Intra-atrial, lateral tunnel, fenestrated, total cavopulmonary connection using a polytetrafluoroethylene patch: a video presentation

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Received: 10 July 2019 / Accepted: 01 August 2019

Two currently favored approaches to the modified Fontan circuit include the extracardiac or lateral tunnel techniques [1-4]. We report here-in the surgical technique of an intra-atrial, fenestrated, lateral tunnel construction for a patient with tricuspid atresia and normally related great arteries.

A six-year-old female patient diagnosed with tricuspid atresia underwent intra-atrial fenestrated lateral tunnel connection with interruption of antegrade pulmonary blood flow. The post-operative Fontan pathway pressure was 14 mmHg with stable hemodynamics and postoperative recovery was uneventful.

Surgical technique
1. Following median sternotomy, the thymus is subtotally excised taking care not to expose the brachiocephalic vein.
2. The pericardium is incised in the midline in between stay sutures. After aortobicaval cannulation, the fat pad between the aorta and pulmonary artery is incised for later selective aortic cross-clamping and ligation of the main pulmonary artery to interrupt antegrade pulmonary blood flow.
3. Note the placement of selective angled metal-tipped venous cannula into the distal-most portion of the superior caval vein and at the inferior vena cava-right atrial junction.
4. The intra-pericardial portion of the right atrial appendage is dissected from the mediastinal pleura till the main pulmonary artery-right pulmonary artery junction.
5. Two marking sutures are placed on two sides of the distal superior caval vein just above the sinoatrial nodal artery to avoid later distortion during the construction of superior vena cava-pulmonary artery anastomosis.
6. The right pulmonary artery is opened superiorly in between sutures close to the bifurcation of the pulmonary trunk to promote distal laminar flow to the contralateral left pulmonary artery and to prevent eddy current formation following lateral tunnel connection.

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DOI: 10.5455/im.302644391
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7. The superior cavo-pulmonary anastomosis is constructed using continuous 5-0 polypropylene sutures (Johnson and Johnson Ltd., Ethicon, LLC, San Lorenzo, USA) between the cephalic end of the superior vena cava and superior portion of the pulmonary artery.

8. The aorta is individually cross-clamped.

9. Myocardial preservation is achieved by a combination of cold hyperkalemic blood cardioplegia administered to the aortic root and topical ice-cold saline irrigation.

10. The right atrium is opened longitudinally 1 cm lateral to the atrioventricular groove.

11. The undersurface of the right pulmonary artery is opened up in between stay sutures.

12. The cardiac end of the superior caval vein is anastomosed to the under surface of the right pulmonary artery away from the cranial superior vena cava-pulmonary artery anastomosis using 5-0 polypropylene.

13. The distance between the superior and inferior vena cava is measured. A polytetrafluoroethylene patch (W.L. Gore Inc., Elkton, MD, USA) is used to construct the lateral tunnel using 4-0 polypropylene sutures. Note that the suturing starts at the mid portion of the intratrial septal remnant, proceeds caudally around the inferior vena cava opening and superiorly around the superior vena cava opening.

14. A 4.0 mm fenestration is created in the center of the polytetrafluoroethylene patch.

15. The anterior end of the patch is sandwiched between the incised edges of the right atrium using 4-0 polypropylene suture.

16. While suturing the patch, care being taken not to leave behind any gap in the patch-right atrial suture line.

17. The main pulmonary artery is ligated using No 2-ductus silk to interrupt the antegrade pulmonary blood flow.

18. The completeness of the Fontan pathway is assessed using transesophageal echocardiography and intra-operative pressure measurement of the superior and inferior vena cava.

Conflict of interest
The authors declare no conflict of interest.

Funding
The authors declare no financial support.

References

