



Case Report

Direct Implant of a Transcatheter Aortic Valve Prosthesis for Prosthetic Mitral Valve Endocarditis

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ABSTRACT

We describe the case of a 64-year-old woman presenting with severe prosthetic mitral valve endocarditis 1 year after coronary artery bypass grafting and double valve replacement. Echocardiogram revealed high-pressure gradients through the bioprosthetic MV with a bulky vegetation. As the patient had presented operative difficulties due to severe mitral annular calcification, was in renal failure, and in the absence of any perivalvular involvement, an open-heart surgical catheter-based valve implantation was successfully performed after removal of the infected leaflets, leaving the stent frame and sewing cuff behind. Albeit controversial, this case represents an alternative approach for select high-risk reoperative mitral cases with mitral annular calcification.

RÉSUMÉ

Cet article décrit le cas d'une femme de 64 ans qui a présenté une endocardite sur prothèse mitrale sévère 1 an après avoir subi un pontage aortocoronarien et un double remplacement valvulaire. L'échocardiogramme a mis au jour des gradients de pression élevés dans la bioprothèse mitrale et une végétation volumineuse. Comme la patiente avait souffert de complications opératoires en raison d'une importante calcification annulaire mitrale et qu'elle était en insuffisance rénale, mais que la zone périvalvulaire n'était pas atteinte, une valve a été implantée par cathéter pendant une opération à cœur ouvert, une fois les lames valvulaires infectées retirées; l'endoprothèse et le manchon de suture ont été laissés en place. Bien que cette méthode puisse susciter la controverse, elle offre une solution de rechange dans certains cas, lorsqu'un patient présentant une calcification annulaire mitrale nécessite une nouvelle intervention associée à un risque élevé.

In recent years, a strong trend favouring transcatheter valve interventions has been noted due to their lesser invasiveness, greater tolerability, and excellent short-term outcomes. However, catheter-based mitral valve replacement is still limited by anatomical complexities and other pathologies that may need to concomitantly be addressed. Meanwhile, reoperations for mitral valve conditions remain challenging and can result in operative mortality ranging between 11.1% and 37.5%.¹⁻³ Although catheter-based approaches have selectively been employed,⁴ their use in an adult reoperative context of endocarditis has not previously been reported. We herein describe a successful case where a hybrid,

catheter-based approach was useful in treating a patient for whom a classic reoperative procedure may have been fraught with prohibitive risk.

Case

A 64-year-old woman with a 1-year prior history of aortic valve replacement (Magna Ease #21; Edwards Lifesciences Corporation, Irvine, CA), mitral valve replacement (Epic #29; Abbott, Chicago, IL), coronary artery bypass grafting (LIMA-LAD, ascending aorta-SVG-PDA), and patent foramen ovale closure presented to our emergency department with shortness of breath and productive cough. Her past medical history also included remote Hodgkin's lymphoma treated with chemotherapy and radiation, radiation chondritis, severe mitral annular calcification (MAC), chronic renal insufficiency, type 2 diabetes mellitus on insulin, chronic atrial fibrillation, hypertension, dyslipidemia, hypothyroidism, and permanent pacemaker implantation due to Mobitz type 2 atrioventricular block. During her first cardiac surgery, a conservative-extirpative approach to the circumferential MAC had been

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Ethics Statement: This research was performed according to ethical guidelines at our institution.

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See page 305 for disclosure information.

Novel Teaching Point

- Open surgical catheter-based valve implantation could be an alternative approach for select high-risk reoperative mitral cases with MAC.
- Optimal sizing and positioning of a SAPIEN valve in a mitral position are still controversial and should be cautiously determined by direct measurements.

used, that is, removing enough calcium so that a sizable mitral prosthesis be inserted, yet leaving the bulk of MAC behind and carefully passing large interrupted stiches through the calcium.

The patient developed shortness of breath on exertion and productive cough 10 months after the first surgery. Her symptoms persisted and progressed, and she was admitted with pneumonia and progressive acute on chronic renal failure, requiring dialysis. Echocardiography revealed severe right ventricular dilation with markedly reduced systolic function and severe tricuspid regurgitation, secondary to a large vegetation (size: 2.0×1.4 cm) on the mitral valve, which caused severe mitral stenosis with an 18 mm Hg mean pressure gradient (Fig. 1). Simultaneously, blood cultures revealed coagulase-negative staphylococci, and she was started on intravenous vancomycin. Her Society of Thoracic Surgeons (STS) predicted operative mortality was calculated as $> 30\%$, and an endocarditis heart team discussed her challenging management. Amongst others, the persistent circumferential MAC raised concern for annular rupture at redo operation. Consequently, the heart team agreed that proceeding with a catheter-based valve implantation using a SAPIEN 3 valve (Edwards Lifesciences Corp), after removing the infected leaflet tissue, represented the best risk-benefit approach in her case.

Under general anaesthesia, the right femoral artery and vein were exposed to establish cardiopulmonary bypass (CPB) before redo median sternotomy, in light of the dilated right ventricular and patent grafts. A 30F superior vena cava venous cannula was added for the forthcoming tricuspid repair, optimizing drainage. After antegrade cardioplegic arrest and caval isolation, the right and left atria

were opened. We obtained excellent exposure to thoroughly assess the infected valve. There was full annular coaptation between the sewing cuff and the calcified annulus without evidence of annular endocarditis. Therefore, we decided to use a SAPIEN 3 prosthesis in a valve-in-valve fashion. After removing the entire leaflets and vegetations from the old Epic valve, we confirmed that no tissue was left behind. After covering all in dilute betadine, a #29 SAPIEN 3 valve was implanted to full inflation within the remaining valve rim under direct visualization (Video 1 [\[link\]](#), view video online). The left atrium was closed followed by a tricuspid annuloplasty using a Medtronic Contour 3D Annuloplasty ring 28 mm. Weaning from CPB was easily achieved, and intraoperative transesophageal echo revealed all valves functioning well (Video 2 [\[link\]](#), view video online). During her postoperative course, the patient required continued dialysis but otherwise recovered uneventfully. The postoperative transthoracic echocardiogram showed a preserved ejection fraction and no peri-leakage on the mitral position. There was no left ventricular outflow tract obstruction. The mean pressure gradient through the mitral valve indicated 7.3 mm Hg and mild mitral stenosis was suspected, but the study quality was poor due to early timing after operation. The patient was discharged home on postoperative day 14, and intravenous antibiotics regimes were continued for 8 weeks. Subsequent oral antibiotics were discontinued at 10 months postoperatively, after evidence of normal prosthetic valve function that showed a mean gradient of 4 mm Hg through the mitral prosthesis, white blood cell and neutrophil counts, and c-reactive protein levels. No evidence of recurrent infection has been observed at 1-year follow-up, and the patient no longer requires dialysis.

Discussion

Postoperative mortality after redo mitral valve replacement has hovered between 11.1% and 37.5%.¹⁻³ Onorati et al.² recently analysed the risk factors of operative mortality in redo mitral valve surgery, showing that independent risk factors were iatrogenic injury at re-entry and intraoperative injury of a patent LIMA graft, as well as prolonged cardioplegic arrest and CPB duration. In this case, the circumferential severe MAC and comorbidities including severe clinical presentation, history of chest radiation, and prior

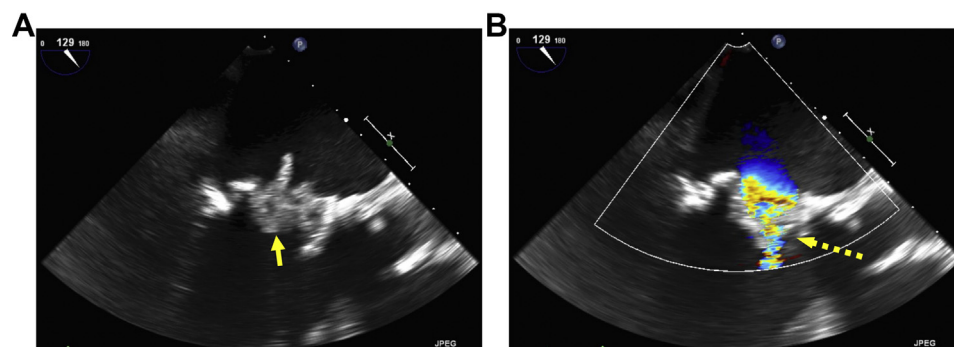


Figure 1. Preoperative 3-dimensional transesophageal echocardiography of the infected mitral valve. (A) Annular calcification can be appreciated and a large vegetation (size: 2.0×1.4 cm) is seen (solid arrow). (B) The prosthetic valve in the diastolic phase was captured. Left ventricular inflow is narrowed by the vegetation attached to the leaflet (dotted arrow).

surgical technical difficulties additionally led this patient to carry a higher risk than calculated. As such, opting for catheter-based mitral open-heart valve implantation over conventional redo mitral valve replacement appeared reasonable to minimize annular disruption, CPB time, myocardial injury, and additional renal injury.

Some concerns around our approach relate to the use of a mitral valve-in-valve approach for prosthetic valve endocarditis. We agree with these concerns and consider having mitigated them. First, we removed all leaflet tissue and left the valve rim to deploy a SAPIEN 3 valve and avoid deterioration of the challengingly MAC. Eventually, the intraoperative cultures other than the vegetation did not show any evidence of bacteria. Considering this case as being at high risk of recurrent infection, we have empirically continued per os antibiotics beyond the initial 8-week intravenous antibiotics regimen.

Secondly, the optimal sizing and positioning of a SAPIEN valve during a mitral valve-in-valve procedure are still controversial. In a meta-analysis, migration accounted for about one-third of technical failure rates, in which the mean incidence of oversized valves ranged between 0% and 20%.⁵ Also, 10%-20% of the SAPIEN valve should lie on the left atrial side when anchoring a SAPIEN valve within the sewing ring of the failed prosthetic valve.⁶ The above concerns were optimally addressed by the use of a direct vision approach in this case.

Follow-up remains limited to 1 year, and longer and careful clinical and echocardiographic follow-up is definitively required.

In conclusion, we believe that the approach described in this article may be of value in some select challenging redo cases of mitral valve endocarditis, particularly in the presence of MAC-related annular difficulties and major patient comorbidities.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2020.03.003>.