The Heart Surgery Forum 2022-5425
26 (2), 2023 [Epub April 2023]
doi: 10.1532/hsf.5425

Online address: http://journal.hsforum.com

Implantation of a Sutureless Valve Into a Stented Prosthesis: An Open Salvage Procedure

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ABSTRACT

Background: A 78-year-old male was admitted to our institute with increasing shortness of breath and decreased exercise tolerance. His increasing symptoms were not relieved with medical management. He had a complex medical history that included aortic valve replacement (AVR). Echocardiography showed a deteriorating aortic bioprosthesis with severe aortic regurgitation.

Method: Intraoperative extraction of this prosthesis proved technically challenging and a valve in valve successfully was implanted as a salvage procedure.

Results: The procedure was successful, and the patient made a full recovery.

Conclusion: Open valve in valve implantation, despite technical difficulties, may be utilized as a salvage procedure.

INTRODUCTION

A standard procedure for symptomatic aortic valve pathology is an AVR. High risk patients may benefit from less invasive transcatheter aortic valve insertion (TAVI).

Sutureless AVR emerged in recent years as an alternative to conventional AVR and TAVI. This involves minimal sewing of the prosthesis into position and has extensively been used in European centers with promising results. To the best of our knowledge, an open intraoperative sutureless valve into a stented valve prosthesis has not been attempted.

CASE REPORT

A 78-year-old male presented to a remote hospital for increasing shortness of breath, which had worsened over the past 6 months. On presenting to our unit, the patient was in acute heart failure with bilateral pleural effusions and pulmonary oedema. He was admitted to the intensive care unit for optimization.

The patient's medical history included an AVR 10 years prior, with a 25mm Edwards PERIMOUNT (Edwards Lifesciences Corporation, Irvine, California, USA) bioprosthetic valve and coronary artery bypass grafting (left internal thoracic artery to left anterior descending coronary artery). The patient also had liver cirrhosis with esophageal varices that recently were banded and a history of malignant hyperthermia. A transesophageal echo (TOE) carefully was introduced with awareness of limited views to avoid manipulation within the esophagus. Angiography showed a patent graft and no further coronary disease.

Echocardiography (echo) showed aortic bioprosthetic failure, severe transvalvular regurgitation, and generalized heart failure mainly affecting the left ventricle. A large paravalvular leak was noted, and therefore a TAVI was deemed inappropriate.

Due to the acute presentation, the decision was made to proceed with urgent in-hospital redo AVR.

Intraoperative TOE confirmed severe valvular regurgitation. The patient was commenced on femoral cardiopulmonary bypass prior to re-sternotomy. Pericardial adhesions were extremely dense and the aorta was calcified toward the root.

The old Magna Ease valve was found to be densely incorporated circumferentially into the aorta to the tips of the commissural columns with no obvious area of paravalvular leak. This confirmed the regurgitation was transvalvular, due to prosthesis failure. We decided that attempting to remove this prosthesis would result in extensive damage to the aortic root, necessitating a Bentall procedure, which in this high-risk patient would be associated with higher morbidity and mortality.

We therefore elected to attempt a valve in valve procedure, using the EDWARDS INTUITY Elite valve system (Edwards Lifesciences Corporation, Irvine, California, USA) as a salvage procedure in an extreme operative situation. The leaflets of the old prosthesis were excised and sent for microbiology, leaving the sewing ring and stents intact and incorporated within the native aorta. A 21mm INTUITY valve was deployed into the previous prosthesis. (Figure 1) The valve deployed was oriented to align with the previous valve commissural stents leaving the coronary ostia clear.

The INTUITY valve sat comfortably into the old prosthesis with the skirt going through the old valve orifice. Valve inflation resulted in covering of the old prosthesis down into the left ventricular outflow tract. This provided satisfactory

Received December 31, 2022; accepted January 30, 2023.

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inflow and covered any suspected area of para valvular leak. (Figure 2) Examination of the deployed valve, coronary ostia, and the overlying aorta thoroughly was done. The patient successfully was weaned off bypass without the need for any support and sinus rhythm was achieved. Intraoperative TOE showed improved left ventricular function, a well-seated aortic prosthesis, and no paravalvular leaks. (Figure 3)

The patient had an uneventful recovery. Three-month follow-up echo showed a well-seated valve and mean gradient of 36 mmHg. The elevated gradient was not associated with any cardiac symptoms and was thought to be related to liver cirrhosis. A seven-month follow up showed mean gradient of 18mmHg, a well-seated prosthesis, and no para-valvular leak. The patient was clinically well. This was a very favorable result over six months postoperative.

DISCUSSION

Standard surgery for severe aortic valve pathology has been the time-tested median sternotomy and AVR. The development of user-friendly and durable bioprostheses has further improved the results of this operation. However, with older and more challenging patients nowadays, in terms of co-morbidities, the risks associated with standard AVR have risen, more so in re-operations.

Therefore, modifications to standard AVR have been developed to reduce risks at first time and re-operation procedures. One modification is stentless bioprostheses, which has shown enhanced hemodynamic performance, potential longevity [Mohammadi 2012; Mazzola 2012], and has been used in patients under 60 years and in adult congenital aortic valvular stenosis [Desai 2011].

Another alternative is TAVI, although long-term results are unknown, particularly in patients with minimal contra-indications to open AVR. TAVI is particularly interesting in higher risk redo patients [Piazza 2011; Kapetanakis 2011].

An evolving technique is sutureless aortic valve prostheses, with promising results. Ease of implantation, reduction in cross-clamp time, and overall operative time have made them an attractive alternative to conventional AVR. However, their use in redo situations is rare. Gariboldi et al. reported implantation in a re-operation scenario. An INTUITY sutureless valve was implanted into a stentless freestyle (Medtronic Inc, Minneapolis, Minnesota, USA) bioprosthesis in a patient with severe aortic stenosis with extensive aortic root calcification involving the coronary ostia [Gariboldi 2013].

In our case, we successfully implanted an INTUITY valve into a stented bioprosthesis, which technically is more challenging, and to the best of our knowledge has never before been reported. This was an unplanned salvage procedure in a difficult operative scenario. Key points that allow for successful implantation include a need for the previous bioprosthesis to be 25mm or more to accommodate annular size restriction, due

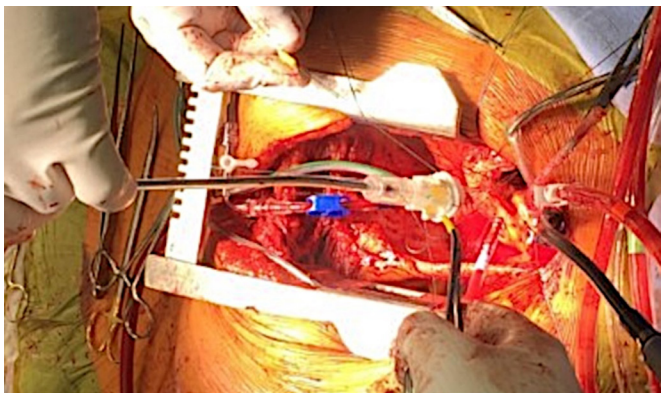

Figure 1. Deployment of the Edwards INTUITY sutureless valve

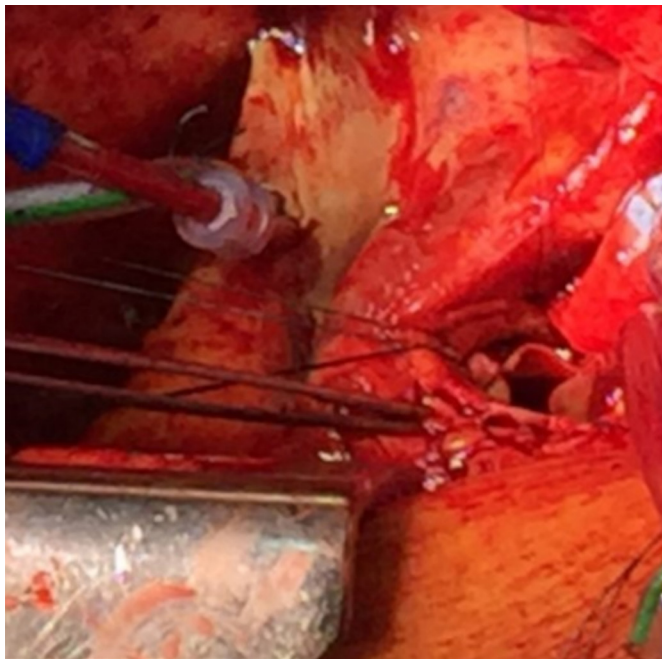

Figure 2. INTUITY sutureless valve in situ

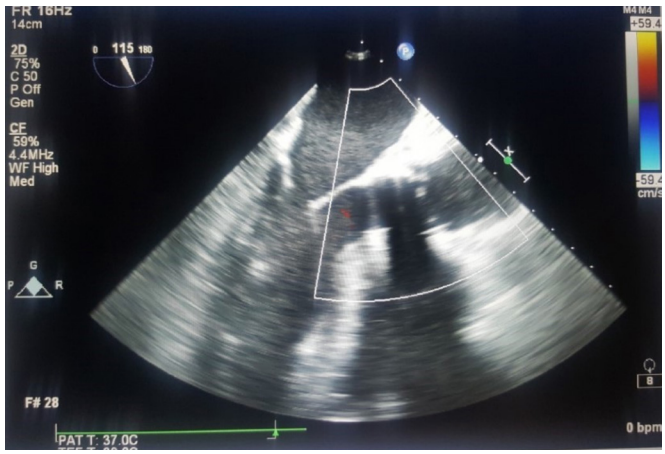

Figure 3. Postoperative echocardiogram valve in valve, showing no aortic regurgitation or paravalvular leak

to the previous sewing ring. The previous valve leaflets should be excised as closely as possible to the sewing ring to increase annular size. Valve deployment should be oriented to align with the previous commissural stents, ensuring adequate secure seating of the new valve. The coronary ostia are inspected, ensuring they are clear prior to deployment. Once the new valve is in place, deployment is similar to first-time operations. Retrograde cardioplegia was given to ensure coronary ostia back bleeding.

Due to the complex root anatomy in this case, it would have been nearly impossible to perform a standard redo AVR or a Bentall procedure, therefore an open INTUITY valve in valve was elected. Implantation was fast, simple, and provided an excellent alternative to complex root reconstruction with good immediate and midterm results [Kocher 2013]. We would expect long-term results to be similar to commonly used Edwards Lifesciences bio prostheses. However, given the technique has not previously been reported, this remains to be seen.

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