Case Report

Valve-in-valve-in homograft: A case of a repeat transcatheter aortic valve replacement in a patient with an aortic homograft

Kimberly Naden Hollander, Mario Montealegre-Gallegos, Feroze Mahmood
Department of Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA

ABSTRACT

In recent years, the use of transcatheter aortic valve replacement (TAVR) has extended beyond the treatment of native aortic valve stenosis in patients with high surgical risk. TAVR is increasingly being performed for bioprosthetic aortic valve failure, i.e., the valve-in-valve (VIV) procedure. Establishing the success of a VIV procedure can be challenging in these cases. Furthermore, the limited availability of prostheses sizes further complicates the management of these patients. We present an unusual case of a repeat TAVR in a patient who previously had a VIV procedure in an aortic homograft.

Key words: Aortic homograft; Transcatheter aortic valve replacement; Transesophageal echocardiography

INTRODUCTION

Transcatheter aortic valve replacement (TAVR) is increasingly being used for the treatment of severe native aortic valve stenosis in patients with a high surgical risk. TAVR has extended beyond the treatment of native aortic valve stenosis; it has also been performed in some cases of bioprosthetic aortic valve failure, i.e., the valve-in-valve (VIV) procedure. Evaluating the success of a VIV procedure can be challenging, since elevated transvalvular gradients occur frequently after VIV when compared to TAVR in native valves. We present a case of a repeat TAVR in a patient who previously had a VIV procedure in an aortic homograft.

CASE REPORT

A 53-year-old man presented to our institution with increasing shortness of breath. The patient had a history of aortic homograft surgery (21 mm) 16 years previously due to endocarditis, as well as hepatitis C and cirrhosis. He was found to have thickened bioprosthetic aortic valve leaflets with severe aortic stenosis (peak gradient of 93 mmHg and mean gradient of 56 mmHg) and severe aortic regurgitation. Given the patient’s comorbidities, he was not considered a candidate for redo surgical aortic valve replacement, and he underwent urgent TAVR with a SAPIEN 23 mm valve (Edwards Lifesciences Corporation, Irvine, CA, USA). After device deployment, there was an improvement in the hemodynamics with mild residual...
stenosis. Transthoracic echocardiography (TTE) on postprocedure day 3 demonstrated a transaortic gradient that was higher than expected but improved when compared to preprocedure (peak gradient of 57 mmHg and mean gradient of 38 mmHg). The patient noted a significant improvement in his symptoms at 1-month follow-up. A TTE performed 1 year after TAVR showed no significant change.

Two years post-TAVR, the patient returned to our institution with worsening shortness of breath. TTE showed an increase in transvalvular gradients without aortic regurgitation. The patient underwent repeat TAVR with a 23 mm Edwards SAPIEN XT valve. Predeployment transesophageal echocardiography (TEE) showed severely thickened aortic valve leaflets [Figure 1] with severe stenosis (peak gradient of 65 mmHg, mean gradient of 36 mmHg, and valve area of 0.57 cm²) [Figures 2 and 3]. After deployment, TEE showed a well-functioning TAVR with a peak gradient of 55 mmHg and no paravalvular leaks. The patient’s symptoms improved and he was discharged on postprocedure day 3.

DISCUSSION

In patients at high risk of surgery, VIV implantation can be a useful alternative for the management of bioprosthetic aortic valve failure. However, VIV procedures are associated with several technical challenges.[1-4] It has been described that elevated postprocedural gradients (mean gradient of >20 mmHg) occurred in approximately 28% of cases after VIV procedures.[1] Elevated transvalvular gradients occur frequently after VIV when compared to TAVR in native valves, possibly because of underexpansion of the prosthesis inside the surgical bioprosthetic valve.[1-3] This underexpansion is particularly relevant with a small bioprosthesis.[2,4] Given our patient’s small 21 mm aortic homograft, the elevated postprocedural gradients were accepted, knowing that a smaller starting orifice would lead to higher gradients.

In this case, the patient had a repeat TAVR 2 years after the first procedure due to persistently elevated and worsening transvalvular gradients with recurrent symptoms of severe aortic stenosis.

There have been some previous reports of repeat VIV procedures for treating failed surgically implanted valves, but these serial TAVRs were done immediately during the initial VIV procedure when the first valve deployment was not successful.[5,6] Furthermore, this patient had an aortic homograft, which accounts
for only 7% of the surgical valves in the Global VIV Registry.[2] Given the feasibility of VIV procedures, and with high postprocedural gradients being an accepted limitation, cases of patients with prior VIV procedure needing repeat TAVR will likely become more frequent in the future.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES
1. Dvir D, Webb J, Brecker S, Bleiziffer S, Hildick-Smith D, Colombo A, et al. Transcatheter aortic valve replacement for degenerative bioprosthetic surgical valves: Results from the global valve-in-valve registry. Circulation 2012;126:2335-44.
2. Webb JG, Dvir D. Transcatheter aortic valve replacement for bioprosthetic aortic valve failure: The valve-in-valve procedure. Circulation 2013;127:2542-50.
3. Dvir D, Webb JG. Transcatheter aortic valve-in-valve implantation for patients with degenerative surgical bioprosthetic valves. Circ J 2015;79:695-703.
4. Noorani A, Radia R, Bapat V. Challenges in valve-in-valve therapy. J Thorac Dis 2015;7:1501-8.
5. Bagur R, Dumont É, Doyle D, De Larochellière R, Rodés-Cabau J. Transcatheter aortic valve-in-valve-in-valve implantation for a failed xenograft. Ann Thorac Surg 2012;93:647-50.
6. Nuis RJ, Benitez LM, Nader CA, Perez S, de Marchena EJ, Dager AE. Valve-in-valve-in-valve transcatheter aortic valve implantation to treat a degenerated surgical bioprosthesis in a subaortic position. Tex Heart Inst J 2013;40:323-5.