Pedal Access:  

*When to Do It*  
*How Does it Fare*

Shant M. Vartanian, MD  
Assistant Professor of Surgery  
Division of Vascular and Endovascular Surgery

**Introduction: Retrograde Access**

- Wide spread application of endovascular techniques to infrageniculate arterial occlusive disease  
- Technical failure rate of crossing complex tibio-peroneal lesions of ~10%  
  - Strongly tied to occlusive anatomy  
  - More likely w/ CTO vs stenosis  
  - Sodor 2000 61% vs 84%  
  - Dorros 2001 76% vs 98%  
  - Faglia 2005 21% vs 87%  
- Retrograde access as a means in increasing the likelihood of successful crossing

- First described by Iyer 1990  
  - Two cases of failed antegrade crossing of PT  
  - Open percutaneous access after surgical cutdown onto PT

- Proliferation of the technique and variations on a theme  
  - SAFARI  
  - TAMI

- Principles  
  - Distal vascular access  
  - Crossing the lesion retrograde  
  - +/- transfer wire control to femoral access

- Wide spread adoption by vascular interventionalists  
  - Fewer than 200 cases reported in the literature  
  - Industry support  
  - Parallels to radial access for interventional cardiology

- What does retrograde access add?  
  - Arterial access close to the occlusive lesion  
  - Pushability  
  - Another attempt at salvaging a failed crossing  
  - Re-establishing intraluminal position for failed subintimal re-entry
**Pedal Access: Case Presentation**

**Technique: Prep**
- Prep in anticipation of needing access
  - Circumferential foot and ankle prep
  - Sterile half-sheet on Angiotable
  - Drape with interventional angio drape
  - Antegrade approach
  - Cut window through angio drape if pedal access is desired
- On the fly prep
  - Cut window into angio drape and prep foot
  - Ioban to secure drapes to prepped foot and exclude unsterile OR table
  - Imaging artifact with ultrasound guided access

**Technique: Access**
- Imaging assisted access
  - Simple fluoroscopic guidance for heavily calcified vessels
    - Guidance by the very object you should try to avoid -> calcified atheroma
    - Lack of 3 dimensional data
  - Angiographic guidance
    - Angiography from above the lesion to roadmap access vessels
  - Ultrasound guided access
    - Identify “softer” parts of the artery that are more receptive to puncture
    - 3 dimensional imaging
    - Less likely to have puncture site complications
**Technique: Access**

- 7 - 15 MHz compact linear array probe
- 4 fr Micropuncture kit with echogenic needle
  - 21 g needle
  - 0.018" wire
- Checkflow valve
- To go small
  - 2.9 fr inner dilator only
- Sheathless access
  - 0.018” wire
  - +/- support catheter, low profile balloon OTW balloon catheter
  - Lose ability to shoot angiograms via the retrograde sheath

**Technique: Crossing the Lesion**

- No single best method for all lesions
- Transluminal vs subintimal
- Wire guides
  - 0.014" vs 0.018" vs 0.035”
  - Hydrophilic vs CTO
- Catheter support
  - Quickcross (Spectranetics)
  - Crossath (Cook)
  - Trailblazer (Covidien)
  - CXI (Cook)
  - 65 cm length, straight or angled tip
- CTO Catheter
  - Viance (Covidien)

**Technique: Crossing the Lesion**

- Treat from retrograde access or transfer wire access to the femoral sheath
- To treat retrograde
  - Upsize sheath vs sheathless access
  - Low profile balloons
  - Lose ability to manage puncture site complications
- To transfer wire access to the femoral sheath:
  - Mate to femoral catheter
    - Position a straight 0.035 catheter as distally as possible from the femoral access
    - Steer the retrograde wire into the catheter and deliver out the sheath
    - Easier if working in a constrained space
  - Snare from femoral sheath
    - Easier if working in a larger space
  - Establish through-and-through wire access
    - Increases pushability
    - Tracking balloon through heavily calcified long CTO
Technique: Subintimal Salvage

A. Schmidt, Parkhospital Leipzig, Germany

Technique: Hemostasis

- Manual compression over puncture site for 10 minutes
  - Ideal for pedal access (DP/PT)
  - Completion angiogram from femoral access
  - Often requires selective injection of NTG to relieve access site spasm
- Intra-luminal balloon control
  - Ideal for puncture sites proximal to the malleolus
  - Cross access site with femoral wire
  - Low pressure appropriately sized balloon
  - +/- application of BP cuff with balloon inflated
  - Completion angiogram with NTG to relieve spasm

Results: Technical Success

<table>
<thead>
<tr>
<th>Number</th>
<th>Technical success</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iyer (1990)</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>Botti (2003)</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Gandini (2007)</td>
<td>4</td>
<td>100%</td>
</tr>
<tr>
<td>Tamashiro (2006)</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Awasthi (2006)</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>Spinosa (2006)</td>
<td>21</td>
<td>100%</td>
</tr>
<tr>
<td>Downer (2007)</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Fusaro (2007)</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Montero-Baker (2008)</td>
<td>51</td>
<td>86%</td>
</tr>
<tr>
<td>Rogers (2011)</td>
<td>13</td>
<td>85%</td>
</tr>
<tr>
<td>Mudolph (2013)</td>
<td>27</td>
<td>85%</td>
</tr>
<tr>
<td>Ruzsa (2013)</td>
<td>51</td>
<td>98%</td>
</tr>
<tr>
<td>Verkatalaalam (2014)</td>
<td>11</td>
<td>82%</td>
</tr>
<tr>
<td>Patena (2012)</td>
<td>28</td>
<td>85%</td>
</tr>
</tbody>
</table>

Conclude that the technique is feasible
Outstanding questions about patient selection and the fate of the puncture site

Results: Fate of the Puncture Site

- Complications of puncture site by location
  - Femoral artery ~5%
    - Dissection 1-2%
  - Retrograde popliteal ~10%
    - Complications more frequent in ESRD, calcified vessels
  - Radial Access
    - Ave reported rate of 5 – 12%
    - Predictors: Small artery diameter, larger sheath/cath, diabetes, smoking, PAD, gender

Should we assume that pedal access will be any different?
Should we assume that the consequences would be worse?
Results: Fate of the Puncture Site

- Of reports addressing the issue, clinical exam or ankle pressures are reported
- No mid or long term follow up data with imaging of the puncture site

  - 51 patients, 47 w/ CLI
  - 1 access site thrombosis that required emergent pedal bypass

- Ruzsa (2013)
  - 51 patients (35% rest pain, 65% tissue loss)
  - 1 tibial artery access site thrombosis salvaged w/ antegrade angioplasty
  - 2 month outcomes
    - 3 urgent bypass operations
    - 8 Major unplanned amputations

What does retrograde access add?
- Arterial access close to the occlusive lesion
- Pushability
- Another attempt at salvaging a failed crossing
- Re-establishing intraluminal position for failed subintimal re-entry

What are the potential risks?
- Loss of critical runoff into the foot
- Failed crossing may worsen clinical exam

Patient Selection

- Patients for whom retrograde pedal access is a good idea
  - Limb threatening ischemia
  - Infrageniculate disease
  - Committed to an endovascular intervention
    - Soft tissue concerns (venous ulcers, scleroderma, XRT)
    - No conduit
    - Prohibitive surgical/anesthetic risk
  - Failed antegrade crossing

- Patients for whom retrograde access is a bad idea
  - Claudication with one vessel runoff
  - Active foot infection
  - Isolated SFA disease
Conclusions

- Retrograde access is a feasible technique that increases the likelihood of technical success
- Reserved for salvaging failed antegrade crossing
- Complications are infrequent but can be dire
  - Likely under-reported
- Outstanding questions about fate of the puncture site