Ross-Konno procedure as a rescue operation in a newborn with critical aortic stenosis

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The treatment of critical aortic stenosis in early infancy continues to be challenging. The severity of aortic stenosis and concomitant pathologies determine treatment after birth. Mostly, interventional balloon valvuloplasty is the first choice of treatment; alternatively, surgical valvuloplasty and Ross or Ross-Konno procedures can be performed. Some patients with poor left ventricular function, fibroelastosis, mitral valve stenosis, and insufficiency may be considered for Norwood operation. The Ross-Konno procedure provides relief for left ventricular tract (LVOT) obstruction. During the operation, LVOT is widened with a patch, a pulmonary autograft is implanted into the transected aortic root, and the pulmonary valve is replaced with a prosthesis. The high risk of the procedure is associated with low body weight, initial dysfunction of the left ventricle (LV), myocardial fibroelastosis, and other cardiac defects [1–5]. The operation is performed mostly in older children and adults. However, we present a successful Ross-Konno procedure performed in a 14-day-old newborn with critical aortic stenosis treated ineffectively with interventional and surgical valvuloplasty.

According to the medical history, the female newborn was delivered at term, weighing 3200 g and scoring 9 Apgar points. Vital signs were unstable with a fast regular heart rate of 170/min, mean arterial pressure of 36–40 mm Hg, and SaO_2 of 84% in lower extremities. Prostaglandin E1 (PGE1) infusion provided general condition stabilization. Transthoracic echocardiography (TTE) revealed a critically stenotic aortic valve with a hypoplastic annulus of 5 mm (Z-score –3.2) with poor contractility of the LV, myocardial fibroelastosis, hypoplastic aortic arch, and isthmus coarctation.

Interventional balloon aortic valvuloplasty with a Tyshak 5 mm balloon catheter was moderately effective, with ejection fraction improvement of up to 50%. However, due to a high-pressure gradient of 60 mm Hg, a decision about surgical treatment was made (Figure 1A, B, Supplementary material, *Video S1, S2*).

A surgical examination revealed a highly dysplastic, unicuspid aortic valve. We performed aortic valvuloplasty: commisurotomy and leaflet shaving, and subsequently aortic arch and isthmus dilation with end-to-side anastomosis. The residual aortic stenosis with symptoms of cardiopulmonary failure required reoperation with the Ross-Konno technique.

A cardiopulmonary bypass was established via median sternotomy with bicaval cannulation. The aortic root was transected, and the aortic valve tissue was resected. After the pulmonary autograft was harvested, a Konno incision was made. A PhotoFix patch was used to enlarge the aortic annulus. Finally, the pulmonary autograft was implanted into the aortic root, and the coronary ostia were implanted. The pulmonary valve was replaced with a prosthesis Contegra 12 mm (Figure 1C–E, Supplementary material, *Video S3, S4*). Postoperative pulmonary branch stenosis required balloon plasty and right pulmonary artery stent implantation (Palmaz Blue 6 mm × 12 mm) (Supplementary material, *Video S5*).

The postoperative period was uneventful, and the child was discharged home. In 3-month follow-up, the infant was in good condition. TTE showed normal left ventricular

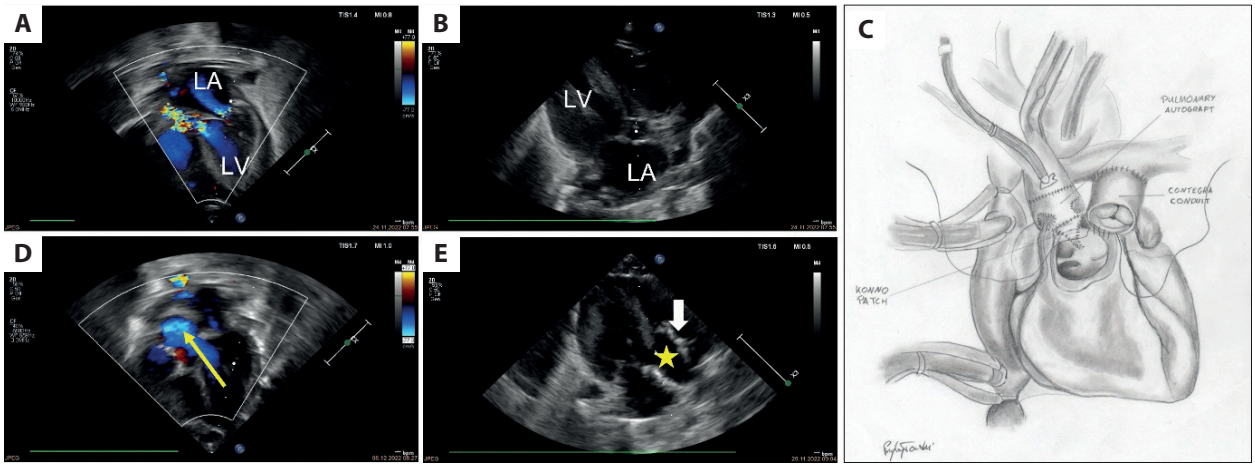

Figure 1. A. TTE. Apical 5-chamber view with color Doppler flow following balloon valvuloplasty — residual severe aortic stenosis and moderate mitral regurgitation with left atrium enlargement. **B.** TTE. 2DE. Longitudinal axis of the LV with a hypoplastic aortic annulus, left ventricular hypertrophy, and left atrial dilation. **C.** A scheme of the Ross -Konno procedure: LVOT widening with a patch (Konno patch). Pulmonary autograft implanted into the transected aortic root. The pulmonary valve replaced with a prosthesis (Contegra conduit). **D.** TTE. 5-chamber view with color Doppler flow: wide LV outflow tract following the Ross-Konno operation (yellow arrow) with normal LV dimension. **E.** TTE. 2DE. Longitudinal axis of the LV. A PhotoFix patch (white arrow) widening the outflow tract and aortic annulus. Pulmonary autograft in the aortic position (yellow asterisk)

Abbreviations: LA, left atrium; LV, left ventricle; LVOT, left ventricular tract obstruction; TTE, transthoracic echocardiography, 2DE two-dimensional

ejection fraction (72%) and moderate pulmonary branch stenosis.

The Ross-Konno procedure in early infancy is an alternative for patients with critical aortic stenosis with severe dysplasia of the aortic valve to provide biventricular repair.

In patients with acceptable left ventricle function, the Ross-Konno procedure with reconstruction of the aortic arch is a preferable option to the Norwood procedure.

Supplementary material

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

Article information

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