

First Polish pediatric experience with percutaneous self-expandable pulmonary valve implantation

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Percutaneous pulmonary valve implantation is an alternative way of restoring valve function to the right ventricular outflow tract [1]. More recently, self-expandable valves have been providing additional options, especially for patients with large outflow tracts [2, 3]. We present the first Polish experience with the Venus P-valve (Venus MedTech) in two pediatric patients. Both were born with tetralogy of Fallot with unusual coronary artery anatomy; both underwent surgical repair with a monocusp pulmonary homograft and presented with progressive pulmonary regurgitation, which was confirmed with non-invasive imaging (Supplementary material, *Table S1*). Virtual Reality models (VMersive) were created to present the anatomy and simulate valve size and position [4].

PATIENT A

In a 10-year-old girl (37 kg), the virtual model showed a 30 × 25 mm Venus P-valve as the most suitable (Figure 1A). After initial angiography and measurements, a 40 mm PTS-X sizing balloon (NuMed) was inflated to check the size and distensibility of the outflow tract. Diameters of the outflow tract could also allow a large balloon-expandable valve but, due to the close proximity and the course of the anomalous coronary artery, discouraged this option. Through a 24 Fr Dryseal sheath (Gore), a 30 × 25 mm Venus P-valve was deployed from the right pulmonary artery (Figure 1B). Control angiography showed proper expansion of the valve, with tapering of the distal flare on lateral imaging (Figure 1C and D). Oversizing of the valve could lead to infolding of one of the walls and significant regurgitation [5]. Although the latter was not observed, the distal segment was adapted

with the PTS-X balloon (Figure 1E) to gain further expansion. A control angiogram confirmed the proper position and function of the valve and excluded coronary artery compression (Figure 1F). Pre-discharge and 6-month follow-up echocardiograms showed good function of the valve with trivial central regurgitation. ECG-Holter monitoring showed no arrhythmia.

PATIENT B

In a 17-year-old boy (75 kg), the virtual model revealed a conical-shaped outflow measuring 35 mm proximally and 23 mm just before the bifurcation (Supplementary material, *Figure S1A, Video S1*). After an initial angiogram (Supplementary material, *Figure S1B*) and subsequent balloon (40 mm PTS-X) sizing with coronary compression exclusion (Supplementary material, *Figure S1C*), a 36 × 25 mm Venus P-valve was introduced through a 26 Fr Dryseal and positioned in the proximal left pulmonary artery (Supplementary material, *Figure S1D*). During the uncovering of the distal flare, the valve shifted below the bifurcation to the middle of the outflow tract. It was recaptured with the Dryseal sheath and once more deployed from the proximal left pulmonary artery with more push on the system. This enabled covering of the distal main pulmonary artery narrowing with the distal flare of the valve. The final angiogram confirmed the full expansion of the valve with unobstructed flow to the pulmonary arteries and a trace of regurgitation (Supplementary material, *Figure S1E*). Retrospectively, a deployment from the right pulmonary artery might have allowed positioning of the distal flare at the bifurcation, beyond the narrowing. Pre-discharge (Supplementary material,

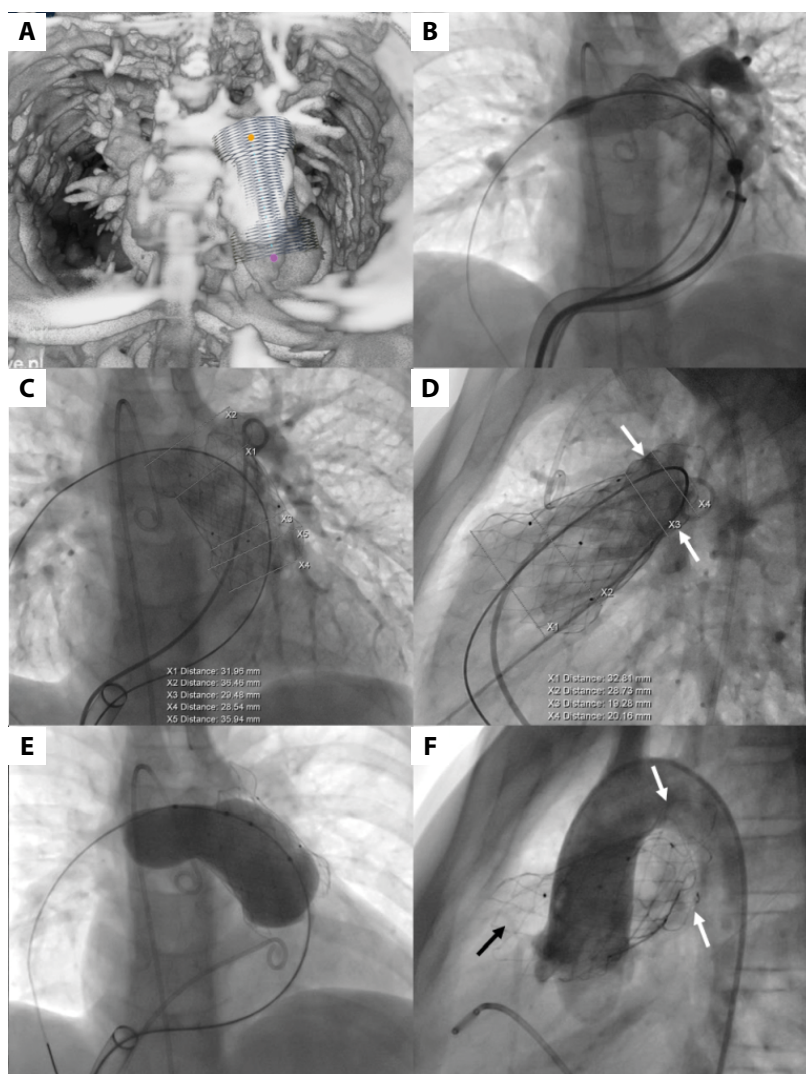


Figure 1. Percutaneous Venus P-valve (Venus MedTech) implantation in a 10-year-old tetralogy of Fallot patient with anomalous coronary artery (an additional left anterior descending artery from the right coronary artery) after patch repair in infancy and currently with significant pulmonary regurgitation. **A.** Virtual reality model processed from cardiac magnetic resonance scans with VMersive software (VR-Learning, Poland) to simulate a 30 mm diameter and 25 mm length of Venus P-valve. **B.** An angiogram during deployment of the distal flare in the proximal right pulmonary artery. **C.** Full expansion of the valve in cranial projection. **D.** The valve tapers towards the distal end (white arrows) in the lateral view. **E.** Adaptation of the distal flare of the valve with a 40 mm PTS-X (NuMed) balloon. **F.** The control aortography shows unobstructed coronary artery flow, including the additional left descending artery (black arrow) originating from the right coronary artery. The widened distal flare (white arrows) of the valve is seen as well

Figure S1F) and follow-up echocardiograms confirmed good valve function. ECG-Holter monitoring showed a slow irregular sinus rhythm.

Supplementary material

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

Article information

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