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Zero-contrast TAVI: A novel alternative for a difficult patient population

Short title: Zero-contrast TAVI

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Transcatheter aortic valve implantation (TAVI) is the current state-of-the-art method of treatment of severe aortic stenosis in high-risk patients, as well as a viable alternative for certain mid- and low-risk patients [1, 2]. Preparation of the procedure requires a computed tomography (CT)-angiogram of the aorta and usually coronary angiography. The procedure itself is contrast guided. In this high-risk population, a significant percentage of patients suffer from chronic kidney disease [3] which had been shown to be the most important risk factor of contrast induced nephropathy (CIN), leading to significantly impaired outcomes [4]. Studies have shown, that in TAVI patients with chronic kidney disease or at risk of CIN, zero-contrast TAVI procedures may be a viable option [5].

A 70-year-old male patient with a left ventricular ejection fraction of 25%, severe aortic stenosis with an area of 0.8 mm² and a mean gradient of 41 mm Hg was admitted to our

institution. The patient was 10-years post coronary artery bypass grafting and had a recently implanted cardioverter-defibrillator. During initial assessment before TAVI in another center a coronary angiography was performed, showing multivessel coronary artery disease with patent LIMA and venous grafts with no indication for further revascularization. Subsequently CIN occurred and a persistent decrease of eGFR to 20–23 ml/min/1.73 m² was observed. Therefore, we have decided to perform a zero-contrast TAVI procedure.

The assessment of access site was performed with doppler ultrasound (showing no significant lesions), followed by a non-contrast CT, which revealed relatively straightforward femoral access with limited calcifications (Supplementary material, *Figure S1*). We have considered nuclear magnetic resonance imaging (NMR), but due to satisfactory CT and doppler images we have decided to confine NMR to the heart and ascending aorta. A normal three cusp anatomy was confirmed in CT, NMR and echocardiography (Supplementary material, *Figure S2*). Aortic angulation, coronary ostia heights and selection of implant view were based on non-contrast CT (Supplementary material, *Figure S3*). The quantification of aortic valve annulus was challenging, as some discrepancies were present in the utilized modalities (3D transesophageal echocardiography [TEE] — 24–25 mm; CT 23.5 mm; NMR 26 mm). Nonetheless, all of the measurements were within the size of a 26 mm Edwards Sapien S3 Ultra valve (Supplementary material, *Figure S4*).

For the procedure the patient was in general anesthesia. Right femoral access with surgical cutdown was utilized in order to optimize access site management. The procedure was under permanent TEE control. A pigtail catheter was introduced to the non-coronary cusp from radial access. Crossing of the valve and introduction of an extra-stiff Confida guidewire was performed. Finally, an AL 1.0 catheter with a protruding wire was introduced to the left coronary cusp from left femoral access (Supplementary material, *Figure S5*). A balloon valvuloplasty was performed with a 25 × 40 mm valvuloplasty balloon. A notch during inflation was observed on the balloon, which in our opinion confirmed correct zero-contrast sizing of the annulus (Supplementary material, *Figure S6*). Valve positioning and implantation were guided by the location of catheters in coronary cusps (Supplementary material, *Video S1*). Final echo showed optimal TAVI result with no paravalvular leak and a mean gradient of 7 mm Hg. The patient was discharged after 3 days of uncomplicated in-hospital stay.

In three-month follow-up the patient remains asymptomatic (New York Heart Association I, Canadian Cardiovascular Society I), with stable renal function, showing that zero-contrast TAVI may be a viable treatment option in these extremely complicated patients.

Supplementary material

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

Article information

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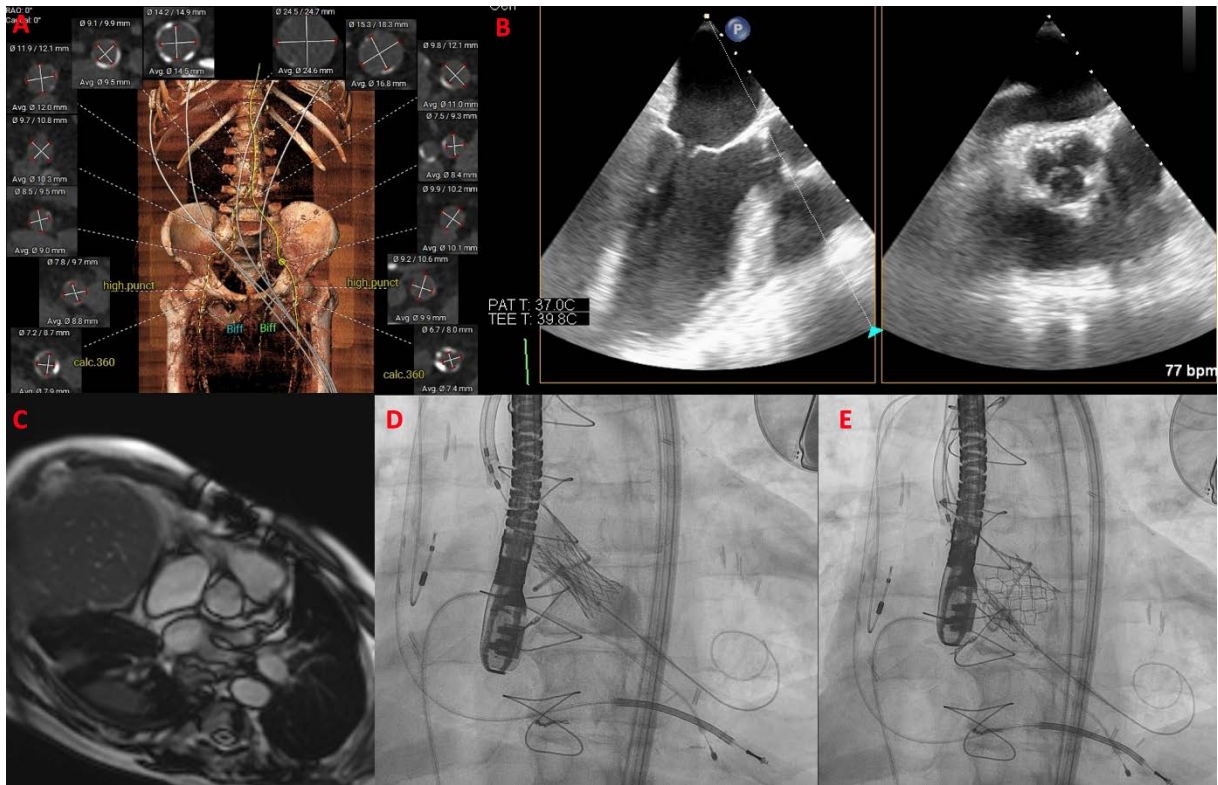


Figure 1. Main aspects of the zero-contrast transcatheter aortic valve implantation procedure