Amplatzer devices are used for the percutaneous closure of ostium secundum atrial septal defects, muscular ventricular septal defects, and patent ductus arteriosus. However, very little experience has been gained in using these devices in infants under 1 year of age. Between January 2001 and January 2008, 22 symptomatic infants aged under 1 year underwent percutaneous treatment: three had an ostium secundum atrial septal defect, 15 had patent ductus arteriosus, and 4 had a muscular ventricular septal defect. All the procedures were completed successfully. No immediate or medium-term complications were observed. Closure of these types of defect using an Amplatzer device in infants under 1 year of age, who would otherwise require surgery, is a safe and effective procedure.

Key words: Atrial septal defect. Ventricular septal defect. Ductus arteriosus. Cardiac catheterization.
We observed no peripheral vascular complications attributable to surgery or administration of heparin and/or thrombolytic agents.

DISCUSSION

Atrial Septal Defects

Most children with OS-ASD have few symptoms and surgery is generally indicated at pre-school age, although some require earlier treatment. It is reported that OS-ASD tend to grow with time. The group of children susceptible to early treatment includes those at greatest risk of progressing to irreversible pulmonary hypertension.

For example, patient 1, with Down’s syndrome, presented severe pulmonary hypertension with AP/AO ratio=1. His pulmonary pressure was normal at 1 year post-procedure.

All procedures were successful. We had no acute or late complications during follow-up of 18.7 (5.5-38.3), 34 (5.7-90.9), and 44.1 (20-65.2) months for OS-ASD, PDA, or m-VSD respectively.

We recorded demographic, clinical and hemodynamic data, procedure duration recorded as radiosity time, results, and immediate and late complications. Data are expressed as mean (range).

RESULTS

We treated 22 children aged <1 year with symptoms of OS-ASD, PDA or m-VSD (Table 1). Clinical indications, hemodynamic variables (Qp/Qs and AP/AO systolic pressure ratio), defect diameter and devices employed are in Table 2.

Radioscopy times for OS-ASD, PDA and m-VSD were 23.7 (13-40), 21.5 (6-60), and 44 (34-57) min, respectively.

All procedures were successful. We had no acute or late complications during follow-up of 18.7 (5.5-38.3), 34 (5.7-90.9), and 44.1 (20-65.2) months for OS-ASD, PDA, or m-VSD respectively.

AP/AO ratio indicates pulmonary artery to aorta systolic pressure ratio; AS: length of interatrial septum; CAVB, congenital complete atrioventricular block; FTT: failure to thrive; HF, heart failure; IAW, interatrial; NA, not available; PHT, pulmonary hypertension; RRI, repeated respiratory infections.

*Girl with truncus arteriosus and additional muscular VSD.
infections, failure to thrive or high Qp/Qs indicated the treatment. Patient 3 (Figure 1), with congenital complete atrioventricular block without indication for pacemaker, had moderate pulmonary hypertension with AP/AO systolic pressure ratio =0.73 during cardiac catheterization. At 6 months, echocardiography showed normal pulmonary pressure. These 3 patients had specific indications for OS-ASD closure and we opted for percutaneous treatment to avoid the inconveniences of surgery. In the only series published in this age-group, OS-ASD required closure with hybrid procedures in 21% of children; although our group is small, we have not needed to employ this technique.

During follow-up (mean, 18.7 months), we found no late atrial wall perforation. A review of this rare complication found it occurs ≤3 years post-procedure. Patient age or weight were not risk factors. Both mismatching defect and device diameters and anterosuperior defect location have been suggested as risk factors for late of perforation.

**Persistent Ductus Arteriosus**

PDA closure was indicated in all four patients because of excessive pulmonary blood flow. In patients 5 and 8, Qp/Qs may have been overestimated due to incorrect blood sampling in the pulmonary artery; however, PDA diameters were 2.5 and 3.2 mm respectively. Patient 4 (Figure 2) was a 40 days old infant girl, with a non-obstructive total abnormal pulmonary veins drainage into coronary sinus and superior vena cava. During cardiac catheterization we found suprasystemic pulmonary hypertension (AP/AO systolic pressure ratio =1.15) and 1.6 mm
as large as 7 Fr Mullins sheaths in the femoral vein (patients 9 and 14).

Muscular Ventricular Septal Defects

In a series of 20 children aged <1 year, Diab et al.\(^5\) reported 30% needed a hybrid procedure. In our 4-patient series, none required this. Patient 22, a girl with type I truncus arteriosus, double VSD (one of them muscular apical), had neonatal pulmonary banding. We decided to close the apical m-VSD first because surgical m-VSD closure entails high morbidity and mortality, especially when the location is apical,\(^{15}\) and the surgical approach may need to be from the left ventricle, with the consequent damage to ventricular function.\(^{16}\)

Risk of Vascular Lesion

Amplatz devices deployment sheaths require venous access and are commercialized by internal diameter size. The largest diameter we used was 7 Fr (patients 2, 3, 9, and 14). In patients with m-VSD

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Figure 3. Closure of muscular ventricular septal defect (m-VSD). A: angiography with 6 Fr Mullins sheath, jugular access. A, B, and C: the arrow points to the device before and after deployment.
(Figure 3), we used 6 Fr sheaths via the internal jugular vein. We believe possible vascular damage caused by such thick sheaths can be minimized by careful handling.

REFERENCES


