Ultrasound-guided antegrade and retrograde access for recanalization of CTO in lower limb

Yin Xia MD, PhD
Division of Vascular Surgery
Fuzhou General Hosipital,China
Disclosure

Speaker name: Yin Xia

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

I do not have any potential conflict of interest
US guided FA antegrade and PT retrograde access

Case 1, Female 66ys, Rutherford category 3. ABI: 0.54
US guided FA antegrade and PT retrograde access
US guided FA antegrade and PT retrograde access

Case 1
US guided PT retrograde access

Case 1
US guided FA antegrade access

Case 2, Male, 64ys, Rutherford category 3. ABI:R 0.70
Recannalization of PT and plantar arterial arch

Case 2
Recanalization of plantar arterial arch

Case 2
US guided SFA retrograde access

Case 3, Male, 72ys, Rutherford category 3. ABI: R 0.76
US guided SFA retrograde access
US guided SFA retrograde access

Case 3
US guided dorsalis pedis retrograde access

Case 4, Male, 68ys, Rutherford category 4-5. ABI: L 0.56
US guided dorsalis pedis retrograde access

Case 4
Danger of peritoneal, abdominal wall and external genital bleeding

Correct puncture region: below the inguinal ligament, not too distal from the inferior edge of femoral head

Danger of thigh hematoma and pseudo aneurism

Ultrasound Guidance Technique

Ultrasound guided femoral antegrade access

- Puncture site should be 1.5-2.0 cm away from the proximal CTO cap.
- Obesity and high bifurcation may preclude antegrade access.
- **Puncture in short-axis view, adjust the wire into the target lumen in long axis view.**

Ultrasound guided PT access

US short access view of the posterior tibial artery

Long access view of the tibial artery showing the needle entering the tibial artery

Long access view showing an 0.014-inch wire traversing a high-grade stenosis

“White Stop Sign”
(Ultrasound guided tibio-pedal access)

Severe calcification in the vessel wall as described “white-stop-sigh” indicates inability to access or cross.

Intraprocedural Outcomes

Compared with fluoroscopic guidance, US guidance was associated with a reduced number of attempts, improved first pass success rate, reduced rate of veni puncture, and reduced time to access.

## Vascular Access Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Fluoroscopy (n = 501)</th>
<th>Ultrasound (n = 503)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma ≥5 cm</td>
<td>11 (2.2%)</td>
<td>3 (0.6%)</td>
<td>0.034</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>0</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Dissection</td>
<td>3</td>
<td>2</td>
<td>NS</td>
</tr>
<tr>
<td>Access bleeding, transfusion</td>
<td>2</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Hematoma with DVT</td>
<td>1</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Any complication</td>
<td>17 (3.4%)</td>
<td>7 (1.4%)</td>
<td>0.041</td>
</tr>
</tbody>
</table>

in the PRIME study, 407 patients underwent 649 procedures with 896 access sites utilized.
### Access-related complications and procedure outcomes

**TAMI (Tibio-Pedal Arterial Minimally Invasive Retrograde Revascularization)**

<table>
<thead>
<tr>
<th></th>
<th>Femoral Antegrade (n = 188)</th>
<th>Femoral Retrograde (n = 185)</th>
<th>Dual Femoral/Tibial (n = 130)</th>
<th>Dual Femoral Retrograde (n = 44)</th>
<th>TAMI (n = 73)</th>
<th>Other (n = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
</tr>
<tr>
<td>Arteriovenous fistula</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [0.8%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [3.4%]</td>
</tr>
<tr>
<td>Hematoma</td>
<td>4 [2.1%]</td>
<td>1 [0.5%]</td>
<td>2 [1.5%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [3.4%]</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
</tr>
<tr>
<td>Compartment syndrome</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>5 [2.7%]</td>
<td>0 [0.0%]</td>
<td>2 [1.5%]</td>
<td>1 [2.3%]</td>
<td>1 [1.4%]</td>
<td>2 [6.9%]</td>
</tr>
<tr>
<td>BARC3a</td>
<td>5 [2.7%]</td>
<td>0 [0.0%]</td>
<td>2 [1.5%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [3.4%]</td>
</tr>
<tr>
<td>BARC3b</td>
<td>1 [0.5%]</td>
<td>1 [0.5%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [3.4%]</td>
</tr>
<tr>
<td>Transfusion</td>
<td>6 [3.2%]</td>
<td>1 [0.5%]</td>
<td>1 [0.8%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>2 [6.9%]</td>
</tr>
<tr>
<td>Endovascular intervention</td>
<td>0 [0.0%]</td>
<td>1 [0.5%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>1 [3.4%]</td>
</tr>
<tr>
<td>Surgical intervention</td>
<td>1 [0.5%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
<td>0 [0.0%]</td>
</tr>
<tr>
<td>Mean contrast volume (cc)</td>
<td>163</td>
<td>196</td>
<td>159</td>
<td>200</td>
<td>57</td>
<td>208</td>
</tr>
<tr>
<td>Mean fluoroscopy time (min)</td>
<td>22</td>
<td>25</td>
<td>44</td>
<td>21</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>Mean procedure time (min)</td>
<td>84</td>
<td>81</td>
<td>134</td>
<td>82</td>
<td>83</td>
<td>105</td>
</tr>
<tr>
<td>Mean hospital stay (days)</td>
<td>1.5</td>
<td>1.3</td>
<td>1.6</td>
<td>1.1</td>
<td>0.9</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Data provided as number (percentage) or mean.
Chronic Total Occlusion Crossing Approach Based on Plaque Cap Morphology: The CTOP Classification

Fadi Saab, MD¹, Michael R. Jaff, DO², Larry J. Diaz-Sandoval, MD¹, Gwennan D. Engen, BSN¹, Theresa N. McGoff, BSN¹, George Adams, MD³, Ashraf Al-Dadah, MD⁴, Philip P. Goodney, MD⁵, Farhan Khawaja, MD⁶, and Jihad A. Mustapha, MD¹
CTO plaque cap morphology classification

Short CTO: <10cm with no-severe calcification

- Preferred approach: Antegrade access

Long CTO: >10cm with severe calcification

- Type I preferred approach: Traditional CFA access
- Type II preferred approach: Dual access
- Type III preferred approach: Dual access
- Type IV preferred approach: Pedal access

Based on proximal and distal cap appearance

The advantages of USG access

- Increase cannulation and crossing success rate
- Reduce radiation exposure, use of contrast and the complication rates
- Increase the possibility of delivering therapy in target lumen
- Utilize hibernating lumen
- Shorten length of hospital stay

Maria Sobolev et al. *Chest.* 2014;146(4_MeetingAbstracts):236A.
The advantages of USG access

- US could facilitate operator find a feasible access site and rule out difficult vessels.
- CTO CAP appearance should be considered regarding target segment recannalization.

The Ultrasound guided access could be of great help for recannalization of CTO in low limb.
Thanks
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Fuzhou General Hospital, China