Transcatheter closure of VSD using Duct Occluder device

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Anatomy of VSD

1. Perimembranous VSD: Aneurysm septal membranous (TV or PA obstruction), AR

2. VSD supcristal beneath PV or/and AV→

Laubry Pezzi syndrome (AV prolapsed)

3. Inlet VSD (AVSD)

4. Muscular VSD
   + Apical
   + Marginal
   + Central
Various locations for VSDs
### Hemodynamic Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>AP/PS</th>
<th>RP/RS</th>
<th>Qp/Qs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Resistive</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
<td>1.0-1.5</td>
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<tr>
<td>Ib</td>
<td>Resistive</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
<td>1.5-2</td>
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<tr>
<td>IIa</td>
<td>Resistive</td>
<td>0.3-0.7</td>
<td>&lt;0.5</td>
<td>&gt;2</td>
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<tr>
<td>Iib</td>
<td>Non resistive</td>
<td>0.7-1</td>
<td>&lt;0.8</td>
<td>&gt;2</td>
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</table>
Hemodynamic Classification

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<thead>
<tr>
<th>Nom</th>
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<tbody>
<tr>
<td>III</td>
<td>Non resistive</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>&lt;1</td>
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<tr>
<td>VI</td>
<td>Non resistive</td>
<td>&lt;0.7</td>
<td>&lt;0.5</td>
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</tbody>
</table>

VSD Ia and Ib: Malade de Roger  
VSD IIa and IIb: VSD high debit  
VSD III: Eissennmenger (large VSD)  
VSD IV: VSD and Pulmonary stenosis
VSD management

VSD IA (Roger): Follow up
VSD IIa: Surgery if
  Medical treatment failure
  Pulmonary pressure increasing
  LV too large
  More than 1 year
VSD IIb: Surgery if single VSD, PA banding
multiple VSD patient < 9 month total correction after
VSD + IA, VSD + RVOT obstruction: Surgery
VSD type IB ????

+ 75% of VSD
+ Wait and see?
+ Osler, AR, LV hemodynamic ...
+ Surgery complication?
+ Intervention complication?
Introduction

- The transcatheter occlusion of VSD is considered to be one of the most sophisticated and complex interventional procedures. Percutaneous closure of a perimembranous VSD is valuable alternative to surgical closure.

- Complications are embolization of the device and arrhythmic (double disk device)
The PM VSD have edge, ampulla's (triangle) form in 90%, look like type A of PDA. Using PDA device for VSD closure is reasonable.

Carefully patient’s selection and long term follow up is very important.
Introduction

- The PDA device (Amplatzer Duct Occluder, Cocoon Duct occluder) is stable and adapter with 6 to 8F sheath (smaller than VSD device with same left disk diameter)
- The fist VSD close by PDA device in Vietnam Heart Institute in December, 2002
The Duct Occluder Device

- The occluder is a cone-shaped device 7 mm in length made of a 0.004-inch Nitinol wire mesh.
- Prostheses are currently available in sizes ranging from 5-4 to 16-14 mm at increments of 2 mm.
- Delivery sheath from 6F to 8F.
- The price is reasonable.
Protocol

- VSD was crossed from the LV with a coronary catheter (JR4) or AM catheter.
- Guide wire Terumo was advanced into the pulmonary artery or the vena cava.
- The tip of the Terumo wire was captured with a snare to create an arterio-venous loop.
- 6 to 8F long sheath was introduced over the loop wire to the ascending aorta.
Protocol

- The 6F to 8F sheath (adapted to Device size selection) was introduced over the loop wire to the ascending aorta.
- The left disk open just beneath aortic valve and pull back to the VDS.
- After check by angiography, the body of device was open in the defect.
**Protocol**

- Angiograms of the LV and the aorta were performed after device detachment to assess device position and the efficacy of closure.
- Echocardiographic assessment included device arm position and integrity, contact with valve structures, residual flow through the defect.
- Follow-up studies with clinical examination and angiogram were carried out at various times after coil or device
Results

- 133 patients with clinical evidence of a VSD.
- December 2002 – June 2009
- The body weight ranged from 6.5 to 58 kg.
- The sizes of the defect (Right Ventricle size) ranged from 3 to 8 mm, measured by means of TTE and or angiography.
- Qp/Qs varied from 1.5 to 3.2 mean 1.8
- Follow up: 6 month (max 7 years)
Results

- ADO was successfully implanted in 128 patients (97%).
- Device embolization (1 case), not proper position (1), too big VSD (2) and AO valve touched (1).
- There were no procedure’s complications: No impairment of the tricuspid and aortic valve, and no important arrhythmias.
Device size

- 6*4
- 8*6
- 10*8
- 12*10
- 14*12
- 16*14

Legend:
- Device size
- %
Results

- Angiogram complete occlusion was observed in 120 cases (93%) after 10 minuets.
- Residual shunt was demonstrated after 24h is 6% (7 cases) and after 1 month is 2 cases (2%).
- No AV bloc transitory after 6 month follow up (max 7 year)
Discussion

- Umbrella-shaped devices have been proved to be suitable and effective in occlusion of muscular VSD and perimembranous VSD.
- The ADO have high rate complete closure (98% after 1 month follow up). The ADO price is cheaper than another device.
Tips and Tips full

- For the choice of a proper size of the device, it is important to measure the diameter of VSD (right and left ventricle size).
- Using echocardiography or angiography, the smaller diameter of the oval VSD can be measured.
- 2 device can be use for 1 patient
Conclusion

- The Amplatzer Duct occluder has demonstrated its capability of avoiding impairment of the aortic and tricuspid valve function, and arrhythmia problems.
- Further data are necessary to assess the efficacy and safety of this device application.