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

Short title: 3D echocardiographic guidance in TMVI

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In June 2019, a balloon expandable stented aortic bioprothesis Sapien 3 29-mm (Edwards, CA, US) has been implanted transapically in a severe regurgitant mitral bioprosthesis (BioIntegral Surgical 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 III class, 61-year-old female not eligible for redo surgery, with a history of aortic and mitral bioprosthesis implantation followed by a Bentall procedure (all BioIntegral Surgical). EuroSCORE II was 18.8%, 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) revealed 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 in computed tomography. TMVI was performed with standard apical approach through the small left anterior thoracotomy. Access point was secured with two „U" stiches. Fluoroscopy was used to visualize guiding catheter placement and advancing/retrieving the valve delivery system apically. An 21 F apical Certitude delivery system was inserted and an Edwards SAPIEN 3 29 mm valve was implanted under rapid pacing and TEE navigation. In the absence of fluoroscopic landmarks in the Biointegral valve, the intraoperative use of real-time 3D images provided by echocardiographers allowed operating team for immediate and correct implantation of transcatheter valve. Echocardiographic images in different planes visualized the interposition of catheters, new and already implanted prosthesis (Figure 1C, D, Supplementary material, *Video S3*). No contrast injection was performed during the procedure. Peri/post-procedural period was uncomplicated. Position of the transcatheter prosthesis was stable and correct with conical shape. While retrieving the delivery system and guidewires under fluoroscopy, we witnessed a conically shaped cage of the deployed valve indicating a commonly recognized morphology of expanded valves in standard procedures. 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 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 proper S3 valve implantation is usually based on fluoroscopic evaluation having radio-lucent prosthesis, successful deployment assessment — in terms of its size, stability, and lack of regurgitant jets was even more feasible in TEE. In this particular case, the transapical access was chosen over 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 lack of visualization of a radiolucent mitral bioprosthesis and is therefore considered an important, indispensable tool for this procedure [1–5].

Supplementary material

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

REFERENCES

1. Latib A, Montorfano M, Agricola E, et al. First-in-Human implantation of a direct flow medical valve in a radiolucent mitral annuloplasty ring. JACC Cardiovasc Interv. 2015; 8(6): e105–e108, doi: 10.1016/j.jcin.2015.01.024, indexed in Pubmed: 25999116.
2. Gong FF, Peters AC, Malaisrie SC, et al. Optimal imaging guidance during transcatheter mitral valve-in-valve replacement in bioprostheses with radiolucent sewing rings. JACC Case Rep. 2020; 2(8): 1129–1134, doi: 10.1016/j.jaccas.2020.05.073, indexed in Pubmed: 34317432.
3. Hudziak D, Parma R, Gocoł R, et al. Infectious endocarditis after valve-in-valve transcatheter aortic valve implantation: reoperative treatment of infectious endocarditis. Kardiol Pol. 2020; 78(1): 84–85, doi: 10.33963/KP.15029, indexed in Pubmed: 31641095.
4. Hudziak D, Ochała A, Gocoł R, et al. The bailout transseptal approach during valve-in-valve transcatheter aortic valve implantation with difficult crossing of the degenerated Mitroflow bioprosthetic valve. Kardiol Pol. 2021; 79(4): 473–474, doi: 10.33963/KP.15871, indexed in Pubmed: 33723975.
5. Huczek Z, Rymuza B, Scisło P, et al. Transcatheter mitral valve-in-valve implantation using a transseptal approach. Postepy Kardiol Interwencyjnej. 2019; 15(1): 107–109, doi: 10.5114/aic.2019.83775, indexed in Pubmed: 31043992.

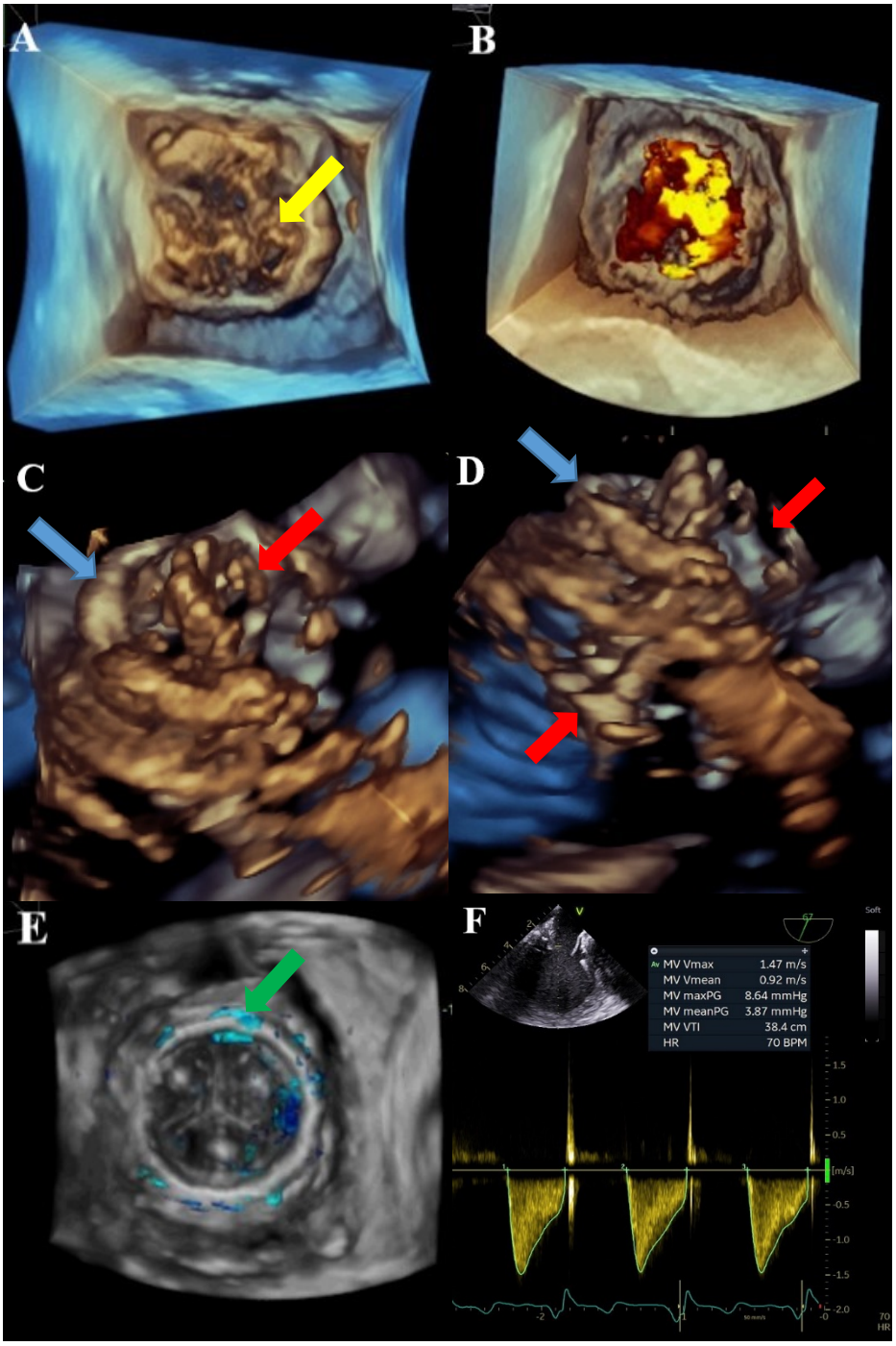

Figure 1. Baseline and during procedure 3D transesophageal echocardiography. **A, B.** Surgical (atrial, en face) view — perforations of mitral bioprosthesis (the yellow arrow, example) resulting in severe mitral regurgitation (see Supplementary material, *Videos S1* and *S2*). **C, D.** 3D view showing implantation of the valve in 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;