

How should I treat a severely symptomatic, high-risk female patient with degenerated mitral (Carpentier-Edwards porcine) and aortic (Sorin Mitroflow) bioprostheses?

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The concluding section "How did I treat?" together with the complete references and the accompanying supplementary data are published online at: http://www.pcronline.com/eurointervention/81st_issue/207

CASE SUMMARY

BACKGROUND: An 83-year-old woman was referred to our dedicated out-patient clinic for evaluation of the feasibility of transcatheter mitral valve-in-valve implantation. She was heavily symptomatic for dyspnoea, and was not a candidate for conventional surgery (logistic EuroSCORE 54.27%). The pre-procedural evaluation confirmed the presence of a severely degenerated 27 mm Carpentier-Edwards porcine mitral bioprosthesis, and revealed the presence of a severely degenerated, malfunctioning 21 mm Sorin Mitroflow aortic bioprosthesis.

INVESTIGATION: Clinical assessment, echocardiography, cardiac catheterisation including coronary angiogram and aortography during balloon aortic valvuloplasty (BAV), cardiac CT.

DIAGNOSIS: Structural valve degeneration of the mitral bioprosthesis causing severe mitral stenosis and moderate to severe mitral regurgitation. Structural valve degeneration of the aortic bioprosthesis causing severe aortic stenosis and severe aortic regurgitation. Tricuspid regurgitation. Pulmonary hypertension. Chronic renal failure. Patency of the coronary arteries during BAV.

TREATMENT: Staged transapical mitral valve-in-valve implantation with a 26 mm Edwards SAPIEN valve and percutaneous aortic valve-in-valve implantation with a 23 mm Medtronic CoreValve.

KEYWORDS: aortic valve disease, mitral valve disease, transcatheter aortic valve implantation

PRESENTATION OF THE CASE

An 83-year-old woman with a malfunctioning mitral bioprosthesis was referred to our dedicated out-patient clinic for evaluation of the feasibility of transcatheter mitral valve-in-valve implantation. In 2000 the patient had undergone triple valve surgery: mitral valve replacement with a 27 mm Carpentier-Edwards porcine valve (Edwards Lifesciences, Irvine, CA, USA), aortic valve replacement with a 21 mm Mitroflow[®] valve (Sorin Group, Milan, Italy) and De Vega tricuspid annuloplasty. She had chronic renal failure, and was heavily symptomatic for dyspnoea. Transthoracic echocardiography confirmed the presence of a marked structural deterioration of the mitral bioprosthesis, causing severe stenosis with a mean transprosthetic gradient of 17 mmHg, and moderate to severe regurgitation. The examination also revealed the presence of a severe structural degeneration of the aortic bioprosthesis: the mean transprosthetic gradient was 48 mmHg, the aortic valve effective orifice area was 0.5 with 3+/4+ aortic regurgitation. The patient had severe pulmonary hypertension (pulmonary artery systolic pressure was 70 mmHg) and moderate to severe tricuspid regurgitation. The left and right ventricular function was normal. The logistic EuroSCORE I was 54.27%, due to the following: female gender, creatinine >2, pulmonary hypertension, previous cardiac surgery, and "other than isolated CABG". The STS score was not available for a double valve procedure. The STS score for the mitral procedure alone was 16.43%. Despite the fact that the patient appeared undeniably fragile, she was still active and independent, and desired to be treated and to return to the normal life that she had conducted until recently.

The patient was brought to the attention of our institution's TAVI team and, although all the team members had the perception that she deserved to be treated, the risk of a conventional surgical procedure was judged unacceptable. On the other hand, the presence of

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a severely degenerated, malfunctioning 21 mm Mitroflow bioprosthesis in the aortic position dampened the enthusiasm for a double valve-in-valve procedure. In fact, the nominal internal diameter of this surgical valve, as provided by the manufacturer, is 17.3 mm: this would expose the patient to a significant risk of underexpansion of the transcatheter prosthesis, and to a high probability of significant post-procedural patient-prosthesis mismatch¹. Moreover,

there is a known risk of coronary ostial occlusion when performing a valve-in-valve procedure inside a Mitroflow bioprosthesis².

Should this lady be considered for optimal medical therapy? Or should the risk of conventional surgery be accepted, considering the high degree of independence and the good performance status that the patient had experienced until recently? Or, finally, should transcatheter therapy be attempted?

How would I treat?

THE INVITED EXPERTS' OPINION

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This case presents a clinical dilemma and we share concerns similar to those of the authors. In the balance is the very high risk of the procedure due to comorbidities with a EuroSCORE of 54.27% against very poor prognosis with medical treatment³. There are three important decisions to be made:

1. Whether valve-in-valve (VIV) is appropriate?
2. If yes, then which route?
3. What sequence of implantation?

Considering the patient is 83 years old and was independent up until a few weeks before presentation makes us err towards performing a valve-in-valve (VIV) procedure. Further, both the valves are stenotic and regurgitant, and hence neither medical management nor balloon valvuloplasty will relieve the patient of her symptoms and in fact may worsen them^{4,6}. VIV is the only viable option available for her treatment.

We would use the SAPIEN XT (Edwards Lifesciences) as the device for both aortic and mitral VIV but the CoreValve[®] Evolut[™] (Medtronic Inc., Minneapolis, MN, USA) could be used for the aortic position^{4,5}. To reduce the procedural complications and improve the chances of success, we would propose the following two options for this patient.

Depending on the suitability of the femoral arteries, two options are available, namely:

Option 1 (preferred)

If the femoral arteries are suitable (>6 mm, with minimal calcification, angulation and tortuosity) for a 23 mm SAPIEN XT implant

then we would perform a transfemoral (TF) VIV with a 23 mm SAPIEN XT using the NovoFlex+ Transfemoral System (Edwards Lifesciences).

We would place guidewires in the coronary ostia if the aortic root is narrow to provide access to them in case of obstruction. The coronary obstruction incidence is <3% but the feasibility of using a 23 mm SAPIEN XT to treat a 21 mm Mitroflow has been reported^{3,4}. Following this, an antegrade VIV procedure for the mitral valve using a NovoFlex+ and a 26 mm SAPIEN XT should be performed through a transseptal puncture utilising the femoral venous access. The feasibility of this approach has also been demonstrated^{7,8}.

As both the valve sizes are known and are visible under fluoroscopy, selection of the SAPIEN XT as per the true internal diameter (ID) and placement in the correct position can be performed using available guidance^{9,10}. The patient does not require preoperative cardiac CT with the associated risk of renal injury or intraoperative echo, and the procedure can be performed under sedation with fluoroscopic guidance alone^{4,10}.

Option 2

If the femoral arteries are not suitable for a 23 mm SAPIEN XT then a double VIV procedure should be performed through the transapical (TA) approach using the Ascendra+ System (Edwards Lifesciences). The procedure would be performed under general anaesthesia, but care should be taken to minimise trauma from rib spreading and to provide excellent analgesia postoperatively¹¹. The aortic bioprosthesis should be treated first with a 23 mm SAPIEN XT using the same

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technique as above, followed by placement of a 26 mm SAPIEN XT in the mitral position. This sequence allows easier placement of an aortic VIV, as crossing the aortic valve through the LVOT is challenging once mitral VIV has been performed¹².

There is a risk of high post-procedure gradients in the aortic position but, considering her level of activity, eliminating

regurgitation should be clinically beneficial as observed in large series^{3,4,11}.

Conflict of interest statement

V. Bapat is a consultant for Edwards Lifesciences, Medtronic Inc., and St. Jude Medical. R. Attia has no conflicts of interest to declare.

How would I treat?

THE INVITED EXPERTS' OPINION

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A cardiac CT scan would be required before deciding upon the strategy in order to show the feasibility of transfemoral TAVI and the distance between the valve and the coronary arteries and the size of the Valsalva sinuses.

The final decision is usually that of the “Heart Team” in such a patient who is not sufficiently represented in the sample population from which any surgical risk score assessment was built. Since the patient seems to be active and willing to undergo a procedure, an intervention should be considered.

According to the description, surgery seems to be very high risk; thus, TAVI is the only alternative to medical therapy.

Performing valve-in-valve implantation in aortic Mitroflow bioprostheses is challenging and risky³. However, it may be considered if TAVI is the only option and if the height of the coronary arteries is sufficient and/or if the Valsalva sinuses are not too small. A useful additional step could be to perform aortography during balloon aortic valvuloplasty (BAV) in order to evaluate the risk of coronary occlusion. Performing BAV in a degenerated left-sided bioprosthesis should usually be avoided but, in such a case, the risk-benefit ratio could plead in favour of this procedure.

There are two options for the approach for TAVI:

The first one is the transapical approach (TA), which would allow treatment of both valves. However, it would be regrettable to pursue this approach if the procedure is stopped after BAV. In addition, it carries the risk of the inherent complications in such a fragile

patient and the suboptimal haemodynamic performance of balloon-expandable prostheses, which are necessarily used during TA.

The alternative would be first to perform the transseptal puncture, leaving the sheath in the left atrium, and then to perform transfemoral implantation of the aortic valve. A small CoreValve (23 mm, Medtronic) would probably be the ideal option, firstly because it could be retrieved during deployment if hypotension occurs suggesting the possibility of coronary occlusion, and secondly because the supra-avalvular valve function is likely to provide better final haemodynamics than a balloon-expandable valve¹³. No doubt the residual gradient will be higher than expected but this would certainly be sufficient in such a patient.

If the aortic procedure is successful, a transseptal mitral “valve-in-valve” procedure could then be performed¹⁴. A balloon-expandable prosthesis could be used after careful sizing of the inner diameter of the valve. At first glance a 26 mm SAPIEN XT would probably fit.

Our preference would be for the second option. The TA approach is still valid and may even be the only option if the diameter of the femoral arteries contraindicates a femoral approach.

Conflict of interest statement

D. Himbert is a consultant and proctor for Edwards Lifesciences and Medtronic Inc. A. Vahanian is a consultant for Abbott Vascular, Medtronic Inc., and Edwards Lifesciences. The other authors have no conflicts of interest to declare.

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