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CLINICAL SPOTLIGHT

Transcatheter Aortic Valve Replacement: A Solution for the Young, Inoperable and Regurgitant

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Transcatheter aortic valve replacement (TAVR) has become an established treatment for patients with severe aortic stenosis and high surgical risk. Ten years of technological advances in valve structure and delivery systems alongside growing operator and centre experience has opened TAVR implantation to an increasingly broad range of patients. The extension to off-label use however needs careful consideration and monitoring. Through discussion of our case involving an inoperable 24-year-old male with severe aortic regurgitation (AR), we highlight the need for an experienced and multidisciplinary team, together with early and extensive patient and family disclosure and engagement, prior to considering any off-label application of TAVR.

Keywords Transcatheter Aortic Valve Replacement (TAVR) • Aortic stenosis • Aortic regurgitation • Off-label indications

Introduction

Transcatheter aortic valve replacement (TAVR) is now established as an important treatment modality for patients with severe aortic stenosis (AS) at high surgical risk. More recently, several off-label applications including valve-in-valve implantation for degenerated aortic bio prostheses [1], have been described in case reports and case series. As valve and delivery systems improve in tandem with operator experience, the indications and criteria for patient selection have become broader. To date, however, severe native aortic regurgitation has generally been considered a contraindication to TAVR [2,3]. We present a patient with severe symptomatic aortic regurgitation who underwent compassionate, off-label TAVR via the subclavian artery using the St Jude Portico Valve (St Jude Medical, St Paul, MN).

Case Report

Our patient was a 24-year-old male with a background of rheumatic heart disease. He had previously undergone surgical aortic and mitral valve repair in 2008 for severe aortic (AR) and mitral regurgitation (MR). At that time, the aortic valve cusps were augmented with autologous pericardial patches and the mitral valve was repaired with the insertion of a 28 mm bioabsorbable ring. Subsequent surveillance transthoracic echocardiography (TTE) showed normal functioning valves with preserved left ventricular (LV) systolic function but his recovery was complicated significantly by recurrent episodes of pericarditis. In 2015, our patient was admitted with six months of progressive NYHA IV dyspnoea. Inpatient TTE showed subtle reduction in overall LVEF at 50% but significant cavity dilation (ESV 201 mL).

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There was focal thickening of the aortic leaflets with fusion of the right and left coronary cusps consistent with previous repair giving rise to moderate AS and severe AR. There was slight thickening of the mitral valve leaflets generating mild to moderate MR. Coronary angiography demonstrated smooth vessels and aortography confirmed severe AR. Salient medical history included HLA-B27 positive spondyloarthropathy and juvenile inflammatory arthritis from which he had sustained severe kyphoscoliosis and fixed flexion deformities of both hips leaving him wheelchair-bound. With such severe deformity and active arthritis, he remained on long-term biological disease-modifying immunosuppressive therapy.

A multidisciplinary review from cardiology, rheumatology and cardiothoracic surgery felt his limited mobility from severe deformity, restrictive lung defect, ongoing and aggressive immunosuppression and subsequent high wound infection risk, together with his previous protracted postoperative recovery portended poor surgical candidacy. Presented at the combined structural heart meeting, TAVR was raised as a potential option and after long discussions with family this was collectively agreed upon. The significant bilateral fixed flexion deformities of the hips precluded transfemoral access and thus TAVR was performed under general anaesthesia via the left subclavian artery. Aortic annulus measurements, including mean diameter and planimetry were performed using CT aorta (Figure 1). The subclavian artery was isolated and prepared for sheath insertion by a vascular surgeon, using standard surgical technique in the middle of a purse string suture. An 18Fr Portico delivery sheath was advanced across the aortic valve over a stiff guidewire. Balloon valvuloplasty was not performed due to the significant aortic incompetence. The St Jude Portico 27 mm aortic prosthesis was deployed in a satisfactory position, 3 mm below the left coronary cusp and 2 mm below the non-coronary cusp (Figure 2). Post-procedure there was trivial paravalvular AR (Figure 3). Pressure gradient across the aortic valve decreased from 40 mmHg to 6 mmHg (Figure 4). Post-procedure TTE showed upper-limits of normal LV cavity size with low normal systolic function (EF=54%) and a well-seated aortic prosthesis with no obvious leak (DPI=0.63, mean gradient of 21 mmHg). One month post-procedure our patient remains well with NYHA II dyspnoea, a TTE largely unchanged from discharge demonstrating a well-seated aortic valve and early improvements in ESV (185 mL).

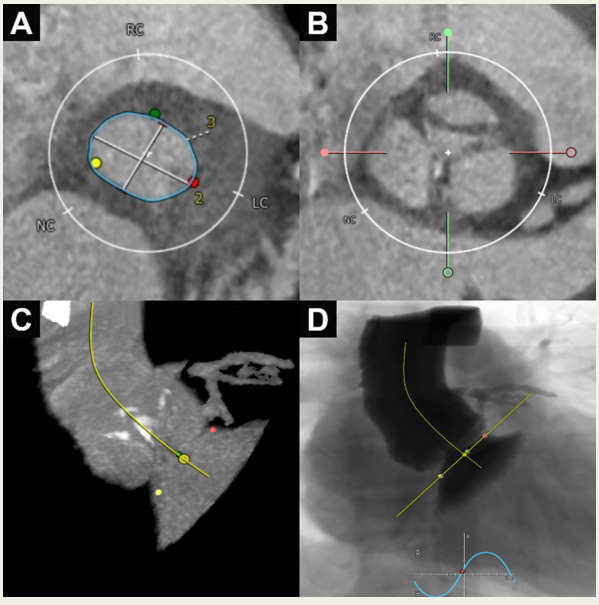

Figure 1 A: CT driven CT annular sizing
B: Aortic Cusps
C: Annular calcification as shown on CT
D: Angle of deployment.

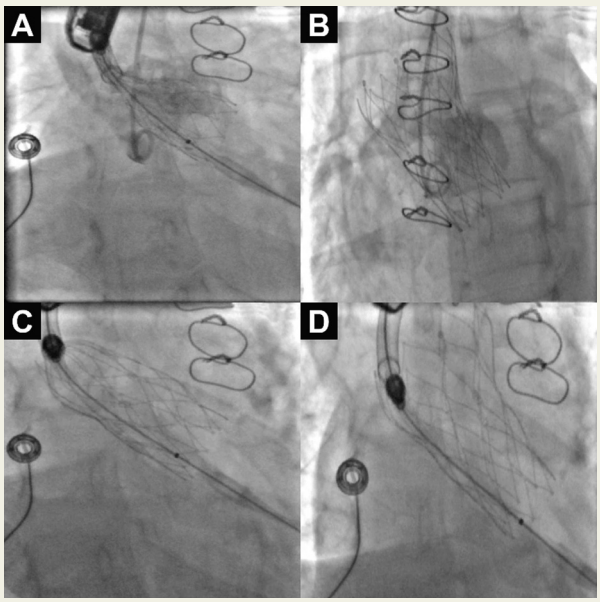

Figure 2 A: Initial placement of aortic prosthesis
B: Positioning of aortic prosthesis post release
C: Deployment of St Jude Portico prosthesis
D: Final release of the St Jude Portico prosthesis.

Discussion

Severe native valve AR has generally been considered a contraindication to TAVR given concerns about valve embolisation due to less pronounced leaflet and annular calcification and larger annular diameters in patients with predominant AR. As described, his significant immobility, ongoing immunosuppression and prior protracted postoperative recovery deemed him unsuitable for re-do valve surgery. In the presence of his symptomatic valvulopathy and >10 year life expectancy, TAVR was considered to be the only viable option. The safety and longevity of TAVR, not only for AR but also in this age group is unknown. To the best of our knowledge, this case has a number of novel aspects; 1) it is the first reported case of TAVR to treat native (albeit repaired), rheumatic AR; 2) it is the first case where a St Jude