

Three-dimensional echo-guided transcatheter mitral valve-in-valve implantation in prosthesis with no radiopaque markers

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In June 2019, a balloon-expandable stented aortic bioprosthesis Edwards SAPIEN 3 29-mm (Edwards Irvine, CA, US) was implanted transapically in a severe regurgitant mitral bioprosthesis (BioInteSurgical Inc., Mississauga, Canada; 33-mm) under real-time 3D echocardiographic guidance. The transcatheter mitral valve-in-valve implantation (TMVI) procedure was recommended by Heart Valve Team for a symptomatic, New York Heart Association (NYHA) class III, 61-year-old female not eligible for redo surgery, with a history of aortic and mitral bioprosthesis implantation followed by a Bentall procedure (all BioInteSurgical). EuroSCORE II was 18.8%, and the Society of Thoracic Surgeons (STS) mortality score was 12.3%. Mitral bioprosthesis was destroyed by infective endocarditis in the past. Transesophageal echocardiography (TEE; GE Healthcare Vivid E95, Chicago, IL, US) showed perforations with multiple severe regurgitant jets across the leaflets of mitral bioprosthesis without remnant signs of active endocarditis or instability of prosthesis (Figure 1A, B, Supplementary material, Videos S1 and S2). The size of the prosthesis was selected on the basis of the ViV Mitral App (UBQO Limited, London, UK) and confirmed on computed tomography. TMVI was performed with a standard apical approach through the small left anterior thoracotomy. The access point was secured with two "U" stitches. Fluoroscopy was used to visualize guiding catheter placement and advancing/retrieving the valve delivery system apically. A 21 F apical Certitude delivery system was inserted and an Edwards SAPIEN 3 29 mm valve was implanted under rapid pa-

cing and TEE navigation. In the absence of fluoroscopic landmarks in the BioInteSurgical valve, the intraoperative use of real-time 3D images provided by echocardiographers allowed the operating team for immediate and correct implantation of the transcatheter valve. Echocardiographic images in different planes visualized the interposition of the catheters and new and already implanted prosthesis (Figure 1C, D, Supplementary material, Video S3). No contrast injection was performed during the procedure. The position of the transcatheter prosthesis was stable and initially correct with a conical shape. While retrieving the delivery system and guidewires under fluoroscopy, we could confirm a conically shaped cage of the deployed valve indicating a commonly recognized morphology of expanded valves in standard procedures. The peri/postprocedural period was uncomplicated. Perioperative trace of paravalvular leakage remained unchanged without significant mitral regurgitation (max/mean pressure gradient of 8.6/3.9 mm Hg) up to 9 months of follow-up (Figure 1E, F, Supplementary material, Videos S4 and S5). The absence of a visible landing zone during the TMVI procedure in a prosthesis without radiopaque markers is associated with an increased risk of dislocation or incorrect position of the new valve. The procedure was performed in a hybrid room in anticipation of possible complications. For radiologically translucent valves, various approaches to identify the level of the mitral annulus have been described, even involving the use of the radiopaque coronary wire advanced into the circumflex artery. Although evaluation of

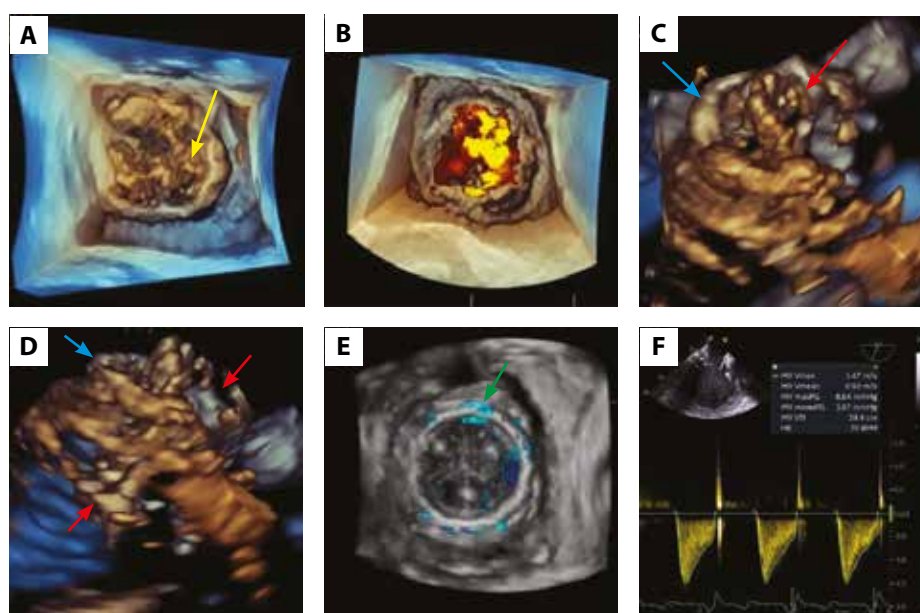


Figure 1. Baseline and periprocedural 3D transesophageal echocardiography. **A, B.** Surgical (atrial, en face) view — perforations of mitral bioprosthesis (the yellow arrow, example) resulting in severe mitral regurgitation (see Supplementary material, *Videos S1*, and *S2*). **C, D.** 3D view showing implantation of the valve in the mitral position — degenerate bioprosthesis (the blue arrows), new bioprosthesis (the red arrows) positioning, and expansion of the crimped valve frame — 1/3 above, 2/3 below the annulus of the mitral valve bioprosthesis (Supplementary material, *Video S3*). **E.** Atrial view with 3D color Doppler — checking symmetry and paravalvular leakage of the newly implanted valve — trace paravalvular leakage (the green arrow) (Supplementary material, *Videos S4* and *S5*). **F.** Measurement of max/mean pressure gradient (Supplementary material, *Videos S1–S5*)

Abbreviations: HR, heart rate; MV, mitral valve

proper S3 valve implantation with radio-lucent prosthesis is usually based on fluoroscopic evaluation, assessment of successful deployment, in terms of its size, stability, and lack of regurgitant jets, was even more feasible on TEE. In this particular case, transapical access was chosen over the known transseptal approach. However, the clinical utility of TEE is even more pronounced in the case of transseptal access, where, in addition to all the above-mentioned advantages, it is also essential in guiding the optimal puncture site of the septum. In our experience, real-time 3D echocardiographic guidance did overcome the major limitation related to the lack of visualization of a radio-lucent mitral bioprosthesis and is, therefore, considered an important and indispensable tool for this procedure [1–5].

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

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