Atrial Septal Defect Closure

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KEYWORDS

• Atrial septal defect • Septal closure device • Percutaneous closure • Adults

KEY POINTS

- Most secundum atrial septal defects are amenable to percutaneous closure.
- Percutaneous secundum atrial septal defect closure is safe, effective, and associated with a low complication rate.
- Appropriate patient selection is imperative to offer optimal results.
- Anatomic variations in secundum atrial septal defects may require alternative closure techniques.

INTRODUCTION

Congenital heart disease accounted for 0.3% of US admissions in 2007, with 48% related to atrial septal defects (ASDs).[1] More than one-fourth of adult congenital heart defects are ASDs, 75% of which are ostium secundum ASDs.[2] The progressive impact of volume overload on the right cardiac chambers can be halted by ASD closure. This review focuses on percutaneous ASD closure.

PUBLISHED REPORTS

Multicenter nonrandomized trials have reported closure rates of 91% to 95% and 83% to 100%, and failure or procedure adverse event rates of 7% to 8% and 16% to 24% for the device and surgical groups, respectively.[3,4] Reported closure and severe complications rates for available devices are described in **Table 1**.[3,5–11] Percutaneous closure avoids sternotomy and cardiopulmonary bypass and is associated with faster right ventricular remodeling, decreased anesthesia time, hospitalization length, and periprocedural morbidity.[3,4,12,13]

INDICATIONS FOR ASD CLOSURE AND PATIENT SELECTION

Box 1 describes indications and contraindications for ASD closure. Indications include evidence of right cardiac volume loading with or without symptoms, platypnea-orthodeoxia, and a history or high risk for paradoxic embolization.[14,15] Exercise-related cyanosis requires further evaluation before deciding on closure. Patients not meeting criteria should undergo echocardiography every 2 to 3 years. The hemodynamic impact of small ASDs may be evaluated with an exercise test with oxymetry. Closure of small ASDs (<5 mm) that do not meet criteria is controversial because it may carry a benign course untreated.[16]

Sinus venosus, coronary sinus, or primum ASDs require surgical repair. Most secundum ASDs are amenable to transcatheter closure. Surgical closure of secundum ASD is reasonable in the setting of unfavorable anatomy for percutaneous closure, after failed transcatheter closure, or when concomitant surgical repair of associated defects is required.

Bidirectional shunt and pulmonary hypertension require pulmonary vasodilator and temporary ASD balloon occlusion testing before deciding on

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Table 1
Percent closure and severe complication rates, ASD size amenable for closure, device size selection recommendations, pros and cons for Amplatzer, Buttonseal Centering on Demand, CardioSEAL, STARFlex, and Helex occluder devices

Device Type	Closure Rate (%)	Severe Complication Rate[a] (%)	ASD Size Amenable For Closure	Device Size Selection	Pros	Cons
Amplatzer	99	1.1	≤36 mm	2 mm larger than stop-flow diameter	FDA approved, self-centering, retrievable, allows repositioning, lower incidence of thrombosis	Associated with most cardiac perforation cases
Buttonseal Centering on Demand	95.6	0.9	ASD sizes 5–30 mm	1.8:1 device to stretch diameter ratio	Centering mechanism triggered by operator	Unavailable in the United States for general use
CardioSEAL/ STARFlex	93/85–98	7/2–25	<25 mm	1.6–1.7:1 device to stretch diameter ratio	Self-centering, allows 180° pivoting	Retrieval can damage device. Extracorporeal removal requires bigger sheath
Gore-Helex	90	7.1	ASD size <18–22 mm, septal thickness <9 mm	Twice stop-flow diameter	FDA approved, allows retrieval and repositioning after deployment	Not self-centering (may be an advantage in certain cases)

[a] Severe complications include need for surgery or a second device.
Data from Refs.[3,5–11]