Successful Transcatheter Aortic Valve Replacement in a Kidney Allograft Patient on Rapamycin

Aashish Chopra, Vijayakumar Subban, Ravinder Singh Rao, Mullasari Ajit, Georgi Abraham[1]*

Departments of Cardiology and [1]Nephrology, Madras Medical Mission Hospital, Chennai, Tamil Nadu, India

Abstract

Aortic valvular stenosis producing hemodynamic compromise is a major determinant of allograft function in kidney transplant recipients. Here, we describe successful transcatheter aortic valve replacement in a 59-year-old patient who had a kidney transplantation 14 years ago on 3 drug maintenance immunosuppression, including rapamycin.

Keywords: Aortic valve stenosis, kidney transplantation, rapamycin, transcatheter aortic valve replacement

Introduction

Aortic stenosis (AS) is one of the most common cardiac degenerative valvular diseases, with a prevalence of 1.3% in patients between 65 and 74 years and 2.8%–4.6% in patients >75 years of age.[1-3] Due to an aging population, the incidence of AS continues to rise over time, and thus, AS has become a significant health-care burden.[1,3,4] Without treatment, these patients have a poor prognosis with 50% mortality in the first 2 years after diagnosis.[5]

Surgical aortic valve replacement (SAVR) is currently considered the gold standard treatment for severe symptomatic AS.[6] Transcatheter aortic valve replacement (TAVR), also known as transcatheter aortic valve implantation (TAVI), being performed since 2002, has now emerged as a viable treatment option for high-risk patients with severe AS who are not suitable candidates for SAVR.[6-9] Recently published results of the 5-year outcomes from multicenter, randomized controlled trials demonstrated a survival benefit of TAVR over standard treatment for patients with inoperable AS[10] and comparable survival rates in high-risk patients with AS undergoing TAVR compared to SAVR.[11]

Cardiovascular disease is the most frequent cause of mortality for kidney transplant recipients.[12] The cardiac disease accounts for 43% of all-cause mortality among dialysis patients and for ≈38% of all-cause mortality after transplantation.[12] Open-heart surgery has particularly high morbidity, mortality, and wound healing is a major issue in patients on rapamycin (mTOR inhibitor). With improved survival and with increased numbers of older patients receiving transplants, the number of kidney transplantation patients at risk for developing the cardiac disease is likely to increase over time. Valvular heart disease is common in patients undergoing renal replacement therapy.[13] Increased calcification rate is an important aspect of left-sided valvular disease in end-stage renal disease patients;[14] the rate of AS progression is ≈3 times faster in dialysis patients than in the general population (0.23 vs. 0.05–0.1 cm^2/year).[15]

Case Report

A 59 years old male hypertensive, status postrenal transplant for the past 14 years on immunosuppressant therapy including prednisolone, rapamycin, mycophenolate mofetil presented with gradual onset of exertional dyspnea of 6 months' duration. The New York Heart Association Class II to Class III. Clinical and Echocardiographic evaluation revealed severe

Corresponding Author: Dr. Georgi Abraham, Department of Nephrology, Madras Medical Mission Hospital, Chennai - 600 037, Tamil Nadu, India.
E-mail: abraham_georgi@yahoo.com

Received: 26-08-2019; **Revision:** 22-11-2019; **Accepted:** 19-10-2019; **Published:** 31-12-2019

How to cite this article: Chopra A, Subban V, Rao RS, Ajit M, Abraham G. Successful transcatheter aortic valve replacement in a kidney allograft patient on rapamycin. Indian J Transplant 2019;13:303-6.

Access this article online

Quick Response Code:

Website: www.ijtonline.in

DOI: 10.4103/ijot.ijot_41_19

degenerative aortic valve disease, bicuspid leaflet with heavy calcification. The aortic valve means gradient of 70 mmHg, peak gradient of 115 mmHg, and aortic valve area of 0.7sqcm with normal left ventricular (LV) function. Baseline serum creatinine of 1.42 mg/dl was noted. Nephrologist consultation was taken, advised to continue with oral immunosuppressant – mycophenolate mofetil, rapamycin and prednisolone, and high SAVR was considered. Hence, he was worked up for alternative management as TAVI.

Prior to computed tomography (CT), he was initiated with hydration therapy. CT aortogram and gated cardiac CT scan showed severe calcific aortic valve with an annular diameter 21.3 mm, annular perimeter of 68.6 mm. His surgical risk stratification revealed Society of thoracic surgeons (STS) score for mortality was 4.85% with combined mortality and morbidity score of 21.7%. Cardiac catheterization was done through the left radial artery as the right radial artery had Arteriovenous Fistula (AVF). Angiogram revealed normal epicardial coronaries.

Transfemoral TAVI was planned under conscious sedation. All vascular access were achieved through a percutaneous approach, ultrasound-guided and were preclosed with percutaneous vascular closure device (ProGlide, abbott vascular). Through the left femoral artery, 14 Fr Python sheath was placed for TAVI prosthesis delivery. The right femoral artery was not considered in view of the right renal transplant to avoid injury [Table 1].

After crossing the aortic valve through routine technique and exchanging for a preshaped Medtronic Confida across the AV, balloon aortic valvuloplasty was done during rapid ventricular pacing with 20 mm MERIL Mammoth balloon to predilate the bicuspid and severely calcified aortic valve. A 23-mm balloon expanding valve Myval (Meril Lifesciences India Pvt. Ltd) was deployed by standard technique. Postdeployment, there was residual mean gradient of 4 mm Hg with no paravalvular leak [Figure 1].

Discussion

Cardiovascular disease and infectious complications remain the leading causes of death in kidney transplant recipients.[16] Patients with chronic kidney disease (CKD) more often develop premature calcification of the mitral and aortic

Table 1: Serial Creatinine Values

Serum creatinine					
Baseline (mg/dl)	**CT Aortogram (g/dl)**	**Post-CT Aortogram (mg/dl)**	**Postcoronary angiogram (mg/dl)**	**TAVI (mg/dl)**	**POD 1 (mg/dl)**
1.42	1.19	1.21	1.15	1.19	1.17

CT: Computed tomography, TAVI: Transcatheter aortic valve implantation, POD: Post Operative Day

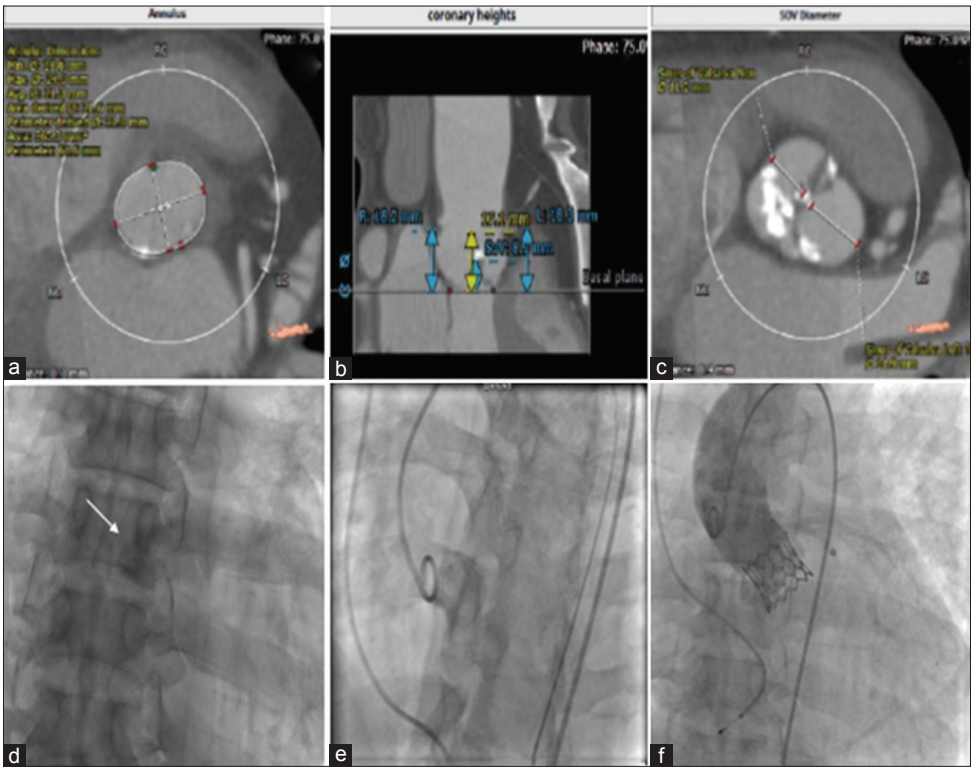

Figure 1: (a) Annulus dimensions, (b) coronary heights, (c) sinus of Valsalva width, (d) fluoroscopic view calcified aortic valve (white arrow), (e) pigtail catheter at noncoronary cusp and (f) final aortogram showing optimally positioning the valve

valve compared to the general population.[15,17] The number of kidney transplant recipients that may require aortic valve heart surgery will increase as their longevity improves, and as the average age of kidney transplant recipients rises. Patients with severe symptomatic AS have a poor prognosis with medical treatment alone. Patients with CKD and transplant recipients experience an increased risk of adverse outcomes after open-heart surgery. Kidney transplant recipients with severe aortic valve stenosis are often at higher risks for open-heart surgical valve replacement due to CKD, potential side effects of immunosuppressive therapy, and related comorbidities.

Data from the US renal data system database indicate that the intrahospital mortality of kidney transplant recipients undergoing valvular heart surgery is 14%, and 2-year mortality after cardiac valvular surgery in post renal transplant patients is 40%.[16] Renal transplantation patients requiring valve replacement have high morbidity and mortality rates due to poor wound healing while on rapamycin. Therefore, these patients have to be considered as high-risk patients.

Recently, TAVI has demonstrated improving survival, quality of life, and functional status in nonoperable patients and has been shown to be a viable option in high-risk patients.[18] TAVI appears to be an effective and safe alternative to conventional surgery for aortic valve and mitral valve replacement in patients with prior renal transplantation. The open surgical procedure in long-term kidney transplant recipients' carries very high infection rates due to prolonged use of immunosuppressive agents. Improvement in kidney function is seen within a short time as in our patients with minimum morbidity following TAVI.

Conclusion

Patients with CKD and kidney transplant recipients experience an increased risk of adverse outcomes after open-heart surgery. Renal transplantation patients requiring valve replacement have high mortality rates.

Infection control and renal protection should be stressed to ensure the safety of cardiac surgery in this patient group, while preoperative renal insufficiency, mitral valve disease, and LV dysfunction are associated with early adverse outcomes.

Establishing the minimum effective dose of immunosuppressant is crucial to prevent postoperative infections and loss of the renal graft.

TAVI is promising to be a viable option in high-risk patients with prior renal transplantation and also appears to be an effective and safe alternative to conventional surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Iung B, Vahanian A. Epidemiology of acquired valvular heart disease. Can J Cardiol 2014;30:962-70.
2. Nkomo VT, Gardin JM, Skelton TN, Gottdiener JS, Scott CG, Enriquez-Sarano M. Burden of valvular heart diseases: A population-based study. Lancet 2006;368:1005-11.
3. Eveborn GW, Schirmer H, Heggelund G, Lunde P, Rasmussen K. The evolving epidemiology of valvular aortic stenosis. The tromsø study. Heart 2013;99:396-400.
4. Mangieri A, Regazzoli D, Ruparelia N, Colombo A, Latib A. Recent advances in transcatheter aortic valve replacement for high-risk patients. Expert Rev Cardiovasc Ther 2015;13:1237-49.
5. Brown JM, O'Brien SM, Wu C, Sikora JA, Griffith BP, Gammie JS. Isolated aortic valve replacement in North America comprising 108,687 patients in 10 years: Changes in risks, valve types, and outcomes in the Society of Thoracic Surgeons national database. J Thorac Cardiovasc Surg 2009;137:82-90.
6. Adams DH, Popma JJ, Reardon MJ, Yakubov SJ, Coselli JS, Deeb GM, *et al.* Transcatheter aortic-valve replacement with a self-expanding prosthesis. N Engl J Med 2014;370:1790-8.
7. O'Brien SM, Shahian DM, Filardo G, Ferraris VA, Haan CK, Rich JB, *et al.* The Society of Thoracic Surgeons 2008 cardiac surgery risk models: Part 2 – Isolated valve surgery. Ann Thorac Surg 2009;88:S23-42.
8. Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP 3rd, Guyton RA, *et al.* 2014 AHA/ACC guideline for the management of patients with valvular heart disease: Executive summary: A report of the American College of Cardiology/American Heart Association task force on practice guidelines. Circulation 2014;129:2440-92.
9. Reardon MJ, Adams DH, Kleiman NS, Yakubov SJ, Coselli JS, Deeb GM, *et al*. 2-year outcomes in patients undergoing surgical or self-expanding transcatheter aortic valve replacement. J Am Coll Cardiol 2015;66:113-21.
10. Kapadia SR, Leon MB, Makkar RR, Tuzcu EM, Svensson LG, Kodali S, *et al*. 5-year outcomes of transcatheter aortic valve replacement compared with standard treatment for patients with inoperable aortic stenosis (PARTNER 1): A randomised controlled trial. Lancet 2015;385:2485-91.
11. Mack MJ, Leon MB, Smith CR, Miller DC, Moses JW, Tuzcu EM, *et al*. 5-year outcomes of transcatheter aortic valve replacement or surgical aortic valve replacement for high surgical risk patients with aortic stenosis (PARTNER 1): A randomised controlled trial. Lancet 2015;385:2477-84.
12. United States Renal Data System. USRDS 2008 Annual Data Report: Atlas of Chronic Kidney Disease and EndStage Renal Disease in the United States. Bethesda, Md: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2008.
13. Abbott KC, Hshieh P, Cruess D, Agodoa LY, Welch PG, Taylor AJ, *et al.* Hospitalized valvular heart disease in patients on renal transplant waiting list: Incidence, clinical correlates and outcomes. Clin Nephrol 2003;59:79-87.
14. London GM, Pannier B, Marchais SJ, Guerin AP. Calcification of the aortic valve in the dialyzed patient. J Am Soc Nephrol 2000;11:778-83.
15. Ureña P, Malergue MC, Goldfarb B, Prieur P, Guédon-Rapoud C,

Pétrover M. Evolutive aortic stenosis in hemodialysis patients: Analysis of risk factors. Nephrologie 1999;20:217-25.
16. Sharma A, Gilbertson DT, Herzog CA. Survival of kidney transplantation patients in the United States after cardiac valve replacement. Circulation 2010;121:2733-9.
17. Hoshina M, Wada H, Sakakura K, Kubo N, Ikeda N, Sugawara Y, *et al.* Determinants of progression of aortic valve stenosis and outcome of adverse events in hemodialysis patients. J Cardiol 2012;59:78-83.
18. Leon MB, Smith CR, Mack M, Miller DC, Moses JW, Svensson LG, *et al.* Transcatheter aortic-valve implantation for aortic stenosis in patients who cannot undergo surgery. N Engl J Med 2010;363:1597-607.