



## Modified Primary Sutureless Repair for TAPVC Associated with Right Atrial Isomerism

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### Abstract

We herein reported an 11-month-old infant with right isomerism heart undergoing successful modified primary sutureless repair of total anomalous pulmonary venous connection and bidirectional Glenn shunt. Postoperative cardiac catheterization showed excellent hemodynamics without pulmonary venous obstruction. The modified primary sutureless repair of total anomalous pulmonary venous connection might be a good option also for right isomerism heart.

**Keywords:** Sutureless technique; Total anomalous pulmonary venous connection; Right isomerism heart; Univentricular heart

### Introduction

In patients with univentricular heart associated with right isomerism heart, total anomalous pulmonary venous connection is well-known as a major risk factor of mortality and pulmonary venous obstruction after the repair [1], and the repair is still a clinical challenge with high early and late mortality [2].

We have carried out modified primary sutureless repair of total anomalous pulmonary venous connection and bidirectional Glenn shunt in an 11 month-old infant with univentricular heart associated with right isomerism heart.

### Case Presentation

A 1-day-old neonate with a univentricular heart was transferred to our medical school due to cyanosis. Chest X-ray on admission showed dextro-cardia with cardio-thoracic ratio of 45%. Electrocardiogram showed sinus rhythm with heart rate of 145/min and 2 patterns of P-wave and QRS complex. Echocardiography showed common inlet right ventricle, pulmonary atresia, total anomalous pulmonary venous connection to the left superior caval vein and patent ductus arteriosus. Pulmonary venous obstruction was not detected. Prostaglandin E1 was intravenously administered. The right Blalock-Taussig shunt was carried out via a right thoracotomy 2 months after birth.

Echocardiography 9 months after birth showed good growth of the bilateral pulmonary arteries with a minimal regurgitation of the common atrio-ventricular valve. Pulmonary venous obstruction was not identified. Cardiac catheterization revealed that mean pulmonary artery pressure was 10mmHg with systemic-pulmonary flow ratio of 1.5 and pulmonary vascular resistance of 1.5 Um<sup>2</sup>. PA index was increased to 296 mm<sup>2</sup>/m<sup>2</sup>. Pulmonary venous flow returned to the left superior caval vein without the obstruction. However, repair of total anomalous pulmonary venous connection was mandatory to carry out left bidirectional Glenn shunt because the vertical vein returned to high position of the left superior caval vein.

Modified primary sutureless repair of total anomalous pulmonary venous connection and left bidirectional Glenn shunt were carried out at the age of 11 months.

Under general anesthesia, median full sternotomy was done. After establishment of cardio-pulmonary bypass, BT shunt was ligated and the stamp was closed. There was no adhesion between the posterior wall of the atrium and the posterior mediastinal pleura. The common chamber of the pulmonary veins was minimally and partially dissected to confirm the both right and left side edge of the common chamber. The common chamber situated behind left-side of the common atrium. Blood flow from the pulmonary veins to the superior caval vein was well drained by the venous

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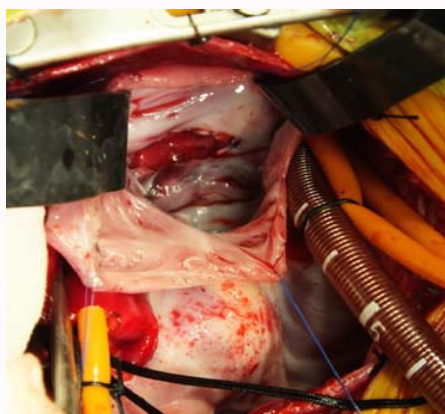
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**Figure 1:** Operative Schema showing the posterior wall of the atrium was sutured to the posterior mediastinal pleura surrounding the common chamber with 7-0 prolene sutures. The suture line was 2 mm to 3 mm far from the common chamber.

cannulae inserted into the left superior caval vein. After cardiac arrest, the left-sided atrium was obliquely opened along the appendage. The posterior wall of the atrium was vertically incised along the common chamber, and the atrial orifice was sutured to the posterior mediastinal pleura surrounding the common chamber with 7-0 prolene sutures. The suture line was 2 mm to 3 mm far from the common chamber (Figure 1). Next, the common chamber was longitudinally incised. The incision was elongated along the common chamber not to reach the each pulmonary veins. Using two 7-0 prolene sutures, orifice of the common chamber was bilaterally fixed. At last, the left superior caval vein was anastomosed with the left pulmonary artery after division of the azygos vein and the vertical vein.

Weaning from cardio-pulmonary bypass was easy with good hemodynamics. Mean pressure of the superior caval vein was 9 mmHg with systolic blood pressure of 80 mmHg and arterial oxygen saturation of 85%. Amiodarone (5 microg/kg/min) and landiolol (5 microg/kg/min) were intravenously infused to prevent postoperative life-threatening tachycardia.

She was extubated 4 hours after the surgery, and was transferred to the cardiac ward 2 days after the surgery. Junctional cardiac rhythm was recovered to sinus rhythm 7 days after the surgery. No paroxysmal supra-ventricular tachycardia occurred postoperatively. She was discharged 19 days after the surgery.

Echocardiogram 6 months after the surgery showed no obstruction of the pulmonary vein with maximal flow velocity of 0.8 m/s. Cardiac catheterization revealed that mean pressure of the left superior caval vein and the pulmonary arteries was 7 mmHg with arterial oxygen saturation of 89%. Angiogram showed good return from the pulmonary veins without obstruction. Now she is waiting for the Fontan operation.

## Discussion

Sutureless repair of total anomalous pulmonary venous connection was first reported as a re-do technique for pulmonary venous obstruction after the repair [3]. The aim was to avoid damage of pulmonary venous wall and the endothelium by needle and sutures. Then this technique was modified and reported as the primary repair of total anomalous pulmonary venous connection [1]. Modified technique consists of suturing the posterior wall of

the left atrium to the posterior mediastinal pleura and leaving orifice of the common chamber open. Then the indication of this primary sutureless repair was extended to a univentricular heart associated with right isomerism heart [4,5]. We decided to go for this modified technique, and good results were obtained. This modified repair of total anomalous pulmonary venous connection would be a good option also for a univentricular heart and total anomalous pulmonary venous connection associated with right isomerism heart.

Operating under bloodless surgical field is important for the appropriate fine anastomosis. Blower was reported to be useful to remove blood from the incised common chamber at the anastomosis and obtain good operating field [5]. We have carried out the anastomosis in the good operating field without blood before incision of the common chamber. Because blood flow returning from the pulmonary veins was well drained by venous cannula in the left superior caval vein. When pulmonary venous return is well drained under the cardio-pulmonary bypass, it would help obtaining good operating field to incise the common chamber after suturing the atrial wall to the posterior mediastinal pleura.

Another concern about this entity would be postoperative arrhythmias. Various arrhythmias have occurred after surgery for right isomerism heart [6], and after repair of total anomalous pulmonary venous connection [7]. These arrhythmia often markedly impair patient's hemodynamics. Our case represented 2 patterns of P-wave and QRS complex, which is obvious risk of postoperative supra-ventricular tachycardia often inducing shock [6]. We used intravenous infusion of amiodarone and landiolol to prevent these life-threatening arrhythmias after the surgery. No postoperative tachycardia occurred after the surgery [8].

This modified sutureless repair of total anomalous pulmonary venous connection would be a good option also for univentricular heart and total anomalous pulmonary venous connection associated with right isomerism heart.

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