Percutaneous Intervention for totally Occluded Coarctation Of Aorta

John Jose, Vipin Kumar, Ommen K George
Dept Of Cardiology
• Coarctation of aorta (CoA) forms 5-7% of congenital heart diseases

• Totally occluded CoA is very rare
  – Surgical repair is the standard treatment

• Few cases exist in the literature concerning angioplasty & stenting for totally occluded CoA
  – Percutaneous procedures successful in analogous situations: pulmonary valve atresia, IVC webs
# Clinical details

## History
- 27 year old female with secondary hypertension
- Referral after failed coarctoplasty attempt elsewhere

## Findings
- Turner phenotype
- Upper limb BP: 170/80 mmHg; feeble lower limb pulses
- CVS: Ejection click +
Investigations

ECG

• Sinus rhythm, Left ventricular hypertrophy

Echo

• Bicuspid aortic Valve
  Normal LV Function

Chest Radiograph
Total cutoff of descending thoracic aorta just distal to the left subclavian artery origin.

Arch angiogram (LAO 45°) (trans brachial access)

Descending Thoracic Aortogram (femoral access)

Retrograde & Antegrade Simultaneous Angiogram (6F femoral & right brachial access)
Diagnosis & Management Options

- Congenital Acyanotic Heart disease
- Coarctation of aorta – totally occluded
- Bicuspid Aortic valve

Management Options
- Interventional
  - ✓
- Surgical
## Percutaneous Intervention: Materials

<table>
<thead>
<tr>
<th><strong>Sheath:</strong></th>
<th><strong>Catheters:</strong></th>
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<tbody>
<tr>
<td>6F → 12F short sheath (femoral)</td>
<td>5F Glide Cath (<em>Terumo™</em>), 6F pig tail, Judkin’s right 4 (<em>Cordis</em>)</td>
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<table>
<thead>
<tr>
<th><strong>Guide wires:</strong></th>
<th><strong>Balloons:</strong></th>
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</thead>
<tbody>
<tr>
<td>0.014” <em>Conquest Pro, Miracle 12</em> coronary wires (<em>Asahi Intecc</em>)</td>
<td><strong>Coronary balloons:</strong> 1x10mm &amp; 2x12 mm</td>
</tr>
<tr>
<td>0.035” <em>hydrophilic wire</em> (<em>Terumo Glide Technology™</em>)</td>
<td><strong>Peripheral balloons:</strong></td>
</tr>
<tr>
<td><em>Amplatz Super Stiff</em> Guide Wire (<em>Boston Scientific</em>)</td>
<td>- 4x20mm, 6x20mm <em>ATB</em> (<em>Cook Medical</em>)</td>
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<td></td>
<td>- 14X40mm <em>Maxi LD</em> (<em>Cordis</em>)</td>
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<th><strong>Stent:</strong></th>
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<tbody>
<tr>
<td>P5014 <em>Palmaz stent</em> (<em>Cordis Corporation, a Johnson &amp; Johnson company; Warren, NJ</em>)</td>
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## Procedure Steps: Crossing the lesion

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Miracle and conquest pro coronary wires, soft end</td>
</tr>
<tr>
<td>2</td>
<td>Fail</td>
</tr>
<tr>
<td>3</td>
<td>0.035” hydrophilic wire</td>
</tr>
<tr>
<td>4</td>
<td>Fail</td>
</tr>
<tr>
<td>5</td>
<td>Back (hard) end of conquest pro wire</td>
</tr>
<tr>
<td>6</td>
<td>Success</td>
</tr>
</tbody>
</table>

**Image:**
- **LAO 45°**
- Puncture assisted by orthogonal views & repeated angio above occlusion site
Procedure Steps: Initial dilatation

- Serially dilated with a 1x10 mm & 2x12mm coronary balloon at 14atm

- Coronary wire exchanged with a 0.035” hydrophilic Glide wire

- Glide catheter taken over the hydrophilic wire → Amplatz Super Stiff Wire exchange
Procedure Steps: Balloon dilatation

Dilatation with 4x20 mm balloon

Dilatation with 6x20 mm balloon

LAO 45°
Procedure Steps: Stenting

P5014 Palmaz stent mounted on a 14x40 mm Maxi LD balloon, deployed at 8 atm

LAO 45°
### Pressure data (mmHg)

<table>
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<tr>
<th>Region</th>
<th>Pre</th>
<th>Post</th>
</tr>
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<tbody>
<tr>
<td>Ascending Aorta</td>
<td>174/92</td>
<td>142/82</td>
</tr>
<tr>
<td>Femoral Artery</td>
<td>97/85</td>
<td>135/80</td>
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</table>

**LAO 45°**

**Post stenting Aortogram**
Complications & follow up

- No complications during or after procedure
- Asymptomatic on follow up
- Planned re-intervention in June 2013
Key learning points

• Percutaneous intervention for total occlusion of CoA/ local aortic atresia feasible if

1. Appropriate case selection
2. Appropriate puncture material
3. Adequate care during puncture
Learning points

I. Patient selection for percutaneous treatment

Fig. A  CoA

Fig. B Complete obliteration

Fig. C Segmental atresia

Fig. D Absence of part of aortic arch

Courtesy: G. Joseph et al, CMCH Vellore
2. Instruments for puncturing the atretic segment

- **Coronary wires, soft end**
  - Fail

- **0.035” hydrophilic wire**
  - Fail

- **Back (hard) end of coronary CTO wires**
  - Fail

- **Brockenbrough needle**
  - Fail

- **PowerWire™ Radiofrequency Guidewire (Baylis)**
  - FIRST REPORT
3. Approach during the puncture

• Monitor direction of movement of the puncturing instrument in two orthogonal views

• Repeated contrast injections from above
Challenges & limitations

• **Immediate complication:**
  - Risk of aortic perforation & extravastion
  - Aortic rupture
  - Dissection

• **Long term complications:**
  - ? aneurysms
Conclusion & Take Home Message

• Percutaneous intervention is feasible in certain cases of totally occluded CoA

• Recanalisation, balloon angioplasty & stenting can be safely and successfully performed
  • proper case selection, appropriate precautions

• Cheap & safe alternative to surgery
Acknowledgements

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  – Dr. George Joseph, Prof & Head, Dept Of Cardiology-I, CMCH, Vellore
  – Dr. Purendra Pati, Prof, Dept Of Cardiology-II, CMCH, Vellore

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