Percutaneous closure of a superior sinus venosus atrial septal defect with partial pulmonary anomalous venous drainage: An option also for children

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Percutaneous treatment of atrial septal defects (ASD) has been used for more than 20 years, however, it was reserved only for type II defects. Successful single attempts at percutaneous closure of sinus venosus defects have been made for several years, but this applies almost exclusively in adult patients or older adolescents [1, 2].

Here, we present the first reported case of a transcatheter closure of superior sinus venosus atrial septal defect (SSV-ASD) in Poland using the stents overlapping technique.

The procedure was performed in a 10-year-old girl with signs of significant volume overload of the right heart, caused by the presence of SSV-ASD with abnormal drainage of the right upper pulmonary vein. A hemodynamic examination revealed the significance of the defect — Qp/Qs = 2.6:1.0 with normal pressure and pulmonary resistance. The child's legal guardians did not consent to the procedure using extracorporeal circulation, and transvascular treatment was proposed.

Angiography confirmed the presence of 13 mm diameter defect with an L-R shunt (Figure 1A). A semicompliant Tyshak balloon 22 mm × 4 cm was advanced from the femoral vein over a stiff guidewire across the superior cavoatrial junction. During balloon inflation, venography was performed in the right upper pulmonary vein, excluding the risk of its narrowing/closing. At the same time, the vessel was calibrated — in the cranial part, the superior vena cava (SVC) had a diameter of 15 mm, and at the right atrium — 21 mm. A 45 mm covered Cheatham platinum stent was placed on a BIB 24 balloon and expanded until the defect was closed (Figure 1B). After a few minutes, the stent was embolized into the right atrium. A Tyshak II 25 mm × 4 cm balloon was inserted into the lumen of the stent and inflated under low pressure, then the whole system was introduced into the defect site and pressurized to 3 atmospheres, placing the stent in the SVC, but the defect was not closed (Figure 1C). Therefore, another 45 mm covered Cheatham platinum stent was placed on BIB 16, which was deployed in the SVC partially above the previously implanted stent, and then the balloon was withdrawn and a 24 mm BIB balloon was inserted, with which the lower part of the stent was widened (Figure 1D) until the SSV-ASD was closed. Finally, adequate flow and the absence of a gradient between the pulmonary veins and the left atrium were confirmed. A trace residual leak was found immediately after the procedure. Currently, 4 months after the procedure, the dimensions of the heart chambers have normalized.

Percutaneous treatment of SSV-ASD is an attractive treatment option also in the pediatric population. Despite the significantly smaller dimensions of the cardiovascular structures in children, it is necessary to use long stents or overlapping stents as an alternative. In this particular case, due to the girl's low body weight — 25 kg, a 45 mm long stent was used. However, the use of a longer stent would have been possible and would have increased its stability.

Stent embolization can be managed percutaneously with an overlapping covered stent with good final result, although most patients require cardiac surgery [3].

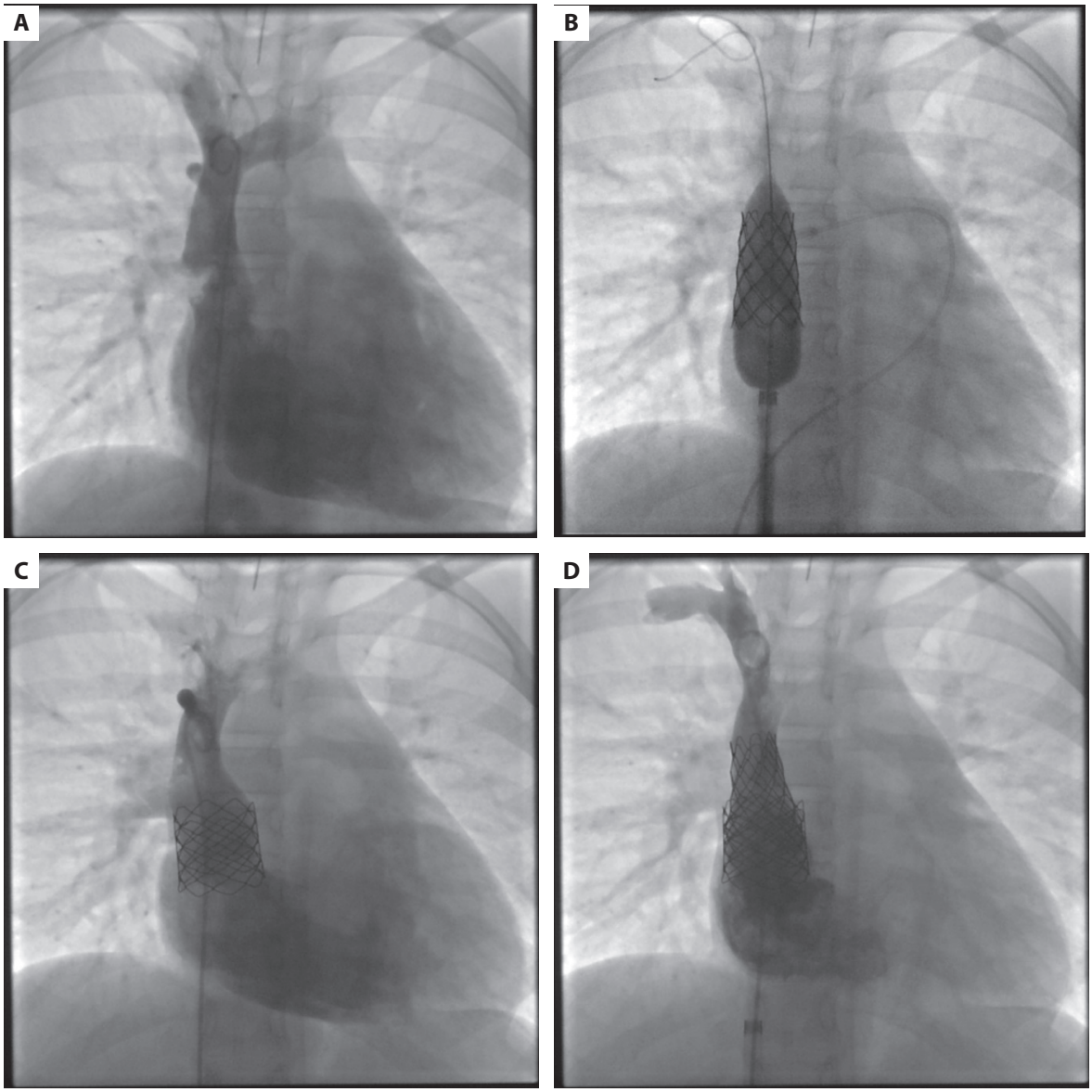

Figure 1. A. Venography in the superior vena cava — the shadow on the right side indicates the defect. **B.** A 45 mm covered Cheatham platinum stent placed on a BIB 24 balloon. **C.** The migrated stent has been placed back in the superior vena cava. The defect is visible just above the stent on the right. **D.** Overlapping stents placed in the correct position

New techniques are being developed to minimize the risk of stent instability, stent embolization and residual shunts. The selection of the appropriate one (long stents, overlapping stents, temporary suture-holding technique, *etc.*) should depend on the individual clinical situation and the experience of the center [4].

Article information

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