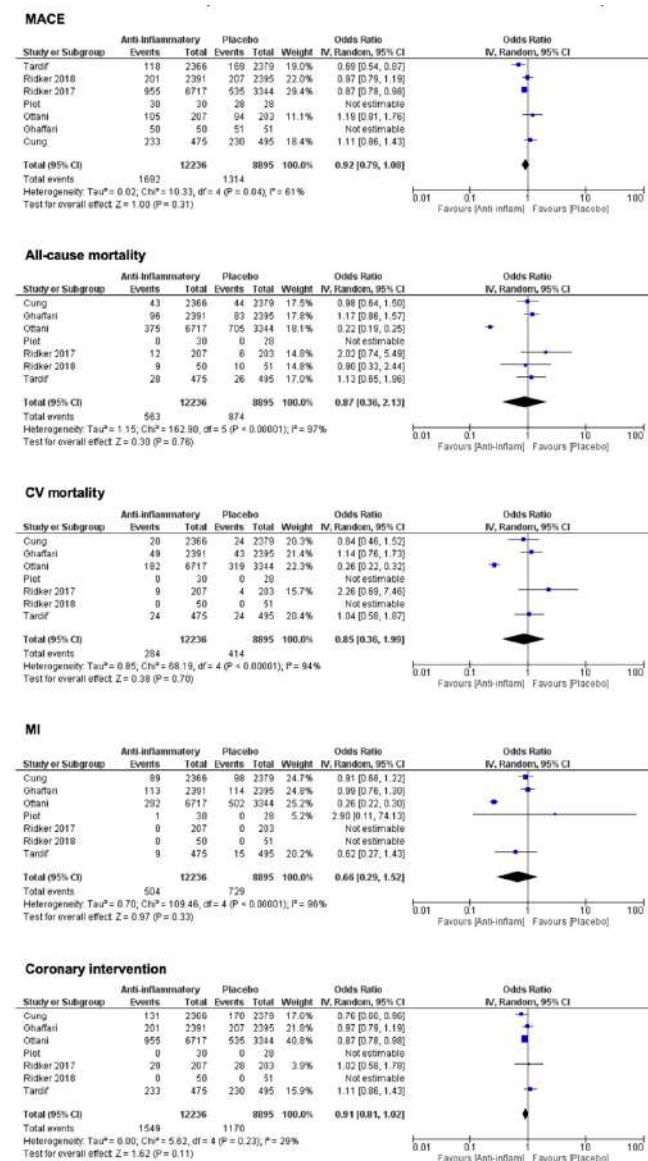


Figure 1

Conclusions: The use of anti-inflammatory in CAD was not associated with improved clinical outcomes as compared to placebo.

Disclosures: H. K. Fong *Nothing to disclose*. J. L. Tan *Nothing to disclose*. M. Eniezat *Nothing to disclose*. J. Yap *Nothing to disclose*. K. M. Low *Nothing to disclose*. R. Desai *Nothing to disclose*. M. Haider *Nothing to disclose*. T. Enezate *Nothing to disclose*.

IV-50 | Safety and Efficacy of Antiplatelet Regimens after Percutaneous Coronary Intervention using Drug Eluting Stents: A Network Meta-analysis of Randomized Controlled Trials

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Background: We aimed to determine the efficacy and safety of different anti-platelet regimens after percutaneous coronary intervention (PCI) with drug eluting stent (DES) implantation using a network meta-analysis of randomized controlled trials (RCTs).

Methods: RCTs comparing shorter duration (≤ 6 months) of dual anti-platelet therapy (S-DAPT) with either aspirin (ASA) or P2Y12 monotherapy against longer duration (≥ 12 months) DAPT (L-DAPT) after PCI were searched in the MEDLINE, EMBASE and COCHRANE databases. End-points of interest were all-cause death, cardiovascular (CV) death, myocardial infarction (MI), stent thrombosis (ST), major bleeding and major or minor bleeding. Network meta-analyses were done using frequentist approach.

Results: Eighteen RCTs with total of 57,942 patients met the inclusion and exclusion criteria. This included 14 RCTs ($N = 28,853$) of S-DAPT with ASA monotherapy and 4 RCTs ($N = 29,089$) with P2Y12 monotherapy. Compared with L-DAPT, the rates of MI were significantly higher with S-DAPT with ASA monotherapy [OR 1.22s; 95% CI 1.01-1.48], but not with S-DAPT with P2Y12 monotherapy [0.98; 0.85-1.14]. Both S-DAPT regimens lowered rates of major bleeding when compared to L-DAPT; ASA monotherapy [0.70; 0.49-1.00] and P2Y12 monotherapy [0.67; 0.45-0.98]. There were no differences in risks of all-cause death, CV death or ST with use of either regimen of S-DAPT and L-DAPT. In ACS subgroup, ASA monotherapy was associated with increased risk of ST [1.55; 1.021-2.36] but such effect was not apparent with P2Y12 monotherapy [0.93; 0.58-1.48].

Conclusions: Among patients undergoing DES implantation, S-DAPT with P2Y12 monotherapy reduces rate of bleeding without increased risk of MI or ST compared with L-DAPT. Adequately powered trials are needed to evaluate if S-DAPT with P2Y12 monotherapy is superior to S-DAPT with ASA monotherapy for ischemic protection.

Disclosures: A. Garg *Nothing to disclose*. A. Rout *Nothing to disclose*. D. Sargsyan *Nothing to disclose*. A. Sharma *Nothing to disclose*. S. Waxman *Nothing to disclose*. M. Cohen *Nothing to disclose*. J. B. Kostis *Nothing to disclose*. S. V. Rao *Nothing to disclose*.

IV-51 | A Real-World One-year Clinical Outcomes Using CYP2C19 Genotype-Guided P2Y12 Inhibitor Antiplatelet Therapy After PCI From a Single Center

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Background: To assess clinical outcomes in patients receiving P2Y12 inhibitor antiplatelet (in addition to aspirin) based on CYP2C19 genotype test after PCI in our center

Methods: We performed a retrospective analysis of 862 patients who received CYP2C19 genetic test with CAD after PCI between Nov 2016 and Feb 2018. All patients who received loading dose of P2Y12

inhibitor prior to PCI, underwent genotype immediately after PCI. We divided patients into 4 categories as illustrated below. We made an appropriate switch to either Clopidogrel or an alternate P2Y12 inhibitor based on the genotype (illustration and table 1). Baseline demographics and procedural characteristics (table 2 and 3) were collected in all four categories. Death due to cardiac causes, bleeding events, non-fatal myocardial infarction (MI), target vessel revascularization (TVR) and major adverse cardiovascular events (MACE) in all four categories were calculated at 1, 6 and 12 months

Results: We did not observe a significant difference between all 4 phenotype categories for death due to cardiac causes ($p=0.440$), bleeding events ($p=0.335$), non-fatal MI ($p=0.703$). There is a significant difference between categories at 1 month for TVR ($p=0.011$). However, there was no significant difference in TVR at 1-year follow-up. There was no difference in MACE in all four categories at 12 months ($p=0.583$) (table 4).

Conclusions: Our study showed that it is effective, reliable and feasible to use CYP2C19 genotype-guided antiplatelet therapy after PCI. The clinical outcomes are comparable in patients

Illustration

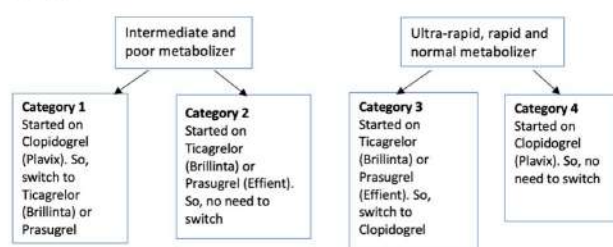


Table 2. Baseline Characteristics

	Category 1 (N=206)	Category 2 (N=69)	Category 3 (N=67)	Category 4 (N=520)	p-value
Age (mean (SD))	70.13 (12.50)	62.04 (12.47)	68.97 (11.12)	69.89 (11.31)	<0.001
Sex = Male (%)	137 (66.5)	46 (66.7)	43 (64.2)	345 (66.5)	0.985
Race (%)					0.107
Caucasian	194 (94.2)	63 (91.3)	60 (89.6)	486 (93.6)	
African American	0 (0.0)	1 (1.4)	0 (0.0)	5 (1.0)	
American Indian	8 (3.9)	3 (4.3)	6 (9.0)	24 (4.6)	
Asian	1 (0.5)	2 (2.9)	0 (0.0)	1 (0.2)	
Declined	3 (1.5)	0 (0.0)	1 (1.5)	3 (0.6)	
Hypertension (%)	169 (82.0)	43 (62.3)	56 (83.6)	445 (85.7)	<0.001
Diabetes Mellitus (%)	76 (36.9)	24 (34.8)	20 (29.9)	197 (38.0)	0.612
Dyslipidemia (%)	166 (80.6)	44 (63.8)	51 (76.1)	416 (80.2)	0.015
Tobacco use (%)	124 (60.2)	49 (71.0)	36 (53.7)	328 (63.2)	0.180
Peripheral vascular disease (%)	45 (22.0)	10 (14.5)	6 (9.0)	130 (25.1)	0.009
Family History of heart disease (%)	126 (61.2)	38 (55.1)	40 (59.7)	347 (67.0)	0.130

Table 4. Clinical Outcomes

	Category 1	Category 2	Category 3	Category 4	p-value*
Cardiac Death - N (%)					
1 month	0 (0.0)	1 (1.4)	0 (0.0)	3 (0.6)	0.369
6 months	3 (1.5)	1 (1.5)	0 (0.0)	5 (1.0)	0.733
12 months	2 (1.0)	0 (0.0)	0 (0.0)	11 (2.3)	0.444
12 months (cumulative)	5 (2.6)	2 (3.0)	0 (0.0)	19 (3.9)	0.440
Bleeding events - N (%)					
1 month	7 (3.4)	5 (7.2)	3 (4.5)	25 (4.9)	0.568
6 months	23 (11.5)	3 (4.5)	3 (4.5)	46 (9.1)	0.214
12 months	12 (10.6)	1 (2.6)	2 (5.0)	19 (6.2)	0.335
MI - N (%)					
1 month	5 (2.4)	4 (5.8)	2 (3.0)	8 (1.6)	0.106
6 months	6 (3.0)	1 (1.5)	0 (0.0)	17 (3.4)	0.550
12 months	8 (4.2)	4 (6.2)	2 (3.1)	29 (6.0)	0.703
Target vessel revascularization - N (%)					
1 month	0 (0.0)	3 (4.3)	1 (1.5)	3 (0.6)	0.011
6 months	3 (1.5)	0 (0.0)	0 (0.0)	12 (2.4)	0.520
12 months	6 (3.2)	3 (4.6)	1 (1.5)	22 (4.6)	0.674
MACE - N (%)					
1 month	40 (100.0)	11 (100.0)	15 (100.0)	85 (100.0)	—
6 months	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.2)	1.000
12 months	0 (0.0)	0 (0.0)	0 (0.0)	4 (4.6)	0.583

*Fisher's exact test

Table 1. Classification by metabolizer type

	Category				Total
	1	2	3	4	
Poor Metabolizer	19	5	0	0	24
Intermediate Metabolizer	187	64	0	0	251
Normal Metabolizer	0	0	44	283	327
Rapid Metabolizer	0	0	18	198	216
Ultra-rapid Metabolizer	0	0	5	39	44
Total	206	69	67	520	

Table 3. Procedure Characteristics

	Category 1	Category 2	Category 3	Category 4	p-value
Number Stents (mean (SD))	1.58 (0.89)	1.54 (0.76)	1.50 (0.79)	1.59 (0.88)	0.865
Diameter Mean (mean (SD))	2.98 (0.47)	2.94 (0.49)	3.09 (0.49)	3.00 (0.47)	0.279
Length Mean (mean (SD))	21.32 (7.22)	21.41 (7.43)	20.13 (6.78)	20.92 (7.59)	0.670
PCI - N (%)					
LAD	92 (44.7)	26 (38.2)	28 (41.8)	209 (40.4)	0.708
LCx	30 (14.6)	17 (25.0)	10 (14.9)	113 (21.9)	0.069
RCA	77 (37.4)	29 (42.6)	29 (43.3)	200 (38.7)	0.766
LMCA	7 (3.4)	1 (1.5)	2 (3.0)	27 (5.2)	0.381
Ramus	3 (1.5)	1 (1.5)	1 (1.5)	6 (1.2)	0.984
SVG	18 (8.7)	1 (1.5)	3 (4.5)	32 (6.2)	0.161

who received Clopidogrel versus alternate P2Y₁₂ therapy based on the CYP2C19 genotype testing at one-year

Disclosures: M. Gedela *Nothing to disclose*. S. N. Gowda *Nothing to disclose*. R. Sharma *Nothing to disclose*. A. Abdullah *Nothing to disclose*. T. Petraskova *Nothing to disclose*. M. Blue *Nothing to disclose*. C. K. Desai *Nothing to disclose*. J. P. Wilson *Nothing to disclose*. Z. Varga *Nothing to disclose*. B. Simpson *Nothing to disclose*. V. Bares *Nothing to disclose*. R. Wilke *Nothing to disclose*. A. T. Stys *Nothing to disclose*. C. Hajek *Nothing to disclose*. T. Stys *Nothing to disclose*.

IV-52 | Safety and Efficacy of Short-Term (1 to 3 months) Dual Antiplatelet Therapy in Patients Undergoing Percutaneous Coronary Interventions: A Meta-Analysis of Randomized Controlled Trials

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Background: Among patients who have undergone percutaneous coronary intervention (PCI), the use of dual antiplatelet therapy (DAPT) is associated with increased risk of bleeding, but decreased stent thrombosis and myocardial infarction unrelated to the stent. As PCI techniques and devices have progressed, the optimal duration of DAPT has come into question.

Methods: We conducted a systematic database search for all randomized controlled trials (RCT) of patients undergoing PCI, who received one or more drug eluting stents (DES) for stable coronary artery disease (CAD) or acute coronary syndrome (ACS), and randomized to short (1-3 months) versus standard (12-24 months) duration DAPT. The prespecified primary outcome was major adverse cardiovascular events (MACE) defined as the composite of any death, myocardial infarction, or stroke. Important secondary outcomes were net adverse clinical events (NACE) defined as MACE and major bleeding; any bleeding; major bleeding; all cause death; cardiovascular death. We used random-effects model for the meta-analysis.

Results: Analysis included 6 RCT, comprising 34,361 patients and 50,329 patient years of follow-up. The mean (SD) age of patients was 64.6 ± 10.5 years, 47.4% of patients presented with ACS, and 25.7% were female. The duration of short-term DAPT was 3 months in 4 trials, and 1 month in 2 trials. There was no difference between short

and standard length DAPT in regards to MACE (HR 0.93; 95% CI 0.83-1.03; p=0.14), NACE (HR 0.92; 95% CI 0.83-1.03; p=0.15), all cause death (HR 0.90; 95% CI 0.78-1.03; p=0.12), or cardiovascular death (HR 0.79; 95% CI 0.59-1.07; p=0.12). However, short-term DAPT was associated with significantly reduced major bleeding events (HR 0.63; 95% CI 0.41-0.97; p=0.04; number needed to treat [NNT]=157) and any bleeding event (HR 0.63; 95% CI 0.44-0.90; p=0.01; NNT=51) compared with standard length DAPT.

Conclusions: In patients undergoing PCI for stable CAD or ACS, the use of short-term DAPT (1-3 months) followed by single antiplatelet therapy was associated with a lower incidence of clinically relevant bleeding events, but with similar risk of MACE, all cause death, and cardiovascular death compared with standard duration DAPT.

Disclosures: B. Kheiri *Nothing to disclose*. T. Simpson *Nothing to disclose*. M. Osman *Nothing to disclose*. H. Golwala *Nothing to disclose*. Q. Radaideh *Nothing to disclose*. K. Kumar *Nothing to disclose*. H. Rahmouni *Nothing to disclose*. P. Divanji *Nothing to disclose*. J. E. Cigarroa *Nothing to disclose*. F. Zahr *Nothing to disclose*.

IV-53 | Poor Prognosis of Contrast Induced Nephropathy Observed during Long term Clinical Follow Up

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Background: The development of contrast-induced nephropathy (CIN) was related to short-term poor prognosis. The aim of our study was to evaluate the long-term outcome of CIN during 10-year follow up.

Methods: We enrolled 544 patients (mean follow up 75±56 months) who received coronary intervention in Chonbuk National University Hospital (South Korea, Jeonju) from January 2005 to December 2006. The primary study endpoints were the all-cause death at 1, 5, and 10-year. The secondary study endpoints were major adverse cardiac events (MACE) including cardiac death, non-fatal myocardial infarction (MI), and target vessel revascularization (TVR) at 1, 5, and 10-year.

Results: Study population was divided into two groups: group I (No CIN, n= 496, 62±11 years, male 63.9%) and group II (CIN, n=48, 64±12 years, male 64.6%). Baseline clinical characteristics and cardiovascular risk factors were not significantly different between the two groups except the baseline creatinine level (1.21 mg/dL vs 1.95 mg/dL, p=0.001). All-cause death at 1-year (3.6% vs 14.5%, log-rank, p=0.001), 5-year (17.7% vs 33.3%, log-rank, p=0.004), and 10-year (25.2% vs 45.8%, log-rank, p=0.001) were higher in group II. MACE at 1-year (4.2% vs 10.4%, log-rank, p=0.069), 5-year (7% vs 19.2%, log-rank, p=0.044), and 10-year (13.5% vs 25%, log-rank, p=0.049) were higher in group II. Multivariate Cox regression analysis showed CIN (HR 2.367, 95% CI 1.46 – 3.83, p<0.0001) was an independent predictor for 10-year MACE.

Conclusions: The poor prognosis of CIN was persistently observed even after 10-year clinical follow up.

Disclosures: S. Lee *Nothing to disclose*. T. Liu *Nothing to disclose*.

IV-54 | One year re-admissions for bleeding and major procedures post PCI

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Background: Bleeding events or the need for urgent surgery leading to early discontinuation of dual antiplatelet therapy (DAPT) following percutaneous coronary intervention (PCI) is associated with increased risk of adverse events. These patients may benefit from a temporary reversal agent. We sought to describe the frequency of these events at 1-year following PCI.

Methods: We retrospectively identified all patients readmitted within 1-year of PCI with a primary diagnosis of a bleeding event or surgical procedure that would potentially require cessation of DAPT from a single large health system.

Results: Between 01/2014 -08/2018, 705/9102 (8%) patients were readmitted within 1-year of PCI for either an invasive procedure or a major bleeding event. Cause for readmission and median time to readmission can be seen in table I. Interestingly, 50% of readmission occurred within 90 days of PCI (Figure 1A). The majority (189/355, 53%) of readmissions within the first 90 days were due to a bleeding event or an endovascular procedure. Readmission for major bleed (OR 2.7, CI1.6-4.5, $p<0.001$) and endovascular procedure (OR 1.8, CI1.2-2.8, $p=0.009$) were independently associated with increase mortality. These findings held true on multivariate analysis. (Table 2)
Conclusions: Fifty percent of all readmissions for an invasive procedure or major bleed occurred within 90 days of PCI, at a time where DAPT

discontinuation may not be ideal. These patients may benefit from an anti-platelet reversal agent.

Disclosures: F. Ortiz *Nothing to disclose*. G. A. Stouffer *Nothing to disclose*. J. Rossi *Nothing to disclose*.

IV-55 | Colchicine in Coronary Artery Disease: A Meta-analysis of Randomized Controlled Trials

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Background: Colchicine is an anti-inflammatory drug commonly used in gout and pericarditis. Recently, trials have explored the use of colchicine in coronary artery disease (CAD). We performed a meta-analysis of randomized controlled trials (RCTs) evaluating use of colchicine in patients with CAD.

Methods: We searched Pubmed, Embase, and Cochrane databases for RCTs using colchicine in patients with CAD. Random effect meta-analysis was used to calculate the risk ratio and 95% confidence intervals.

Results: Four studies with 5873 patients (Colchicine group $n=2949$, control group $n=2924$) and a median follow up of 11.8 months were included in final analysis. Risk of death [RR 0.82 (95% CI 0.43-1.58) $p=0.55$], myocardial infarction [0.81 (0.53-1.22) $p=0.30$], new revascularization [1.29 (0.13-12.62)], and composite cardiovascular outcomes [0.78 (0.44-1.39)] were similar with or without colchicine. Colchicine reduces the risk of stroke when compared to the control group [0.26 (0.10-0.63) $p=0.003$].

Figure 1

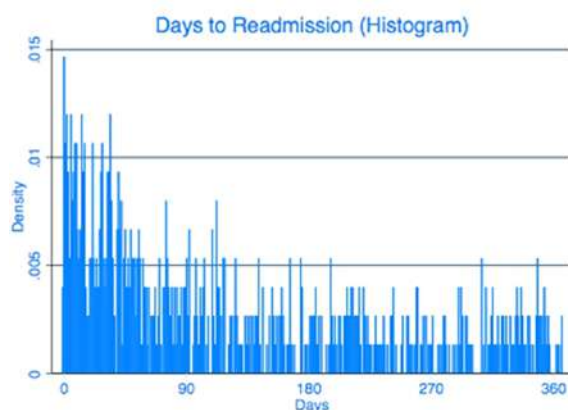


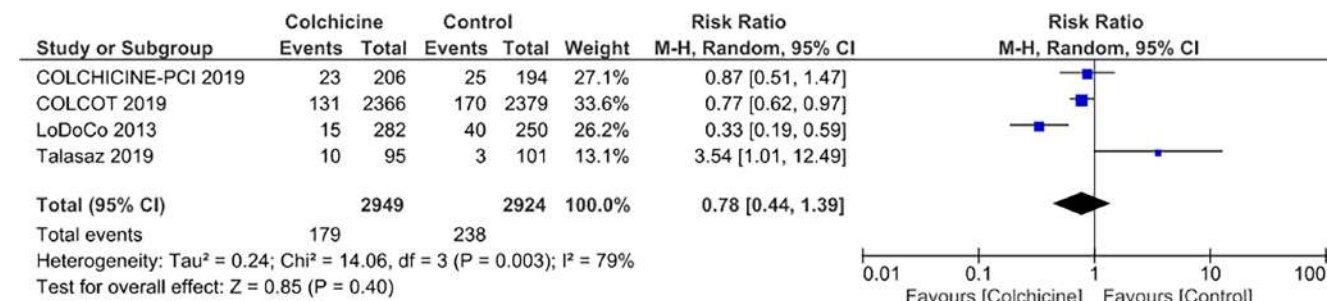
Table 1

Readmission Diagnosis	n (%)	Mean days to readmission (SD)	One year Mortality
Vascular Surgery	86 (12%)	128(±105)	7%
Cardiothoracic Surgery	142 (20%)	150 (±109)	11%
Surgery other *	129 (18%)	164 (±110)	7%
Endovascular Procedure	197 (27%)	86 (±92)*	20%*
Other/Minor Surgery	70 (10%)	147(±122)	11%
Major Bleed	85(12%)	90 (±98)*	27%*

* Statistically significant, $p<0.05$

Table 2

Predictors of Increase Mortality in Multivariate Analysis	O.R.	P value
Admission for Major Bleed	3.3 (CI 1.8-6.0)	<0.001
Admission for Endovascular Procedure	2.2 (CI 1.3-3.6)	0.003
Admission within 90 days of PCI	1.7 (1.1-2.7)	0.024



Conclusions: Based on our analysis, colchicine does not reduce the risk of cardiovascular outcomes in patients with CAD. Further studies are required to explore the potential use of colchicine in this population.

Disclosures: A. Rout *Nothing to disclose*. A. Garg *Nothing to disclose*. U. Tantry *Nothing to disclose*. M. Novakovic *Nothing to disclose*. A. S. Chan *Nothing to disclose*. S. Sarkar *Nothing to disclose*. K. P. Bliden *Nothing to disclose*. P. A. Gurbel *Nothing to disclose*.

IV-56 | Dual Antiplatelet Therapy (DAPT) Duration in Diabetes Mellitus (DM) in Patients Undergoing PCI: A Review of Prior Trials

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Background: A significant portion of patients undergoing percutaneous coronary intervention (PCI) have diabetes mellitus (DM). Dual antiplatelet therapy (DAPT) is an important aspect of post-stent management. Our review looked at previous trials to assess whether DAPT duration was a factor in PCI outcomes of DM patients.

Methods: A PubMed Database query was performed. An advanced search was performed with keywords of "dual antiplatelet therapy" and "diabetes mellitus." The criteria was further selected to include only "Clinical Trial" under Article Type. The main trials we included in our review that analyzed outcomes of DAPT in DM were the SECURITY, OPTIMIZE, and DAPT trials due to their inclusion of DM related outcomes in DAPT patients.

Results: In the SECURITY trial, having DM was not a significant predictor of the primary endpoint of the study such as a combination of cardiac death, myocardial infarction (MI), stroke, definite or probable stent thrombosis, or major bleeding ($P=0.069$) whether the patients were on 6 months or 12 months of DAPT. In the OPTIMIZE trial, having DM was not a significant predictor of the primary endpoint of the study such as a combination of death from any cause, MI, stroke, or major bleeding ($P=0.065$) whether the patients were on 3 months or 12 months of DAPT. In the DAPT trial, having DM was not a significant factor in definite/probable stent thrombosis ($P=0.08$) or severe/

moderate bleeding ($P=0.85$). Having DM was a significant factor in having major adverse cardiovascular and cerebrovascular events (MACCE) ($P=0.01$) and MI ($P=0.004$).

Conclusions: Our review showed mixed results for the duration of DAPT in patients with DM. The SECURITY and OPTIMIZE trial showed no significance in terms of primary endpoints. On the contrary, the DAPT Trial demonstrated DAPT duration in DM patients was shown to be a significant factor in having MACCE and MI, but not in definite/probable stent thrombosis or severe/moderate bleeding.

Disclosures: R. A. Thakker *Nothing to disclose*. A. Elbadawi *Nothing to disclose*. M. Agarwal *Nothing to disclose*.

IV-57 | Comparative Safety and Efficacy of Prasugrel and Ticagrelor in Acute Coronary Syndrome: A Systematic Review and Meta-Analysis

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Background: The newer oral P2Y₁₂ inhibitors (i.e., prasugrel and ticagrelor) are preferred over clopidogrel for patients with acute coronary syndrome (ACS) undergoing percutaneous coronary intervention (PCI). The comparative safety and efficacy of one agent over the other remain inconclusive.

Methods: MEDLINE and Cochrane databases were queried to identify relevant randomized control trials (RCTs) and observational studies. Random-effects model was used to calculate the unadjusted odds ratio (OR) of bleeding, mortality and major cardiovascular events (MACE), a composite of ACS, stroke and death.

Results: A total of 31 studies compared prasugrel with ticagrelor. Prasugrel was associated with a significantly lower odds of MACE (OR 0.64, 95% confidence interval (CI) 0.58-0.70, $p<0.00001$) and mortality (OR 0.67, 95% CI 0.61-0.74, $p<0.00001$) on 30 days and one year follow up durations (OR 0.79, 0.68-0.92, $p=0.002$ and OR 0.87, 95% CI 0.79-0.96, $p=0.004$, respectively). There was no significant difference in the odds of overall major bleeding events between

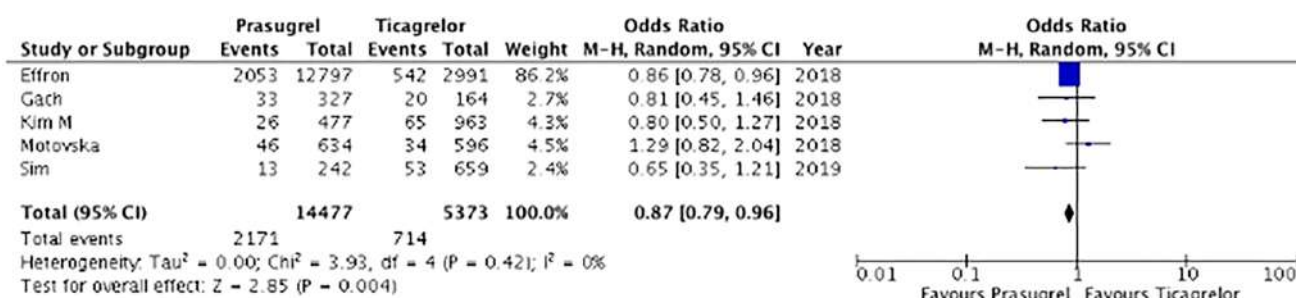


Figure 1: Forest Plot at one year follow up showing a significant reduction of MACE in prasugrel compared to ticagrelor.

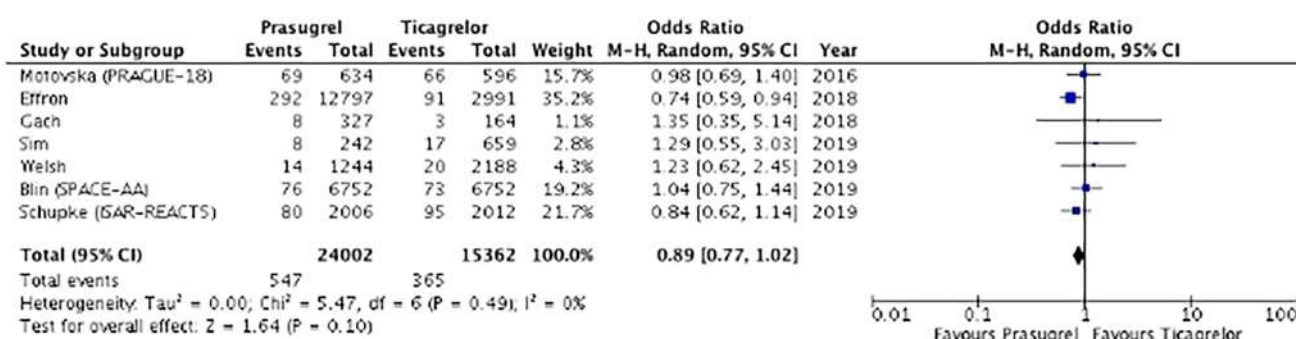


Figure 2: Forest Plot at one year follow up showing no significant difference in bleeding between prasugrel and ticagrelor.

the two groups on both 30days (OR 0.84, 95% CI 0.68-1.04, $p=0.12$) and 1year (OR 0.89, 95% CI 0.77-1.02, $p=0.10$) follow up. (Figure 1,2)

Conclusions: Prasugrel is favored over ticagrelor in terms of lower major adverse cardiovascular events and overall mortality at both short and long term follow up durations. There was no significant difference in the safety of the two drugs.

Disclosures: W. Ullah *Nothing to disclose*. Z. Ali *Nothing to disclose*. U. Sadiq *Nothing to disclose*. S. Saleem *Nothing to disclose*. D. L. Fischman *Nothing to disclose*.

IV-58 | Benefit of longer than 1-year dual antiplatelet therapy on cardiovascular events in high-risk patients undergoing percutaneous coronary intervention

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National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China; Kefei Dou, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences & Peking Union Medical College, China

Background: Dual-antiplatelet therapy (DAPT) exceeding 1 year may increase a bleeding risk despite reducing the risk of ischemic events. The benefits and harms of prolonging DAPT with aspirin and clopidogrel beyond 1 year after percutaneous coronary intervention (PCI) with drug-eluting stent implantation for patients with high-risk for bleeding or an ischemic event remain unknown in the real-world practice.

Methods: Between January 2013 and December 2013, all consecutive patients undergoing PCI were prospectively included in the Fuwai PCI Registry. We evaluated 7521 patients who were at high risk for ischemic or hemorrhagic complications and were event-free (no ischemic events or major bleeding) at 1 year after the index procedure. Subjects were divided into 2 groups: DAPT>1-year group ($n=5252$) and DAPT≤1-year group ($n=2269$). Patients at high-risk for ischemic or bleeding events were defined as having at least one additional clinical feature and one angiographic feature according to TWILIGHT trial criteria. The primary outcome was major adverse cardiac and cerebrovascular events [MACCE] (a composite of all-cause death, MI, or stroke).

Results: During a median follow-up of 30 months after the index procedure, DAPT>1-year with aspirin and clopidogrel was associated with a reduction in risk for MACCE compared with DAPT≤1-year (1.5% vs. 3.8%; adjusted hazard ratio [HR]: 0.36; 95% confidence interval [CI]: 0.27-0.50; $P<0.001$) after multivariable adjustment. This difference was largely driven by a lower risk of all-cause mortality. In contrast, the risk of BARC type 2, 3 or 5 bleeding was statistically similar between the 2 groups (1.0% vs. 1.1%; adjusted HR: 0.81; 95% CI: 0.50-1.30; $P=0.373$). The results were maintained after propensity score-matched analysis and were consistent across various subgroups.

Conclusions: DAPT continuation with aspirin and clopidogrel beyond 1-year after DES implantation resulted in a significantly lower rate of MACCE with no higher risk of clinically relevant bleeding in patients who were at high-risk for ischemic or bleeding events. Our results suggest that prolonged DAPT may improve clinical outcomes after PCI for high-risk patients if they were free of ischemic or bleeding events at 1 year.

Disclosures: H. Wang *Nothing to disclose*. R. Gao *Nothing to disclose*. Y. Yang *Nothing to disclose*. S. Wang *Nothing to disclose*. B. Xu *Nothing to disclose*. K. Dou *Nothing to disclose*.

IV-59 | Risk-Benefit Profile of dual antiplatelet therapy continuation beyond 1 year after PCI in patients with high ischemic risk features as endorsed by 2018 ESC/EACTS myocardial revascularization guidelines

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Background: The 2018 ESC/EACTS myocardial revascularization guidelines endorsed high risk features of ischemic events. The benefits and harms of continuing DAPT with aspirin and clopidogrel beyond 1 year after PCI with drug-eluting stent (DES) implantation for patients with high ischemic risk (HIR) remain unknown.

Methods: Between January 2013 and December 2013, all consecutive patients undergoing PCI were prospectively included in the Fuwai PCI Registry. We evaluated 4578 patients who were at ESC/EACTS-endorsed HIR criteria and were events free (no death,

myocardial infarction [MI], stroke, stent thrombosis [ST], any revascularization, or major bleeding) at 1 year after the index procedure. Subjects were divided into 2 groups: >1-year DAPT group ($n=3278$) and ≤1-year DAPT group ($n=1300$). Patients at ESC/EACTS-endorsed HIR criteria were defined as diffuse (defined as lesion length ≥20 mm) multivessel disease in patients with diabetes, chronic kidney disease, ≥3 stents implanted, ≥3 lesions treated, bifurcation with 2 stents implanted, total stent length>60 mm, and treatment of CTO, and history of ST-elevation myocardial infarction. The primary outcome was major adverse cardiac and cerebrovascular events [MACCE] (a composite of all-cause death, MI, or stroke).

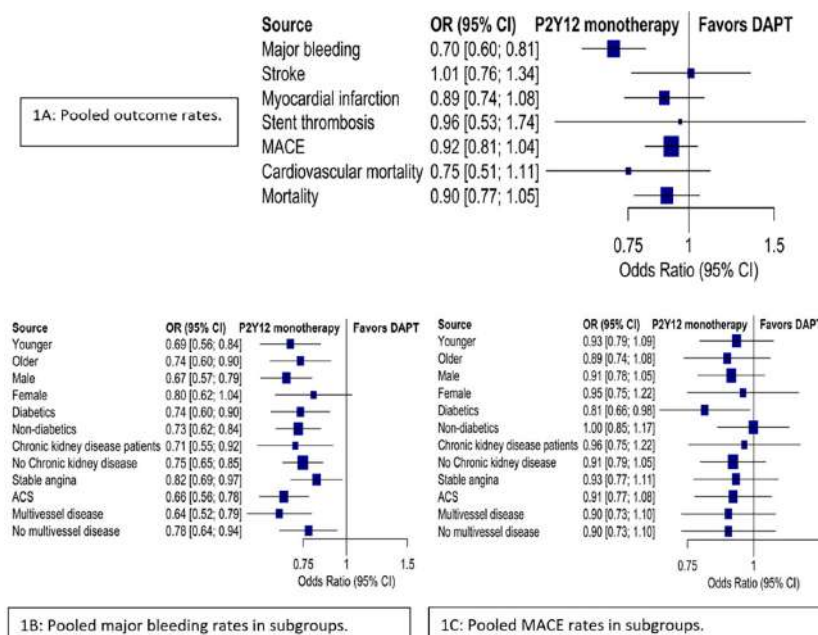
Results: During a median follow-up of 30 months after the index procedure, >1-year DAPT was associated with a reduction in risk for MACCE compared with ≤1-year DAPT (1.9% vs. 4.6%; adjusted hazard ratio [HR]: 0.39; 95% confidence interval [CI]: 0.28-0.57; $P<0.001$) after multivariable adjustment. This difference was largely driven by a lower risk of all-cause mortality. The clinical benefit of DAPT>1-year was also consistent after IPW adjustment and propensity score matching. In contrast, the risk of BARC type 2, 3 or 5 bleeding showed no significant difference between the 2 groups (1.1% vs. 0.9%; adjusted HR: 0.81; 95% CI: 0.50-1.30; $P=0.373$). Results regarding major bleeding were consistent after IPW adjustment and propensity score matching.

Conclusions: DAPT continuation with aspirin and clopidogrel beyond 1-year in patients with HIR features after DES implantation resulted in a significantly lower rate of MACCE, without clear evidence of increased major bleeding.

Disclosures: H. Wang *Nothing to disclose*. R. Gao *Nothing to disclose*. Y. Yang *Nothing to disclose*. B. Xu *Nothing to disclose*. K. Dou *Nothing to disclose*.

IV-60 | Outcomes with Dual Antiplatelet Therapy Versus P2Y₁₂ Inhibitor Monotherapy After Percutaneous Coronary Intervention: A Meta-Analysis of Randomized Controlled Trials

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Background: We evaluated the efficacy and safety of dual antiplatelet therapy (DAPT) compared with P2Y12 inhibitor-monotherapy (MT) after percutaneous coronary intervention (PCI).

Methods: PubMed, Embase and Cochrane Central were systematically searched to identify randomized controlled trials (RCTs) that compared outcomes with either DAPT or P2Y12 inhibitor-MT after a brief period of DAPT following PCI. Primary outcomes studied were major bleeding, ischemic events (**Figure 1A**), all-cause and cardiovascular mortality. Event rates were extracted and the Mantel-Haenszel fixed-effects model was used to perform a meta-analysis. Summary statistics are reported as odds ratios (OR) with 95% confidence intervals (CI). Detailed subgroup analyses were performed using OR and the generic inverse method.

Results: We identified 4 RCTs with 29,089 randomized patients (GLOBAL LEADERS, TWILIGHT, SMART CHOICE, and STOP-DAPT 2). Use of P2Y12 inhibitor-MT was associated with 30% lower odds of major bleeding 0.70 (0.60-0.81; $p < 0.01$). Ischemic and mortality outcomes were similar between the two strategies; **Figure 1A**. There was a consistent benefit favoring P2Y12 inhibitor-MT for major bleeding within subgroups of age, sex, diabetes, chronic kidney disease, acute coronary syndrome, and multivessel disease; **Figure 1B**. Study defined major adverse cardiovascular event rates were similar with either strategy in the subgroups; **Figure 1C**.

Conclusions: Following an initial period of short-term DAPT after PCI, P2Y12 inhibitor-MT compared with prolonged DAPT appears to be a superior strategy for optimization of bleeding and thrombotic risk.

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TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)

IV-61 | Prognostic Utility of Invasive Hemodynamic Assessment Prior to Transcatheter Aortic Valve Replacement

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Background: Pulmonary hypertension is associated with adverse outcomes after transcatheter aortic valve replacement (TAVR). Other parameters that are easily attainable from the right heart catheterization have not been systematically assessed. Therefore, we sought to determine the prognostic utility of invasive hemodynamic assessment prior TAVR.

Methods: All patients undergoing TAVR between June 2011 and March 2019 at a single center who have undergone invasive hemodynamic assessment before TAVR were included. Variables evaluated included: right atrial (RA) pressure, systolic pulmonary artery pressure (PA) pressure, pulmonary capillary wedge pressure (PCWP), and mixed venous oxygen saturation (MVO2). Outcomes of all-cause mortality and heart failure hospitalization after TAVR were analyzed.

Results: A total of 547 patients (average age 82.2 ± 7.4 years, 50% female) with complete invasive hemodynamic data were included in this study. At a mean follow-up of 21.2 ± 17.5 months there was increased all-cause mortality in those with systolic PA pressure ≥ 50 mmHg (54.8% vs 47.7%, $p=0.008$), and MVO₂ $< 60\%$ (56.7% vs 46.2%, $p=0.03$). There was an increased rate of heart failure hospitalizations after TAVR in those with elevated RA pressures ≥ 10 mmHg (46.8% vs 15.2%, $p=0.002$), systolic PA pressure ≥ 50 mmHg (29.5% vs 16%, $p=0.01$), and PCWP ≥ 15 mmHg (28.4% vs 12.1%, $p=0.012$). When adjusted for age, sex, diabetes mellitus, and chronic kidney disease, systolic PA pressure ≥ 50 mmHg (HR 1.6, 95% CI 1.1–2.4, $p=0.01$) and MVO₂ $< 60\%$ (HR 1.5, 95% CI 1.05–2.2, $p=0.027$) were independent predictors of all-cause mortality.

Conclusions: Invasive hemodynamic assessment by right heart catheterization prior to TAVR has prognostic utility in predicting future morbidity and mortality. Consideration for routine use of these parameters could help risk stratify patients being evaluated for TAVR.

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IV-62 | Comparison of a Single Versus Double ProGlide Technique for Trans-femoral Transcatheter Aortic Valve Replacement

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Background: Vascular complications following transcatheter aortic valve replacement (TAVR) is associated with increased morbidity. The “preclose” technique allows for a complete percutaneous approach to trans-femoral TAVR with a high rate of technical success. The optimal strategy utilizing a single versus double Perclose ProGlide device is unclear.

Methods: This is a single center, prospective observational study of patients undergoing trans-femoral TAVR between February 2018 and July 2019. Immediate technical success, bleeding and vascular complications during the index hospitalization, and clinical outcomes were compared between groups. Technical success was defined as achievement of hemostasis without requiring alternative treatment. Access site related vascular and bleeding complications were defined

according to the Valvular Academic Research Consortium-2 (VARC-2) criteria.

Results: A total of 206 patients (average age 81.1 ± 8.5 years, 47% female) were included. A single ProGlide device was used for 91 patients, and double ProGlide devices for 115 patients. Technical success in the single and double ProGlide device groups were similar (94.5% vs 92.2%, $p=0.509$). Vascular complications occurred less frequently in the single than in the double ProGlide group (3.3% vs 12.2%; relative risk [RR] 0.27, 95% Confidence Interval [CI] 0.08–0.91, $p=0.023$). Bleeding complications also occurred less frequently in the single than in the double ProGlide group (2.2% vs 12.2%; RR 0.18, 95% CI 0.04–0.77, $p=0.008$). 30-day mortality was similar between groups (single vs double; 3.4% vs 3.0%, $p=0.749$).

Conclusions: A single ProGlide device technique is associated with fewer vascular and bleeding complications compared to a double ProGlide device technique.

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IV-63 | Recovered Left Bundle Branch Block and Outcomes After Transcatheter Aortic Valve Replacement

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Background: Conduction disturbances are a known complication after transcatheter aortic valve replacement (TAVR). New-onset left bundle branch block (LBBB) has been associated with adverse clinical outcomes after TAVR, but little is known about the prevalence and outcomes of those with recovered or transient LBBB.

Methods: Patients without baseline conduction disturbances or prior permanent pacemaker (PPM) undergoing TAVR between June 2011 and February 2019 were included. Patients receiving 1st generation, self-expandable valves and of prohibitive or high surgical risk were included. Recovered-LBBB was defined as occurrence of LBBB on ECG after TAVR but with resolution to normal on subsequent electrocardiograms (ECGs). Clinical outcomes were compared between those with no-LBBB, persistent-LBBB, and recovered-LBBB.

Results: A total of 419 patients (average age 81.7 ± 7.9 years, 53% female) were studied, of which 229 (54.7%) patients developed new-LBBB post-TAVR. Of these, 90 (39%) had recovered-LBBB and 139 (61%) had persistent-LBBB. Median time to LBBB recovery was 15.5 days (Interquartile range [IQR] 1-90). Median follow-up was 19.3 months (IQR 8.8-36.1 months). Persistent-LBBB had a higher rate of 30-day new PPM (31.7% vs 16.7%, $p < 0.001$) compared to recovered-LBBB, but no differences in all-cause mortality (47.8% vs 57.3%, $p = 0.4$) or heart failure hospitalizations (18.4% vs 13.3, $p = 0.7$). Both persistent-LBBB and recovered-LBBB had higher 30-day new PPM rate (both $p < 0.01$) compared to no-LBBB. Among those receiving PPM post-TAVR, those with recovered-LBBB were more likely to have conduction recovery (defined $\leq 1\%$ ventricular pacing) (71.4% vs 37.6%, $p < 0.001$) on device interrogation follow-up.

Conclusions: New LBBB post-TAVR is transient and recovers in almost 40% of patient at a median time of about 15 days. These patients have a lower risk for 30-day new PPM compared to those with persistent-LBBB, however their risk remained elevated compared to no-LBBB. In those who received PPM post-TAVR, those with recovered-LBBB are more likely to demonstrate conduction recovery on device interrogation.

Disclosures: V. J. Aharonian: Medtronic: Consulting and Principal Investigator for a Research Study; D. Q. Phan Nothing to disclose. J. Goitia Nothing to disclose. M. S. Lee Nothing to disclose. N. A. Moore Nothing to disclose. P. W. Mansukhani Nothing to disclose. S. S. Brar Nothing to disclose. R. Zadegan Nothing to disclose.

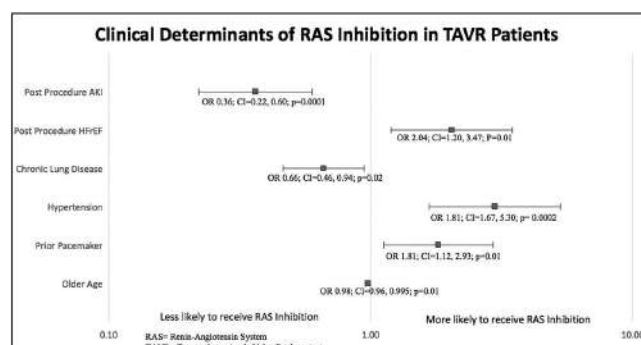
IV-64 | The Incidence and Predictors of Renin-Angiotensin System Inhibition after TAVR

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Background: Renin-Angiotensin System (RAS) Inhibition after Transcatheter Aortic Valve Replacement (TAVR) is associated with lower cardiac mortality and heart failure readmissions. We determined the utilization and predictors of RAS inhibition after TAVR.

Methods: We analyzed 735 consecutive TAVR patients (2014-2019) who survived to hospital discharge at a single high volume TAVR center. RAS Inhibitors were defined as any discharge dose of ACEI, ARB's, or aldosterone inhibitors. Characteristics and hospital outcomes were compared between patients receiving vs. not receiving discharge RAS Inhibitors. Multivariate analysis was used to determine predictors of RAS Inhibition after TAVR.

Results: 40% of TAVR patients were discharged with a RAS Inhibitor. Among patients with Ejection Fraction (EF) $\leq 40\%$, RAS Inhibitors use



was 55%. Outcomes were similar in both groups with the exception of Acute Kidney Injury (AKI), which was less in patients discharged with RAS Inhibitors (8% vs 18%, $p = 0.0001$). Multivariate analysis identified 3 predictors of RAS inhibitor use: prior pacemaker, hypertension and reduced EF. Older age, chronic lung disease and AKI were associated with less utilization of RAS inhibitors. Patients developing AKI were 64% less likely to receive RAS inhibitors than those without AKI (Figure).

Conclusions: A minority of TAVR patients were prescribed RAS inhibitors at discharge. AKI post TAVR predicts decreased RAS Inhibition at discharge and may have long term consequences.

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IV-65 | Periprocedural Outcomes of Transaxillary and Transapical TAVR at a Tertiary Center

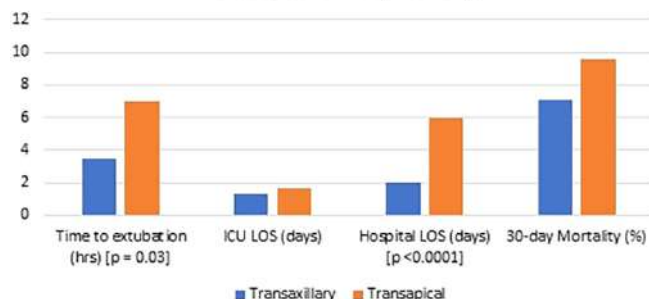
Justin Price, Ochsner Cardiology, United States; Hussain Almusawi, Chabert Medical Center, United States; Adam Cloninger, Ochsner Cardiology, United States; Tamunoinemi Bob-Manuel, Ochsner Clinic Foundation, United States; Jose David Tafur Soto, Ochsner Heart And Vascular Institute, United States

Background: There is an increasing need for alternative access approaches in patients who have unsuitable anatomy for Transfemoral transcatheter aortic valve replacement (TAVR). Data on differences in periprocedural outcomes in alternative access are scarce.

Methods: We performed a retrospective analysis of patients who underwent Transaxillary (TAX) or Transapical (TAP) TAVR at our center from 2012 to 2019. All data were summarized and displayed as a mean $\pm$ SD for continuous variables and number of patients in each group. The Fisher's exact test was used to evaluate statistical significance between continuous and categorical variables.

Results: A total of 102 patients underwent TAVR via alternative access; 28 patients (27%) via transaxillary (TAX) and 74 patients (73%) via transapical (TAP) access. The average time to extubation in the TAX group was 5.3 ± 3.5 hours vs 9.1 ± 8.8 hours in the TAP patients

Periprocedural Outcomes in Transaxillary vs Transapical TAVR (Median)



(p = 0.03). None of the TAX patients required reintubation compared to 23% of TAP TAVR (p = 0.003).

The average hospital length of stay for TAX was 2.4 ± 2.0 days compared to 6.9 ± 3.3 days (p < 0.0001) for TAP. 28% of patients in the TAX group needed new pacemaker implantation vs 9.5% of patients in the TAP group (p = 0.02).

Conclusions: TAX TAVR patients had significantly lower re-intubation rates, shorter time to extubation and in-hospital length of stay, but higher pacemaker implantation rates. There was no difference in 30-day mortality. TAX TAVR had improved periprocedural outcomes compared to transapical TAVR and remains the preferred TAVR alternative access.

Disclosures: J. Price *Nothing to disclose*. H. Almusawi *Nothing to disclose*. A. Cloninger *Nothing to disclose*. T. Bob-Manuel *Nothing to disclose*. J. D. Tafur Soto *Nothing to disclose*.

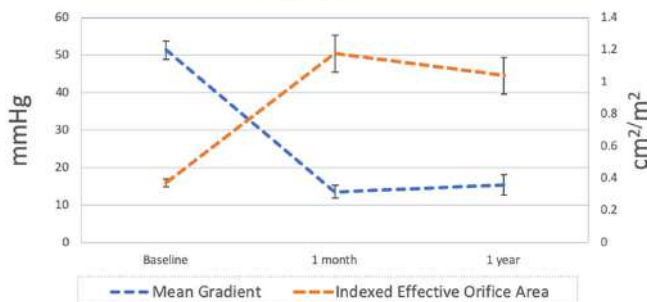
IV-66 | Patient-Prosthesis Mismatch after Transcatheter Aortic Valve Replacement in Patients with BMI above 35: Size Does Matter

Natalia Giraldo Echavarria, Univ ICESI/Fundacion Clinica Valle del Lili, Colombia; Christopher W. Puleo, Ochsner Cardiology, United States; Justin Price, Ochsner Cardiology, United States; Stephen R. Ramee, Ochsner Cardiology, United States; Patrick Parrino, Ochsner Cardiology, United States; Jose David Tafur Soto, Ochsner Heart And Vascular Institute, United States

Background: Obesity presents multiple challenges to transcatheter aortic valve replacement (TAVR) and there is limited data available regarding the prevalence of patient-prosthesis mismatch (PPM) in this population. With the worsening prevalence of obesity, and reported PPM rates of 53 to 60% in obese patients who undergo surgical aortic valve replacement (SAVR), it is essential to identify the risk of PPM in this patient population when undergoing TAVR.

Methods: A retrospective chart review was performed on 117 patients with body mass index (BMI) >35 kg/m² who underwent TAVR between 2017 and 2019 in a tertiary referral medical center. Demographic and echocardiographic data was collected at baseline, 1 month and 1 year following TAVR. Subjects with prior AVR were excluded.

Echocardiographic Outcomes of TAVR in Patients with BMI > 35



Results: All patients underwent TAVR with either balloon-expandable valve (BEV) or self-expanding valve (SEV), with 50% of included participants in each arm. Indexed effective orifice area (iEOA) with 95% CI for all participants are plotted against mean gradient in figure 1. The rates of overall PPM (iEOA < 0.85 cm²/m²) and severe PPM (iEOA < 0.65 cm²/m²) were 37.5% and 9.4%, respectively, 30 days following TAVR. When stratified based on valve type, BEV had a PPM rate of 56% (severe PPM 13%) and SEV had a PPM rate of 19% (severe PPM 6%).

Conclusions: TAVR is a feasible therapeutic option in patients with BMI > 35. There appears to be a lower incidence of PPM in TAVR compared to SAVR based on previously reported PPM rates in similar SAVR cohorts. SEV appear to have superior hemodynamic performance compared to BEV. Randomized trials are required to confirm this observation.

Disclosures: N. Giraldo Echavarria *Nothing to disclose*. C. W. Puleo *Nothing to disclose*. J. Price *Nothing to disclose*. S. R. Ramee *Nothing to disclose*. P. Parrino *Nothing to disclose*. J. D. Tafur Soto *Nothing to disclose*.

IV-67 | Hemodynamic Performance of Self-Expanding vs Balloon-Expandable Valves in Patients with BMI above 35 Undergoing Transcatheter Aortic Valve Replacement

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Background: Transcatheter aortic valve replacement (TAVR) has been shown in select populations to be a reasonable alternative to surgical aortic valve replacement (SAVR). Although multiple retrospective studies suggest superior improvement in hemodynamics following placement of self-expanding valves (SEV) compared to balloon-expandable valves (BEV), there is limited data regarding

hemodynamics of these valves in obese population cohorts. Given the high rates of patient-prosthesis mismatch (PPM) following both SAVR and TAVR in obese patients, it is essential to identify the postoperative risks and hemodynamics of these valves in this growing population.

Methods: A retrospective chart review was performed on 117 patients with body mass index (BMI) >35 kg/m² who underwent TAVR between 2017 and 2019 in a tertiary referral medical center. Demographic and echocardiographic data was collected at baseline as well as at 1 month and 1 year following TAVR. Patients with prior AVR were excluded.

Results: The mean age of participants was 72.6 years (47–93). Mean STS score was 4.4%. All patients underwent TAVR with either SEV (49%) or BEV (51%). Each valve type was associated with 1 in-hospital death and 1 VARC-2 major vascular complication. Percutaneous closure device failure and covered stent was required in 4 SEV cases (6.9%) and 3 BEV cases (5.1%). Post-operative pacemaker placement was required following implantation of 12 SEVs (20.7%) and 11 BEVs (18.6%). At 1 month following SEV implantation, mean indexed effective orifice area (iEOA) was 1.33 cm²/m² (95% CI [1.19, 1.48]) and mean mean gradient (MG) was 10.4 mmHg (95% CI [9.0, 11.9]). At 1 month following BEV implantation, mean iEOA was 1.02 cm²/m² (95% CI [0.85, 1.20]) and mean MG was 16.7 mmHg (95% CI [13.81, 19.66]). Moderate or worse paravalvular leak at follow up was noted in 3 SEV cases (5.2%) and 3 BEV cases (5.1%). Mean improvement in NYHA category was 0.94 for subjects who received an SEV and 0.89 for those who received a BEV.

Conclusions: TAVR is a feasible therapeutic option in patients with BMI > 35 , with a similar complication rate for SEV and BEV, though SEV appear to have superior hemodynamics at 1 month. Randomized trials are required to confirm this observation.

Disclosures: C. W. Puleo *Nothing to disclose*. J. Price *Nothing to disclose*. N. Giraldo Echavarria *Nothing to disclose*. S. R. Ramee *Nothing to disclose*. C. J. Lavie *Nothing to disclose*. P. Parrino *Nothing to disclose*. J. D. Tafur Soto *Nothing to disclose*.

IV-68 | Clinical Outcomes of Transcatheter Aortic Valve Replacement in Patients with BMI above 35

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Background: In select patient populations, transcatheter aortic valve replacement (TAVR) has revolutionized the treatment of patients with severe aortic stenosis (AS) with decreased complications compared to

surgical aortic valve replacement (SAVR). However, the worsening prevalence of obesity presents multiple challenges to this procedure, including interference with image quality, vascular access, and the potential for increased post-procedural complications. There is limited data regarding the influence of obesity on clinical outcomes and complications following TAVR in this population.

Methods: A retrospective chart review was performed on 117 patients with BMI >35 kg/m² who underwent TAVR between 2017 and 2019 in a tertiary referral medical center. Data regarding severity of aortic valvular disease, comorbidities, diagnostic imaging, and clinical and echocardiographic outcomes were obtained.

Results: The mean age of subjects was 72.6 years (47–93). Comorbidities included hypertension (93.2%), dyslipidemia (93.2%), diabetes mellitus (59.0%), atrial fibrillation (37.6%), and prior valvular surgery (12.8%). Mean STS score was 4.4%. 82.1% of patients had preserved ejection fraction at baseline. All patients underwent TAVR with either balloon-expandable (50.4%) or self-expanding (49.6%) valve. Access was obtained via percutaneous trans-femoral approach in 96.6% of patients. A new post-procedural pacemaker was required in 19.7% of cases. There were 2 VARC-2 major vascular complications. 6% had percutaneous closure device failure and covered stent was required. Hospital death occurred in 2 patients (1.7%). The mean length of stay was 1.4 days. Heart failure readmission at 30 days was 2.6%. On follow up at 1 month, the mean improvement in NYHA category was 0.92. Moderate or worse paravalvular leak at 30-day follow up was 5.5%. 12-month survival was 95.7% which is similar to or better than typical TAVR cohorts.

Conclusions: TAVR is a feasible and therapeutic option in patients with BMI >35 kg/m². We found complication rates comparable to those reported in non-obese population cohorts. The high 12-month survival rate suggests the possibility of an “obesity paradox” in TAVR, as described in other cardiovascular diseases.

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IV-69 | Comparison of Balloon Expandable vs Self-Expandable Valve For Trans-Catheter Aortic Valve Replacement: A Meta-Analysis

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Background: TAVR has become an effective and safe treatment option for patients with severe aortic stenosis. Most of the currently available prostheses employ either balloon-expandable or self-expandable designs. However, there is a paucity of data comparing these two widely used prosthesis type. The aim of this study is to compare the clinical and safety outcomes of Self Expandable Valves (SEV) vs Balloon Expandable Valves (BEV).

Methods: We conducted an electronic database search including PubMed, Web of Science, Google scholar and Cochrane Database of all published data for studies comparing SEV vs BEV in patients undergoing trans-femoral TAVR. Only the commonly used Medtronic SEV [CoreValve and Evolut R] and Edwards Sapien BEV [Sapien, Sapien XT and Sapien 3] were included for the final analysis. Event rates were compared using a forest plot of odds ratio (OR) using a random-effects model assuming inter-study heterogeneity

Results: A total of 16 studies (n=8671; SEV= 3749, BEV= 4922) were included in the final analysis. Pooled analysis revealed that SEV compared to BEV had higher device failure rates (OR = 2.73, 95% CI = 1.20 – 6.17, P = 0.02), higher 30 day all-cause mortality (OR = 1.76, 95% CI = 1.39 – 2.24, P < 0.00001), higher rates pacemaker implants (OR = 2.70, 95% CI = 1.86 – 3.91, P < 0.00001), greater post procedural any grade para-valvular leak (OR = 2.23, 95% CI = 1.67 – 2.98, P < 0.00001), greater moderate to severe para-valvular leak (OR= 4.17, CI= 1.68 – 10.35, P= 0.002) and greater moderate to severe post procedural trans-valvular aortic regurgitation (OR = 1.89, 95% CI = 1.41– 2.54, P < 0.0001). There was no difference between SEV and BEV in regard to 30-day cardiac mortality (OR = 1.25, 95% CI = 0.50 – 3.12, P = 0.63), major vascular events (OR = 0.89, 95% CI = 0.61– 1.28, P = 0.53), major or life-threatening bleeding (OR = 1.05, 95% CI = 0.76 – 1.46, P = 0.75), 30-day myocardial infarction (OR = 0.95, 95% CI = 0.11– 8.47, P = 0.96) and 30-day stroke (OR = 0.96, 95% CI = 0.38 – 2.44, P = 0.94)

Conclusions: SEV compared to BEV in patients undergoing trans-femoral TAVR has higher device failure rate, higher 30-day all-cause mortality, higher incidence of new pacemaker implants, greater para-valvular leak and trans-valvular aortic regurgitation post procedure

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IV-70 | TAVR outcomes in renal transplant patients vs. no renal transplant; Population-Based Study

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United States; Toshiaki Isogai, Cleveland Clinic Foundation, United States; Taha Ahmed, Cleveland Clinic, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States

Background: Renal transplantation is considered one of the common solid organ transplants in the US. These patients are considered high risk patients for surgical intervention. Transcatheter aortic valve replacement (TAVR) has been introduced as an alternative to surgical aortic valve replacement in patients at high operative risk with Aortic Stenosis (AS). However, the outcomes of TAVR in renal transplant patients regarding benefits and harms have not been well studied in nationally representative data.

Methods: Patients who were hospitalized for TAVR between January 2011 and September 2015 were identified retrospectively in the Nationwide Readmission Database (NRD). Patients were subdivided based on having a previous history of renal transplant.

Results: A total of 65,719 patients underwent TAVR and were included in this analysis, of which, 185 patients had a history of a renal transplant. Renal transplant patients were significantly younger with a mean of 71 +/- 8.4 years (vs. 81.1 +/- 9 years in the non-transplant group). Patients with renal transplant history were more likely to have a second degree heart block (5.4% vs. 1.4%, P<.001), but less likely to have atrial fibrillation (30.8% vs. 44.2%, P<.001). Other baseline comorbidities including atrial flutter, conduction disorders, third degree heart block, congestive heart failure, and hypertension did not show significant different between both groups. In-hospital mortality rates were not significantly different between the two groups (4.3% in renal transplant patients vs. 3.8%, P=.699). However, despite the younger age renal transplant patients were more likely to develop stroke (10.8% vs. 2.3%, P<.001) and acute kidney injury (33% vs. 16.4%, P<.001).

Conclusions: Patients who underwent renal transplantation experience an increased risk of adverse outcomes following TAVR when compared to non-renal transplant patients. Further attention should be directed to measures in order to improve such outcomes in renal transplant patients undergoing TAVR.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; O. Abdelfattah *Nothing to disclose*. A. M. Saad *Nothing to disclose*. M. Hassanein *Nothing to disclose*. M. M. Gad *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. S. Shekhar *Nothing to disclose*. T. Isogai *Nothing to disclose*. T. Ahmed *Nothing to disclose*.

IV-71 | Trends and outcomes of pacemaker use following transaortic valve replacement

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United States; Shashank Shekhar, Cleveland Clinic Foundation, United States; Manpreet Kaur, Cleveland Clinic, United States; Taha Ahmed, Cleveland Clinic, United States; Ingrid Hsiung, Cleveland Clinic Foundation, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States

Background: Permanent pacemaker (PPM) implantation following transcatheter aortic valve replacement (TAVR) is a common procedural complication and understanding the outcome temporal changes may help provide further insight into potential interventions to reduce rates of complications.

Methods: Patients who underwent TAVR during 2012-2016 were reviewed using the Nationwide Readmission Database (NRD), and grouped based on the need to receive in-hospital post-procedural PPM implantation.

Results: A total of 115,931 patients underwent TAVR and were included in this analysis, of which 10.7% received PPM. Rates of getting PPM were lowest in low-volume hospitals, followed by medium-then high-volume hospitals (8.9% vs. 10.4% vs. 12%, respectively, $P < .001$). The most common cause for PPM was 3rd degree AV block (61.9%), followed by sick sinus syndrome (9.7%), and 2nd degree AV block (4.1%). The need for PPM following TAVR increased from 7.4% in 2012 to 12.1% in 2015, but decreased to 10.6% in 2016 ($P < .001$). The trend in 30-day readmission rate changed from 19.7% in 2012 to 23.5% in 2013, and finally decreased to 16% in 2016 ($P < .001$). From 2012-2016, rates of prolonged hospital stay (more than 4 days) decreased from 96.1% to 69.2% ($P < .001$). Following discharge, rates of being readmitted within 30 days to get a pacemaker decreased from 0.6% in 2012 to 0.2% in 2014, then started to increase reaching 1.5% in 2016, $P < .001$.

Conclusions: PPM implantation following TAVR increased over the study duration, which may be attributed to the introduction and increased use of self-expanding valves since 2014, along with the decreased use of balloon-expanding valves. The length of stay in patients getting PPM is decreasing over time, which may be related to operator experience or volume of cases. Further research is needed to further reduce the rates of adverse events.

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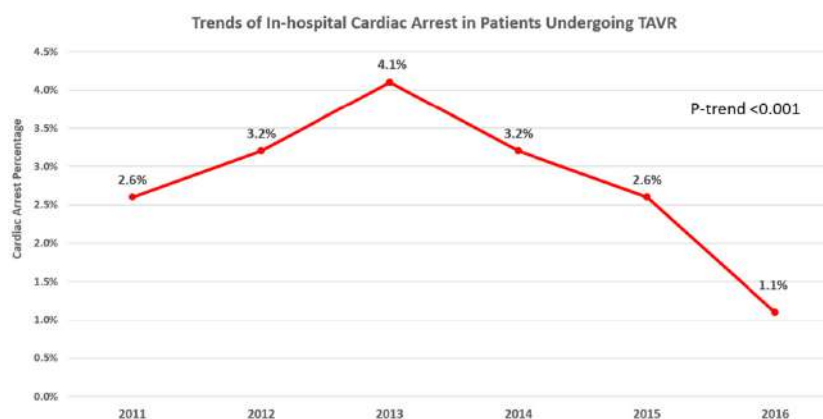
IV-72 | National Trends and Predictors of In-hospital Cardiac Arrest in Patients Undergoing Transcatheter Aortic Valve Replacement

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Background: Transcatheter aortic valve replacement (TAVR) has become a safe alternative in patients with severe symptomatic aortic stenosis regardless of the surgical risk. Cardiac arrest is a main cause of sudden death. We aim to determine the trends and predictors of cardiac arrest during the same hospitalization of TAVR.

Methods: Using the National Inpatient Sample, we identified all patients who underwent TAVR. Variance-weighted regression has been used to test for linear and curvilinear trends of cardiac arrest over time among TAVR recipients. Multivariate logistic regression was performed to identify the predictors of cardiac arrest.

Results: From 2011 to 2016, 110045 patients underwent TAVR, of whom 2640 (2.4%) had in-hospital cardiac arrest. The rates of cardiac arrest showed a statistically significant downtrend from 2.6% in 2011 to 1.1% in 2016; p -trend < 0.001 . Comorbidities such as congestive heart failure (OR 1.834; 95% CI 1.630 – 2.063; $p < 0.001$), atrial



fibrillation (OR 1.414; 95% CI 1.301 – 1.538; p<0.001), peripheral vascular disease (OR 1.298, 95% CI 1.187 – 1.421; p<0.001), renal failure (OR 1.262; 95% CI 1.155 – 1.379; p<0.001), and coagulopathy (OR 1.643; 95% CI 1.499 – 1.800; p<0.001) were independent multivariate predictors of cardiac arrest.

Conclusions: The incidence of in-hospital cardiac arrest among patients undergoing TAVR is declining. Congestive heart failure, atrial fibrillation, peripheral vascular disease, renal failure and coagulopathy predicted inpatient cardiac arrest.

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IV-73 | Trends of Hematologic Complications of Transcatheter Aortic Valve Replacement- Analysis From Nationwide Inpatient Sample Database (NIS)

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Background: Hematologic complications following Transcatheter Aortic Valve Replacement (TAVR) are not well known. Therefore, we sought to measure the frequency of association of hematologic complication in patients undergoing TAVR

Methods: Using the NIS database between October 2016 and September 2017 were included identified all patients with TAVR who developed hematological complications.

Results: A total of 3,785 post-TAVR patients were identified. The mean age of patients undergoing TAVR was 80 ± 46 years. The baseline demographics of the patient population are shown in Table 1. Thrombocytopenia was the most common weighted complication (n=500,13.2%), followed by anemia (n=495, 13%) post TAVR. Other complications include post-hemorrhagic anemia, iron deficiency anemia, anemia other specified, anemia of chronic disease, leukocytosis, and pancytopenia. (Figure 1)**Conclusions:** Post-TAVR, thrombocytopenia and unspecified anemia are the two most common hematologic abnormalities.

Disclosures: M. C. Alraies: *Abiomed: Royalties*; Y. Sattar *Nothing to disclose*. W. Ullah *Nothing to disclose*. A. Titus *Nothing to disclose*. S. Biswas *Nothing to disclose*. O. E. Ali *Nothing to disclose*. Z. Hakim *Nothing to disclose*.

Baseline demographics	TAVR (n = 3785)
Age (Mean ± SD)	80 ± 46 years
Gender	
Male	1925 (51%)
Female	1860 (49%)
Race	
Caucasian	3375 (91.2%)
African American	105 (2.8%)
Hispanic	115 (3.1%)
Asian/Pacific Islander	25 (0.67%)
Others	80 (2.16%)
Primary payer of procedure	
Medicare	3395 (91%)
Commercial/private insurance	270 (7.2%)
Medicaid	65 (1.7%)
Comorbidities	
HLD	2360 (62%)
DM	1625 (43%)
HTN	1020 (27%)

Table 1. Showing study population demographics and comorbidities. (HLD: Hyperlipidemia; DM: Type 2 Diabetes Mellitus; HTN: Essential Hypertension)

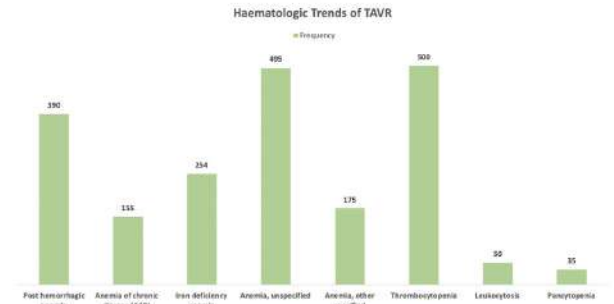


Figure 1: Showing frequencies of different hematologic complications among the total sample of TAVR patients (n=3785) in NIS-2017

IV-74 | Trends of Valve Site / Paravalvular Complications of Transcatheter Aortic Valve Replacement (TAVR)- Analysis from Nationwide Inpatient Sample Database (NIS)

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Background: Posttranscatheter aortic valve replacement (TAVR) valvular or paravalvular complications has been decreasing due to new iteration of devices and operators' experience. However, the national trends of these complications are unknown.

Methods: Using the NIS database was queried all post TAVR complications that include the following, aortic valve insufficiency, heart valve prosthesis leakage, heart valve prosthesis displacement, paravalvular leaks, annular rupture, and mitral valve disruption were included in the analysis.

Results: A total of 3,785 TAVR patients were identified (age 80 ± 46 years). Baseline demographics of the patient population is shown in Table 1. The individual frequency of complications are

Baseline demographics	TAVR (n = 3785)
Age (Mean ± SD)	80 ± 46 years
Gender	
Male	1925 (51%)
Female	1860 (49%)
Race	
Caucasian	3375 (91.2%)
African American	105 (2.8%)
Hispanic	115 (3.1%)
Asian/Pacific Islander	25 (0.67%)
Others	80 (2.16%)
Primary payer of procedure	
Medicare	3395 (91%)
Commercial/private insurance	270 (7.2%)
Medicaid	65 (1.7%)
Comorbidities	
HLD	2360 (62%)
DM	1625 (43%)
HTN	1020 (27%)

Table 1. Showing study population demographics and comorbidities. (HLD: Hyperlipidemia; DM: Type 2 Diabetes Mellitus; HTN: Essential Hypertension)

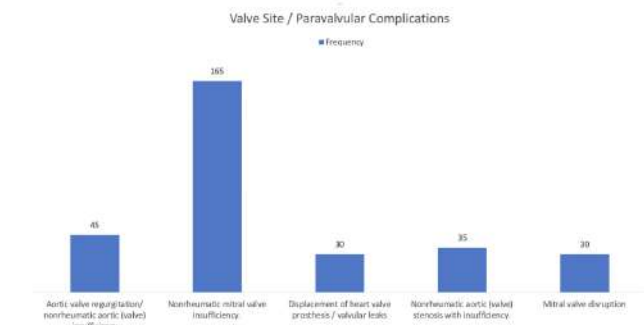


Figure 1: Showing frequencies of valve site/paravalvular complications among a total sample of TAVR (n=3785) in NIS-2017

shown in Figure 1. The most common paravalvular complication was nonrheumatic mitral valve insufficiency followed with, aortic valve insufficiency, displacement of prosthesis/valve leaks, and mitral valve disruption.

Conclusions: MV and AV insufficiency are the most common valvular complications after TAVR; careful investigation and management should be given in such cases.

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IV-75 | Safety and Predictors of Next-day Discharge after Transcatheter Aortic Valve Replacement: A Systematic Review and Meta-analysis

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University, United States; Yakov Elgudin, Louis Stokes Cleveland Veterans Affairs Medical Center, United States; Marc Pelletier, Case Western Reserve University, United States; Alan H Markowitz, Case Western Reserve University, United States

Background: Transcatheter valve replacement (TAVR) is now approved for patients with severe aortic stenosis (AS) across all risk profiles. Next-day discharge (NDD) is an attractive strategy in a selected cohort of patients; however, supporting evidence is limited. Hence, we conducted a systematic review to present results in NDD patients after TAVR.

Methods: We conducted a systematic search (till August 2019) to identify peer-reviewed original studies reporting clinical outcome of NDD after TAVR. We analyzed events rates for mortality, stroke, acute kidney injury and readmissions using a random effects model. We also evaluated predictors promoting NDD.

Results: We included 6 studies (2906 TAVR patients, 17 centers world-wide) in our meta-analysis. Five studies were retrospective analyses of a single center experience; 1 was an industry-funded prospective cohort study. We observed wide variation in NDD (22% - 45.71%; $p < 0.001$). The majority received balloon-expandable valves, only 5.21% patients were implanted with self-expanding valves. Overall, 30-day mortality was 1% (0.5% - 1.995). Mortality was not influenced by study volume ($p = 0.15$). Pacemaker rates were 2.2% (0.5% - 8.52%) with wide variation between studies (0.6% - 15.54%). Early readmission rate was 6.63% (4.7% - 9.21%); this varied significantly between studies (range 3.85% - 13.64%; $p = 0.06$). Acute kidney injury and stroke rates were 1% and 0.8% respectively. When compared with routine discharge, NDD did not impact mortality [OR 1.4 (0.66 - 2.93)] or readmission [OR 0.66 (0.36 - 1.2)]. Male sex, normal sinus rhythm and normal kidney function promoted likelihood of NDD.

Conclusions: Data evaluating NDD after TAVR are limited. In selected patients, this strategy appears to be safe with low risk for readmissions. Preliminary data suggest that these patients have outcomes comparable to the acceptable standards.

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IV-77 | Predictors and Outcomes of Conservative Therapy in Patients with Heart Failure in an Era of TAVR and SAVR

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United States; Keerat Rai R Ahuja, Cleveland Clinic, United States; Beni Verma, Cleveland Clinic, United States; Nicholas Kassis, Cleveland Clinic Foundation, United States; Mohamed M Gad, Cleveland Clinic, United States; Samir Ramesh Kapadia, Cleveland Clinic, United States

Background: Treatment options for patients with symptomatic severe aortic stenosis (AS) and congestive heart failure (CHF) include surgical aortic valve repair (SAVR), transcatheter aortic valve replacement (TAVR), and conservative therapy. Little is known about the predictors of receiving conservative therapy and its implication on short-term outcomes.

Methods: From the National Readmissions Database, we retrospectively identified patients >18 years with AS and CHF who were admitted to hospitals capable of performing both TAVR and SAVR in 2016. Multivariable logistic regression was performed to examine the predictors of conservative versus interventional (TAVR/SAVR) therapy. Rates of 30-day readmission were compared among the TAVR, SAVR, and conservative therapy groups.

Results: We identified 94,363 patients, of which 74.5% were treated conservatively, 17% with TAVR and 8.5% with SAVR. The median age of patients treated with SAVR was lower than for conservative therapy and TAVR (73 vs. 82 vs 82 years respectively; $p < .001$). The strongest predictors of conservative therapy were sepsis [OR=6.2; 95%CI [5.59-6.87]; $p < .001$] and dementia [OR=3.55; 95%CI [3.32-3.8]; $p < .001$]. Other factors associated with conservative therapy included female sex, systolic heart failure, cancers, renal failure, drug abuse and pulmonary hypertension, whereas obesity, dyslipidemia and prior PCI were significantly associated with getting interventional therapy. Patients who received conservative therapy were more likely to be readmitted within 30 days when compared to TAVR and SAVR groups (23% vs 12% vs 16% respectively; $p < .001$).

Conclusions: Despite increasing knowledge about TAVR and SAVR, a considerable number of patients with AS and CHF undergo conservative therapy. Given the increased 30-day readmission rates, more patients may need to be considered for interventions.

Disclosures: S. R. Kapadia: *Admedus: Advisory Board/Board Member; Navigate: Ownership Interests: Stocks, Stock Options*; S. Shekhar *Nothing to disclose*. A. M. Saad *Nothing to disclose*. T. Isogai *Nothing to disclose*. M. Kaur *Nothing to disclose*. O. Abdelfattah *Nothing to disclose*. K. R. R. Ahuja *Nothing to disclose*. B. Verma *Nothing to disclose*. N. Kassis *Nothing to disclose*. M. M. Gad *Nothing to disclose*.

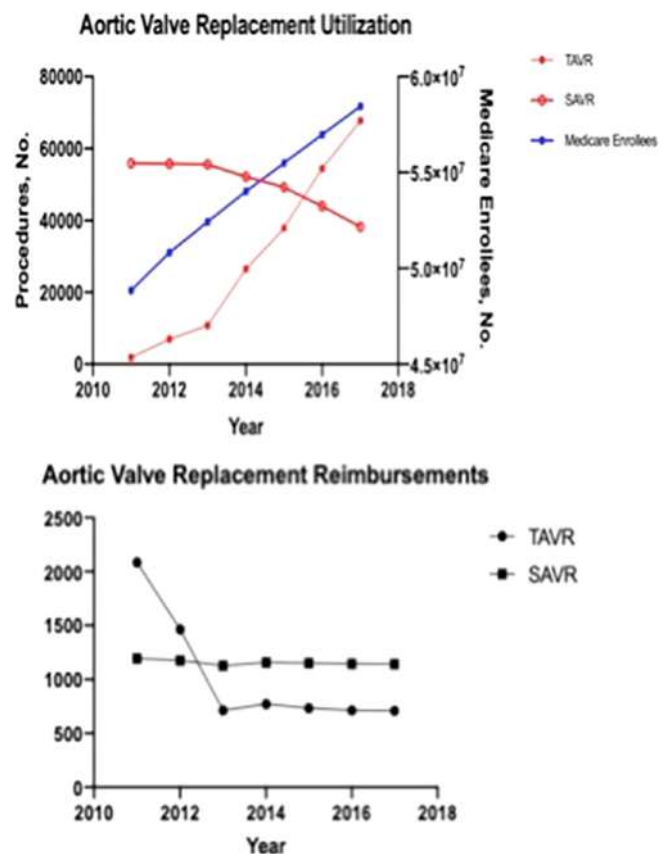
IV-78 | Utilization of Aortic Valve Replacement in the United States Medicare Population and its Impact on Reimbursement

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Swaiman Singh, Newark Beth Israel Med Ctr Card, United States; Sergio Waxman, Newark Beth Israel Medical Center, United States; Arash Salemi, Newark Beth Israel Medical Center, United States

Background: Indications for Transcatheter Aortic Valve replacement (TAVR) have quickly expanded from inoperable to low-risk patients. We examined the changes in the trends of utilization and payments for TAVRs and surgical replacements (SAVR) in the United States.

Methods: This is a population-based, cross sectional study of US Medicare beneficiaries from 2011-2017. The Centers for Medicare and Medicaid Services' database was queried for TAVR and SAVR by using CPT codes. Trends in medicare enrollees, procedures, and reimbursements were analyzed.



Results: The number of Medicare enrollees rose sharply from 5 to 6 million ($p < 0.01$). The national utilization per enrollee has increased by 2886% (R^2 value = 0.971; $p < 0.001$) for TAVR and decreased by 42.8% for SAVR (0.961; $p < 0.001$). Physician compensation per procedure has decreased by 66% for TAVR (0.639; 0.031) and decreased by 4.5% for SAVR (0.471; 0.089).

Conclusions: The increased utilization for TAVR has been associated with a lower reimbursement for procedure, and it is expected to further decline as TAVR expands to the low risk population.

Disclosures: E. Siddiqui *Nothing to disclose*. A. Shah *Nothing to disclose*. A. K. Okoh *Nothing to disclose*. S. Singh *Nothing to disclose*. S. Waxman *Nothing to disclose*. A. Salemi *Nothing to disclose*.

IV-79 | Valve Hemodynamics in Sievers Type 0 Compared to Type 1 Bicuspid Aortic Stenosis Following Transcatheter Aortic Valve Replacement

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Background: Bicuspid aortic valve (BAV) hemodynamics and effective orifice area after TAVR are similar to trileaflet valves across a range of second generation devices. However, valve hemodynamics and degree of paravalvular leak (PVL) are unknown when assessed by anatomic Sievers Type. We aimed to identify how BAV morphology affects hemodynamics and degree of PVL following TAVR.

Methods: A retrospective analysis was performed of patients with severe bicuspid AS who underwent TAVR from 1/1/2017 to 9/1/2019 with Medtronic Evolut R valves. Echocardiograms were analyzed prior to TAVR and at 30 days. Parameters assessed were peak velocity, peak and mean gradient, stroke volume (SV), dimensionless index (DVI), effective orifice area (EOA), and degree of PVL on a 0-3 scale.

Results: The cohort consisted of 49 patients; 78% (38) Sievers Type 1 and 22% (11) were Type 0. The mean age was 70 ± 9 years, 61% were male, valve size was 30 ± 3 mm, and the STS risk score was 3.6% with no differences between groups. There were no significant differences in pre-TAVR hemodynamics between the groups with a peak velocity of 4.5 ± 0.8 vs 4.6 ± 0.9 m/s and mean gradient of 51 ± 19 vs 57 ± 26 mmHg, for Type 1 and Type 0, respectively.

Post-TAVR hemodynamics tended to have a more favorable profile in Type 1 vs Type 0 patients with lower mean gradient (10 ± 5 vs 14 ± 7 mmHg, $p=0.047$), a trend towards lower peak gradient (19 ± 11 vs 25 ± 14 mmHg, $p=0.19$), higher DVI (0.57 ± 0.15 vs 0.47 ± 0.15 , $p=0.067$), and higher EOA (2.1 ± 0.6 vs 1.9 ± 0.8 cm², $p=0.57$) for the same valve area. The degree of PVL was lower in Type 1 vs Type 0 with numerically trace PVL (0.6 ± 0.4) vs mild PVL (1.1 ± 0.6) respectively ($p=0.004$). There was a wide range of stroke volumes, which tended to be higher in Type 0 patients ($p=0.025$), but with similar ejection fractions between groups ($p=0.39$).

Conclusions: In severe bicuspid AS, Sievers Type 1 anatomy was associated with a better hemodynamic profile with lower gradients and a lesser degree of PVL for the same valve implant size and same echo derived EOA when compared to Type 0. As TAVR shifts to a lower

risk cohort, understanding how BAV morphologies affect long term hemodynamics warrants continued study.

Disclosures: T. Simpson *Nothing to disclose*. K. Kumar *Nothing to disclose*. K. Rajotte *Nothing to disclose*. S. Khouw *Nothing to disclose*. C. Fuss *Nothing to disclose*. S. Weller *Nothing to disclose*. H. Song *Nothing to disclose*. H. Golwala *Nothing to disclose*. F. Zahr *Nothing to disclose*. S. Chadderdon *Nothing to disclose*.

IV-80 | Procedural and Mid-Term Outcomes of Coronary Protection: Insight from a Single-Center Retrospective Analysis

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Background: Coronary Obstruction is a rare but life-threatening complication of transcatheter aortic valve replacement (TAVR). Previous studies had shown coronary protection with guidewires and an undeployed coronary balloon or stent positioned in the coronary artery is helpful in the prompt diagnosis and treatment of coronary obstruction following TAVR. However, longer term data was limited.

Methods: We retrospectively analyzed the institutional TAVR and TVT registry at Henry Ford Hospital from January 2015 to August 2019 and identified patients underwent coronary protection before TAVR. Procedural efficacy (i.e. TAVR without coronary obstruction) and safety endpoints and intermediate-term outcomes including rate of target vessel re-intervention, myocardial infarction or stroke were studied.

Results: During the study period, 25 (2.1%) patients underwent TAVR with coronary protection including 10 (40%) valve-in-valve procedures. The mean STS score was 7.2%. A total of 28 coronary arteries were protected, with coronary heights of 9.0 ± 1.8 mm and virtual valve-to-coronary distance of 4 ± 0.9 mm. Procedural efficacy endpoint was met in 24/25 (96%) patients. A total of 13/28 (46.4%) coronaries were "chimney"-stented using 9 drug-eluting stents, 3 bare-metal stents and 1 biliary stent. Procedure-related complications included 1 stent balloon entrapment requiring subsequent snaring and 1 distal stent edge dissection requiring additional stent implantation. After a mean follow-up period of 16.3 months, there was no target vessel re-intervention, myocardial infarction or stroke.

Conclusions: Our study showed promising mid-term coronary patency in low coronary height patients undergone TAVR with coronary protection. However, feasibility of repeat coronary intervention in target vessel remains uncertain.

Disclosures: T. Frisoli: Abbott (St. Jude): Clinical Proctor; Boston Scientific Corp.: Clinical Proctor; Edwards Lifesciences: Clinical Proctor; Medtronic: Clinical Proctor; D. D. Wang: Edwards Lifesciences: Consulting; Boston Scientific Corp.: Consulting; Materialise: Consulting; Boston Scientific Corp.: Research Grant; W. W. O'Neill: Abiomed: Consulting; Boston Scientific Corp.: Consulting; Edwards Lifesciences: Consulting; M. H. Eng: Edwards Lifesciences: Clinical Proctor; C. Y. So Nothing to disclose. G. Kang Nothing to disclose. P. Villablanca Nothing to disclose. J. Lee Nothing to disclose. J. F. Wyman Nothing to disclose.

IV-81 | Catheter versus surgical based therapies for the management of concomitant aortic stenosis and coronary artery disease

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Background: Compared to coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI) is associated with higher rates of repeat revascularization as complexity increases. In severe aortic stenosis (AS), transcatheter aortic valve replacement (TAVR) is

Table 1: Demographics and Outcomes

Characteristic	SAVR+CABG (n=144)	TAVR+PCI (n=80)	p
Age (mean, SD)	71.98 (9.26)	81.49 (7.96)	<0.001
Gender Male (n, %)	104 (72.2%)	40 (50%)	0.001
White Race (n, %)	128 (89.5%)	76 (95%)	0.247
Diabetes (n, %)	55 (38.2%)	30 (37.5%)	1.000
Hypertension (n, %)	132 (91.7%)	78 (97.5%)	0.150
Diabetes (n, %)	23 (16%)	14 (17.5%)	0.915
Stroke (n, %)	9 (6.2%)	16 (20%)	0.004
Smoker (n, %)	18 (12.5%)	1 (1.2%)	0.008
Peripheral Artery Disease (n, %)	33 (22.9%)	29 (36.2%)	0.048
Atrial Fibrillation (n, %)	20 (13.9%)	31 (38.8%)	<0.001
Chronic Lung Disease (n, %)	42 (29.2%)	43 (53.8%)	<0.001
BMI (mean, SD)	28.88 (5.54)	29.22 (6.17)	0.680
Syntax Score (median, IQR)	23.0 (13.0-31.25)	9.0 (6.0-14.50)	<0.001
STS Score (median, IQR)	3.68 (2.21-6.59)	6.05 (4.50-8.66)	<0.001
LVEF (median, IQR)	60.0 (45.0-68.0)	59.0 (40.0-68.0)	0.421
Valve Area (median, IQR)	0.80 (0.70-0.90)	0.70 (0.60-0.80)	<0.001
Peak Velocity (mean, SD)	3.94 (0.77)	3.84 (0.71)	0.314
NYHA Class (n, %)			< 0.001
1	8 (5.6%)	0	
2	55 (38.2%)	6 (7.5%)	
3	64 (44.4%)	45 (56.2%)	
4	17 (11.8%)	29 (36.2%)	
Mitral Valve Regurgitation (n, %)			0.001
None	40 (27.8%)	9 (11.2%)	
Mild	90 (62.5%)	52 (65%)	
Moderate	12 (8.3%)	18 (22.5%)	
Severe	2 (1.4%)	1 (1.2%)	
Mortality			
30 Days	3 (2.1%)	2 (2.5%)	0.91
6 Months	7 (4.9%)	6 (7.5%)	0.84
1 Year	11 (7.7%)	15 (18.8%)	0.10
Mortality by Access Route (TAVR only)		6 Months 1 year	0.002
Femoral		1 (2%) 5 (9%)	
Subclavian		2 (25%) 3 (38%)	
Transaortic		2 (15%) 6 (46%)	
Transapical		1 (100%) 1 (100%)	
Bleeding	26 (18%)	4 (5%)	0.01
Rehospitalization	8 (6%)	17 (21%)	<0.01
Stroke	5 (3%)	4 (5%)	0.72
AKI	45 (31%)	19 (24%)	0.30

SD- standard deviation, IQR- interquartile range, LVEF- left ventricular ejection fraction, STS- Society for Thoracic Surgeons, NYHA- New York Heart Association, SAVR- surgical aortic valve replacement, CABG- coronary artery bypass grafting, TAVR- transcatheter aortic valve replacement, PCI- percutaneous coronary intervention. AKI- acute kidney injury.

comparable to surgical valve replacement (SAVR). Management of concomitant coronary artery disease and severe AS in the era of TAVR needs elucidation.

Methods: A single center retrospective analysis comparing TAVR+PCI to CABG+AVR between 2014 to 2018 was performed. Adults with PCI $\leq$ 6 months before TAVR or SAVR+CABG were included. Data were abstracted from TVT and STS registries along with patient charts. Primary endpoints were mortality (1, 6, 12 months). Secondary endpoints included mortality by access route and procedural complications.

Results: We identified 80 TAVR+PCI and 144 SAVR+CABG cases (demographics Table 1). Two SAVR+CABG patients were lost to follow up. After adjusting for STS and Syntax scores, mortality between TAVR+PCI and SAVR+CABG was not different at 30 days (HR=0.40, $p=0.42$), 6 months (HR=1.19, $p=0.90$), or 1 years (HR=2.65, $p=0.06$). In TAVR patients, mortality was significantly less in transfemoral access. SAVR+CABG group had more bleeding (18% vs 5%, $p<0.001$) and TAVR+PCI group had more rehospitalizations (18% vs 6%, $p<0.001$).

Conclusions: In selected patients with concomitant CAD and AS, catheter and surgical strategies are complementary with similar short-term outcomes after adjusting for STS and Syntax risk scores.

Disclosures: J. M. Lasala: *Abiomed: Advisory Board/Board Member and Consulting*; M. Thangam *Nothing to disclose*. P. Thakker *Nothing to disclose*. M. Husaini *Nothing to disclose*. E. Deych *Nothing to disclose*. M. Damiano *Nothing to disclose*. M. Sintek *Nothing to disclose*. N. Quader *Nothing to disclose*. H. S. Maniar *Nothing to disclose*. P. Kachroo *Nothing to disclose*. S. Melby *Nothing to disclose*. A. Zajarias *Nothing to disclose*.

IV-82 | Transcatheter Aortic Valve Replacement versus Surgical Aortic Valve Replacement: A Comparative Analysis of National Inpatient Sample (NIS) Database

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Background: Transcatheter aortic valve replacement (TAVR) has emerged as a safe and effective therapeutic alternative for patients with severe aortic stenosis (AS) who are at prohibitive risk for surgical aortic valve replacement (SAVR). This study sought to compare SAVR vs. TAVR in terms of patient demographics, in-hospital length of stay (LOS), procedure cost and overall outcomes.

Methods: The United States National Inpatient Sample (NIS) database was evaluated to identify all cases of AVR from October 2016 till November 2017. The categorical data were analyzed using the Pearson chi-square and means of the continuous variables were compared using an independent t-test analysis.

Results: A total of 60,740 patients underwent AVR, comprising of 55870 (91%) SAVR and 4870 (9%) TAVR patients. The SAVR population was significantly younger by about 14 years compared to TAVR patients (65 ± 13 vs. 79 ± 8 years, $p=0.0001$). SAVR patients more likely belonged to a household with an income in the 4th quartile (26.1% vs. 22.0%) and less likely to the 1st quartile (22.1% vs. 27.8%). The mean number of days from admission to the procedure was significantly lower for TAVR compared to the SAVR group by 0.28 days (1.15 vs. 1.43 days, $p<0.0001$, respectively). The average LOS was 5 days lower for the TAVR group (4.84days) as compared to the SAVR group (9.48, $p<0.0001$). The mean cost difference between SAVR and TAVR was 21016 US dollars (\$), significantly higher ($p<0.001$) for SAVR (\$240999) compared to TAVR (\$219983). TAVR was more likely an elective procedure (80% vs. 74%, 3870/4865, $p=0.001$), and was less commonly associated with in-hospital mortality compared to the SAVR group (1.1%, 55/4870 vs. 2.9%, 1630/55845, $p<0.001$, respectively).

Conclusions: In contrast to SAVR, TAVR is cost-effective and is associated with a shorter hospital stay and lower in-hospital mortality. Patients undergoing TAVR are more likely older, of the Caucasian race, and belong to low socioeconomic areas.

Disclosures: W. Ullah *Nothing to disclose*. H. M. Abdullah *Nothing to disclose*. S. S. Roomi *Nothing to disclose*. Y. Sattar *Nothing to disclose*. D. L. Fischman *Nothing to disclose*.

IV-83 | Clinical Outcomes of Renal Transplant Patients undergoing Transcatheter Aortic Valve Replacement

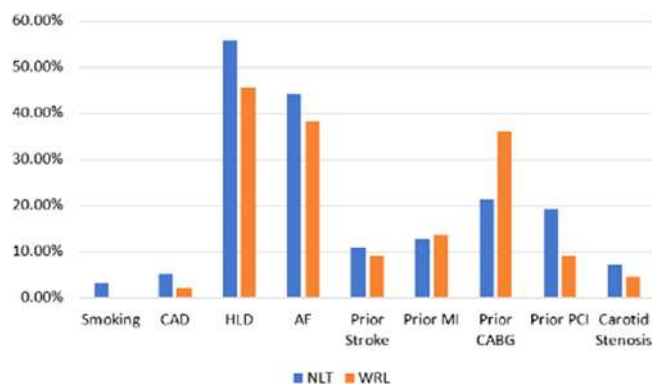
Waqas Ullah, Abington Jefferson Health, United States; Yasser Al-khadra, Cleveland Clinic Foundation, United States; Yasar Sattar, Icahn School of Medicine at Mount Sinai Elmhurst, United States; Fahed Darmoch, St. Vincent charity medical center, United States; Zaher Hakim, Detroit Medical Center Heart Hospital, United States; M. Chadi Alraies, Detroit Medical Center Heart Hospital, United States

Background: The United States (US) Renal System database demonstrated higher mortality rates (14-40%) of patients with renal transplant (WRT) undergoing open valve replacement. The transcatheter aortic valve replacement (TAVR) presents as a viable alternative, but data on its safety and clinical outcomes are limited.

Methods: We retrieved relevant data from the US National Inpatient Sample (NIS) for the year 2011-2015. Data was analyzed using an unadjusted odds ratio (OR), chi-squared and t-test analysis.

Results: A total of 62399 TAVR patients were identified; 62180 (99.6%) with no history of renal transplant (NRT), and 219 (0.4%) WRT, comprising of 52% and 71% male patients, respectively. (comorbidities, figure) The mean age was 70±8 (WRT) and 81±8 years (NRT). There was no significant difference in odds of in-hospital mortality (OR 0.61, 95% CI 0.25-1.5, p=0.37), major bleeding (OR 1.14, 95% CI 0.77-1.67, p=0.57), cardiac complications (OR 0.99, 95% CI 0.68-1.42, p=0.97), in-hospital permanent pacemaker implantation (OR 1.11, 95% CI 0.73-1.68, p=0.71), stroke (OR 1.17, 95% CI 0.81-1.69, p=0.44), vascular (OR 0.61, 95% CI 0.25-1.48, p=0.35) and respiratory complications (OR 1.09, 95% CI 0.74-1.61, p=0.74) between NRT and WRT patients. The odds of developing acute kidney injury (AKI) in patients WRT were significantly higher than NRT patients (OR 2.12, 95% CI 1.65-2.91, p<0.001).

Conclusions: Kidney transplant patients are relatively younger, financially affluent, and had twice the chance of developing post-TAVR AKI. Overall, TAVR in kidney transplant patients is safer and is not associated with higher odds of major systemic complications or mortality.



Disclosures: M. C. Alraies: *Abiomed: Royalties*; W. Ullah *Nothing to disclose*. Y. Al-khadra *Nothing to disclose*. Y. Sattar *Nothing to disclose*. F. Darmoch *Nothing to disclose*. Z. Hakim *Nothing to disclose*.

IV-84 | Clinical Outcomes of Liver Transplant Patients undergoing Transcatheter Aortic Valve Replacement

Waqas Ullah, Abington Jefferson Health, United States; Yasser Al-khadra, Cleveland Clinic Foundation, United States; Yasar Sattar, Icahn School of Medicine at Mount Sinai Elmhurst, United States; Fahed Darmoch, St. Vincent charity medical center, United States; Zaher Hakim, Detroit Medical Center Heart Hospital, United States; M. Chadi Alraies, Detroit Medical Center Heart Hospital, United States

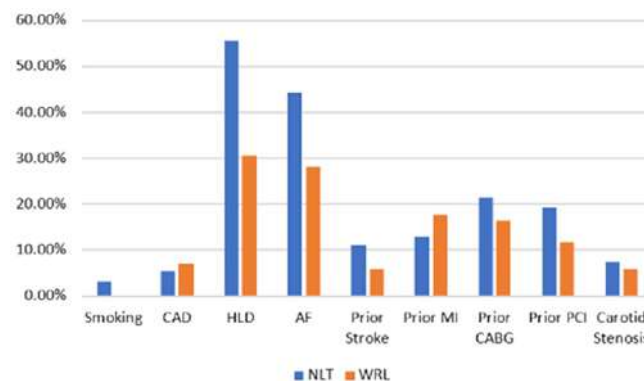
Background: Liver disease is a known risk factor for perioperative morbidity and mortality in patients undergoing valvular surgeries.

Limited research articulating clinical outcomes in patients with liver transplant (WLT) who are actively undergoing transcatheter aortic valve replacement (TAVR).

Methods: The US National Inpatient Sample (NIS) for the year 2011-2015 was queried to identify relevant data. Data was compared using an unadjusted odds ratio (OR).

Results: A total of 62399 TAVR patients were identified; 62314 (99.9%) with no history of liver transplant (NLT), and 85 (0.1%) WLT patients. (baseline characteristics are in figure) The mean age for WLT patients was significantly lower (72±7) compared to NLT (81±8 years, p<0.0001). Patients with a history of liver transplant more likely belonged to a household with an income in the 4th quartile (47.1% vs. 28.3%) and less likely to the 1st quartile (4.7% vs. 21%) compared NLT patients. There was no significant difference in odds of cardiac complications (OR 0.67, 95% CI 0.36-1.34, p=0.34), in-hospital permanent pacemaker (PPM) implantation (OR 1.14, 95% CI 0.59-2.21, p=0.82), acute kidney injury (AKI) (OR 0.61, 95% CI 0.32-1.20, p=0.10) and stroke (OR 0.82, 95% CI 0.42-1.60, p=0.67) between NLT and WLT patients. The odds of developing respiratory complications in patients WLT were significantly lower than NLT patients (OR 0.35, 95% CI 0.13-0.96, p=0.04).

Conclusions: Liver transplant patients are relatively younger, well-off financially, and had a 75% lower chance of developing post-TAVR respiratory complications.



Disclosures: M. C. Alraies: *Abiomed: Royalties*; W. Ullah *Nothing to disclose*. Y. Al-khadra *Nothing to disclose*. Y. Sattar *Nothing to disclose*. F. Darmoch *Nothing to disclose*. Z. Hakim *Nothing to disclose*.

IV-85 | An Updated Meta-Analysis Comparing Transcatheter Aortic Valve Replacement With Surgical Aortic Valve Replacement For Severe Aortic Stenosis Encompassing All Patient Risk (Low, Intermediate, High-Prohibitive) Groups

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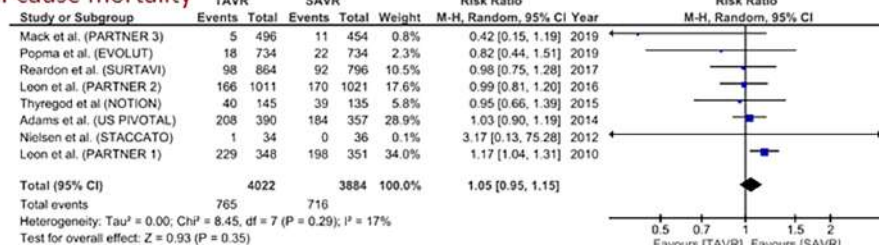
Siddamsetti, John H Stroger Jr Hospital of Cook County, United States; Vamsi K. Kodumuri, John Stroger Hospital of Cook County, United States

Background: Transcatheter aortic valve replacement (TAVR) has shown promising results in treatment of aortic stenosis from prohibitive to now low risk patient population. We performed a meta-

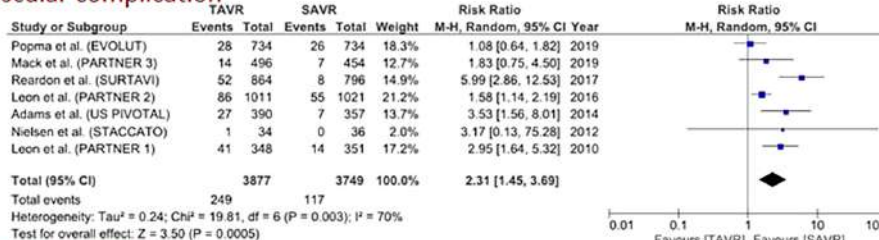
analysis encompassing all available data to assess efficacy and safety of TAVR vs. SAVR.

Methods: We performed a systematic literature search for studies that compared TAVR vs. SAVR in all-comer patients, irrespective of risk profile. Only randomized controlled trials (RCT's) were included. Outcomes of all-cause mortality, cardiovascular mortality, hospitalization, rate of

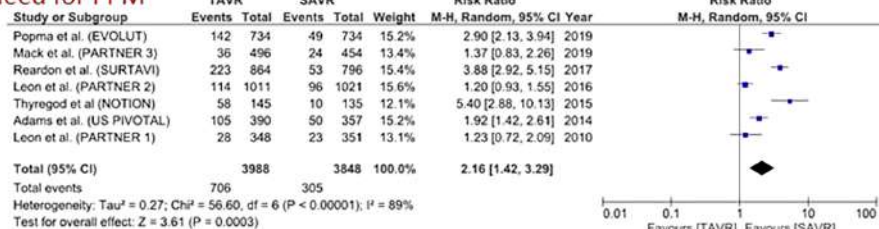
All-cause mortality



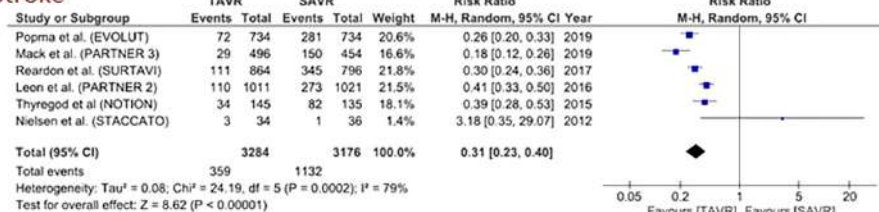
Vascular complication



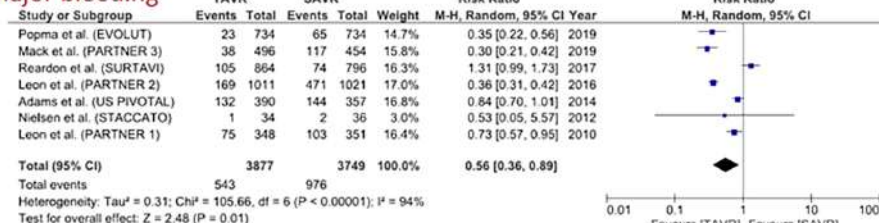
Need for PPM



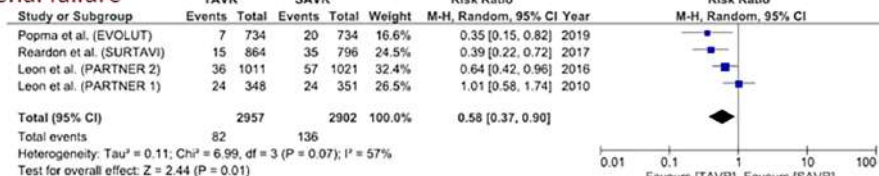
Stroke



Major bleeding



Renal failure



new onset of atrial fibrillation (AF), need for permanent pacemaker (PPM) placement, stroke, renal failure, vascular complications and major bleeding were analyzed. Separate subgroups analysis was done in low and intermediate-high risk group. Mantel-Haenszel random-effects model was used to estimate risk ratio (RR) and 95% confidence intervals (CI).

Results: Eight RCT's were included with a total of 7906 patients. Mean age was 79.4 years and mean STS score was 4.8 (TAVR) and 4.9 (SAVR). There was no statistically significant difference in outcome of all-cause mortality; [RR =1.05, [95% (CI), 0.95 to 1.15]; $p=0.29$] or in cardiovascular mortality, hospitalization or stroke. There was a statistically higher risk of need for PPM and vascular complication in the TAVR arm. However, compared to TAVR, SAVR had higher risk of new onset AF, major bleeding and renal failure.

Conclusions: TAVR is a reasonable alternative to SAVR. There is no difference in all-cause mortality when analyzed for all-comers irrespective of STS score. TAVR efficacy and safety appears to be superior to SAVR in low risk patients.

Disclosures: A. Vij *Nothing to disclose.* K. Kassab *Nothing to disclose.* V. Ravi *Nothing to disclose.* S. Siddamsetti *Nothing to disclose.* V. K. Kodumuri *Nothing to disclose.*

IV-86 | Impact of Chronic Liver Disease on Outcomes of Endovascular Transcatheter Aortic Valve Replacement in the United States

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Table 1: Clinical Characteristics and outcomes of patients with transcatheter aortic valve replacement with or without underlying chronic liver disease.

Baseline Characteristics	Un-Matched			Matched(1:1)		
Overall TAVR cohort	Non-CLD N=47198	CLD N=1256	P value	Non-CLD N=1228	CLD N=1256	P value
Age (mean $\pm$ SD)	82.08 $\pm$ 7.52	73.04 $\pm$ 9.3	<0.01	73.1 $\pm$ 12.4	73.04 $\pm$ 9.3	0.82
Male	52.8	57.9	<0.01	59.9	57.9	0.30
Female	47.2	42.1	<0.01	40.1	42.1	0.30
Hypertension	80.1	72.8	<0.01	73.3	72.8	0.82
Diabetes mellitus Uncomplicated	28.5	38.7	<0.01	37.3	38.7	0.48
Diabetes Mellitus Complicated	6.1	11.3	<0.01	15.0	11.3	0.007
Hyperlipidemia	52.7	40.1	<0.01	39.9	40.1	0.93
History of smoking	24.5	28.4	0.002	28.3	28.4	0.92
Obesity (BMI>30)	15.9	23.6	<0.01	25.4	23.6	0.32
Family History of coronary artery disease	2.7	2.2	0.37	1.9	2.2	0.67
History of CABG	18.2	9.7	<0.01	10.0	9.7	0.84
History of PCI	17.9	12.6	<0.01	12.4	12.6	0.90
History of CHF	8.5	9.1	0.41	8.0	9.1	0.35
Peripheral vascular disease	27.9	19.2	<0.01	20.4	19.2	0.45
History of Atrial Fibrillation	41.6	33.1	<0.01	36.6	33.1	0.064
History of Chronic Lung Diseases	32.3	30.3	0.15	34.1	30.3	0.044
Chronic Kidney Disease	35.2	37	0.19	33.4	37	0.059
History of Cerebrovascular accident	9.3	4.5	<0.01	3.7	2.5	0.36
Outcomes	Non-CDL (N=1228)	CLD (N=1256)	Odds Ratio (CI)		P Value	
In hospital mortality	3.6	2.7	0.67(0.41-1.11)		0.20	
In-hospital MI	2.1	1.4	0.78(0.33-1.81)		0.28	
Stroke	1.9	1.3	0.78(0.33-1.81)		0.34	
Acute Kidney Injury	14.3	17.7	1.34(1.05-1.71)		0.019	
Vascular Complications	4.1	2.5	0.61(0.38-0.98)		0.040	
Blood transfusions	19.3	24.2	1.41(1.15-1.74)		0.004	
Need for PPM	12.3	9.3	0.72(0.55-0.95)		0.02	

Numbers are n (%) or mean $\pm$ SD (where indicated).N- number, SD- Standard deviation, BMI- Body mass index, CABG- Coronary artery bypass graft, PCI- Percutaneous coronary intervention, CAD- Coronary artery disease, CHF- Congestive heart failure

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Background: Chronic liver disease (CLD) is a known risk factor for adverse perioperative outcomes in patients undergoing cardiac surgery. Limited data exist on the outcomes of patients with CLD undergoing transcatheter aortic valve replacement (TAVR).

Methods: We queried the National Readmission Database from January 2012 to September 2015 for TAVR admissions with and without CLD, creating a propensity-matched cohort to compare outcomes.

Results: A total of 48,454 patients underwent TAVR, with 1256 patients having underlying CLD (2.59%). Patients with CLD were younger with a male preponderance. TAVR patients with CLD compared to those without CLD had a lower prevalence of hypertension, peripheral vascular disease and atrial fibrillation (Table 1). After propensity matching, TAVR in CLD was associated with a similar in-hospital mortality, myocardial infarction and ischemic stroke but a statistically significant lower vascular complications and need for permanent pacemaker implantation (PPM) (Table 1). On multivariable analysis, CLD was noted to be a positive predictor of PPM implantation (odds ratio, 1.41; 95% CI: 1.15-1.74) but negative predictor of vascular complications (odds ratio, 0.61; 95% CI: 0.38-0.98). **Conclusions:** These findings suggest that TAVR is a reasonable treatment option for patients with severe aortic stenosis (AS) and CLD. These results may contribute to better decision making in patients impacted by CLD and AS

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IV-87 | Three-Year Outcomes with a Contemporary Self-Expanding Transcatheter Valve in the US – Data from the Evolut PRO US Clinical Study

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Background: Transcatheter aortic valve replacement (TAVR) has now been approved for severe symptomatic aortic stenosis in patients across all surgical risk categories. New device iterations, such as the self-expandable Evolut PRO, further aim to improve outcomes with optimal short-and long-term hemodynamics in the form of low mean gradients and low rates of paravalvular leak (PVL).

Methods: The Evolut PRO US Clinical Study included 60 patients at intermediate surgical risk (mean $\pm$ SD STS score = $6.4 \pm 3.9\%$) undergoing TAVR with the Evolut PRO valve at 8 investigational sites in the United States. Clinical outcomes were evaluated using VARC-2 criteria and included all-cause mortality, cardiovascular mortality, disabling stroke and valve complications. PVL and hemodynamics centrally assessed by an independent echocardiographic core laboratory (Mayo Clinic, Rochester, Minnesota).

Results: The 3-year data of this study will complete and be available for presentation in May of 2020. At 2 years, the Kaplan-Meier rates of all-cause mortality was 20.8% (cardiovascular mortality 12.6%), disabling stroke was 3.8%, and 1 patient had a myocardial infarction (2.4%). Valve hemodynamics were excellent (mean gradient 7.2 ± 4.3 mmHg; effective orifice area 2.1 ± 0.5 cm²) with no case of repeat valve intervention, endocarditis, coronary obstruction, and 1 incident of valve thrombosis (2.4%). A permanent pacemaker was implanted in 15.5% of patients. At 2 years, 33/38 patients (86.8%) had no or trace PVL and no patients had moderate or severe PVL. At 2 years, NYHA class I symptoms were present in 30/37 patients (81.1%), class II in 6/37 (16.2%), and class III in 1/37 (2.7%).

Conclusions: Outcomes at 2-years following TAVR with a contemporary self-expanding prosthesis are favorable, with no signal of valve deterioration, excellent hemodynamics, low consistent PVL prevalence and significant symptomatic improvement. The 3-year data of this study will complete and be available for presentation in May of 2020.

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IV-88 | Impact of Frailty on Mortality and 6-month Re-admission Rates after Transcatheter Aortic Valve Replacement

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Background: Transcatheter aortic valve replacement (TAVR) is being increasingly performed in elderly and frail patients. We aimed to

evaluate the impact of frailty on hospital mortality and readmissions rates after TAVR.

Methods: We identified patients who underwent TAVR from the 2016 US Nationwide readmission database (NRD). These patients were categorized using the Hospital Frailty Risk Score (HFRS), a validated ICD-10 code-based scoring system for administrative databases, into three categories of low (HFRS $\leq$ 4), intermediate (HFRS 5-15) and high frailty (HFRS $>$ 15). The primary outcome was 6-months readmission rate across the three frailty categories. Secondary outcomes included mortality and causes of readmissions. STATA 16.0 software was used for survey-specific statistical tests.

Results: Of 20,504 patients who underwent TAVR, 58.9% were low-, 39.6% were intermediate-, and 1.5% were in the high-frailty group. Overall in-hospital mortality was 1.9% (N=396) and was 0.6%, 3.3%, and 16.8% ($p<0.01$) with increasing frailty. Of the 20,108 patients who survived to discharge, 6,427 (32%) patients were readmitted within 6-months after TAVR. The readmission rates increased proportionally across the three frailty categories from 27.9% in low-, 37.6% in intermediate- and 51.1% in high frailty group ($p<0.01$). While

cardiac causes (mostly heart failure) were the predominant readmission etiologies across frailty levels (low: 51.2%, intermediate: 34.1%, high frailty: 27.2%), rates of infectious and injury related readmissions increased with higher frailty (low: 11%, intermediate: 30%, high: 45%). Mortality during readmissions was also worse with increasing frailty increasing from 0.8%, 5.3% and 8.5% ($p<0.01$).

Conclusions: Over 40% of patients undergoing TAVR were of intermediate-high frailty. Increasing frailty was associated with significantly worse post procedure mortality, readmissions and related mortality after TAVR. Heterogeneity was noted for the cause of readmission across frailty. These findings support incorporating frailty scoring into patient selection criteria for TAVR to improve health care resource utilization and outcomes, and to determine need for closer follow up.

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