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Short title: Ross – Konno procedure in newborns with critical aortic stenosis

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The treatment of critical aortic stenosis in early infancy continues to be a challenging problem. Severity of aortic stenosis and concomitant pathologies contributes the way of 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 to Norwood operation. Ross – Konno procedure provides a relief of the left ventricular tract (LVOT) obstruction. During the operation LVOT is widened with a patch, pulmonary autograft is implanted into the transected aortic root and pulmonary valve is replaced with a prosthesis. The high risk of the procedure is associated with low body weight, initial dysfunction of the 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.

In medical history a newborn was delivered at term weighing 3200 g and scoring 9 Apgar points. Vital signs were unstable with fast regular heart rate of 170/min, mean arterial pressure of 36–40 mm Hg, and SaO₂ of 84% in lower extremities. PGE1 infusion provided general

condition stabilization. Transthoracic echocardiography (TTE) revealed critically stenotic aortic valve with hypoplastic annulus of 5 mm (z score -3.2) with LV poor contractility, myocardial fibroelastosis, hypoplastic aortic arch and isthmus coarctation.

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

Surgical examination revealed highly dysplastic, unicuspid aortic valve. Aortic valvuloplasty – commissurotomy leaflet and shaving, subsequently aortic arch and isthmus dilation with end to side anastomosis was performed. The residual aortic stenosis with symptoms of cardiopulmonary failure required reoperation with Ross Konno procedure.

Cardiopulmonary bypass was established via median sternotomy, with bicaval cannulation. The aortic root was transected and aortic valve tissue was resected. After the pulmonary autograft was harvested, Konno incision was made. Photo-Fix patch was used to enlarge aortic annulus. Finally pulmonary autograft was implanted into the aortic root and coronary ostia were implanted. Pulmonary valve was replaced with a prosthesis Contegra 12mm (Figure 1C–E, Supplementary material, Video S3, S4). Postoperative pulmonary branches 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 a good condition. TTE showed normal LVEF (72%) and moderate pulmonary branches stenosis.

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

In patients with an 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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REFERENCES

1. Winlaw D, Greenberg J, O'Donnell A. The Ross and Ross-Konno Operation in Neonates and Infants. *Operative Techniques in Thoracic and Cardiovascular Surgery*. 2022; 27(4): 423–446, doi: [10.1053/j.optechstcvs.2022.07.003](https://doi.org/10.1053/j.optechstcvs.2022.07.003).
2. Najm H, Gupta S, Weingarten N, et al. Infant Ross-Konno, Endocardial Fibroelastosis Resection and Mitral Valve Repair. *World J Pediatr Congenit Heart Surg*. 2022; 13(3): 389–392, doi: [10.1177/21501351211054380](https://doi.org/10.1177/21501351211054380), indexed in Pubmed: [34775844](https://pubmed.ncbi.nlm.nih.gov/34775844/).
3. Said SM. The Ross-Konno procedure for congenital aortic stenosis. *Ann Cardiothorac Surg*. 2021; 10(4): 527–537, doi: [10.21037/acs-2021-rp-31](https://doi.org/10.21037/acs-2021-rp-31), indexed in Pubmed: [34422569](https://pubmed.ncbi.nlm.nih.gov/34422569/).
4. Sames-Dolzer E, Wickenhauser E, Kreuzer M, et al. The Ross-Konno procedure in neonates and infants less than 3 months of age. *Eur J Cardiothorac Surg*. 2018; 54(1): 71–77, doi: [10.1093/ejcts/ezy030](https://doi.org/10.1093/ejcts/ezy030), indexed in Pubmed: [29444227](https://pubmed.ncbi.nlm.nih.gov/29444227/).
5. Ohye RG, Gomez CA, Ohye BJ, et al. The Ross/Konno procedure in neonates and infants: intermediate-term survival and autograft function. *Ann Thorac Surg*. 2001; 72(3): 823–830, doi: [10.1016/s0003-4975\(01\)02814-4](https://doi.org/10.1016/s0003-4975(01)02814-4), indexed in Pubmed: [11565665](https://pubmed.ncbi.nlm.nih.gov/11565665/).

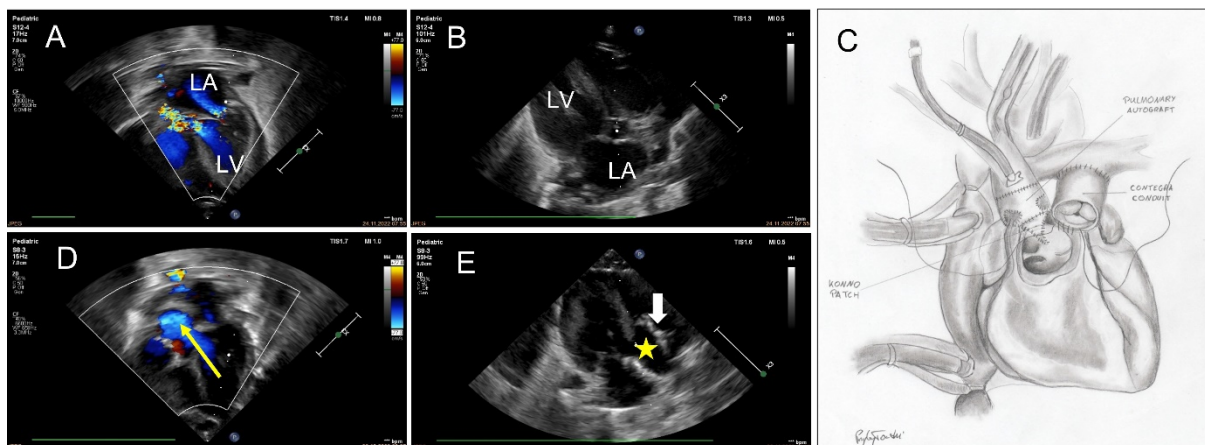


Figure 1. A. TTE. Apical 5 chamber view with color Doppler flow following balloon valvuloplasty — residual severe aortic stenosis and moderate mitral regurgitation with left atrium enlargement. **B.** TTE. 2DE. Longitudinal axis of the LV with hypoplastic aortic annulus, left ventricle hypertrophy and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

Abbreviations: LA, left atrium; LV, left ventricle; LVOT, left ventricular tract obstruction; TTE, transthoracic echocardiography