Brief communications

Adjustable suture of the vertical pulmonary vein for repair of infracardiac total anomalous pulmonary venous connection

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The results of repair of total anomalous pulmonary venous connection (TAPVC) have dramatically improved over recent years.¹ However, a higher mortality and morbidity still remain significant in patients less than 3 months of age who have right-sided hypertension, pulmonary venous obstruction, and low volume in the left side of the heart.^{2,3} Postoperative low cardiac output may persist because of a small and noncompliant left atrium and ventricle or episodes of reactive pulmonary hypertension.

Several surgical techniques have been suggested to reconstruct an unrestrictive wide connection between the left atrium and pulmonary veins, as this connection will allow the left side of the heart time to adapt and maintain cardiac output.⁴

Most authors suggest ligation or interruption of the vertical vein just above the diaphragm, although the authors of a past report⁵ were concerned about the occurrence of acute liver necrosis immediately after the operation. We believe that leaving an adjustable suture during the immediate postoperative period may be useful for venting of the left ventricle, especially if low cardiac output persists despite the creation of an wide left atrium-pulmonary vein anastomosis.

A 4-week-old infant weighing 2 kg was admitted because of increasing cyanosis, pulmonary edema, and hepatomegaly. Two-dimensional echocardiography with Doppler and color flow mapping study and cardiac catheterization demonstrated infracardiac type TAPVC with the portal system. The operation was performed with profound hypothermia and circulatory arrest (31 minutes). The repair was carried out by a wide anastomosis between the common pulmonary vein, with the incision being extended into the upper right pulmonary vein and the posterior left atrial wall.

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The interatrial communication was closed and an adjustable Prolene suture (Ethicon, Inc., Somerville, N.J.) was placed around the vertical vein below the lower pulmonary veins and just above the diaphragm. The suture was passed through a snare of an 8F polyethylene tube. After it was tightened, the suture was fixed in position with a series of hemoclips placed on the suture and the polyethylene tube, and the end was left beneath the linear alba. During the first 8 hours after the operation the patient had persistent low cardiac output associated with metabolic acidemia and oliguria despite maximal treatment with dopamine, dobutamine, and amrinone. The right atrial pressure ranged between 12 and 15 mm Hg, left atrial pressure between 22 and 25 mm Hg, and mean arterial pressure between 40 and 50 mm Hg. Echocardiography and Doppler flow study demonstrated moderately reduced left ventricular function with no evidence of tamponade or pulmonary hypertension. In addition, liver enzyme levels were highly elevated, indicating acute liver ischemia. At this point, the adjustable suture was completely opened. Rapid hemodynamic improvement ensued, with a significant rise of blood pressure, decrease of left atrial pressure to 15 mm Hg, and improvement of urine output and acid-base balance. In this particular case we elected not to retighten the suture because of documented liver damage. The patient was extubated 7 days later. Liver enzyme levels gradually decreased during the following days. Serial echocardiography and Doppler study (follow-up of 3 months) showed gradual decrease of the blood flow through the vertical vein and increase of left heart volume. We advocate the routine use of an adjustable suture around the common pulmonary vein during repair of TAPVC, especially in the presence of a diminutive noncompliant left atrium.

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Innominate artery pseudoaneurysm presenting as a widened mediastinum

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Few cases of isolated innominate artery injury have been reported in the literature. Reported here is a successfully managed case of a false aneurysm of the innominate artery after blunt trauma.

A 23-year-old man was admitted after a motor vehicle accident. On admission he was in hemodynamically stable condition. Examination demonstrated a seat belt friction burn over the left clavicle. Upper extremity pulses were equal bilaterally. A chest roentgenogram revealed a grossly widened superior mediastinum, bilateral apical capping, and obscuration of the aortic knob. An oblique fracture of the left first rib was also noted (Fig. 1). Contrast-enhanced computed axial tomography revealed a normal aortic arch and aortic isthmus. There was no

evidence of a transected aorta. Because of a persistently widened superior mediastinum, an arch aortogram was obtained several days later, which demonstrated a false aneurysm of the innominate artery at its origin (Fig. 2).

At operation, a 3 by 3 cm aneurysm of the innominate artery was found with a posterior intimal tear. Proximal control of the innominate artery was achieved intrapericardially. Distal control was obtained at the bifurcation of the innominate artery. Heparin was not used. After closure of the origin of the innominate artery with pledget-supported polypropylene sutures, an aorta-innominate artery bypass with a 10 mm Dacron graft was performed with continuous electroencephalographic (EEG) monitoring.

The patient was discharged 4 days later. Currently the patient has no neurologic symptoms and has equal blood pressure in both arms.

Of 51 reported thoracic vascular injuries in a recent series, only one case of isolated trauma to the innominate artery was recorded.¹ Blunt trauma of the thorax most frequently produces thoracic aortic transection (45%) distal to the left subclavian artery.

Radiologic clues to the diagnosis of thoracic vascular injury include widening (>8 cm) of the superior mediastinum, apical pleural capping, obscuration of the aortic knob, and a fractured first rib; all were present in our patient. Other signs include depression of the left main bronchus more than 140 degrees from the trachea, loss of aortic knob contour, and deviation of the nasogastric tube in the esophagus away from the midline.

In a hemodynamically stable patient, arteriography is mandatory.² The use of computed tomography and magnetic resonance imaging is currently not recommended.³ The primary objection to computed tomography as a screening tool is that in most instances, including this case, it provides only circumstantial evidence of an aortic injury. Transesophageal echocardiography has recently been de-

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Fig. 1. Chest roentgenogram showing widened mediastinum, bilateral pleural capping, fractured left first rib, and obscuration of the aortic knob.