

Egyptian Society of CARDIOLOGY

Minia University Tanta University Zagazig University

45<sup>TH</sup> 45<sup>th</sup> Annual International Congress of the EGYPTIAN SOCIETY OF CARDIOLOGY **CardioEgypt 2018**

## Modalities for Assessment of The Interatrial Septal Defects

By  
Dr. Fatma Aboalsoud Taha, MD  
Lecturer of Cardiology, Tanta University  
Consultant of Congenital Heart Diseases


## Interatrial Septal Defects

- Atrial Septal Defect (ASD)
- Patent Foramen Ovale (PFO)
- Atrial Septal Aneurysm (ASA)

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# Indications for ASDs Closure

**TABLE 1. INDICATIONS FOR ASD CLOSURE OF CARDIOLOGY/AMERICAN HEART**



European Heart Journal (2010) 31, 295–297  
doi:10.1093/eurheartj/ehp349

**ESC GUIDELINES**

**ESC Guidelines for the management of grown-up congenital heart disease (new version 2010)**

The Task Force on the Management of Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC)

Endorsed by the Association for European Paediatric Cardiology (AEPIC)


vasodilators, or test occlusion of the defect is successful

**Table 3 Indications for intervention in atrial septal defect**

Indications	Class <sup>a</sup>	Level <sup>b</sup>
Patients with significant shunt (sign of RV volume overload) and PVR <1 WU should undergo ASD closure regardless of symptoms	I	B <sup>+</sup>
Device closure is the method of choice for secundum ASD closure when applicable	I	C
All ASDs regardless of size in patients with suspicion of paradoxical embolism (exclusion of other causes) should be considered for intervention	IIa	C
Patients with PVR ≥15 WU but <2/3 SVR or PAP <1/3 systemic pressure (baseline or when challenged with vasodilators, preferably nitric oxide, or other targeted PAH therapy) and evidence of net L-R shunt (Qp/Qs = 1.5) may be considered for intervention	IIb	C
ASD closure must be avoided in patients with Eisenmenger physiology	III	C

<sup>a</sup>Class of recommendation.  
<sup>b</sup>Level of evidence.

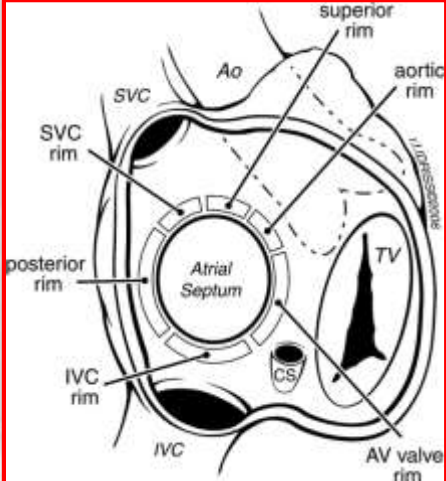
ASD = atrial septal defect; L-R shunt = left-to-right shunt; PAH = pulmonary arterial hypertension; PAP = pulmonary artery pressure; PVR = pulmonary vascular resistance; Qp/Qs = pulmonary to systemic flow ratio; SVR = systemic vascular resistance; WU = Wood units.

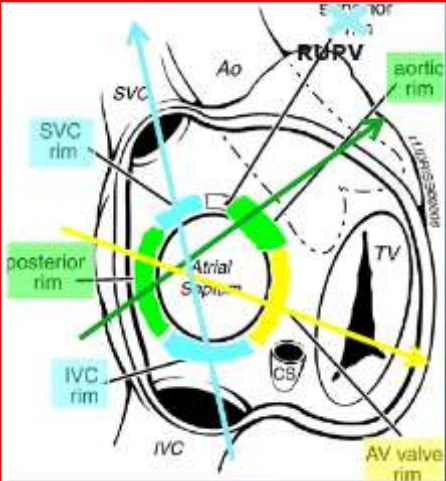



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# ASDs Rims Assessment







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## **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.**



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## **Transthoracic Echocardiography (TTE)**



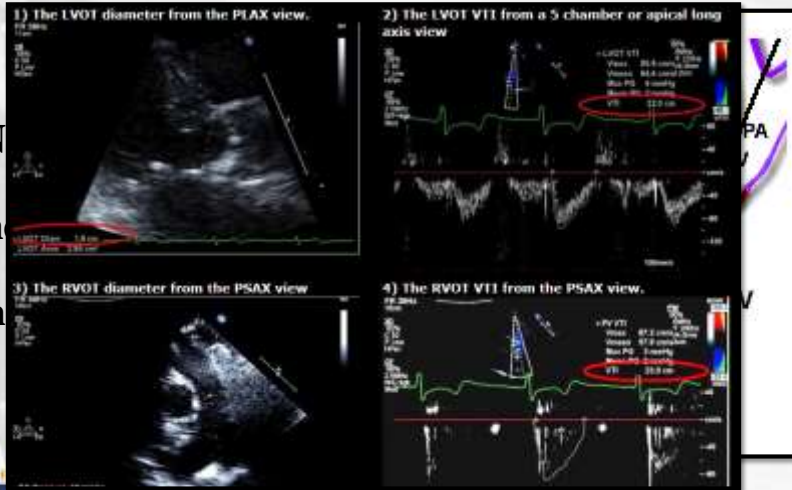
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# Transthoracic Echocardiography

## Magnitude of shunt

> N  
m  
th



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# Transesophageal Echocardiography

## (TTE)



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# Intracardiac Echocardiography (ICE)



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## 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.**



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**Contrast (agitated saline)**  
**TTE, TEE, ICE and 4D**

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**Real time 4D TTE & TEE.**

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## Cardiac Catheterization.



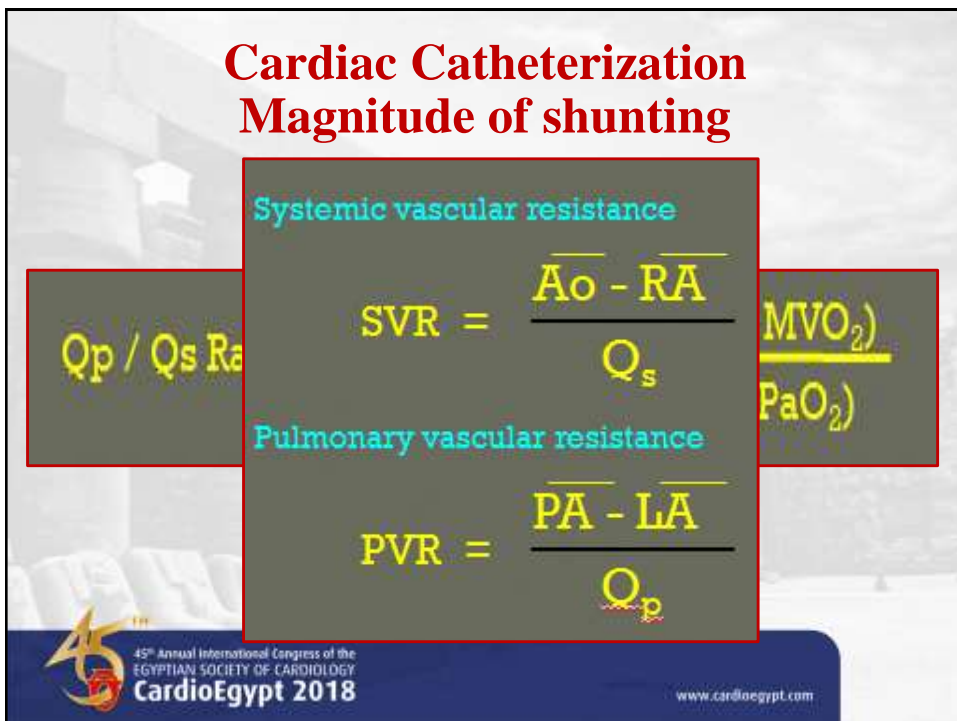
## Cardiac Catheterization Magnitude of shunting

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.



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## 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.

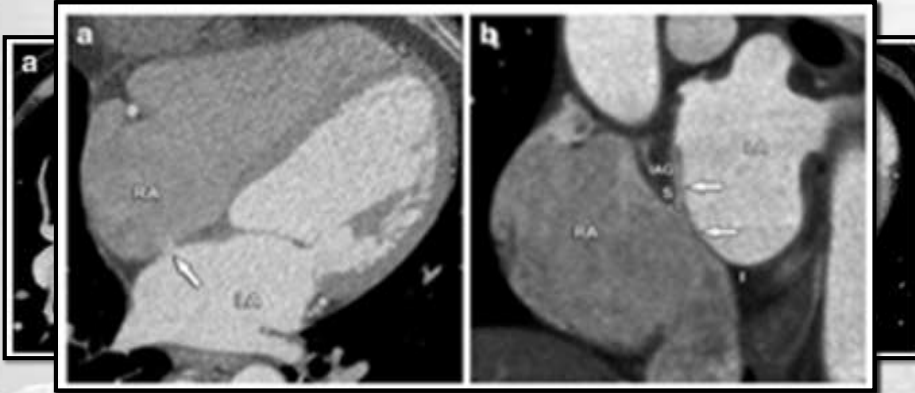


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## Contrast-enhanced CT Examination



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## Multi-modal Assessment of The Interatrial Septal Defects.



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## 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.



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## 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.



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## 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.



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## 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.



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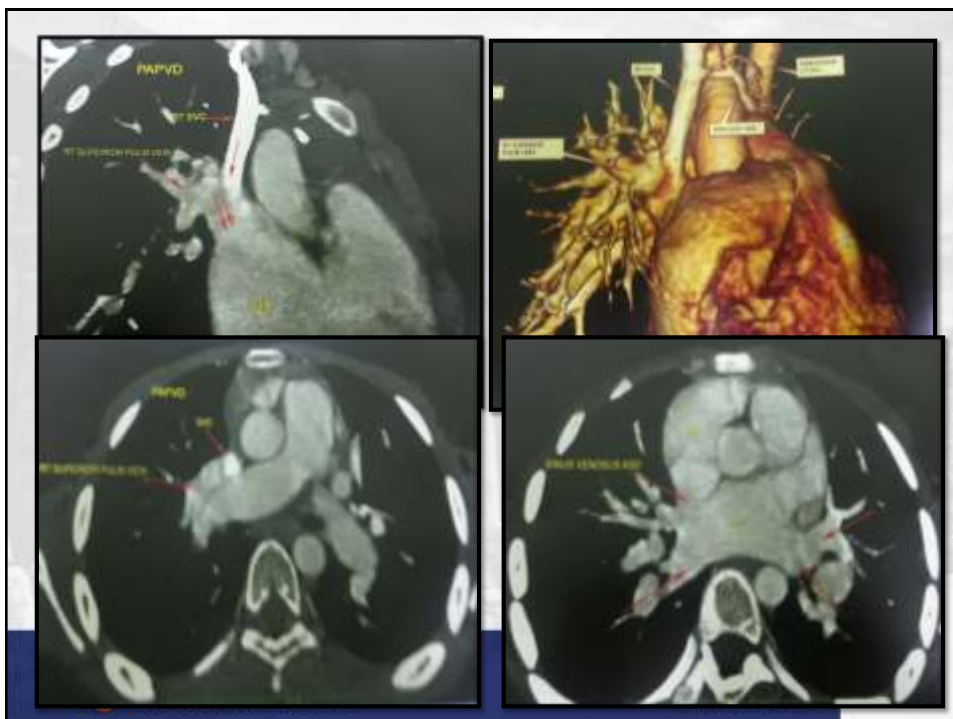
## Case 4 (Sinus venosus SVC type ASD)

- ❑ 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.



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## Case 5 (OS ASD with TAPVD mixed type)

- ❑ 7 months old boy, 7 Kg.
- ❑ Cyanosis & recurrent chest infections.
- ❑ SaO<sub>2</sub>: 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.



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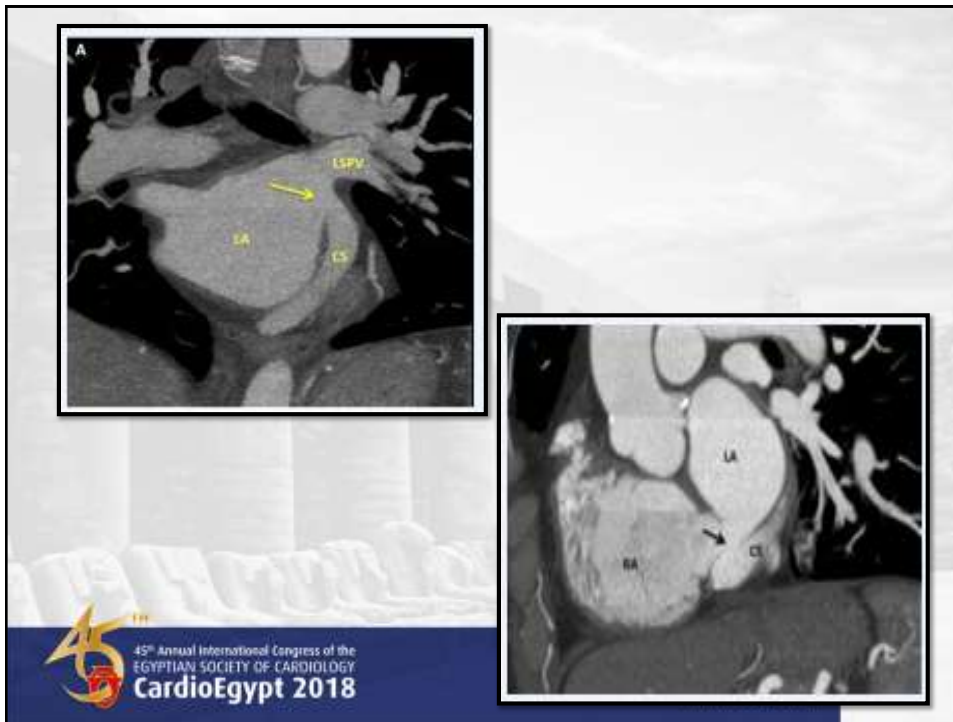
## Case 6 (Unroofed coronary sinus)

- ❑ 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.



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## 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.





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