Atrial Septal Defects and Percutaneous Closure

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- Introduction
- Embryology
- Pathophysiology
- Types of ASD
- Clinical presentation
- Diagnosis
- Treatment options
What is an ASD?
Atrial Septal Defect

- Congenital defects of the atrial septum are common, accounting for approximately 13 percent of congenital heart disorders, with a reported birth prevalence of approximately 2 per 1000 live births.
Embryology of ASD

INITIAL PHASE

SECOND PHASE

FINAL PHASE—NORMAL

FINAL PHASE—ATRIAL SEPTAL DEFECT
Pathophysiology of ASD

A Normal heart

- Pulmonary artery (to lungs)
- Aorta (to body)
- Right atrium
- Right and left ventricles
- Deoxygenated blood flow in right heart

B Heart with atrial septal defect

- Left atrium
- Atrial septal defect
- Right atrium
- Mixing blood from left (oxygenated) and right (deoxygenated) atria
Types of ASD

Septum Primum ASD:
- 15-20% of ASDs
- Lower portion of septum
- Associated with other heart defects, cleft mitral valve
- Down’s syndrome
Types of ASD

Sinus Venosus ASD:
- 5-10% of ASDs
- Near the orifice of superior or inferior vena cava
- Associated with anomalous pulmonary venous return
Types of ASD

Coronary Sinus ASD:
- 1% of ASDs
- Associated with persistent left superior vena cava
Types of ASD

Secundum ASD:
- Most common type
- 70% of ASDs
- Only type of ASD that can be closed without surgery!
Clinical Presentation: Spontaneous closure

- In a study of 200 children diagnosed at a mean age of five months (range 0.1 months to 13.9 years) who were followed for a mean 3.5 years (range 0.5 to 9.4 years)

- Spontaneous closure or a decrease in size <3 mm in diameter was observed in:
  - 69 of 81 patients (85 percent) with a 4 to 5 mm ASD
  - In 36 of 56 patients (64 percent) with a 6 to 7 mm ASD
  - In 15 of 41 patients (36 percent) with a 8 to 10 mm ASD
  - In 22 patients with an ASD >10 mm there was no spontaneous resolution, but two had a defect that regressed to <3 mm

Hanslik A et al Pediatrics. 2006;118(4):1560
Clinical Presentation

- Age at presentation depends on how large the defect is
- Left to right shunting increases with age
- Symptoms
  - Asymptomatic
  - Recurrent respiratory infections
  - Failure to thrive
  - Migraine headaches with aura
  - Atrial Fibrillation
  - Heart failure
  - Platypnea/Orthodeoxia
  - Eisenmenger syndrome
  - Paradoxical Embolism
Eisenmenger Syndrome

[A diagram illustrating atrial septal defect with labels for RA, RV, LA, LV]
Important cardiac exam findings

- Jugular venous pressure
- Right ventricular heave
- Fixed split S2 (A2 and P2)
- Pulmonary systolic ejection murmur
- Diastolic murmur
- Holosystolic murmur tricuspid regurgitation
ECG

- Right axis deviation
- Right ventricular enlargement
- Left axis deviation – Ostium primum defects
Echocardiogram
Indications for closure

- Right Ventricular Enlargement with or without symptoms
- $Q_p/Q_s > 1.5$
- Paradoxical Embolism
- Platypnea/Orthodeoxia syndrome
- Scuba Divers
- High altitude

- When not to close?
Percutaneous Closure Devices

Amplatzer PFO Occluder
Illustration courtesy of AGA Medical Corp.

CardioSEAL Septal Occluder
Illustration courtesy of NMT Medical

Gore Helix Septal Occluder
Illustration courtesy of W. L. Gore & Associates, Inc.
Methods of Closure

Only septum secundum ASDs can be closed percutaneously <38 mm and with good rims of approximately 5 mm

Multiple ASDs/Frenestrated ASD

Surgical vs Percutaneous- Observations Studies

- No difference in mortality rate
- Procedural success is similar
- Rate of early complications is lower with percutaneous closure
- Recovery is quicker with percutaneous closure
- 5 year re intervention rate is higher with percutaneous closure

Complications of percutaneous closure

https://www.youtube.com/watch?v=fqiuGNrYAWc
Other considerations

Device Erosion
Technical challenges (ASA)
Endocarditis prophylaxis
- Unrepaired ASD
- Repaired ASD
ASDs are a common congenital heart defect
Most small ASDs close spontaneously
Septum Secundum ASD is the most common type
Indications of closure
Only Septum Secundum ASDs can be closed percutaneously.
Other ASDs require surgical closure
Both surgery and percutaneous closure have overall comparable success and risk of complications
Thanks You
Questions