CLINICAL VIGNETTE

Intentional fracture of the bioprosthetic valve ring during transcatheter aortic valve implantation

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An 82-year-old woman underwent a minimally invasive surgical implantation of a bioprosthetic aortic valve (19-mm Medtronic Mosaic bioprosthesis, Medtronic Inc., Minneapolis, Minnesota, United States) in our center in 2016. Since 2018, progressive dyspnea to New York Heart Association (NYHA) class III was observed, accompanied by an increase in mean pressure gradient postoperatively from 23 to 38 mm Hg and peak transvalvular pressure gradient to 75 mm Hg as well as reduction in the indexed effective orifice area to 0.41 cm^2/m^2.

Because of a significant risk of death during reoperation (logistic regression version of the European System for Cardiac Operative Risk Evaluation [EuroSCORE], 31.16%; Society of Thoracic Surgeons [STS] risk score, 6.2%), the patient was disqualified from a surgical procedure and referred for transcatheter valve-in-valve replacement. Due to the very small size of the surgical bioprosthesis, implantation of a new valve might not guarantee the desired outcome because of further decrease in the orifice area. Therefore, a decision was made to perform controlled ring fracture (bioprosthesis valve fracture [BVF]). The distance between the coronary ostia and the surgically implanted bioprosthesis valve, estimated by computed tomography angiography to be 2 mm, was an additional risk factor. Considering that after cracking the ring, this parameter may be further reduced, it was decided to utilize coronary protection technique.

The procedure was performed by a team of cardiac surgeons and interventional cardiologists. First, using the left radial and femoral approaches, guiding catheters were placed in the coronary artery ostia, and guidewires loaded with stents ready for implantation were positioned for backup in both coronaries (FIGURE 1A). Second, a 23-mm Medtronic CoreValve Evolut R (Medtronic Inc.) was directly implanted using the right femoral access (FIGURE 1B). At this stage, echocardiography revealed a decrease in pressure gradients down to maximum (mean) of 23 (11) mm Hg, and reduction in peak velocity down to 2.37 m/s. Subsequently, a 20-mm Atlas Gold PTA (BARD Canada Inc., Oakville, Ontario, Canada) dilatation catheter was positioned into both valves. Under rapid ventricular pacing up to 180 bpm lasting 9 seconds, it was dilated with pressure of 20 atm until the ring of surgical valve cracked (FIGURE 1D and 1E). The moment of the fracture was noticeable in the fluoroscopy as a visible release of the balloon waist and confirmed by sudden drop in inflation pressure on the manometer.

After the completion of the procedure, further improvement of echocardiographic parameters was noticed: a maximum (mean) pressure gradient of 17 (8) mm Hg and a reduction in peak velocity to 2.1 m/s (FIGURE F). No aortic regurgitation, paravalvular leak, arrhythmias, ischemia, or pericardial effusion were observed. There was no need for stent deployment (FIGURE C). The patient was transferred to the postoperative care unit in good condition and was discharged 5 days after the procedure with notable improvement of her symptoms to NYHA class I.

There has been a limited number of cases of valve-in-valve transcatheter aortic valve replacement with BVF carried out in the world. The procedure is strictly connected with the type of

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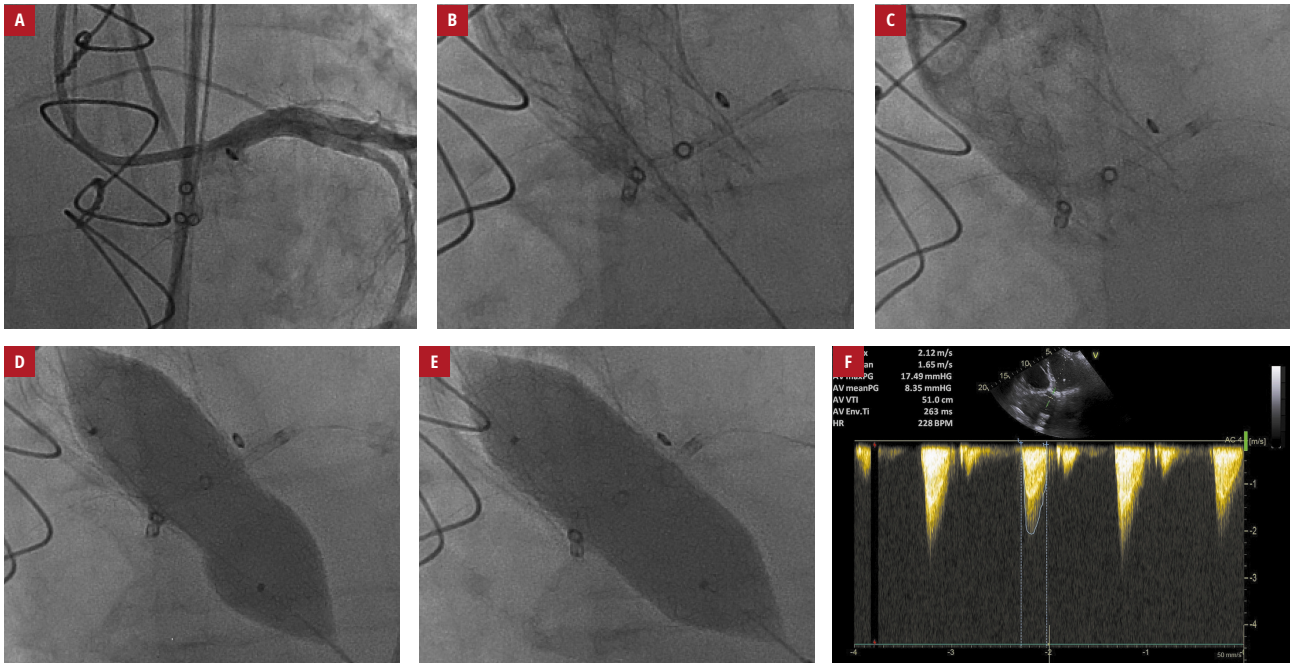

FIGURE 1 **A** – the anatomy of the coronary arteries with guidewires. Bioprosthesis with new Evolut valve inside before (**B**) and after (**C**) ring fracture. The moment before (**D**) and after (**E**) fracture of the valve ring. **F** – ultrasonography results directly after the procedure

the previously used bioprosthesis.1,2 Especially bioprosthetic valves of small size result in high residual transvalvular gradients that have been associated with increased mortality.3 Procedures with BVF that are described in the literature are associated with 2.6% 30-day mortality. Postprocedural mean (SD) transvalvular gradient was 9.2 (6.3) mm Hg (P <0.001).1 A multicenter study of 70 procedures revealed a reduction in mean (SD) transvalvular gradients after the placement of transcatheter implanted valve in surgical implanted valve of 19.0 (8.8) mm Hg (P <0.001) and a further mean (SD) gradient reduction after BVF of 8.1 (4.8) mm Hg (P <0.001) as well as an increase in mean (SD) effective orifice surface of 1.4 (0.8) cm^2 (P <0.001) and a further mean (SD) increase after BVF of 2.1 (0.8) cm^2 (P <0.001).4

Intentional fracture of bioprosthetic valve ring during valve-in-valve TAVI is a procedure with low mortality risk which may be considered in a patient with a very small surgically impanted bioprosthesis to achieve the lowest transvalvular gradient.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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