Acta Clin Croat (Suppl. 1) 2024; 63:86-89
doi: 10.20471/acc.2024.63.s1.16

Case Report

VALVE-IN-VALVE IMPLANTATION GONE SOUTH: A CASE REPORT

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ABSTRACT – Valve-in-Valve (ViV) procedures for failed surgical bioprostheses are becoming increasingly common. We present a case of a 73-year-old male patient with significant comorbidities who underwent a primary transcatheter aortic valve implantation (TAVI) with an Evolut 29 mm (Medtronic, Minneapolis, MN, USA) valve. This TAVI-prosthesis implantation failed due to the inability to fix the valve at the appropriate height to achieve an optimal hemodynamic result. The valve had to be snared and pulled into an adequate position and was then fixed by an implantation of another TAVI-prosthesis (29 mm Sapien S3, Edwards Lifesciences, Irvine, CA, USA) with optimal final result. The patient was discharged after significant clinical improvement and without further complications.

Key words: *structural interventions, transcatheter aortic valve replacement, complications*

Introduction

Past decades have witnessed a significant increase in implantation of bioprosthetic valves instead of mechanical protheses. However, bioprosthetic valves have a definite durability, which is determined by valve degeneration and ultimately failure, mostly as dominant regurgitation[1,2]. Since these patients are often not acceptable surgical candidates due to age and developing comorbidities, transcatheter aortic valve implantation (TAVI) has been used increasingly to treat the failed surgical bioprosthesis, as a valve-in-valve (ViV) procedure. Several technical aspects are critical and may limit the success of this method, such as limited space in the aortic root (with the possibility of coronary obstruction) and more severe prosthesis-patient mismatch (with elevated residual gradients)[3].

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Case report

A 73-year-old male patient with a history of aortic bioprosthetic valve implantation 15 years ago was evaluated for severe dyspnoea and heart failure (BNP 2207 pg/ml, UNL 150 pg/ml) due to massive aortic regurgitation of the degenerated valve. The left ventricle showed significant dilation and reduced systolic function (EF 35%). Comorbidities included chronic renal failure, renal anaemia on transfusions, type-2 diabetes mellitus and severe form of Parkinson's disease. The case was discussed in the heart team and the decision was made for a valve-in-valve percutaneous implantation of a TAVI prosthesis, due to clearly increased surgical re-do risk (primarily with respect to the advanced neurological condition, which is not reflected in the usual scores).

The procedure was performed under local anesthesia and i.v. sedation via right femoral arterial access. Aortography was performed, confirming the severe

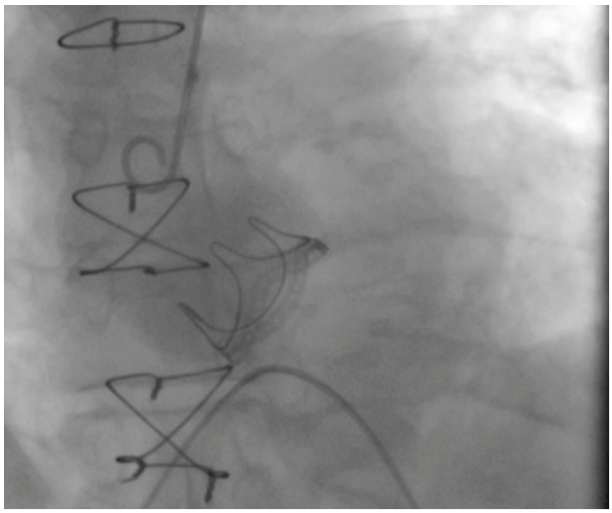

Figure 1. Preprocedural AR (Perimount 27 mm)

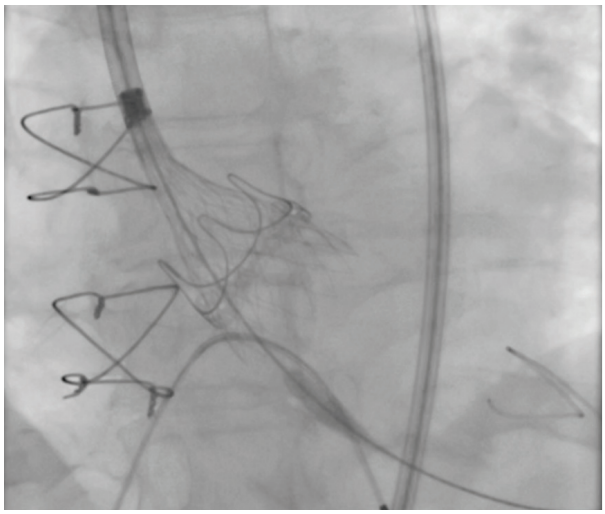

Figure 2. Positioning of the Evolut 29mm prosthesis in degenerated aortic bioprosthetic valve.

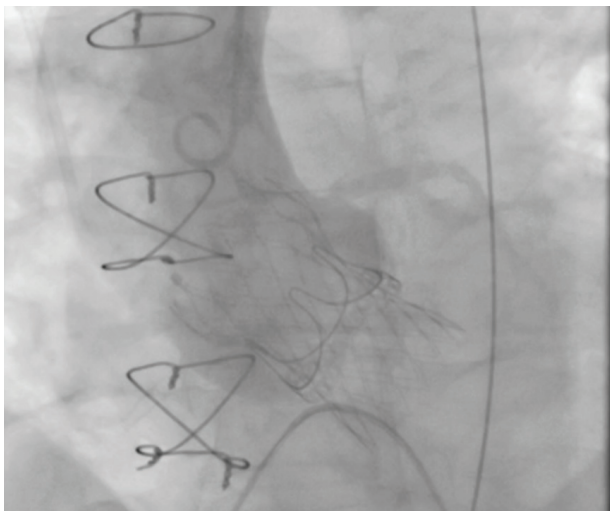

Figure 3. Migration of the Evolut 29 mm prosthesis into the left ventricle and severe AR.

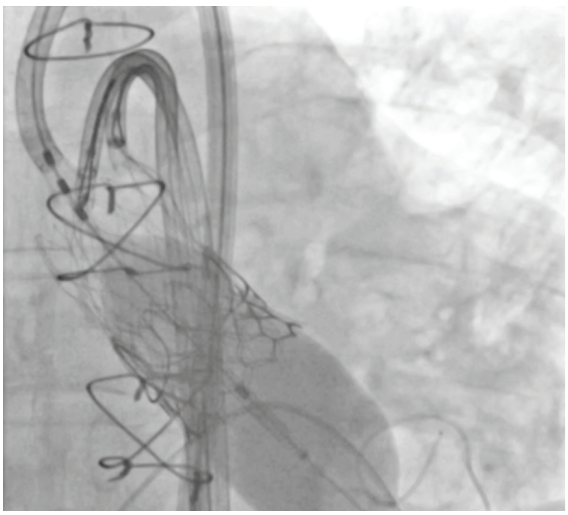

Figure 4. Simultaneous Sapien S3 29 mm TAVI-implantation and pulling of the Evolut prosthesis in the direction of the aorta by double snare engagement using Agilis sheaths.

aortic regurgitation (Figure 1). Based on the size of the surgical bioprosthetic valve (Carpentier-Edwards Perimount 27mm, Edwards Lifesciences, Irvine, CA, USA), an Evolut 29 mm (Medtronic, Minneapolis, MN, USA) valve was selected, using the sizing valve-in-valve app developed by Vinayak Bapat. The degenerated valve was easily passed and a preformed Amplatz Super Stiff (Boston Scientific, Marlborough, MA, USA) wire was placed in the left ventricle. The Evolut prothesis was advanced directly retrogradely over the bioprosthetic valve and easily positioned within the pre-existing valve ring (Figure 2). However, multiple releases and recaptures of the Evolut prosthesis were necessary, as it failed to achieve an adequate position and height due to deficient anchoring of the pre-existing valve frame. After several attempts the valve had to be released and migrated deep in the left ventricle with a resulting severe aortic regurgitation (Figure 3).

Additional arterial access via the left femoral artery was obtained. At first, a single snare was advanced

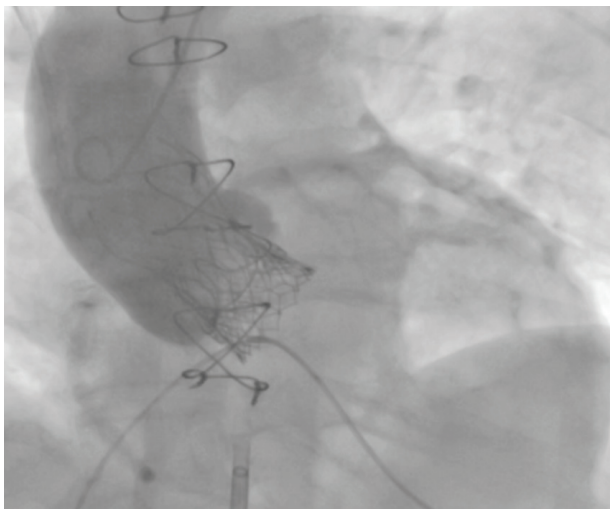

Figure 5. Optimal position of both TAVI prostheses and absence of AR.

and captured one of the Evolut valve frame loops. It was not possible to achieve adequate repositioning of the prosthesis by asymmetrical pulli on just one of the loops. An additional arterial access was obtained via the left femoral artery and two long steerable Agilis NXT sheaths (Abbott, Minneapolis, MN, USA) were advanced to support both Evolut loops being engaged with two separate snares. After several attempts, it was possible to pull the prosthesis in the direction of the aorta, achieving an optimal implantation height with no residual regurgitation; however, upon releasing the pull on both snares, the valve repeatedly migrated back into the ventricle, so that no stable result was possible.

The decision was then made to exchange the access sheath in the right femoral artery for an 16F Edwards sheath. A 29 mm Sapien S3 TAVI-prosthesis was advanced and finally implanted in the Evolut prosthesis, while pulling the latter in an adequate position simultaneously (Figure 4). After the implantation of the Sapien S3, both TAVI-prostheses remained at an optimal height and no AR could be documented (Figure 5).

The access sites were successfully percutaneously closed with an 18 F Manta device (Teleflex, Morrisville, USA) and two 8F Angio-Seal devices (Terumo, Somerset, USA). The procedure was completed without further complications.

The patient reported a striking improvement of dyspnoea and exercise capacity immediately following the procedure. The follow-up echocardiographic evaluation confirmed the optimal function of the prosthesis with no AR. The heart failure medication was optimized, and the patient recovered completely. He was discharged without symptoms on 10th post-procedural day.

Discussion

The exact cause of the failure of the first Evolut prosthesis to engage the bioprosthetic valve and stay in adequate position and height remains elusive. We still consider the choice of the initial TAVI-prosthesis for this ViV-procedure to be appropriate, based on proper sizing (ViV-app) as well as consideration of the advantages of the supra-annular design of the self-expandable Evolut prosthesis with benefits regarding less prothesis-patient-mismatch and residual gradient issues. The most probable cause was the complete lack of calcium within the smooth degenerated bioprosthetic valve which would allow for this prosthesis to be fixed in the existing ring. Only after the optimal position was achieved by pulling symmetrically on the Evolut prosthesis, it was possible to anchor it with an additional balloon-expandable Sapien S3 valve.

Conclusion

This case demonstrates a rare scenario of inability for stable positioning of self-expandable TAVI-valve in pure AR failed surgical bioprothesis fixed by going "outside the box" and applying unusual catheter techniques to achieve a final optimal result.

References

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Sažetak

KAD IMPLANTACIJA VALVULE U VALVULU KRENE PO ZLU – PRIKAZ SLUČAJA

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Učestalost postupka implantacije valvule u valvulu (valve-in-valve, ViV) kod degeneriranih kirurških bioproteza posljednjih je godina sve učestalija. Ovdje prikazujemo slučaj 73-godišnjeg muškog bolesnika sa značajnim komorbiditetima i prohibitivnim kirurškim rizikom, kod kojeg je primarno pokušana implantacija transkateterske aortne valvule (TAVI) primjenom Evolut 29 mm (Medtronic, Minneapolis, MN, USA) proteze. Implantacija ove proteze nije bila uspješna zbog nemogućnosti fiksiranja valvule na adekvatnoj poziciji unutar anulusa s optimalnim hemodinamskim rezultatom. Dislocirana valvula je zahvaćena omčama i povučena na adekvatnu poziciju te je ovdje fiksirana implantacijom još jedne TAVI-proteze (29 mm Sapien S3, Edwards Lifesciences, Irvine, CA, USA) s optimalnim konačnim rezultatom. Bolesnik je otpušten u klinički značajno poboljšanom stanju i bez daljnjih komplikacija.

Ključne riječi: *strukturne intervencije, transkateterska zamjena aortnog zaliska, komplikacije*