Video Presentation

Completion extracardiac, non-fenestrated, total cavopulmonary connection using a polytetrafluoroethylene conduit: a video presentation

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Direct connection of both cavae to the pulmonary artery would be the ideal right heart bypass by virtue of elimination of prosthetic material and extensive atrial suture lines. When the direct connection is impossible, this may be accomplished by a prosthetic graft or a viable in situ pedicled pericardium. The extracardiac technique separates the high-pressure conduit from the atrial wall and systemic venous atrial cavity, avoids intra-atrial placement of prosthetic material, theoretically minimizes the risk of supraventricular arrhythmias and possibly preserves ventricular and pulmonary function because it can be performed without aortic cross-clamp. Concerns include lack of growth potential of the synthetic conduit, late supraventricular dysrhythmias, conduit narrowing or obstruction and thromboembolic complications [1-5].

A 14-year-old female patient diagnosed with a functionally univentricular heart, hypoplastic left ventricle, anteroposteriorly related great arteries who had prior superior cavopulmonary anastomosis without antegrade flow interruption at the age of nine years, underwent extracardiac, non-fenestrated, total cavopulmonary connection using a 20 mm polytetrafluoroethylene conduit. The post-operative Fontan pathway pressure was 16 mmHg with stable hemodynamics. Post-operative recovery was uneventful.

Surgical technique

1. Following secondary median sternotomy using an oscillating saw, the pericardium is incised with scissors and cautery in the midline in between stay sutures.
2. The pericardium overlying the aorta and right atrial appendage is dissected over the proposed site of cannulation using cautery and peanut dissection.
3. The patient is placed on cardiopulmonary bypass with aorto-atrial cannulation and the cardiac chambers and great vessels are carefully freed of the adhesions. The diaphragm overlying the inferior vena cava is incised and the extra-pericardial segment of inferior vena cava is dissected till above the hepatic veins.
4. Both venous cannulae are relocated on the distal most portion of the superior caval vein at the superior vena cava-brachiocephalic vein junction and about 1 cm below the inferior cavoatrial junction.

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5. The inferior cavoatrial junction is transected using Potts scissor in between stay sutures. Utmost care is taken to place two stay sutures at the cardiac end of the inferior cavoatrial junction. Note the transection is done gradually and suturing proceeds along with transection to prevent accidental slippage, thus preventing intracardiac air suction and systemic air embolization. The transected cardiac end of the inferior cavoatrial junction is sutured in two layers, ensuring perfect hemostasis.

6. The caudal end of the inferior vena cava is opened up in between the stay sutures to obtain perfect apposition during graft-caval anastomosis.

7. An appropriately sized 20 mm polytetrafluoroethylene conduit (W.L. Gore Inc., Elkton, MD, USA) is selected for the extracardiac pathway. The graft-inferior vena caval anastomosis is constructed using 5-0 polypropylene suture (Johnson and Johnson Ltd., Ethicon, LLC, San Lorenzo, USA) in two layers, ensuring perfect hemostasis.

8. The graft is laid over the para-right atrial recess and an appropriate length is retained, ensuring no kinking, waistling, flattening after completion of the graft-pulmonary artery anastomosis.

9. Three felt-supported 4-0 polypropylene sutures are placed across the main pulmonary artery at its origin. Subsequently, the main pulmonary artery is transected and the cardiac end is over sown in two layers, ensuring perfect hemostasis.

10. The cephalic end of the transected main pulmonary artery is spatulated. A strip of the bovine pericardium is sutured on the posterior portion of the transected main pulmonary artery at bifurcation to prevent tension/torsion and anastomosed to the graft using 5-0 polypropylene sutures in two layers, away from the superior cavopulmonary anastomosis, thus avoiding head-on collision/eddy current formation of the bicaval stream of blood.

11. Note the smooth, non-redundant completed extracardiac lateral tunnel pathway without kinking or flattening. The post-operative Fontan pathway pressure was 16 mmHg and no tunnel fenestration was considered necessary. The patient had stable hemodynamics and the post-operative recovery was uneventful.

Conflict of interest
The authors declare no conflict of interest.

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References