Surgical double valve replacement after transcatheter aortic valve implantation and interventional mitral valve repair

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Abstract

Transcatheter aortic valve implantation, as well as interventional mitral valve repair, offer reasonable therapeutic options for high-risk surgical patients. We report a rare case of early post-interventional aortic valve prosthesis migration to the left ventricular outflow tract, with paravalvular leakage and causing severe mitral valve regurgitation. Initial successful interventional mitral valve repair using a clipped edge-to-edge technique revealed, in a subsequent procedure, the recurrence of mitral valve regurgitation leading to progressive heart failure and necessitating subsequent surgical aortic and mitral valve replacement.

Keywords: Surgery • TAVI • MitraClip • Aortic valve replacement • Mitral valve replacement • Valve migration

INTRODUCTION

Aortic stenosis and mitral valve regurgitation are the most frequent valvular heart diseases in western countries. Surgical valve replacement and repair currently represent the ‘gold standard’ for treatment in these pathologies. However, within the last decade, the aging multi-morbid patient population necessitated the introduction of alternative therapeutic options that address the increased perioperative risk in these patients. Therefore interventional protocols, such as transcatheter aortic valve implantation (TAVI) and interventional mitral valve repair have been developed. Although successfully introduced within several clinical trials, the criteria for adequate patient selection for these new therapeutic options remain a subject of intensive discussion [1, 2].

We report here a rare case of a patient primarily treated with TAVI and interventional mitral valve repair, who secondarily underwent successful surgical double valve replacement after failure of initial interventional therapies.

CASE REPORT

An 84-year-old male patient with a history of coronary artery disease and right coronary artery (RCA) stenting was admitted to our university hospital in February 2012 because of progressive dyspnoea and recurring syncopes. Cardiological work-up revealed a grade III severe symptomatic aortic stenosis. Due to relevant co-morbidities (logistic EuroSCORE of 19 points) and severe femoral arteriopathy, he was scheduled for trans-subclavian TAVI. After successful implantation of a CoreValve prosthesis (Medtronic) [Medtronic World Headquarters Medtronic Parkway Minneapolis, Minnesota, USA] (diameter 31 mm) and initial discharge, he was referred back to the hospital because of dyspnoea due to bilateral pleural effusions. Transoesophageal echocardiography (TEE) showed a severe mitral regurgitation (MR), which was subsequently treated by interventional mitral valve repair using the MitraClip (Abbott Vascular, Abbott Laboratories, Abbott Park, Illinois, U.S.A.) and procedurally dependent atrial septal defect (ASD) closure AMPLATZER™ PFO Occluder (St. Jude Medical GmbH, Helfmann-Park 7, Eschborn, Germany).

Two weeks after secondary discharge, the patient developed progressive heart failure in combination with acute renal failure. Immediate echocardiography revealed a moderate-to-severe aortic regurgitation and recurrent severe MR. Valvular defects resulted from a slight but significant aortic valve prosthesis migration towards the left ventricular outflow tract, which had caused aortic paravalvular leakage and partial posterior mitral leaflet detachment (Fig. 1). As a consequence of these findings, the patient was transferred to our cardiac surgery department. Preoperative coronary angiography revealed a progression of the coronary artery disease. Consequently the patient was scheduled for conventional aortic and mitral valve replacement, as well as coronary artery bypass surgery.

The operation was performed via median sternotomy. On initialization of cardiopulmonary bypass, the ascending aorta was opened for exploration of the aortic valve (Fig. 2A). After careful removal of the CoreValve prosthesis, an Edwards Perimount aortic valve prosthesis (diameter 25 mm) was implanted. After vein-grafting of the circumflex coronary artery, the mitral valve was explored via the left atrium and excised with the attached clip. Thereafter, an Edwards Perimount mitral valve prosthesis (diameter 31 mm) was implanted. More recently, the atrial septal occluder was removed prior to direct closure of the resulting septal defect with a single-suture line (Fig. 2B).
Intraoperative echocardiography revealed adequate function of both prostheses and the operation was completed in the usual manner.

During the postoperative phase, the patient recovered well from surgery although hospitalization was prolonged by transient renal failure and recurring pleural effusions. After a month of postoperative care, the patient was discharged from hospital to rehabilitation in a good condition, without signs for heart failure.

At follow-up three months after surgery, the patient was still in a cardiopulmonary stable condition, undergoing additional physiotherapy.

**DISCUSSION**

Several studies have shown that high-risk surgical patients benefit from TAVI, compared with conservative treatment. Nevertheless, this procedure has the potential for serious complications [3]. In high-risk patients requiring aortic valve replacement, TAVI offers a beneficial early postoperative outcome; however, mid-term results in respect of all-cause mortality appear comparable to conventional surgery [4]. Severe paravalvular leakage and malpositioning during TAVI have a reported prevalence of 4–9% and require subsequent valve-in-valve-procedures, valve repositioning or even surgical valve replacement as a bail-out procedure [5].

In this specific case, however, conventional surgery was not performed in an emergency scenario, but as a planned, secondary procedure after failure of the interventional approach. Furthermore there was probably a misinterpretation of the mitral valve pathology following TAVI procedure. Most probably, the migration of the aortic valve into the left ventricular outflow tract caused a direct interaction between the CoreValve prosthesis and the anterior mitral valve leaflet, resulting in severe MR. In this case, given a borderline pre-procedural EuroSCORE, primary patient selection therefore needs to be questioned critically. In particular, it must be considered that a surgical approach addressing the MR would possibly have offered mitral valve repair instead of valve replacement. Moreover, recent data from prospective randomized trials indicate a relevant number of follow-up surgeries after interventional edge-to-edge mitral valve repairs.

Comparable borderline cases should undergo elaborated primary decision-making within a heart team, as recommended by current guidelines. Complex pathologies after failure of an initial interventional approach require careful re-evaluation. Lately, it has been required that team decisions be made transparent to the patient, in order to gain a truly informed pre-procedural consent.

**CONCLUSION**

So far, surgical aortic and mitral valve reconstruction/replacement remain the ‘gold standard’ in patients with aortic and mitral valve diseases.

In conclusion, our case underlines the importance of having an interdisciplinary heart team, consisting of cardiologists and cardiovascular surgeons, for the evaluation of high-risk surgical patients. Any team decision should include an individual therapeutic escalation plan, considering the main intricacies, such as the one reported here.

**Conflict of interest:** none declared.

**REFERENCES**

