Fontan postoperative complication: antegrade pulmonary flow

Complicação pós-operatória de Fontan: fluxo pulmonar anterógrado

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CLINICAL DATA
In the period from January 2003 to December 2008, 152 operations of total cavopulmonary connections were performed in our department, 106 (71.2%) with extracorporeal circulation and 46 (28.8%) without this procedure. The ligation of the pulmonary trunk was performed with the use of cardiac tape attached to the pulmonary trunk wall with three separate polypropylene sutures 5-0 in 131 cases (86.1%). The transthoracic echocardiography with color-flow mapping performed before hospital discharge showed no residual antegrade flow.

The suspected diagnosis of pulmonary residual flow was performed by auscultation of systolic murmur over the pulmonary area, and confirmed by echocardiogram.

Case 1
An 11-year-old female, 24.9 kg, with a diagnosis of transposition of great arteries with hypoplastic left ventricle and pulmonary stenosis, who underwent atrial septostomy on her third day of life, a right modified Blalock when she was 1 year and 2 months, and bidirectional Glenn + Fontan operation with an extracardiac conduit and pulmonary artery ligation without extracorporeal circulation at 8 years old. In the late postoperative period, 2 years after surgery, the mother reported fatigue and eyelid edema in the morning.

During diagnostic investigation, doppler echocardiography showed antegrade pulmonary flow (gradient of 81 mmHg) and origin of the pulmonary arteries stenosis, especially on the left. The magnetic angioresonance showed critical stenosis of the left pulmonary artery and aneurysm of the proximal stump of the pulmonary trunk (Figure 1).

Fig. 1 - Aneurysms of the pulmonary trunk and branch pulmonary stenosis caused by banding
SVC - superior vena cava, RPA - right pulmonary artery

Study conducted the Heart Institute of the University of São Paulo Medical School.

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Article received on June 18th, 2010
Article approved on December 1st, 2010
The ligation of the pulmonary trunk in total cavopulmonary operation was described by Fontan and Baudet [1] in 1970.

At the Heart Institute of the Clinical Hospital at the University of Sao Paulo Medical School, in three cases (2.3%) of ligation of the pulmonary trunk in Fontan operation (n = 131), surgical intervention was necessary due to the presence of residual antegrade pulmonary flow and / or pulmonary stenosis.

The presence of additional pulmonary flow in Fontan operations causes a competition between the pulmonary flow and venous return of vena cava, leading into increased pulmonary pressure, venous stasis and Fontan circulation failure [2].

The migration of the distal banding can lead to pulmonary branches stenosis, increasing the resistance to pulmonary flow, hampering the Fontan passive systemic venous drainage and increasing the “single ventricle” postload.

The diagnosis of clinical suspicion of recanalization of the pulmonary trunk is the presence of systolic murmur over the lung and clinical features of right congestive heart failure.

The echocardiography confirmed the presence of residual antegrade pulmonary flow and pulmonary branches stenosis.
stenosis, and supplemented by angiotomography, angioresonance or cardiac catheterization.

The surgical reintervention should be carried out in clinical features with congestive heart failure or signs of pulmonary artery obstruction. During reoperation with the aid of extracorporeal circulation, the pulmonary trunk is dissected and sectioned. The proximal stump is closed comprising the pulmonary valve with double suture and, the same process happens to distal stump, or it is closed with a pulmonary hemograft patch. The enlargement of the pulmonary arteries was performed using bovine pericardium (one case) and pulmonary homograft (one case). The postoperative evolution was satisfactory.

The risk of recanalization of the pulmonary trunk after ligation of the trunk can occur at any time in the postoperative period. The suspected diagnosis is performed by the presence of heart murmur over the lung and clinical features of congestive heart failure. The diagnosis is confirmed by echocardiography and branch pulmonary artery stenosis by angiotomography of pulmonary artery or catheterization.

Another complication related to the ligation of the pulmonary artery after Fontan operation is the thrombus formation in the proximal portions of the pulmonary trunk with systemic embolization [3]. The treatment consists of surgical removal of thrombus and pulmonary valve closure.

In our institution, the ligation of the pulmonary artery used to be routinely performed in the Fontan operation due to its technical ease, however, after these complications, we have been seeking for direct pulmonary valve closure or a patch placement, or even the section and suturing of the pulmonary trunk.

CONCLUSION

The recanalization risk of the pulmonary trunk after ligation of the pulmonary trunk can occur at any time in the postoperative period. The diagnosis is performed by the presence of heart murmur and clinical features of congestive heart failure and confirmed by echocardiography, pulmonary angiography or angiotomography of pulmonary arteries.

The patients with ligation of the pulmonary trunk should be monitored in order to assess these complications.

REFERENCES