TRANS-CATHETER ASD CLOSURE TIPS & TRICKS

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Terminology

Types of atrial septal defects with their locations

ASD Type

ASD Rims
Complex Ostium Secundum type (ASD):

- Large ASD Secundum with max diameter of ≥ 34mm
- Dimensions of total septal length smaller than LA disc of chosen device (Small child)
- Unusually placed ASD (eccentric = deficient rims): Deficient aortic and posterior rims, deficient IVC, or AV rim
- Multiple ASDs, Multifenestrated septum
- ASDs with redundant (floppy), flimsy and aneurysmal septal rims.
- Prominent Eustachian valve and Chiari-malformation

Potential Difficulties (Challenging)

(Pathophysiology/ Decision related, difficult access)?

- Interrupted IVC.
- Pulmonary HTN.
- Old adult with LV dysfunction.
- Arrhythmia.
- Small children and infant.
However, in complex ASDs with deficient rims, the classical implantation technique of ASO device can result in failure.

One of the most crucial problems related to this technique is the perpendicular orientation of the left atrial disk on the atrial septum resulting in prolapse into the right atrium.

Compared to simple defects, transcatheter ASD closure is relatively challenging in these cases, and different techniques have been defined to increase procedure success.

Acceptable limits of device sizing

**Children:**
- 8-10 Kg: < 15 mm
- 10-15 Kg: < 20 mm
- 15-25 Kg: < 28 - 30 mm

**Adults:**
- 40 - 46 mm

(Kannan BRJ, Anil SR, Sivakumar K, Kumar RK, Transcatheter closure of the very large atrial septal defects using the Amplatzer septal occluder, Catheterization and Cardiovascular Interventions 2003;59:522-527)
Echocardiography

- **TTE:**
  Patient selection

- **TEE:**
  Important in patient selection
  Guide implantation and assess correctness of position

- **ICE:**
  Anatomy of postero-inferior secundum ASD
  Capture of the postero-inferior rim by the device

- **3-D:**

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Data required from echocardiography

- **Type of ASD**
  - Pulmonary veins (at least two one right and one left)
  - RV pressure
  - Mitral valve regurgitation
  - Measurements

- **What to measure?**
  - Number of ASDs
  - Size of ASD
  - Total septal length
  - Rims
Balloon Sizing

- Useful .... Most defects are oval
- Balloons can falsely stretch the ASD – Oversize
- Balloon stretched diameter needs avoiding

- **Stop flow technique**
  - Inflate the balloon until no shunt on Colour
  - Deflate the balloon until shunting appears
  - Re-inflate to eliminate the shunt (stop flow diameter of ASD).

- **Pull back technique**


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Stander Technique

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Why standard approach does not work?

- Floppy inferior rim
- Deficient rims
- Small LA size
- Abnormal LA curvature
Tips and Tricks
How to align the left atrial disc?

- Look at TTE or TEE, not fluoroscopy
- Keep the anterior edge of the device away from the septum
- Sheath should point posteriorly and the tip towards the pulmonary veins
- Rotate the sheath (and the delivery cable) to keep it pointing posteriorly

Deficient Aortic rim

- Catheter/Dilator tip (Wahab technique)
- Over the wire or assisted delivery
- Hausdorff sheath
- Left Upper pulmonary vein technique
- Balloon assisted technique (BAT)

Deficient posterior rim

- Right upper pulmonary vein technique
- Left atrial roof technique

RUPV
Use of Straight, Side-hole sheath


Avoidance of complications

- Air embolism
- Secondary bleeding/haematoma
- Arrhythmias
- Device embolisation
- Thromboembolism
- Erosions/perforation
To Sum Up

- ASDs as large as 36 - 38 mm diameter can be closed
- The size, rims and stability of the septum define Limits
- Use of an adequate size device that safely fits

Large but unsuitable ASD’s

- Absent IVC or deficient both IVC and posterior margins, AV rim also must be considered
- ASD II but Larger than 38mm
Closure of large ASDs

- Safety shall be paramount
- I can do it but shall I do it

Take Home Message (Tips & Tricks)

- Standard deployment may not be adequate in large challenging ASDs
- Different methods/manoeuvres needed:
  - Device deployed in RUPV or LUPV
  - Device loaded over a Guidewire & deployed in a PV
  - Device deployed with assistance from a catheter/dilator/balloon assisted technique
  - Hausdorf Sheath / Straight side - hole sheath
- Most complications are well understood, hence avoidable
Take Home Message (Tips & Tricks) Large ASD’s

- Almost all large ASD's have no anterior rim:
  No problem!

- They may have a small inferior or posterior rim:
  May be critical but you still can try

- If they do not have a cranial rim:
  Be careful!

What Determines Results of Catheter Closure of ASD?

<table>
<thead>
<tr>
<th>Anatomy of Defect</th>
<th>Patient characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Weight</td>
</tr>
<tr>
<td>Location</td>
<td>Age</td>
</tr>
<tr>
<td>Margins</td>
<td>Co-morbidity</td>
</tr>
<tr>
<td>Neighboring structures</td>
<td>Associated lesions</td>
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</tbody>
</table>
### What Determines Results of Catheter Closure of ASD?

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Operator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Echocardiography</td>
<td>• Imaging guidance</td>
</tr>
<tr>
<td>• Devices</td>
<td>• Experience</td>
</tr>
<tr>
<td>• Delivery systems</td>
<td>• Hand-eye coordination</td>
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</tbody>
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### Avoidance of complications

<table>
<thead>
<tr>
<th>Device embolisation</th>
<th>Erosion/Perforation/PE</th>
</tr>
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<tbody>
<tr>
<td>• Risk varies 0.5-1%:</td>
<td>• Incidence of haemodynamic</td>
</tr>
<tr>
<td>Under-sizing</td>
<td>compromise 1/1000</td>
</tr>
<tr>
<td>Improper deployment</td>
<td>Deficiency of aortic rim/superior rim</td>
</tr>
<tr>
<td></td>
<td>Oversizing</td>
</tr>
<tr>
<td></td>
<td>• Edge of RA or LA disc eroded through free atrial wall</td>
</tr>
<tr>
<td></td>
<td>• If extended to aorta, tamponade was rapid</td>
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<tr>
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<td>• Majority occurred within 05 days</td>
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<td>• Shape memory may play a role</td>
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<td></td>
<td>• Rarely aorta to RA or LA fistula</td>
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<tr>
<td>• Especially failing to recognize deficient IVC rim</td>
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<tr>
<td>• Constant pull and push</td>
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<tr>
<td>• If device is not parallel to septum, it must be recaptured and redeployed</td>
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</tbody>
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Thanks For Your Attention