Retrograde tibial puncture has changed our algorithm for crossing tibial lesions in CLI: How and when to do it?

Peter A. Schneider, MD
Kaiser Foundation Hospital
Honolulu, Hawaii
Disclosure

Peter A. Schneider

Potential conflicts of interest to report:

Enter patients in studies sponsored by: Gore, Cordis, Medtronic, Silk Road, Bard, NIH, Limflow

Modest royalty: Cook

Scientific Advisory Board (non-compensated): Abbott, Medtronic, Boston Scientific

Chief Medical Officer: Intact Vascular, Cagent
Vascular involvement in diabetic subjects with ischemic foot ulcer: morphologic categorization of disease severity.

417 diabetics with CLI-2893 lesions
74% were in the BTK arteries
66% of BTK lesions were occlusions
50% of occlusions were >10cm

Crossing tibial occlusions is key to making endovascular a broadly useful tool for treating CLI patients.
Retrograde Access

Algorithm

• OLD-Cannot cross from proximal direction:
  Try again or bypass

• NEW-Retrograde approach

  1. Branches and collaterals take off with a caudal angle: wire from above gets lost but wire from below seeks larger artery.
  2. Distal end of the occlusion is often softer than the proximal end.
  3. Safer than I thought it would be.
Retrograde Access

Clinical Issues

- CTO’s that reconstitute in the popliteal or tibial arteries.
- Reconstitute with enough true lumen working room to engage the lesion.
- Time limit on antegrade attempt (5 min.)
- Retrograde access is one method of approaching from the opposite direction
  - Pedal or distal access, Pedal loop, Transcollateral, Direct puncture of occlusion
Technical Aspects

**RETROGRADE TIBIAL PUNCTURES**

Points:
1. Long sheath (45cm) positioned at or just below the knee
2. Multiple options for puncture site
3. Retrograde wire passage, then through wire, then track catheter, then reverse wire

**ANKLE LEVEL PUNCTURES**

- All 3 vessels suitable
- Useful for long tibial CTOs
- Usually sheathless with support catheter

From: Varcoe LINC 2016
Retrograde Access

Technical Aspects

- Ultrasound vs fluoro guidance
- Micropuncture with V18 or Command 18
- CXI or Quickcross CTO microcatheter support
- 3 or 4 Fr sheath if needed (<10% of cases)
- Pass wire from retrograde and externalize, then treat from antegrade direction
- Dorsiflexion and plantar flexion of foot
PRIME CLI: Ultrasound Guided Access Outcomes Among Patients With CLI

Mustapha et al. J Invasive Cardiology 2016;28:259

649 procedures
896 access sites
Retrograde Access In Practice

Leipzig Experience

343 limbs over 14 months
Intention to cross antegrade

Failure to cross antegrade 17.8%
Success with retrograde approach 86.3%
Pedal access site occlusion 2%
Other local complications 8%
(perforation and hematoma)

University of Virginia Experience
99 patients treated using retrograde tibial/pedal access
Technical success 89%
Complications 8%

Sabri et al. J Vasc Interv Radiol 2015;26:29
Retrograde Access In Practice

Avoidance of Major Amputation after Retrograde Pedal Access

Ochsner Clinic Experience
2% of patients treated using retrograde tibial/pedal puncture

Retrograde Access in Practice

University of Texas Experience
21 patients
Technical success 95%
No access-related complications

<table>
<thead>
<tr>
<th>Table III. Procedural details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access vessel</td>
</tr>
<tr>
<td>Dorsalis pedis</td>
</tr>
<tr>
<td>Anterior tibial</td>
</tr>
<tr>
<td>Posterior tibial</td>
</tr>
<tr>
<td>Interventions</td>
</tr>
<tr>
<td>Angioplasty</td>
</tr>
<tr>
<td>Stenting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table IV. Morbidity, mortality, and objective performance goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbidity and mortality</td>
</tr>
<tr>
<td>Mortality</td>
</tr>
<tr>
<td>Morbidity</td>
</tr>
<tr>
<td>Systemic</td>
</tr>
<tr>
<td>Lesional</td>
</tr>
<tr>
<td>Local</td>
</tr>
<tr>
<td>30-Day objective performance goals</td>
</tr>
<tr>
<td>30-Day MACE</td>
</tr>
<tr>
<td>30-Day MALE</td>
</tr>
<tr>
<td>30-Day major amputations</td>
</tr>
<tr>
<td>1-Year objective performance goals</td>
</tr>
<tr>
<td>1-Year MALE free</td>
</tr>
<tr>
<td>1-Year MALE + POD free</td>
</tr>
<tr>
<td>1-Year AFS</td>
</tr>
<tr>
<td>1-Year limb salvage</td>
</tr>
<tr>
<td>1-Year survival</td>
</tr>
</tbody>
</table>
Primary Patency the same, whether using unidirectional or bidirectional access.
## Retrograde Access: Complications

**Cook Tibio-Pedal Registry of Retrograde Access**

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local pain at access site</td>
<td>2.5% (5/199)</td>
<td></td>
</tr>
<tr>
<td>Infection at access site</td>
<td>1.0% (2/199)</td>
<td></td>
</tr>
<tr>
<td>Bruising at access site</td>
<td>1.0% (2/199)*</td>
<td></td>
</tr>
<tr>
<td>Bleeding at access site</td>
<td>1.0% (2/199)</td>
<td></td>
</tr>
<tr>
<td>Acute vessel dissection</td>
<td>0.5% (1/199)</td>
<td></td>
</tr>
<tr>
<td>Acute vessel thrombosis</td>
<td>0% (0/199)</td>
<td></td>
</tr>
<tr>
<td>Compartment syndrome</td>
<td>0% (0/199)</td>
<td></td>
</tr>
<tr>
<td>Urgent surgical revascularization</td>
<td>0% (0/199)</td>
<td></td>
</tr>
</tbody>
</table>

*Mustapha TCT 2014*
Angio after opening long segment PT occlusion and removing retrograde wire.
TABLE II. Amputation-Free Survival Rate Estimated by Kaplan–Meier Analysis

Transmetatarsal approach
Popliteal occlusion

Large pergenicular collateral

Peroneal a.

Wire

Peroneal a.
Use stump of occluded anterior tibial artery
Bidirectional approach
Retrograde tibial puncture has changed our algorithm

Conclusion

• Becoming more widely practiced.
• Appears to be safe and effective.
• Significantly increases success rate for crossing difficult popliteal and tibial lesions.
• Set a time limit for antegrade attempts at crossing.
Retrograde tibial puncture has changed our algorithm for crossing tibial lesions in CLI: How and when to do it?

Peter A. Schneider, MD
Kaiser Foundation Hospital
Honolulu, Hawaii