DEVICE CLOSURE OF DIFFICULT & LARGE ASD- TECHNIQUE and TRICKS

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Patient Selection

- Key to success!
- Is the defect suitable for transcatheter closure
- Criteria:
  - ASD secundum with max diameter of 34mm
  - Rims except aortic rim of at least 5mm
  - Dimensions of total septal length not smaller than LA disc of chosen device
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
Large ASD

- No universal definition
- Size > 20 mm? Device
  > 25mm
• A sound knowledge of the Atrial septal rims
  
  Limbus of Fossa Ovale
  
  Structures that surround the secundum ASD
  
  Coronary Sinus
  
  Tricuspid Valve
  
  ASD Tricuspid Valve
  
  Limbus of Fossa Ovale
  
  ASD
Atrial Septal Rims

(Dr. Mathewson, San Diego Children’s Hospital)

Shrivastava S et al Ind Heart J 2003;55:88-89
Amin Z. Catheter Cardiovasc Interv 2006;68:
4-Chamber view

Short Axis view

Bi-caval view

AV valve rim
Superior rim

Short axis view:
Aortic rim
Posterior rim

Bi-Caval view:
SVC rim
IVC Rim
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)

Balloon Sizing

- Thin flailing septum primum
- Patience is a virtue
Size of the device

- Waist 1-2 mm greater than the sizing balloon diameter-stop flow diameter
- Waist 1-2 mm greater than largest size measured on colour by TEE
- Extra 2-4 mm or so when aortic margin is absent or margins are floppy
- LA must be able to accommodate the device!
Selection of device

- Amplatzer septal occluder is the only one capable of closing large defects
  - Self-Expandable
  - Short-connecting Waist
  - Nitinol wire .004” - .008”
  - Sizes: 4-40 mm
Standard Approach
Why standard approach does not work?

- Small LA size
- Abnormal LA curvature
- Floppy inferior rim
- Deficient rims
Small trick can work?
Large Challenging ASD’s

- Deficient aortic rim
- Deficient posterior rim
- Deficient aortic and posterior rims
- Floppy rims
- Small child with a large ASD
- Unusually placed ASD
- Multiple ASD
- Any large ASD (diameter >25mm)
Deficient Aortic rim

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

LUPV Technique
Balloon Assisted Technique - Balloon in LUPV, device in LA

Dalvi BV, Pinto RJ, Gupta A. Cath Cardiovasc Interv 2005;64:102-107
Balloon in LUPV, device in LA
Balloon Assisted Technique - Balloon in LUPV, device in RUPV
Balloon in RUPV, device in LA
Deficient posterior rim

- Right upper pulmonary vein technique
- Left atrial roof technique
Right Upper pulmonary vein technique
Left Atrial Roof technique
Use of Straight, Side-hole sheath

Avoidance of complications

- Air embolism
- Secondary bleeding/haematoma
- Arrhythmias
- Device embolisation
- Thromboembolism
- Erosions/perforation
Conclusions

- ASDs as large as 36-38 mm diameter can be closed
- The size, rims and stability of the septum define limits
- Amplatzer device is the only choice
- Use of an “adequate” size device that safely fits
Conclusion-1

- Standard deployment may not be adequate in large challenging ASDs

- Different methods/manoeuvres needed:
  - Device deployed in R or LUPV, left atrial roof
  - 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
Large but unsuitable ASD’s

- Absent IVC or deficient both IVC and posterior margins
- Larger than 36-38mm
Closure of large ASDs

- Safety shall be paramount:
  - I can do it but shall I do it?
Gatekeeper role of the cardiologist for surgical referrals

- Pre-op assessment
- Peri-op assessment
- Post-op assessment
- Judgment regarding adequacy of surgical results determining continued surgical referral

Ziyad Hijazi
Who is the gatekeeper for cardiologist self referrals?
ASD devices

Cardioseal

Starflex

Amplatzer

Helex
- Self-Expandable
- Short-connecting Waist
- Nitinol wire .004” - .008”
- Sizes: 4-40 mm
Device closure of secundum ASD

Moderate ASD – colour jet width & balloon sizing, device closure
Procedure
Procedure

- Dilator and wire removed slowly to ensure no air is sucked into the sheath
- Device inserted in saline and examined before screwing to delivery cable
- Device loaded into the loader
- Loader attached to delivery sheath by clockwise rotation (make sure cable is not partly unscrewed)
Bi-caval View

Deficient IVC rim shall be considered a contraindication to device closure!
Data required from echocardiography

What to measure?

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

- Number of ASDs
- Size of ASD
- Total septal length
- Rims
Sizing of defect

- In 4-chamber view by TTE or TEE
- AV valve rim + average size of ASD + superior rim
- A device where LA disc of ASO is equal to or smaller than the total septal length may be used
Delivery of device over wire in RUPV
Delivery in LUPV

Deployment in LUPV over a wire
Size of the ASD

- In at least two orthogonal views – “Oval”

- Three standardised views on TOE:
  - 4 Chamber view
  - Short axis view
  - Bi-caval view
Balloon Assisted Technique
Balloon in LUPV, device in RUPV

Dalvi BV, Pinto RJ, Gupta A. Cath Cardiovasc Interv 2005;64:102-107
## Complications of ASD Closure

**Surgery versus devices**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Device (n=442)</th>
<th>Surgery (N=154)</th>
<th>p</th>
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<tbody>
<tr>
<td>Arrhythmia needing Rx</td>
<td>2</td>
<td>0</td>
<td>0.03</td>
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<tr>
<td>Device embolization with surgical removal</td>
<td>3</td>
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<tr>
<td>Marker band embolism with surgical removal</td>
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<td>Cerebral embolism</td>
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<td>Pericardial effusion with tamponade</td>
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<td>Pulmonary oedema</td>
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<tr>
<td>Repeat surgery</td>
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<tr>
<td>Wound complications</td>
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<td>2</td>
<td>0.066</td>
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<td><strong>Total</strong></td>
<td>7 (1.6%)</td>
<td>8 (5.4%)</td>
<td>0.30</td>
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Gatekeeper role of the cardiologist for surgical referrals

- Pre-op assessment
- Peri-op assessment
- Post-op assessment
- Judgment regarding adequacy of surgical results determining continued surgical referral
Modification of pusher cable
Avoidance of complications

Device embolisation

- Risk varies 0.5-1%
  - Undersizing
  - Improper deployment
- Especially failing to recognise deficient IVC rim
- Gentle wiggle
- Constant pull and push
- If device is not parallel to septum, it must be recaptured and redeployed
Avoidance of complications

Erosion/Perforation/PE

- Incidence of haemodynamic compromise 1/1000
  - Deficiency of aortic rim/superior rim
  - Oversizing
- Edge of RA or LA disc eroded through free atrial wall
- If extended to aorta, tamponade was rapid
- Majority occurred within 05 days
- Shape memory may play a role
- Rarely aorta to RA or LA fistula

ASD sites

- Superior Sinus Venosus defect
- Oval Fossa defect
- Inferior Sinus Venosus defect
- Atrio-ventricular Septal defect (Primum ASD)
- Coronary Sinus defect
Balloon in LUPV, device in RUPV