Closure of a Blalock-Taussig Shunt With an Amplatzer Device After the Fontan Operation

To the Editor:

Cardiac catheterization is an effective intervention for treating different congenital heart conditions and immediate and delayed postoperative sequelae. The Amplatzer device has been used since 1998 for percutaneous closure of patent ductus arteriosus.[1] We present the case of a boy with a Blalock-Taussig shunt that could not be ligated during the Fontan operation. The patient presented with serious postoperative heart failure that improved after percutaneous closure of the shunt with an Amplatzer ductal device.

The boy, now aged 7 years, was diagnosed with L-transposition of the great vessels with pulmonary atresia, interventricular septal defect and hypoplasia of the right ventricle as a neonate. During the neonatal period, a left-modified Blalock-Taussig shunt was performed, which was followed by a bidirectional Glenn intervention when he was 2 years old. Cardiac catheterization performed before completion of the Fontan procedure showed that the caliber of the pulmonary arteries was good. Mean blood pressure was 14 mm Hg and there was a patent Blalock-Taussig shunt. An extracardiac conduit was placed between the inferior vena cava and the right pulmonary artery. The Blalock-Taussig shunt was left open because of the difficulty of access. Immediately after the operation, the child presented serious systemic venous congestion refractory to treatment, so we decided to perform percutaneous closure of the shunt. Three weeks after surgery, cardiac catheterization showed a mean pulmonary artery blood pressure of 29 mm Hg with systemic-pulmonary flow through the shunt (Qp/Qs=1.3/1), the diameter of which was 3.6 mm (Figure 1A). We tried to close the shunt via a femoral artery approach, but advance was almost impossible because of the tight angle between the shunt and the descending aorta. Therefore, we decided to enter the left axillary artery to place a 4×6 mm Amplatzer ductal device (AGA Medical Corporation®) (Figure 1B). After placement of the device, an angiogram showed total closure of the shunt (Figure 1C), with no protrusion of the device into the left pulmonary artery. The mean pulmonary pressure after closure decreased to 16 mmHg and the patient was discharged the following week.

A patent systemic-pulmonary shunt in patients who have undergone a Fontan operation has a clearly negative hemodynamic effect. Given that surgical ligation may be technically difficult, such shunts can be closed by percutaneous catheterization. Different devices have been used such as coils, detachable balloons, Rashkind ductal occluders[2] and Gianturco-Grifka vascular occlusion devices.[3] In 1989, Perry et al[4] reported that 8% of coils used for closure of shunts embolized other vessels. For Blalock-Taussig shunts, the percentage of undesired embolization is as high as 21%. Burrows et al[2] found that attempted closure of a Blalock-Taussig shunt with a coil led to embolization of pulmonary circulation in 29% of patients. Other techniques have been used to prevent embolization of pulmonary circulation, such as the use of guidewires[5] or placing a stent in the pulmonary artery.[6]

For our patient, we decided to use the Amplatzer ductal device due to the high risk of embolism with use of coils and the patient's unstable condition. Before performing the occlusion, we estimated the length of the device after implantation. We could thus ensure that it would be shorter than the shunt to avoid protrusion into the pulmonary artery or left subclavian artery, and we did indeed confirm that there was no protrusion. The importance of access via the left axillary artery for performing the procedure should be emphasized. The technique would have been almost impossible

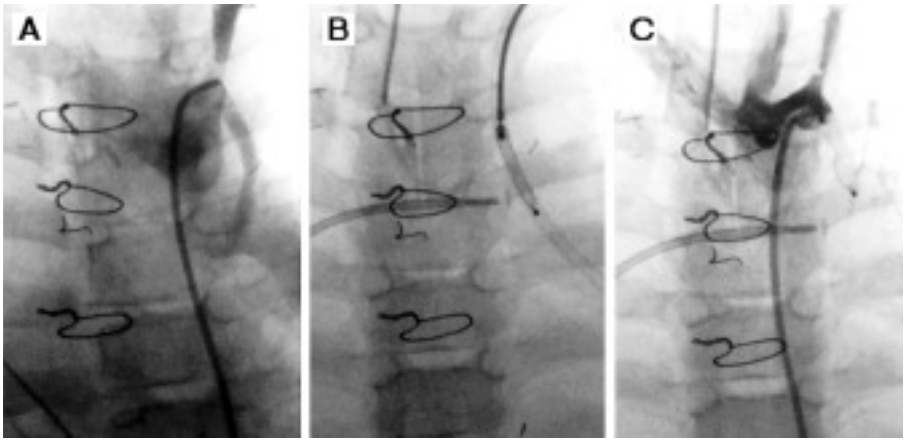

Fig. 1. Angiographs of the Blalock-Taussig shunt before (A) and after (C) implantation of the Amplatzer device. The shunt was accessed via the left axillary artery (B).

by via the femoral vein and the childs clinical situation would have required further high-risk surgery.

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