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Case Report

Transcatheter Aortic Valve in Valve Replacement with Transseptal Wiring: A Case Report

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Abstract

Valve in valve procedures within transcatheter aortic valve replacement therapy are especially challenging when it comes to crossing trough the degenerated bioprosthesis. We discuss the case of a 58-year-old man, with a degenerated 25 mm size bioprosthesis (CE Perimount 2800, Edwards Lifesciences, Irvine, California), who was admitted to our department for transcatheter aortic valve replacement. Despite successful guidewire passage and balloon predilatation, we were not able to implant the new transcatheter heart valve. Choosing another cusp for guidewire passage was only possible after transseptal puncture and antegrade wiring. Repeat balloon valvuloplasty and transcatheter aortic valve replacement was done after successful externalisation of the guidewire from traditional femoral route. This case illustrates that antegrade–retrograde technique can also be useful as a bailout solution in an uncrossable aortic bioprosthesis.

Keywords: Transcatheter Aortic Valve Replacement; Valve in Valve Procedure; Transseptal Puncture; Case Report

Abbreviations: TAVR: Transcatheter Aortic Valve Replacement; SAVR: Surgical Aortic Valve Replacement; NYHA: New York Heart Association; VIV: Valve-In-Valve; LBBB: Left Bundle Branch Block

Introduction

Transcatheter aortic valve replacement (TAVR) for degenerated surgical bioprosthesis can pose several technical challenges including difficult valve crossing.

Antegrade transseptal approach was utilized in the first human case of TAVR, it was not only used in the early phase of this intervention, but also in case of complex valve-in-valve TAVR [1-3]. Various challenges with the antegrade transseptal approach including procedural complexity, need for atrial septal crossing, and potential for injury to the mitral valve apparatus led to it to being supplanted by other approaches.

Case Description

Patient Information

The 56-year-old man had a history of hypertension, type two diabetes mellitus, paroxysmal atrial fibrillation, and multiplex surgical interventions due to lumbar disc herniation. In 2011, he went through surgical aortic valve replacement (SAVR), for severe aortic valve stenosis, during which a 25 mm size bioprosthesis (CE Perimount 2800, Edwards Lifesciences, Irvine, California) was used.

Clinical Findings and Diagnostic Assessment

In 2022, the patient was hospitalized due to reduced functional capacity and heart failure (New York Heart Association (NYHA) Class III). Transthoracic echocardiography showed

mildly reduced systolic left ventricular ejection fraction (EF: 48%), concentric left ventricular hypertrophy, dilatated left and right ventricles, diffuse hypokinesia, moderate mitral regurgitation, and due to calcification structural bioprosthetic valve dysfunction (mean gradient 54 mmHg, peak gradient 76 mmHg). ECG showed sinus rhythm, normal PQ and QRS intervals, and 1 mm ST depression in lateral leads. Due to these findings, he was admitted to a coronarography, which showed mild atherosclerosis without any significant stenosis. Pre-procedural cardiac computed tomography revealed heavily calcified bioprosthetic leaflets. (Figure 1.) After the evaluation, and the throughout discussion about a redo intervention, the patient did not give his consent to a second open heart surgery, therefore and because of the poor rehabilitation potential due to lumbar disc herniation the Heart Team's decision was TAVR.

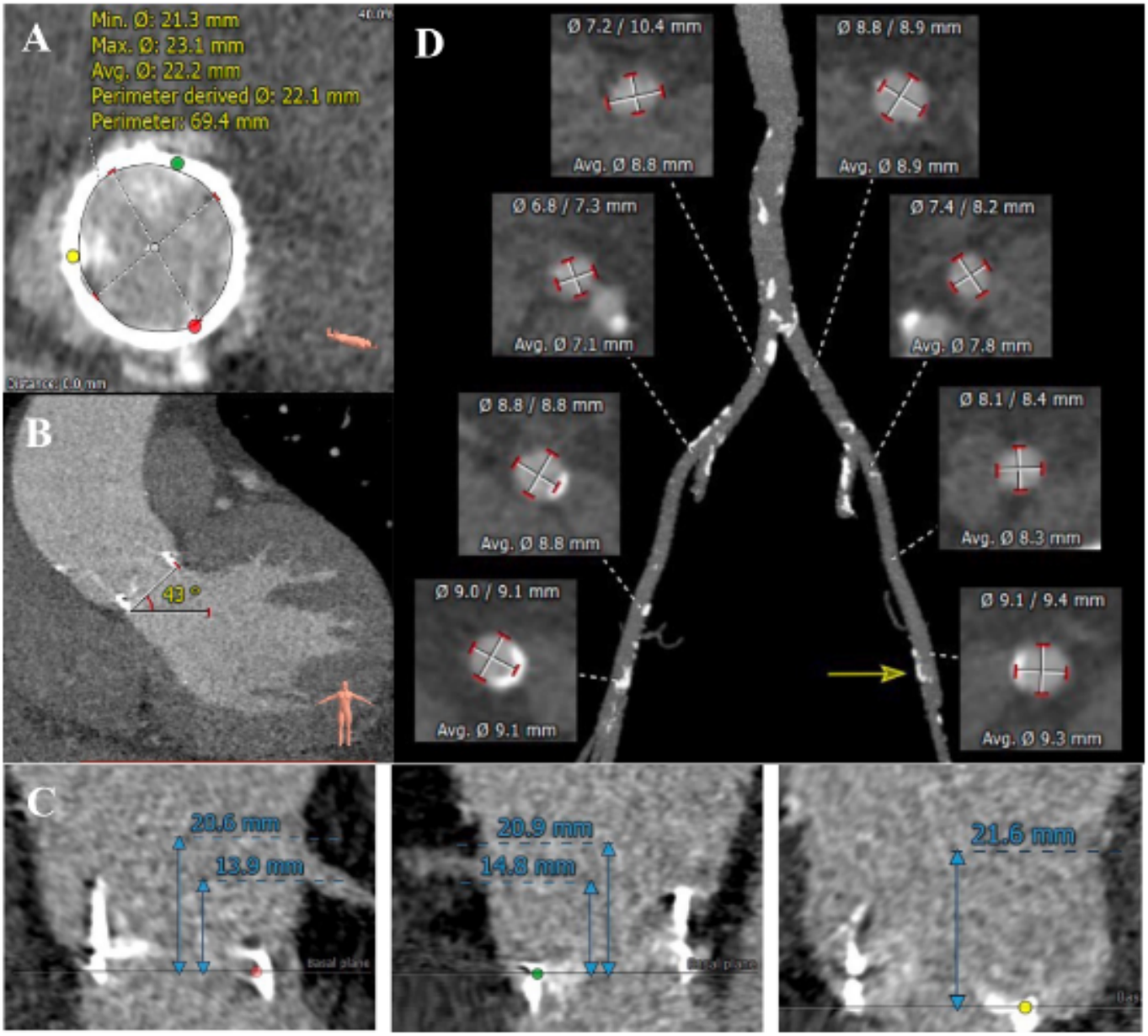

Figure 1: Results of the TAVR CT scan A. Annulus diameter B. Annular angulation C. Sinus height D. Descending aorta, and the iliofemoral arteries.

Therapeutic Intervention

Valve-in-valve (VIV) procedure was planned with 29-mm Evolut R valve (Medtronic, Minneapolis, Minnesota) under conscious sedation. After the placement of a Sentinel device (Boston Scientific, Marlborough, Massachusetts) for cerebral embolic protection from right distal radial access, the left distal radial artery was punctured for pig tail insertion. The right femoral artery was punctured and preclosed with a Proglide (Abbot, USA), and the degenerated valve was passed with a Glidewire (Terumo Co, Japan). The Glidewire has been changed for Confida wire (Medtronic, Minneapolis, Minnesota) and later for Lunderquist wire (Cook Medical Co, USA) over a pig tail catheter. Balloon valvuloplasty was done with a 20x40 mm Cristal balloon (Balt Co, France), and later with a 22x40 mm VACS II balloon (Osypka AG, Rheinfelden, Germany) but despite good predilatation the valve passage was unsuccessful. It was seen from the transesophageal ultrasound pictures that the wire was impacted between the non and left coronary cups. (Figure 2) We decided to pass the aortic valve through another cusp, first from a retrograde way, and later from an antegrade way. After switching to general anesthesia, under transesophageal ultrasound guidance, atrial transseptal puncture was performed from a right femoral vein access. The transseptal puncture was performed with a BRK XS needle (Abbott Vascular, Santa Clara, California) via Swartz 8.5F steerable introducer. Through this introducer, a 6.5 F MP1 catheter was placed into the left atrium and the surgical bioprosthetic valve was passed in an antegrade fashion with a Glidewire, followed by a 5F JR4 catheter and a standard exchange length J-tipped guidewire (Cordis, USA, 260 cm). The guidewire was successfully snared in the descending aorta using an Atrieve vascular snare (Argon Medical Devices) and externalized from the 14F iSleeve sheath (Boston Scientific, Marlborough, Massachusetts) through the right femoral artery. Through this externalized standard wire, one pre-dilatation with a 14 mm Armada balloon (Abbott Vascular, Santa Clara, California)), then an exchange to a Lunderquist wire and a second pre-dilatation with 22x40 mm VACS II balloon were performed. (Figure 3) Following that, the Evolut R 29 mm valve was successfully implanted with no significant paravalvular leak and an invasively measured gradient of 14 mmHg. The femoral access closure was done with a Manta (Teleflex, USA) due to the failure of the Pro-Glide (Abbot Vascular, USA) percutaneous closure device.

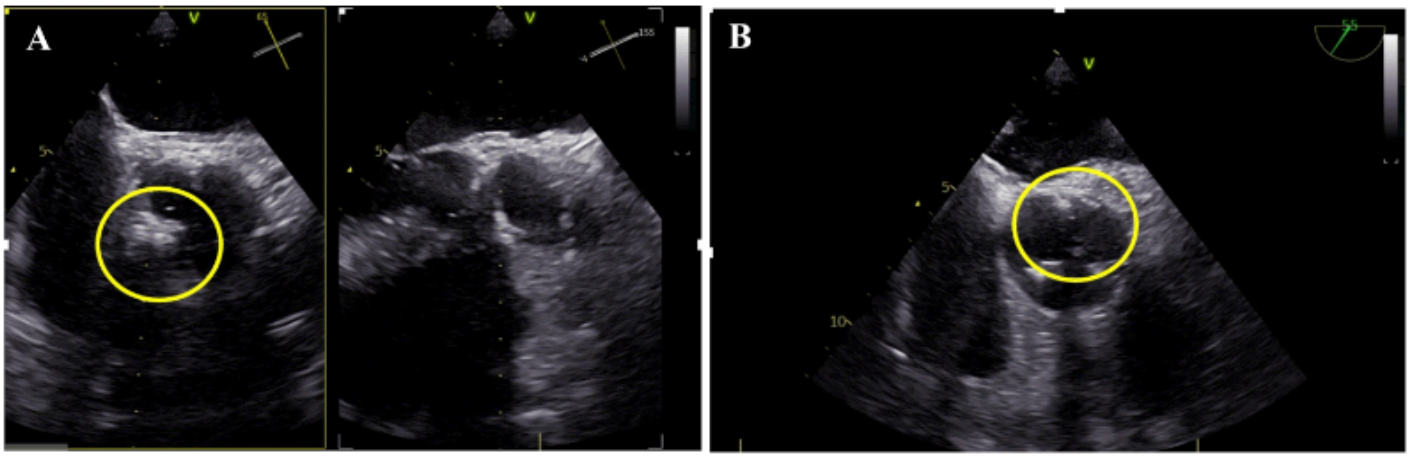

Figure 2: Transesophageal echocardiography A. Wire position from retrograde way (yellow circle). B. Wire position after antegrade wiring (yellow circle).

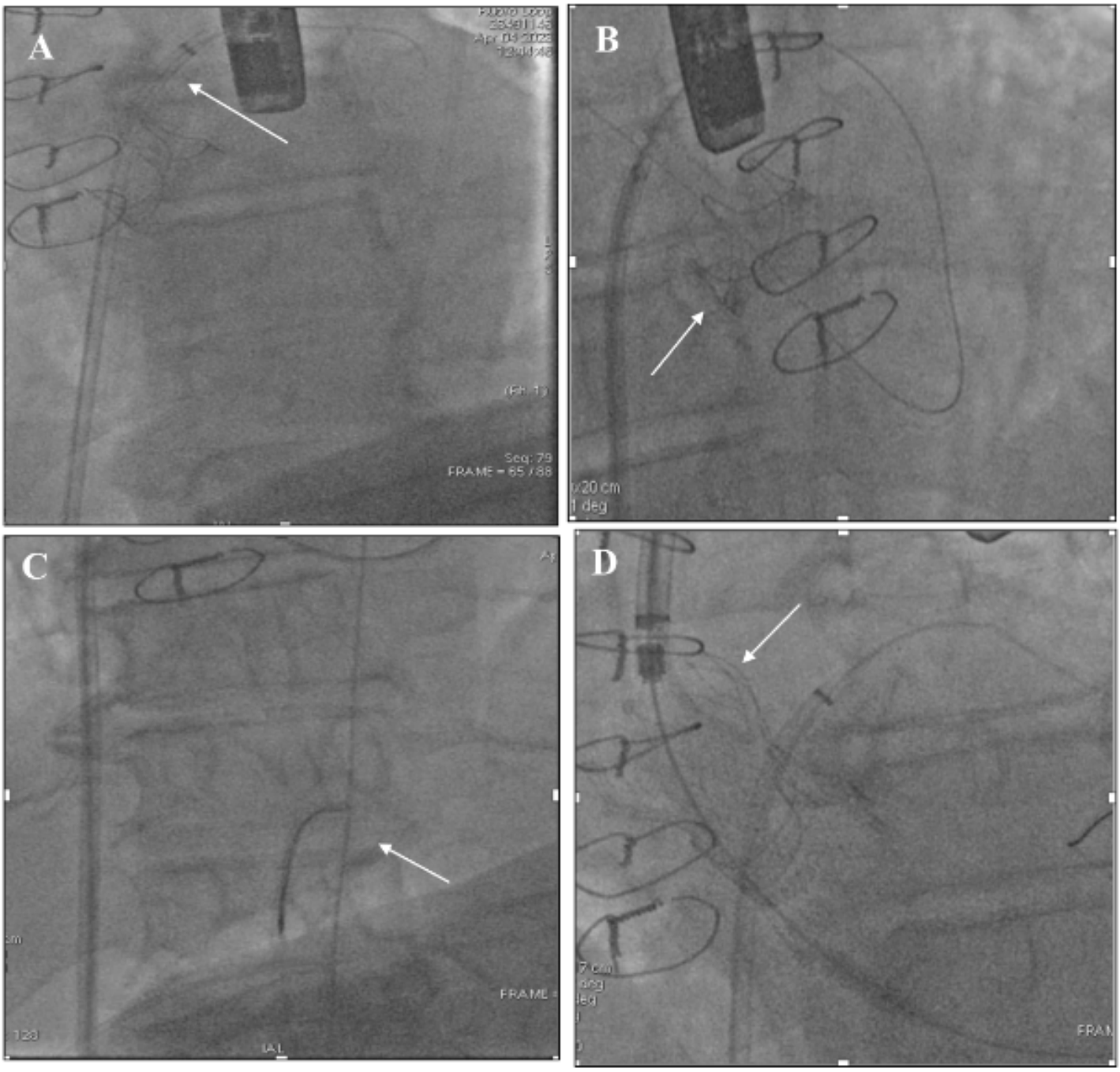

Figure 3: Transfemoral ViV TAVR A. transseptal puncture and wiring (transseptal sheath in the left ventricle arrow) B. antegrade wiring trough the degenerated bioprosthesis (arrow) C. externalization of the snared wire (arrow) D. fluoroscopy of the self-expandable valve (Evolut R 29 mm; arrow) in the implantation position.

Follow-up and Outcomes

After the procedure, the patient was observed at our cardiac intensive care unit for one day, then he was admitted to our general cardiology ward for rehabilitation. On the ECG, a newly onset left bundle branch block (LBBB) was observed; therefore, an electrophysiological study was performed during which a supra His block was verified thus, a permanent pacemaker was not needed.

At the one and three months follow up visits, the patient reported improvement in his functional capacity, and he was free of chest pain and dyspnoe. Echocardiography showed good bioprosthesis function (mean gradient 20 mmHg, peak gradient 11 mmHg) with trace paravalvular regurgitation.

Discussion

Despite VIV TAVR being a widely accepted and less invasive alternative compared to reoperation in patients with degenerated surgical valves, it can pose some technical procedural challenges like device malposition, ostial coronary obstruction, and high gradients after the implantation [4]. In many cases, the crossing of the bioprosthesis is straightforward because there is some degree of regurgitation or less calcifications than in the native valve. In our case, the passage of the self-expandable Evolute R valve was impossible despite balloon pre-dilatation, guidewire exchange. Our plan was to pass through another cusp, but this was impossible from retrograde way with conventional methods. The antegrade–retrograde technique is a widely applied technique in the field of coronary chronic total occlusions. This case illustrates that this technique can also be useful as a bailout solution in an uncrossable aortic bioprosthesis during VIV TAVR, especially when conventional methods fail.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient.

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Conflict of interest: There is none to be declared.

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