

SHORT CASES IN CARDIOLOGY

A novel use of an Amplatzer septal occluder

S A Hope, J Partridge, Z Slavik

A 4 year old girl with an underlying diagnosis of atrioventricular discordance, double outlet right ventricle with pulmonary valvar atresia, and subpulmonary ventricular septal defect, was admitted for elective surgery. She had had surgery as a neonate to insert a right 5 mm Gore-tex modified Blalock Taussig shunt, and again at 3 years old for formation of a bidirectional Glenn anastomosis. Cardiac catheterisation showed mean pulmonary artery pressures of 7-10 mm Hg and she was admitted for completion of total cavopulmonary connection. Although this procedure was successful, the Blalock Taussig shunt previously inserted was surgically inaccessible due to adhesions and was therefore left patent.

Pleural effusions and tense ascites associated with poor urine output complicated the immediate postoperative period. The patient required inotropic support to a maximum of 0.36 µg/kg/min of noradrenaline (norepinephrine), 0.09 µg/kg/min of adrenaline (epinephrine), and 10 µg/kg/min of enoximone with 4 µg/kg/min of dopamine. The pleural and ascitic fluid was drained using chest drains and a peritoneal dialysis catheter. However, we felt that her clinical condition was compromised by the persistent patency of the modified Blalock Taussig shunt. Therefore, on the first day after the operation, percutaneous occlusion was attempted in the catheter laboratory using an 8 mm Cook coil introduced via the right femoral artery. This embolised immediately and was retrieved twice from the right pulmonary artery; the procedure was then abandoned. The child remained ventilator dependent, with large losses from the pleural drains, and peritoneal losses averaging 130 ml hourly. We felt, therefore, that a novel approach to occlusion of the patent shunt was justifiable.

In the catheter laboratory, a 4 mm Amplatzer septal occluder (AGA Medical Corporation, Minnesota, USA) was placed in the patent shunt via the left femoral vein, right atrial tunnel, and right pulmonary artery. Consideration was given to the unexpanded length of the device and likely length after limited expansion within the shunt. We deployed the device and tested its stability before releasing it from the delivery system. Subsequent pulmonary angiography with follow through showed complete occlusion of the shunt with the device well placed at the systemic arterial end. It was protruding slightly into the right pulmonary artery but was not causing obstruction (fig 1).

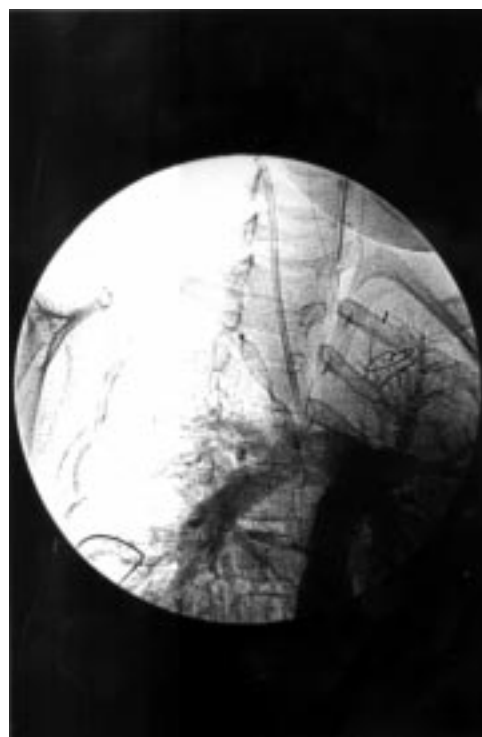


Figure 1 Pulmonary angiogram showing the deployed Amplatzer septal occluder, in the right modified Blalock Taussig shunt, protruding slightly into the right pulmonary artery.



Figure 2 Chest x ray demonstrating satisfactory position of the Amplatzer septal occluder 14 days after deployment.

After the procedure, peritoneal fluid losses diminished immediately by 40% and pleural losses dropped by 30%. The patient was then anticoagulated because of anxieties raised by the presence of the device protruding into the pulmonary artery. Thereafter, she made good progress and was extubated five days later. She was discharged 14 days after the procedure; her

Paediatric Surgical
Unit, Harefield
Hospital, Harefield,
Middlesex UB9 6JH,
UK

S A Hope
Z Slavik

Radiology
Department,
Harefield Hospital
J Partridge

Correspondence to:
Dr Hope.

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discharge was delayed for anticoagulation control. The Amplatzer septal occluder was in a stable position at this time (fig 2).

Discussion

Total cavopulmonary connection requires low pulmonary artery resistance, as pulmonary blood flow is dependent on systemic venous pressures alone. This situation can be compromised by excessive pulmonary blood flow with persistent patency of aortopulmonary collateral arteries, or, as in our patient, a systemic to pulmonary artery shunt.^{1,2} Percutaneous coil occlusion failed in this case, probably due to high blood flow through a smooth shunt with no narrowing at the pulmonary end. High central venous pressures may lead to pleural and peritoneal effusions and generalised oedema, which further increases pulmonary artery resistance. This cycle may lead to diminishing cardiac output, multiorgan failure, and death.

The Amplatzer septal occluder is effective in the closure of atrial septal defects. It is easy to use and is associated with a low incidence of

complications.³⁻⁵ Additionally, its stability may be assessed after full deployment, and it is fully retrievable until the time of release. The Amplatzer septal occluder was, therefore, attractive in the clinical situation we described. We have shown an effective use of this device in occluding a patent shunt, thus avoiding a high risk surgical procedure. We have since learned of its use in occluding a persistent left superior vena cava (Amplatz K, personal communication 1998). Follow up of the patient is essential to assess the long term safety of this procedure.

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- 3 Thanopoulos BD, Laskari CV, Tsaousis GS, *et al.* Closure of atrial septal defects with the Amplatzer occlusion device: preliminary results. *J Am Coll Cardiol* 1998;**31**:1110-16.
- 4 Chan KC, Walsh KP, Godman MJ, *et al.* Percutaneous closure of atrial septal defect with the Amplatzer septal occluder (ASO): total United Kingdom results [abstract]. *Heart* 1998;**79**(suppl 1):P25.
- 5 Walsh KP, Tofeig M, Peart I, *et al.* Comparative effectiveness of the Sideris and Amplatzer septal occlusion devices [abstract]. *Heart* 1998;**79**(suppl 1):P25.