Kompleks Siyanotik Kalp Hastalıklarında Blalock Taussig Shunt Uygulaması

NEONATAL BLALOCK TAUSSIG SHUNT IN COMPLEX CYANOTIC HEART PATHOLOGIES

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Özet

Sistemik - pulmoner şant ameliyatları yenidoğan siyanotik kalp hastalıklarının tedavisinde halen önemli bir tedavi metodudur. Ancak kayda değer mortalite ve morbidite oranları göz ardı edilmemelidir. Bu raporda yeni ve basit bir yaklaşımla parsiyel sternotomi yoluyla yenidogan şant operasyonu tekniği tarif edilmektedir. Bu metod her iki puloner arter dallarında yeterli ve eşit genişlemeyi sağlamaktadır. Ayrıca yapışıkların daha az olmasına neden olmaktadır.

Anahtar kelimeler: Blalock tausing şant, parsiyel sternotomi, ana pulmoner arter, kompleks anomali

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Summary

Systemic pulmonary shunt is still the surgical technique of choice for palliation of cyanotic congenital heart lesions of neonates. However, this procedure is associated with some degree of morbidity and mortality. Here, we recommend a new simple technique for shunt operations via partial sternotomy. This method provides equal enlargement of the pulmonary artery branches and minimizes iatrogenic deformations, which are very important for the subsequent interventions.

Keywords: Blalock taussig shunt, partial sternotomy, main pulmonary artery, complex anomaly

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Introduction

Palliative shunts are still in widespread use in congenital heart surgery for cyanotic patients. Modified and classical Blalock Taussig (BT) shunt procedures are the most frequently applied ones. In today's cardiovascular surgical era, technique of palliative shunt procedures especially for neonatal complex congenital heart surgery is still an issue of debate. Some authors recommend thoracotomy whereas others prefer median sternotomy. Median sternotomy has gained popularity in recent years [1]. Shunt to the right or left pulmonary artery branches may cause complications such as iatrogenic deformation of the effected pulmonary artery or excessive blood flow in one pulmonary artery side [2,3]. Here, we present 10 neonates who had modified Blalock Taussig shunts between brachiocephalic artery and main pulmonary artery or pulmonary bifurcation, through partial median sternotomy, between January 2001 and September 2003. The age of the patients ranged between two and 30 days (mean 16 days). The characteristics of the patients are summarized in Table 1.

Surgical Technique

Partial median sternotomy was performed from jugulum to the third intercostal space. The pleuras were kept intact, right lobe of the timus was completely removed, and innominate vein and brachiocephalic artery were mobilized. Upper 1/3 of the pericardium was opened, leaving the rest of it intact. Aorta and the main pulmonary artery were minimally dissected. After 100 IU/ kg intravenous heparin administration, the side clamp was placed on the main pulmonary artery. Following a longitudinal incision, an end-to side anastomosis with a 4 mm gore-tex graft was applied to the main pulmonary artery (Figure 1a). The other end of the tube graft, after crossing in front of the aorta, was anastomosed to the brachiocephalic artery, which was occluded partially with a lateral clamp (Figure 1b). Continuous 7/0 polypropylene sutures were used for both of the anastomosis. In two patients, whose pulmonary arteries were lying posteriorly to the aorta, the pulmonary arterial side of the anastomosis was applied on to the retroaortic pulmonary bifurcation and the other end was anastomosed to the brachiocephalic artery anteaortically. 3.5

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Table 1. The preoperative and operative findings of the patients.

Pts.	Age(days)	Weight(kg)	Pathology	Pulmonary artery size	
				Main	Right
1	10	3.5	Tricuspid atresia, pulmonary stenosi	7 mm	5mm
2	15	3.8	Tricuspid atresia, pulmonary stenosis	6mm	4mm
3	4	3.2	Pulmonary atresia, intact ventricular septum	9mm	7mm
4	5	3.7	Pulmonary atresia, intact ventricular septum	8mm	6mm
5	20	4	Tricuspid atresia, pulmonary stenosis	7mm	4mm
6	30	4	Double inlet left ventricle, pulmonary stenosis	6mm	4mm
7	2	3	Pulmonary atresia, intact ventricular septum	10mm	8mm
8	4	3.1	Pulmonary atresia, intact ventricular septum	9mm	6mm
9	20	3.6	Double inlet left ventricle, pulmonary stenosis	8mm	5mm
10	15	3.7	Tricuspid atresia, Pulmonary atresia	7mm	4mm

Table 2. Postoperative characteristics of the patients.

Pts.	Intubation time (hrs)	Shunt failure	PaO2 (after extubation)	Hospitalization (days)	Status
1	6	-	88	7	alive
2	2	-	90	6	alive
3	20	+(reintervention)	88	10	alive
4	5	-	95	8	alive
5	2	-	90	5	alive
6	8	-	92	8	alive
7	12	-	90	7	alive
8	360	-	87	-	death
9	8	-	90	10	alive
10	24	-	94	12	alive

PaO2 = arterial oxygen saturation

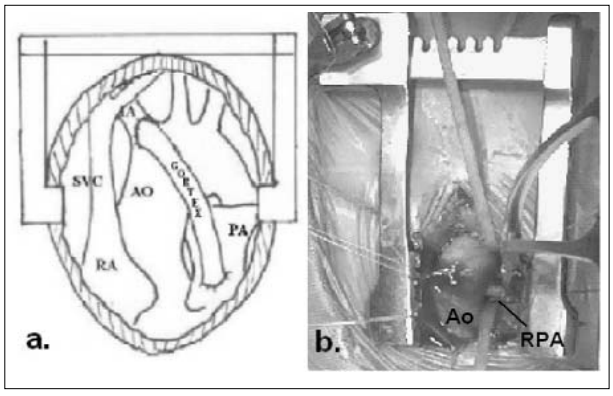

Figure 1a. The illustration of completed systemic pulmonary anastomosis between the innominate artery (IA) and the main pulmonary artery (PA) b. Intraoperative surgeons view showing clamped pulmonary artery and also partial sternotomy.
AO = aorta; RPA = right pulmonary artery; RA = right atrium; SVC = superior vena cava .

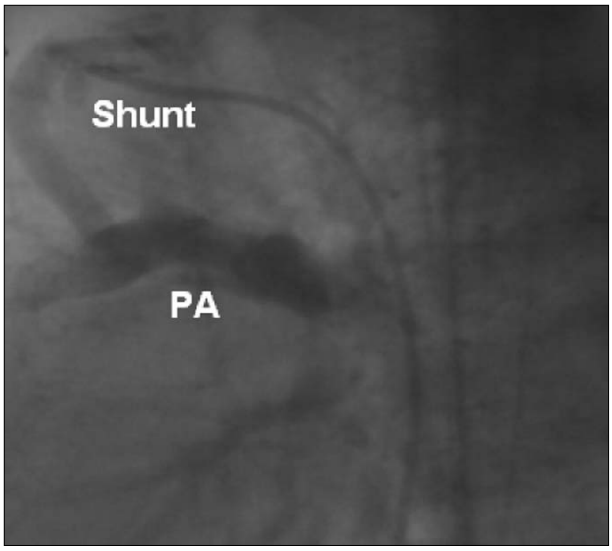

Figure 2. The angiographic assessment of the patient shows systemic to pulmonary shunt. (lateral view)
PA = pulmonary artery

and 4 mm gore-tex tubular grafts were used in children weighing 3.5-4 kg and 2.5–3.5 kg, respectively. Following hemostasis, lower half of the pericardium was loosely closed. Redon drain was placed into the mediastinum and partial sternotomy was closed conventionally.

There was no operative mortality. One patient diagnosed with pulmonary atresia and intact ventricular septum died due to pneumonia and septic shock on 15th postoperative day (Table 2). Surgical reintervention performed due to occlusion of the shunt (arterial oxygen saturation < 70%) for one patient. The graft was stretching anteaortically and was compressed by the aorta. A new longer shunt graft was interposed between barchiocephalic artery and main pulmonary artery. Postoperative incisional minimal inflammation was observed in three patients. All surviving patients were followed up by echocardiographic examination and control angiography was performed for one patient (Figure 2).

Bidirectional Glenn procedure was performed for five of the surviving patients within a period of to 1.5 years. We didn't observe any dense adhesions at reoperations during preparations of the right pulmonary artery and superior caval vein. In two of these cases we observed that the grafts have adhered to the left sternal border. There was no vascular damage at all. During bidirectional Glenn operation, we observed that keeping right pulmonary artery intact in the first intervention made the next operation easier. Additionally, we detected that right and left pulmonary artery branches grew uniformly.

Comment

Surgical approach for systemic to pulmonary artery shunt procedures in neonates is controversial. Shunt procedures performed via thoracotomy incisions do not enlarge both pulmonary arteries equally and may cause early occlusions or iatrogenic pulmonary artery deformations. Alkhulaifi and coworkers [1] reported 33 neonatal right modified BT shunt procedures performed via median sternotomy. Blalock Taussig shunt to the right pulmonary artery in neonates with single ventricle may techniqually compromise the subsequent corrections, such as bidirectional Glenn or Fontan procedures. Potapov and co-workers [2] reported optimal enlargement of left and right pulmonary arteries following central shunts to the main pulmonary arteries. However, in their technique, the risk of pulmonary overflow may occur when the ascending aorta is the site of the proximal anastomosis. There is not such a risk in our technique as the shunt is reconstructed between brachiocephalic artery and main pulmonary artery. Partial occlusion of the main pulmonary artery did not compromise the hemodynamics in ductus dependent cases.

Median sternotomy is considered as a risk factor for subsequent operations of the patients due to adhesions. However, the risk seems to be low in our technique as we make a partial median sternotomy and pericardiotomy and close the partially opened pericardium at the end of the procedure.

We conclude that modified Blalock Taussig shunt between main pulmonary artery and brachiocephalic artery using partial sternotomy is a simple and practical technique without complications. This method provides equal enlargement of the pulmonary artery branches and may be advantageus for subsequent operations such as, bidirectional Glenn or Fontan by leaving intact right pulmonary artery and less adhesions due to limited sternotomy.

References

1. Alkhulaifi AM, Lacour-Gayet F, Serraf A, Belli E, Planche C. Systemic pulmonary shunts in neonates: Early clinical outcome and choice of surgical approach. Ann Thorac Surg 2000;69:1499-504.
2. Potapov EV, Alexi-Meskishvili VV, Dahnert I, Ivanitskaia EA, Lange PE, Hetzer E. Development of pulmonary arteries after central aortopulmonary shunt in newborns. Ann Thorac Surg 2001;71:899-906.
3. Tamisier D, Vouhe PR, Vernant F, Leca F, Massot C, Neveux JY. Modified Blalock-Taussig shunts: Results in infants less than 3 months of ages. Ann Thorac Surg 1990;49:797-801.