Correction of Truncus Arteriosus Using a Fresh Autologous Pericardial Trileaflet Valve Conduit

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Abstract

A fresh autologous pericardial trileaflet valve conduit was used in a 5-month-old infant for correction of truncus arteriosus. The patient recovered from the operation with satisfactory hemodynamics and post-operative echocardiogram at 3 months showed only mild to moderate pulmonary regurgitation. This technique is a useful alternative for correction in an infant with congenital heart disease who needs a tissue valve conduit. It may be more suitable than an aortic homograft by reason of unavailability of small homograft and limitation of organ donation.

Key word : Correction of Truncus Arteriosus, Fresh Autologous Pericardial Trileaflet Valve Conduit, Metallic Trileaflet Valve Conduit Templates

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Persistent truncus arteriosus is an uncommon congenital cardiac malformation accounting for approximately 1.2 per cent of all congenital cardiac malformations[1]. Without surgical intervention sixty-five per cent die within the first three months and up to eighty per cent or more die within the first year[1-5]. Total correction of truncus arteriosus was first reported by McGoon, Rastelli, and Ongley[7] in 1968 in a 5-year-old patient in whom an aortic homograft including the aortic valve was used to establish continuity from the right ventricle (RV) to the pulmonary artery (PA). Recently, successful surgical correction of truncus arteriosus with a Hancock conduit was achieved in infants from 1 to 6 months of age[8,9]. Unfortunately, some infants require an operation in the newborn period and a very small

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conduit is unavailable. Various means of reconstruction have been developed and controversy remain as to which method is the best. Correction of truncus arteriosus in the neonate using a non valve conduit was described by Peetz et al in 1982[6]. However, hospital mortality remains significant with on going morbidity related to conduit obstruction and reoperation. The purpose of this report was to describe the successful use of a fresh autologous pericardial trileaflet valve conduit to establish continuity from the right ventricle (RV) to the pulmonary artery (PA). Unavailability of a small homograft and limited organ donation in the infant age group and the high cost of a conduit are the main reasons for not using homograft. The authors have developed an alternative method of fresh autologous pericardial trileaflet valve conduit and used it successfully in an infant with absence pulmonic valve syndrome.

CASE REPORT

A 5-month-old infant boy, presented with tachypnea and mild central cyanosis and clinically he had congestive heart failure. Chest roentgenogram showed mild cardiomegaly, left sided aortic arch and increased pulmonary vascularity. Electrocardiogram showed right atrial enlargement, right ventricular hypertrophy and left ventricular hypertrophy. Echocardiogram revealed truncus arteriosus type I with mild truncal valve stenosis and insufficiency. There were stenosis of proximal main pulmonary artery with systolic pressure gradient of 46.5 mmHg and a large ventricular septal defect. Cardiac catheterization showed the single arterial trunk which divided into an aorta and a pulmonary artery. The main pulmonary artery was short and divided into left and right pulmonary arteries. The aortic arch was on the left side. Moderate degree of truncal valve regurgitation was demonstrated (Fig. 1). He was treated by digitalis and diuretics but congestive heart failure persisted. At 7 months of age, he underwent total correction. A patch of autologous pericardium is harvested and the fresh autologous pericardial pulmonic valve conduit was constructed using metallic trileaflet valve conduit templates 14 mm in diameter (Fig. 2). The common truncus arteriosus was divided into aortic and pulmonary segments and the lateral

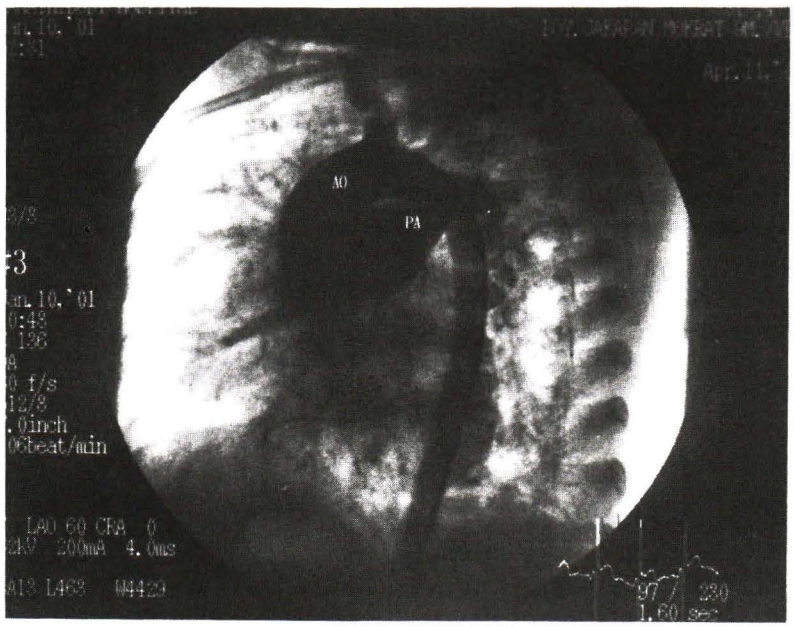

Fig. 1. Cardiac catheterization shows the single arterial trunk divided into aorta and pulmonary artery.

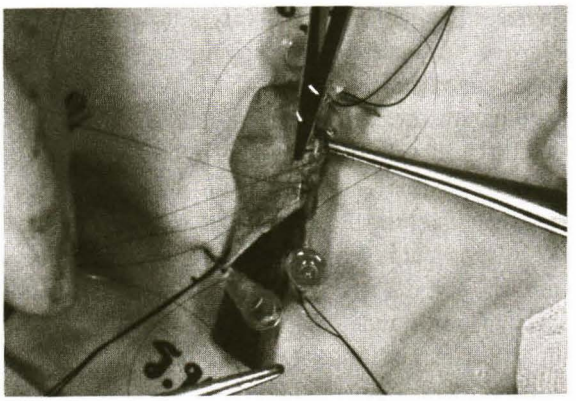

Fig. 2. Show the fresh autologous pericardial pulmonic valve conduit constructed by the trileaflets model 14 mm in diameter size.

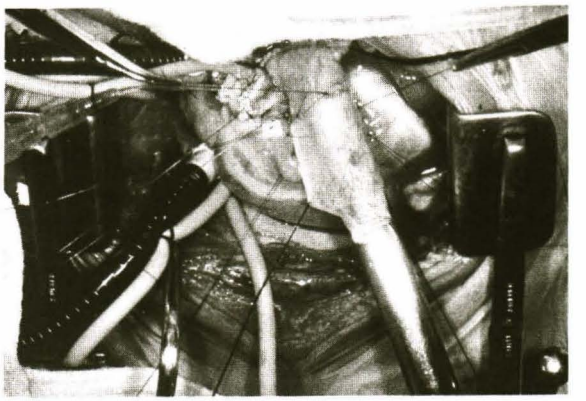

Fig. 3 The proximal end of conduit is sutured to the edge of the right ventriculotomy and a pericardial hood is used to enlarge the right ventricular outflow tract.

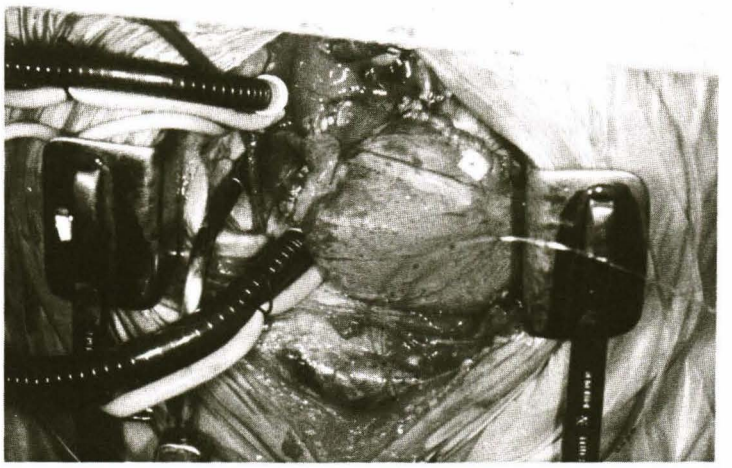

Fig. 4. Replacement of the autologous pericardial pulmonic valve conduit and reconstruction of the right ventricular outflow tract by a small patch of pericardium.

defect in the aortic component was repaired. The ventricular septal defect was closed through a vertical right ventriculotomy with a Teflon patch. A fresh autologous pericardial pulmonic valve conduit was used to establish right ventricular-pulmonary artery communication. The pulmonary arterial anastomosis was made first with continuous running 6-0 polyprophylene suture. The proximal end of the conduit is then sutured to the edge of the right ventriculotomy, incorporating the superior rim of the patch on the ventricular septal defect (Fig. 3). A pericardial hood is then used to complete the reconstruction of the right ventricular outflow tract (Fig. 4). The patient was weaned off cardiopulmonary bypass with 5 $\mu g.kg.^{-1}min.^{-1}$ of dobutamine. Post-operative hemodynamic was satisfactory.

The post-operative course was complicated by granuloma at subglottic area. Tracheostomy was

done and granuloma was removed by laser technic. Post-operative echocardiogram at 3 months showed only mild to moderate pulmonary regurgitation and he was doing well.

DISCUSSION

Total correction with a homograft valved conduit used to reconstruct the right ventricular outflow tract is now recognized as the optimal method of repair of truncus arteriosus. However unavailability of small homografts and the high cost has been the limitation in using. Various means of reconstruction have been developed and controversies remain among usage of Dacron valve conduit, valveless autologous tissue reconstruction etc. Reintroduction of allograft valved conduit during the last 10 years dramatically drop the mortality. Construction of fresh autologous pericardial valve with trileaflet valve conduit further improved the outcome. A 5-month-old infant with absent pulmonary valve syndrome underwent total correction by using a fresh autologous pericardial valve conduit successfully. There was only mild to moderate pulmonary regurgitation by post-operative echocardiogram. Construction of the fresh autologous pericardial trileaflet valve conduit is proved to be effective, inexpensive and more practical than homografts in our institute. During the short term follow-up, our patient has mild to moderate pulmonary regurgitation. He had mild truncal valve regurgitation also, but the hemodynamic seems to remain stable. Correction of truncus arteriosus using a fresh autologous pericardial trileaflet valve conduit is the alternative choice of right ventricular outflow tract technique with a good immediate result. Midterm and long-term result need further follow-up.

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การผ่าตัดแก้ไขโรคหัวใจทรังคัส อาร์เทอริโอสัส โดยการใช้เยื่อหุ้มหัวใจผู้ป่วยมาเย็บเป็นลิ้นหัวใจและเส้นเลือด

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การใช้เยื่อหุ้มหัวใจของผู้ป่วยเองมาเย็บทำเป็นลิ้นหัวใจและเส้นเลือด เพื่อใช้ในการแก้ไขความผิดปกติของโรคหัวใจพิการแต่กำเนิด ที่มีเส้นเลือดออกจากหัวใจเพียงเส้นเดียว ที่เรียกว่า TRUNCUS ARTERIOSUS โดยทำผ่าตัดแก้ไขให้กับเด็กอายุ 5 เดือน หลังการผ่าตัดพบว่า ระบบการทำงานของหัวใจและการไหลเวียนของโลหิตเป็นที่น่าพอใจ จากนั้นได้ติดตามผลการผ่าตัดรักษาด้วยการทำ echocardiography หลังการผ่าตัด 3 เดือน พบว่าลิ้นหัวใจที่ใส่ให้มีการรั่วเล็กน้อย การรักษาวิธีนี้เป็นทางเลือกที่มีประโยชน์วิธีหนึ่งในการผ่าตัด เพื่อแก้ไขความพิการจากโรคหัวใจพิการแต่กำเนิด ซึ่งจำเป็นต้องใช้ลิ้นหัวใจเทียมที่ทำจากเนื้อเยื่อ (tissue valve conduits) และอาจจะมีความเหมาะสมกว่าการใช้ลิ้นหัวใจเทียมชนิด aortic homograft ด้วยเหตุผลที่ไม่สามารถหาขนาดที่เล็กตามต้องการได้ และมีจำนวนผู้บริจาคน้อย

คำสำคัญ : การผ่าตัดแก้ไขโรคหัวใจทรังคัส อาร์เทอริโอสัส, เส้นเลือดพร้อมลิ้นหัวใจเทียมที่ทำจากเยื่อหุ้มหัวใจของตนเอง, แบบพิมพ์เส้นเลือดพร้อมลิ้นหัวใจที่ทำจากโลหะ

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