Transseptal mitral valve-in-ring implantation: Description of the first procedure in Poland

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DOI: 10.33963/KP.a2022.0176

Received:
August 25, 2022

Accepted:
November 7, 2022

Early publication date:
December 21, 2022

Surgical intervention is the gold standard of treatment for severe and symptomatic mitral regurgitation despite guideline-directed medical therapy [1]. Even though these procedures demonstrate good clinical outcomes, in some patients their effectiveness may be time-limited [2]. After performed valve repair, mitral regurgitation can recur due to continuous remodeling of the left ventricle or device failure.

A 74-year-old man with ischemic heart failure with reduced ejection fraction (37%) and severe mitral regurgitation was admitted to the hospital with New York Heart Association (NYHA) symptom class III. Seven months before admission, the patient has undergone mitral annuloplasty with an annuloplasty ring Edwards Physio 1 34 mm (Edwards Lifesciences, Irvine, CA, US). Simultaneously, he had tricuspid annuloplasty (MC3 Tricuspid Annuloplasty Ring 36 mm; Edwards Lifesciences, Irvine, CA, US), left atrial appendage resection, and pulmonary veins ablation. His comorbidities included prior implantation of dual-chamber pacemaker due to tachycardia-bradycardia syndrome (2020), chronic kidney disease stage 3, hypertension, and myocardial infarctions treated with percutaneous coronary intervention with one drug-eluting stent implantation in the left anterior descending artery (2005) and two drug-eluting stents implantation in the left anterior descending artery and diagonal branch (2019).

Preprocedural transesophageal echocardiography showed restriction of the posterior mitral leaflet resulting in failure of coaptation and severe secondary mitral regurgitation. Due to symptomatic valvular dysfunction and high surgical risk, the patient was considered a candidate for mitral valve-in-ring implantation. Computed tomography was performed to assess his anatomical conditions. Particularly, the shape and area of the left ventricular outflow tract (LVOT), the length of the anterior mitral leaflet, and angulation between the mitral ring and the aortic valve were taken into consideration to assess the risk of LVOT obstruction after the procedure. Since his anatomical conditions were proper, the Heart Team referred the patient for mitral valve-in-ring implantation.

The procedure was performed from right femoral vein access in March 2021. Edwards Sapien 3 29 mm bioprosthesis was introduced into the mitral annuloplasty ring after transseptal puncture followed by balloon septostomy. The appropriate position and optimal implantation were achieved. Angiography showed successful implantation without the leak. Transesophageal echocardiography demonstrated correct valve function with a trace of a valvular leak near the anterior commissure between the ring and valve S3 (V_{max} 1.6 m/s, pressure gradient max/mean 11/5 mm Hg, mitral valve area 1.7 cm^2) and a small iatrogenic atrial septal defect. Imaging excluded interaction with LVOT and its obstruction.

Numerous patients undergoing mitral valve repair may require redo surgery, with significantly burdened ones considered high surgical risk and oftentimes disqualified from reoperation. The transcatheter mitral valve-in-ring procedure is an emerging treatment method in this group of patients. In this patient, a surgically implanted Physio 1 ring, which is a complete semi-rigid ring, created appropriate technical conditions for anchoring a Sapien 3 valve. Usually, incomplete or complete rigid rings are unfavorable for Sapien implantation. For patients with significant LVOT obstruction risk usually based on

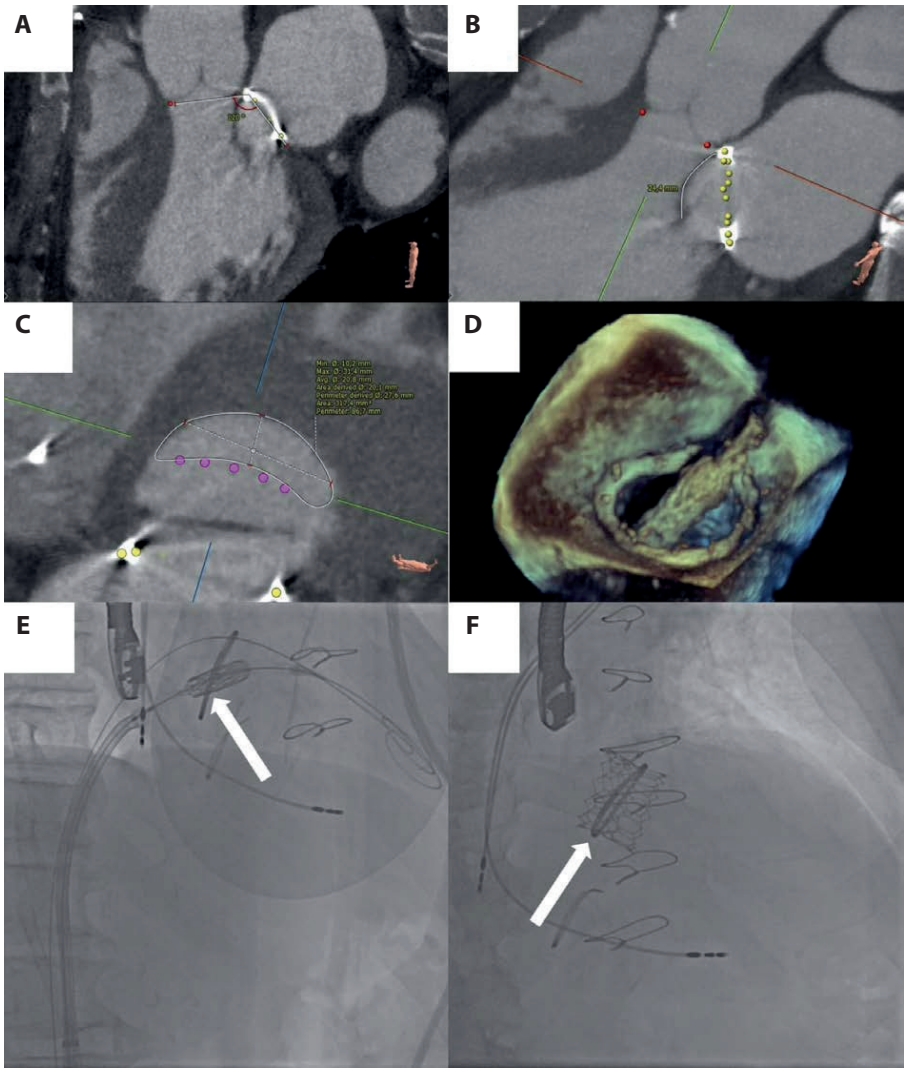

Figure 1. Assessment of the anatomical conditions visualized on CT (**A–C**), angulation between the mitral valve and the aortic valve (**A**), measurement of the anterior mitral leaflet (**B**, white line), simulation of the neo-LVOT (predicted LVOT after S3 valve implantation) and its measurements (**C**). Procedural navigation (**D–F**), positioning of the prosthetic valve visualized on transesophageal echocardiography (**D**) and fluoroscopy (**E**, white arrow). Effect of the procedure – the optimal position of the prosthetic valve in the annuloplasty ring (**F**, white arrow)

Abbreviations: CT, computed tomography; LVOT, left ventricular outflow tract

computed tomography simulation, surgical redo should be considered, or, on rare occasions, anterior leaflet transcatheter splitting (LAMPOON) could be applied. The vast majority of transcatheter valve implantation procedures are performed in the aortic position. Moreover, due to their safety and effectiveness, they are approved for treating degenerative aortic bioprosthesis (valve-in-valve implantation) [3]. Based on these experiences, it is feasible to implant a bioprosthetic valve dedicated to transcatheter aortic valve implantation into a failed mitral bioprosthesis or dysfunctional annuloplasty ring, which creates a therapeutic alternative for open-heart redo surgery in a selected group of high-risk patients.

Article information

Conflict of interest: None declared.

Funding: None.

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