Repair of Taussig-Bing Anomaly with unusual coronary pattern using autologous pericardial tube extension.

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Abstract

The incidence of unusual coronary patterns including single coronary artery is high in Taussig-Bing anomaly (TBA). The relocation of a single coronary artery from a non-facing sinus can be technically challenging with implications on early and late outcomes. Many innovative techniques for coronary transfer have been described and no coronary pattern precludes arterial switch operation in the current era. We describe a technique of coronary transfer using autologous pericardial tube extension with good early outcome.

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Running Title : Coronary transfer using Pericardial tube

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Keywords: Arterial Switch Operation, Coronary artery, Pericardium, Taussig-Bing Anomaly

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Abstract: The incidence of unusual coronary patterns including single coronary artery is high in Taussig-Bing anomaly (TBA). The relocation of a single coronary artery from a non-facing sinus can be technically challenging with implications on early and late outcomes. Many innovative techniques for coronary transfer have been described and no coronary pattern precludes arterial switch operation in the current era. We describe a technique of coronary transfer using autologous pericardial tube extension with good early outcome.

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Word count: 86

Case Report

A two month old girl child weighing 3Kg presented with cyanosis, breathlessness and failure to thrive. On examination, the child had tachycardia and tachypnea with oxygen saturation of 77% on room air. The precordium was hyper dynamic and a systolic murmur was auscultated. The chest radiogram revealed cardiomegaly and pulmonary plethora. The diagnosis of TBA with large sub-pulmonic ventricular septal defect (VSD) and large patent ductus arteriosus (PDA) was confirmed on echocardiogram. A single coronary artery arising from non-facing sinus was reported. The surgery was performed through median sternotomy on moderate hypothermic cardioplegic arrest. The great arteries were in side by side relationship with aorta anterior and to the right of pulmonary artery. A significant size discrepancy between the great arteries was noted. A single coronary was arising from the non-facing sinus and it soon divided into right coronary artery (RCA), left main coronary artery (LMCA) and two prominent conal arteries. The RCA course was usual in the right atrioventricular (AV) groove. The LMCA looped posterior to the great arteries before bifurcating into circumflex (Cx) coursing in the left AV groove and left anterior descending artery (LAD) in the interventricular groove. An additional tiny conal artery was arising from the facing sinus. (Figure 1,2). The Cardiopulmonary bypass was instituted following aortobicaval cannulation. The PDA was divided and antegrade Delnido's cardioplegia was delivered. The VSD was repaired with e-PTFE patch. Aorta was transected and coronary buttons were harvested. The pulmonary artery was transected and LeCompte manoeuvre was performed. The distance between the coronary button and the neoaortic root was 25 mm. An autologous untreated pericardial tube was constructed over 5mm Hegar's dilator (Figure 3) and interposed between the coronary button and the neoaorta. The pulmonary confluence was shifted rightwards away from the pericardial tube. (Figure 4,5) The rest of surgery was routine and postoperative course was uneventful. The Echocardiogram at discharge demonstrated patent coronary artery and good biventricular function. The child was diagnosed with sub-valvar right ventricular outflow tract obstruction (RVOTO) after two years and she underwent surgery for the RVOTO relief. The coronary artery was found patent on the angiogram performed prior to re-operation. (Figure 6) The child continues to do well at 30 months follow-up.

Comment

The single coronary may present technical challenges during arterial switch operation with both early and longterm implications. (1) The transfer of a single coronary artery from non facing sinus in Taussig-Bing anomaly with side by side relationship of great arteries can indeed be difficult. The distance from the non-facing sinus to neo-aorta can be significant enough to preclude direct transfer. The mobilisation of a single coronary artery is further limited by early branching. Atrial switch or Damus-kaye-stansel (DKS) with Rastelli can be considered when traditional arterial switch operation (ASO) can not be performed. (2) However, atrial switch commits right ventricle for systemic circulation and is bound to have poor longterm prognosis. DKS with Rastelli is an innovative technique but the child is committed to multiple operations for the right ventricle outflow tract (RVOT). Therefore, pursuing ASO may still be the best option. Some of

the techniques described to facilitate ASO with "difficult to transfer" coronary patterns are in situ coronary relocation, trap door with pericardial hood and coronary extension using aortic autograft. (3,4,5) Though, aortic autograft concept has an advantage of growth potential, it may not always be feasible to obtain enough aortic tissue to create a tube of desired length. The in situ coronary translocation is not feasible if the coronary artery arises from the non-facing sinus. In such circumstances, autologous pericardial tube which is viable, non-allogenic, pliable, haemostatic and readily available is an acceptable alternative. Animal studies have demonstrated that autologous pericardium has better fibrinolytic activity and less sub-endothelial fibrosis which will translate into less thrombogenicity and contracture. (6) Though, the pericardial tube as coronary extension has remained patent for more than two years, the longterm outcome is yet to be seen and a cautious follow-up is recommended.

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Consent

The patient's family gave permission to publish this case report.

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Legend for figures

Figure 1 : Pre-operative Cross-section view of great vessels and coronary artery anatomy

Figure 2: Pre-operative Frontal plane view of great arteries and coronary artery anatomy. LAD: Left anterior descending artery, LCx: Left circumflex artery, LMCA: Left main coronary artery, PDA: Patent ductus arteriosus, RCA: Right coronary artery, RV: Right ventricle

Figure 3: Pericardial tube construction

Figure 4: Postoperative Cross-section view of great vessels and coronary anatomy with the pericardial tube. PA: Pulmonary artery

Figure 5: Postoperative Frontal plane view of great arteries and coronary anatomy with the pericardial tube. LAD: Left anterior descending artery, LMCA: Left main coronary artery, PA: Pulmonary artery, PDA: Patent ductus arteriosus, RCA: Right coronary artery

Figure 6: Coronary angiogram demonstrating the patent pericardial tube.