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CASE REPORT

Technical Feasibility Does Not Guarantee Clinical Improvement: A Word of Caution for Valve-in-Valve Procedures in Small Surgical Prosthesis

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Abstract

Background: The reoperation of old and frail patients with small tissue valves is a still challenging topic in cardiac surgery.

Case summary: An 85-years-old patient who underwent an aortic valve replacement (AVR) with a Mitroflow 21 mm and single coronary bypass operation 6 years ago, presented again dyspnea NYHA II-III. The echo showed a restenosis of the tissue valve and a mean gradient of 40 mmHg.

Because of age, frailty and calculated perioperative risk, the patient was evaluated for a transcatheter valve-in-valve implantation (ViV).

Due to the small inner diameter of the 21 mm Mitroflow, only a transfemoral (TF) 20 mm Edwards Sapien prosthesis was recommended. The TF-approach was impossible due to peripheral artery disease (PAD).

Therefore, we decided to perform an off-label procedure with an Edwards Sapien 20 mm TF-prosthesis through a transapical-(TA)-approach.

The transapical transcatheter aortic valve implantation (TA-TAVI) was performed successfully without any technical complication, but was damped by the fact, that the invasively measured peak-to-peak gradient was 21 mmHg and echocardiography revealed a peak gradient of 16 mmHg.

Discussion: ViV in patients with small surgical tissue valves (SSTV) is technically feasible, but we have to pay attention to postoperative hemodynamic and clinical improvement.

Introduction

The reoperation of a degenerated SSTV is challenging for standard cardiac surgery as well as for TAVI. Although it is technically feasible to perform a TAVI in a degenerated SSTV, we are still dealing with the problem of the high postoperative gradients.

Use of a SSTV frequently ends up in postoperative higher gradients, due to the small inner diameter and consecutively smaller aortic valve area. Additionally, there are significant varieties between the different companies (Table 1).

This case report points out the problem of TAVI in degenerated SSTV.

Case Description

Six years after surgical AVR with a 21 mm Mitroflow bioprosthesis and concomitant bypass surgery an 85-years-old female patient developed a restenosis of the aortic valve prosthesis. The AVPmean was 40 mmHg and AVVmax was 4.4 m/s with preserved left ventricular function.

Because of the age, frailty and calculated perioperative risk of 38.7% logistic EuroScore and 15% EuroScore II the patient was evaluated for a ViV.

The inner diameter of the Mitroflow is 17 mm, therefore a 20 mm Edwards Sapien Valve is suggested in a TF-approach.

Due to small iliac vessel diameter and PAD a TF-approach was impossible in this patient. A transaortic ap-

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Table 1: Significant varieties of SSTV between different companies.

Aortic bioprosthesis	Labelled size (mm)	Inner diameter (mm)	External diameter/incl. sewing ring (mm)
Edwards Magna Ease	19	18	24
Edwards Magna	19	18	24
Edwards Perimount	19	18	26
Medtronic Mosaic	19	17.5	25
Medtronic Mosaic Ultra	19	17.5	24
Sorin Mitroflow	19	15.4	21
SJM Epic Supra	19	19	25
Edwards Magna Ease	21	20	26
Edwards Magna	21	20	26
Edwards Perimount	21	20	28
Medtronic Mosaic/HancockII	21	18.5	27
Medtronic Mosaic Ultra / HancockII Ultra	21	18.5	26
Sorin Mitroflow	21	17.3	23
SJM Epic Biocor	21	19	25
SJM Epic Biocor Supra	21	21	28

proach would be beneficial for the patient due to the redo situation and the prior CABG, with two venous grafts anastomosed to the ascending aorta. A transsubclavian approach was not possible due to the small diameter of the subclavian vessel. Therefore, we decided to perform an off-label implantation of a TF-20 mm Sapien prosthesis through a TA-approach.

The setting was similar to usual TA-TAVI, except that use of the Sapien 20 mm TF-device for TA-approach.

The procedure was performed in general anesthesia in the operation room with the use of a C-arm. The TF-sheath was introduced into the left ventricle through the apex. After pre-ballooning, the prosthesis was implanted, attended by angiography.

The TAVI was performed successfully without any technical complication. However, the excellent placement of the valve prosthesis with no paravalvular leak, was damped by the fact that the invasive measured peak to peak gradient was 21 mmHg and echocardiography revealed a peak gradient of 16 mmHg.

The patient was extubated within the first postoperative day and the postoperative course was uneventful.

The follow up on echocardiography is shown in Table 2.

Table 2: Echocardiography Follow up.

	Pre-operative	Discharge	1 YFU
AV Vmax	4.4 m/s	3.8 m/s	3.3 m/s
AV Pmean	40 mmHg	37 mmHg	27 mmHg
AV Ppeak	70 mmHg	57 mmHg	45 mmHg
LVEF	55%	55%	45%
NYHA	II-III	II	II-III

Conclusion

AVR in patients with small aortic roots or annuli is challenging, especially for inexperienced surgeons. To avoid a more complex aortic root annuloplasty to enlarge the native aortic annulus, many surgeons tend to rather implant smaller aortic valves. By offering SSTV with promising gradients, the industry was providing a comfortable and satisfying solution. Therefore, root enlargement surgery plays a minor role.

Due to the promising developments and longer durability of bioprosthesis, they were used more generously even in younger patients.

However, life expectancy is increasing and we are going to face a growing number of patients with degenerated SSTV.

With the implantation of a SSTV, several problems have to be addressed.

There might be a, at least moderate, patient-prosthesis-mismatch (PPM) immediately after surgery, regarding the increasing number of obese patients with small native annulus size and rather big body surface area (BSA).

Additionally, if the tissue valve shows signs of degeneration a ViV might be feasible, but ending up with again a smaller aortic valve area and a higher postoperative gradient with missing clinical or haemodynamic improvement.

Regarding the presented case, the patient had a BMI of 27 and a BSA of 1.97 m^2, requiring a Mitroflow valve size of 25 mm to avoid a PPM. So, with receiving a 21 mm Mitroflow the patient already had a moderate PPM after the first operation. With the ViV therefore it was unlikely to achieve an improvement of the symptoms.

In literature a couple of novel approaches have been described to overcome these problems interventionally: Recent case series reported experience with a CoreValve placed supra-annular in the bioprosthesis with a serious increasing risk of coronary obstruction [1].

Other studies describe a high pressure ballooning of the SSTV with consecutive cracking of the prosthesis ring, but these procedures are still experimental bail out procedures with small caseload and have no evidence in larger clinical trials [2,3].

However, in reflection of this case we should not end up with more technical experiments but come back to our surgical roots. We have to avoid the implantation of SSTV, especially in younger patients, by all means.

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