Choice of Atherectomy – Device Related Tips and Tricks

Prakash Krishnan, MD FACC
System Director Endovascular Services (Cardiology)
The Mount Sinai Health System
Associate Professor of Medicine and Radiology
The Icahn School of Medicine at Mount Sinai
New York
Disclosure

Consultant- Medtronic, Abbott, BD, Phillips
So Where Does Atherectomy Fit In?
Atherectomy Devices

- Directional Atherectomy
- Rotational/Aspiration
- Orbital Atherectomy
- LASER
- Excisional
Theoretical Background of Atherectomy

To avoid the induction of a potentially restenosis promoting barotrauma

Problem 1: recoil / restenosis
Problem 2: dissection

Problem 1: intimal hyperplasia
Problem 2: mechanical stress in joint orientated vessel segments

Atherectomy removes the plaque without overstretch of the vessel wall
Common to all Atherectomy Devices

- No randomized control trials vs DCB/DES
- Long term patency rates from randomized trials not available
- Each device has its own merits and faults
- Likely an adjunctive therapy in the new landscape of SFA/Pop therapy
Excimer Laser Atherectomy
Turbo-Booster - More Extensive Photoablation

Guidewire

Laser Catheter
Excimer Laser - Where to use

• Excimer laser might be useful in small vessels
• In larger vessels only in conjunction with the Turbo Booster catheter.
• Superior to PTA for ISR
• Preparation of the artery for endo-prosthesis implantation?
• Controlled /comparative studies needed
Excimer Laser - Where Not to Use

• Severely fractured stents.
• Highly calcified lesions.
• Acute occlusions? – better: mechanical-aspiration thrombectomy or Jetstream atherectomy.
Directional Atherectomy
Silverhawk Atherectomy
Silverhawk - Where to Use

- Has the largest series of patients studied - Definitive LE
- Eccentric lesions & bifurcations.
- Vessel diameter ≤ 7mm.
- Diabetic patients - Definitive LE.
- Preparation of the artery for endo-prosthesis implantation.
- In-stent restenosis
- Controlled/comparative studies needed.
Silverhawk - Where Not to Use

- Severely fractured stents.
- Highly calcified lesions without pre-dilatation.
- Tortuous vessel segments (limited steerability- Bias).
- Vessel diameter \( \leq 2\text{mm} \) below the knee.
Jetstream Atherectomy

Distal Tip

- Differential scraping flutes remove all plaque types
- Aspiration ports collect plaque and thrombus
- One step size expansion

Control Pod

2.1 mm

3.0 mm
Pathway Atherectomy - Where to Use

- Total subacute occlusions with mixed composition of occlusive material (e.g. thrombus).
- Vessel diameter > 3mm and ≤ 5mm due to device size restrictions.
- Calcified lesions.
- Acute occlusions?
- Diabetic patients?
- Preparation of the artery for endoprosthesis implantation.
- In-stent restenosis.
- Controlled/comparative studies warranted.
Pathway Atherectomy - Where Not to Use

• Severely fractured stents.
• Subintimal course of the guide wire (risk of perforation).
• Severe tortuosity below the knee vessels, especially if vessel diameter $\leq$ 3mm.
High Speed Rotational Atherectomy
Diamondback Orbital Atherectomy System

Diamond Coated Abrasive Surface

Uniquely Shaped, Eccentrically Mounted Crown
High Speed Rotational Atherectomy
Rotablator and Diamondback

• Where to use:
  • Highly calcified lesions of infra-popliteal arteries

• Where not to use:
  • Vessel diameters > 3mm because of
    • limited device diameter
    • risk of hemolysis
## Atherectomy Devices

<table>
<thead>
<tr>
<th></th>
<th>Jetstream™ Atherectomy System (Boston Scientific)</th>
<th>Peripheral Rotablator™ Rotational Atherectomy System (Boston Scientific)</th>
<th>Diamondback 360™, Stealth 360™ Atherectomy System (Cardiovascular Systems, Inc)</th>
<th>SilverHawk™, TurboHawk™ Plaque Excision System (Covidien)</th>
<th>Turbo-Elite™ Laser Atherectomy Catheter (Spectranetics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front-Cutting</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Differential Cutting</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Active Aspiration</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentric Lumens</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesion Morphology:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓ (large vessel only)</td>
<td>✓</td>
</tr>
<tr>
<td>Soft/Fibrotic Plaque</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Thrombus</td>
<td>✓ (indicated for thrombectomy and atherectomy)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Atherectomy – Conclusions

• Different debulking concepts are now available for specific lesion morphologies.
• Debulking reduces the need of stents.
• Diabetics may benefit from debulking.
• Debuling & local drug delivery might become the future of endovascular treatment.
Thank You
Choice of Atherectomy – Device Related Tips and Tricks

Prakash Krishnan, MD FACC
System Director Endovascular Services (Cardiology)
The Mount Sinai Health System
Associate Professor of Medicine and Radiology
The Icahn School of Medicine at Mount Sinai
New York