

A successful transcatheter aortic valve implantation of a balloon-expandable valve for paravalvular leak in a patient with bicuspid aortic valve and horizontal aorta

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Transcatheter aortic valve implantation (TAVI) is a well-established modern treatment of severe symptomatic aortic stenosis. Some anatomical features, such as bicuspid aortic valve or severe aortic angulation, often referred to as the “horizontal aorta,” increase the rates of unsuccessful procedures.¹⁻⁴

We present the case of an 83-year-old man with a history of severe symptomatic aortic stenosis, type 2 diabetes mellitus on insulin, and chronic kidney disease who was referred to our institution due to deteriorating exercise tolerance (New York Heart Association class III) and chest pain. Transthoracic echocardiography (TTE) confirmed severely calcified aortic valve with the valve area of 0.9 cm² and mean gradient of 43 mm Hg. The patient was disqualified from surgical valve replacement and referred for TAVI due to high surgical risk (EuroScore II, 9.33%).

Multislice computed tomography revealed femoral arteries suitable for transfemoral access, the aortic annulus with a maximum diameter of 31 mm and minimum diameter of 25 mm, perimeter of 88 mm, and area of 5.6 cm², functionally bicuspid aortic valve, and a horizontal course of the ascending aorta (angle between the horizontal plane and the aortic annulus of 65°; **FIGURE 1A**).

Transcatheter aortic valve implantation was performed under local anesthesia with conscious sedation. The Evolut R 34 mm prosthesis (Medtronic, Minneapolis, Minnesota,

United States) was introduced via the right femoral artery with a 16F integrated sheath. As aortography showed significant paravalvular leakage (PVL) after valve implantation, prosthesis was optimized with a 26-mm balloon during rapid right ventricular pacing (160/min). Periprocedural TTE confirmed proper but relatively low valve position with the maximum gradient of 16 mm Hg and moderate PVL (**FIGURE 1B** and **1C**).

The patient was transferred to intensive care unit where pulmonary edema occurred on the second day after the procedure. On TTE, PVL was assessed as hemodynamically significant and the patient was referred for valvuloplasty with a 30-mm balloon. Despite that, the residual leak did not decrease. On the 14th day following Evolut R implantation, a second prosthesis, 29-mm Sapien 3 (Edwards Lifesciences, Irvine, California, United States), was implanted using a 16F sheath via the left femoral access (**FIGURE 1D**). Final aortography and TTE confirmed proper position of the prosthesis with trace PVL and the maximum aortic gradient of 10 mm Hg.

Further recovery in the intensive care unit was uneventful. Prior to discharge, TTE showed trace PVL and maximum aortic gradient of 10 mm Hg, and the patient was discharged home with significant clinical improvement.

Certain anatomical features, such as a horizontal aorta (in most studies defined as presence of >48° angle between the aortic annulus

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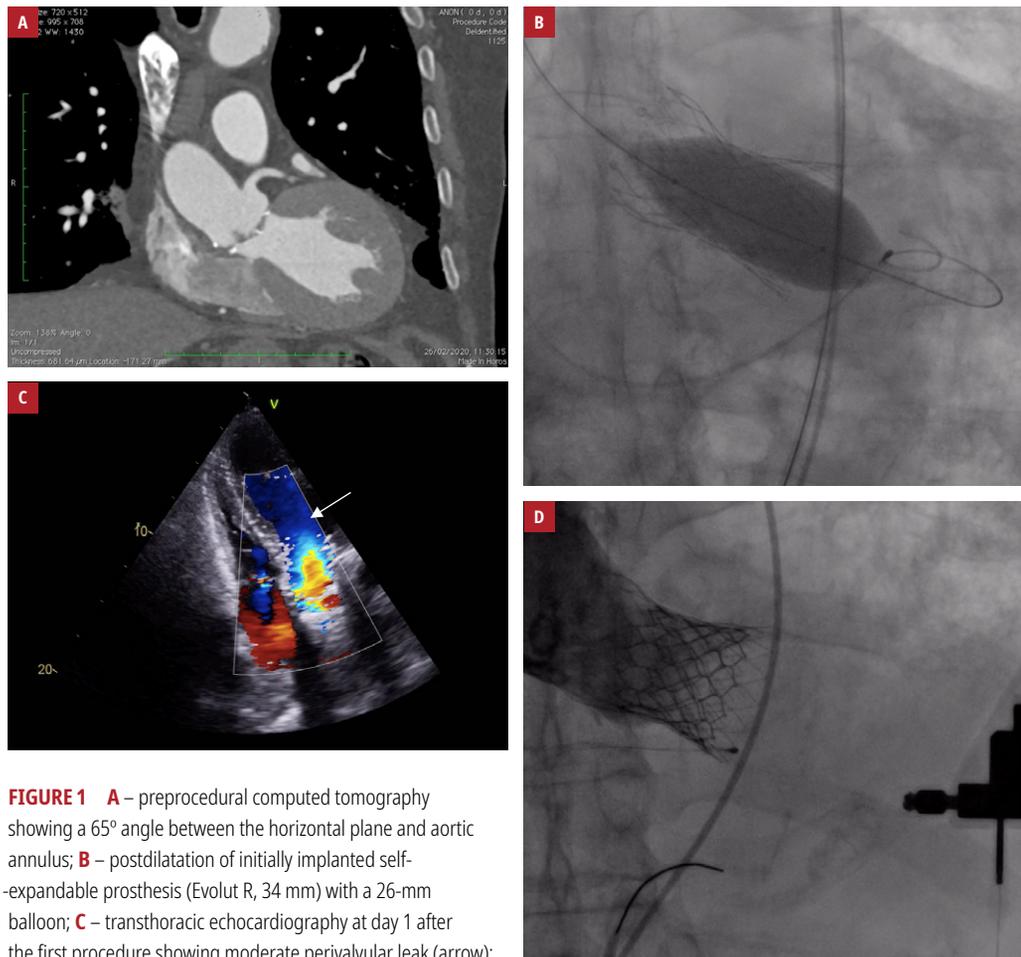


FIGURE 1 **A** – preprocedural computed tomography showing a 65° angle between the horizontal plane and aortic annulus; **B** – postdilatation of initially implanted self-expandable prosthesis (Evolut R, 34 mm) with a 26-mm balloon; **C** – transthoracic echocardiography at day 1 after the first procedure showing moderate perivalvular leak (arrow); **D** – the second balloon-expandable prosthesis (Sapien 3, 29 mm) implanted on day 14 after the initial procedure

plane and the horizontal plane in the coronal view) or bicuspid aortic valve, increase the risk of periprocedural complications and pose a particular technical challenge for proper valve sizing and positioning.¹⁻⁴ Additionally, presence of bicuspid aortic valve may result in a decrease of postdilatation efficacy due to heavy calcifications and noncircularity of such a valve.⁴

It remains an open question whether or not this patient would have benefited from implantation of a balloon-expandable prosthesis as the first choice. In this particular case, a bail-out procedure of valve-in-valve implantation of a balloon-expandable prosthesis resolved the problem of PVL and caused significant clinical improvement.

ARTICLE INFORMATION

CONFLICT OF INTEREST MD is a member of Medical Advisory Board of Medtronic. AW is a proctor of Medtronic. Other authors declare no conflict of interest.

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