Modalities for Assessment of The Interatrial Septal Defects

By

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Interatrial Septal Defects

- Atrial Septal Defects (ASDs).
- Patent Foramen Ovale (PFO).
- Atrial Septal Aneurysm (ASA).
Indications for ASDs Closure

Table 1: Indications for ASD Closure of Cardiology/American Heart

<table>
<thead>
<tr>
<th>Indications</th>
<th>Class</th>
<th>Level</th>
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<tr>
<td>Patients with significant shunt (e.g., RV volume overload) and PVR &lt; 25 U/min should undergo ASD closure regardless of symptoms</td>
<td>I</td>
<td>B</td>
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<tr>
<td>Device closure is the method of choice for the treatment of ASD closure</td>
<td>I, C</td>
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<tr>
<td>ASD closure should be considered for patients with non-cardiac defect</td>
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<td>Patients with RV/LV or PA/PVR &gt; 2.0 or PA &gt; 60 mmHg or PA &gt; 50 mmHg should be considered for intervention</td>
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<tr>
<td>ASD closure may be considered for patients with non-cardiac defect</td>
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*Class of recommendation, Level of evidence.

ASDs Rims Assessment

[Diagram showing ASD rims assessment with anatomical representations of the heart and relevant annotations.]
Modalities for Assessment of The Interatrial Septal Defects

- Transthoracic Echocardiography (TTE)
- Transesophageal Echocardiography (TEE).
- Intracardiac Echocardiography (ICE).
- Contrast (Agitated saline) Echocardiography.
- Real time 4D TTE, TEE and ICE.
- Cardiac Catheterization.
- Contrast-enhanced CT and MR examinations.

Transthoracic Echocardiography (TTE)
Transthoracic Echocardiography
Magnitude of shunt

- Necessitates precise measurements of the valvular annuli.

Transesophageal Echocardiography (TTE)
Intracardiac Echocardiography (ICE)

Advantages
- Single operator.
- Avoids general anesthesia.
- No risk of aspiration or esophageal trauma.
- The best to assess IVC rim.

Disadvantages
- Cost.
- Mainly in adults.
- Vascular risk (8-10F) catheters.
- 3D only recently introduced.
Contrast (agitated saline)

TTE, TEE, ICE and 4D

Real time 4D TTE & TEE.
Cardiac Catheterization

Magnitude of shunting

Systemic vascular resistance

$$SVR = \frac{\overline{Ao} - \overline{RA}}{Q_s}$$

Pulmonary vascular resistance

$$PVR = \frac{\overline{PA} - \overline{LA}}{Q_p}$$
Contrast-enhanced CT and MR Examinations.

- Used in ASDs & other cardiac anomalies.
- Planes: Axial, coronal & sagittal.
- CT versus MRI:
  - MRI
    - Provide functional information: Qp/QS, RV volume and shunt size.
    - Not using radiation & can be performed without contrast.
    - It is more complex.
  - CT
    - Short examination time.
    - Requires radiation and contrast.
Contrast-enhanced CT Examination

Multi-modal Assessment of The Interatrial Septal Defects.
Case 1 (Multiple ASDs in different planes).

- 12 years old girl, 40 Kg.
- Soft systolic murmur on PA. (II/VI).
- Echo:
  - 2 OS ASDs in 2 different planes with Lt to Rt shunt:
    - Anterior one: 9 mm.
    - Central one: 10 mm.
  - Mild RV dilatation.

Case 2 (Large aneurysm of the IAS).

- 5 years old boy.
- C/O: Dyspnea grade III.
- TTE: Large ASA with multiple fenestrations.
- TEE: Large ASA measuring 30 mm with multiple fenestrations and with sufficient all rims except the aortic one.
Case 3 (ASD with deficient rim)

- 4 years old girl.
- C/O: Dyspnea grade III.
- TTE: Large OS ASD, 2.8 cm, Lt to Rt shunt.
- TEE: Large OS ASD, 3.1 cm with deficient flimsy posterior rim.

Case 4 (ASD with redundant EV)

- 12 years old girl.
- Dyspnea Grade III.
- TTE & TEE: Ostium secundum ASD measuring 2.6 cm with very redundant Eustachian valve.
Case 4 (Sinus venosus SVC type ASD)

- 3 years old girl, 12 Kg.
- Soft systolic murmur on PA (II/VI).
- Echo:
  - Sinus venosus ASD SVC type with PAPVD of RUPV.
  - Persistent left SVC draining into dilated coronary sinus.
  - Dilated right side and coronary sinus.
Case 5 (OS ASD with TAPVD mixed type)

- 7 months old boy, 7 Kg.
- Cyanosis & recurrent chest infections.
- SaO2: 75%.
- Echo:
  - Large OS ASD.
  - TAPVD drainage mixed type with all 4 PVs drained into a pulmonary venous confluent which lies posterior and superior to the LA and then drained by two drainage:
    - Supracardiac: To the left innominate V → right SVC (Vertical vein).
    - Intracardiac: To a dilated coronary sinus → RA.

Case 6 (Unroofed coronary sinus)

- 3 months old boy, 4 Kg.
- Repeated attacks of Chest infection.
- Echo:
  - Unroofed coronary sinus with large left to right shunt and dilated right side.
Conclusions

- No one modality is right for diagnosis of different variants of interatrial septal defects.
- The choice between different modalities depends on the local expertise, available equipment and nature of defects.
- Expert echo imaging with its various modalities is essential to the success of interventions.
- Interventionists need to become expert in imaging as percutaneous interventions continue to expand their role.
Thank you