Peroneal artery angioplasty as a single runoff vessel for foot revascularization in patients with CLI

by
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Disclosure

Speaker name: ..........................................................................................

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
Critical limb ischemia (CLI) usually occurs secondary to severe multilevel peripheral arterial disease.
• Prevention of major amputation in critical limb ischemia is the most important goal and is based on the capability for restoring and maintaining straight-line tibial arterial blood flow to the foot.¹

• If neither the anterior nor the posterior tibial artery can be treated, the alternative treatment may consist of providing direct flow along the peroneal artery.

The peroneal artery is relatively spared from the terminal stages of atherosclerosis and is often the last tibial vessel to become occluded in diabetics or end-stage vascular disease.
The peroneal artery has multiple collaterals that supply the pedal arteries via anterior perforating and posterior communicating branches.
Aim of the work
Is to assess:

• The clinical and haemodynamic outcomes of peroneal artery angioplasty as a single runoff vessel for foot revascularization in patients with critical limb ischemia.
Patients
Patients who are admitted to the vascular surgery unit at Ain Shams University Hospitals were prospectively enrolled (SEP 2014 – Jan 2016).
23 Patients

19 Male

4 Female
Patients

23

48 Years

65.5 (Mean age)

76 Years
Selection criteria for our study

• **Inclusion criteria:**
  - Patients presenting with critical limb ischemia (Rutherford categories 4, and 5) due to infragenicular atherosclerotic arterial disease with the peroneal artery as a single target vessel for foot revascularization.
Selection criteria for our study (continue)

• **Exclusion criteria:**
  - Patients presenting with critical limb ischemia (Rutherford category 6) with major tissue loss extending above the transmetatarsal level.
  - Patients who have patent anterior tibial or posterior tibial artery amenable for bypass surgery or angioplasty.
  - Patients presenting with acute thrombotic events.
  - Patients with associated significant lesions in the femoropopliteal or iliac arterial segments.
  - Patients with known intolerance to contrast agents.
Assessment

• Clinical presentation was determined according to Rutherford - Baker scale of severity of peripheral arterial disease for chronic lower limb ischemia as specified by the Society for Vascular Surgery/American Association for Vascular Surgery reporting standards.
Assessment

• CTA was done to assess the infragenicular arterial system and to describe the peroneal artery lesion characteristics (stenosis/occlusion), and length.
Methods
CIN guard

• Our protocol to guard against contrast induced nephropathy was intravenous administration of 0.9% saline at a rate of 0.5-1ml/kg/hr for 12 hours before and after the procedure.

• Using non-ionic contrast media (Ultravist® 300, Bayer) diluted with 0.9% saline at a ratio of 1:1.
1) Pre-procedural assessment.

2) Equipments used.

3) Post-procedural care.

4) Follow up.
1) Pre-procedural assessment.

A- Routine laboratory investigations.

B- Ankle brachial pressure index.

C- Plain X-ray of the foot (if ulcer or infection is present).

D- CTA.
2) Equipments used.

A- C-arm (angiographic apparatus).

B- Materials used in the technique of SIA.

i. Seldinger’s needle.
ii. 6 French caliber sheaths & their dilators.
iii. Hydrophilic coated Terumo® guidewire 0.035 French “J-tipped” of 180 cm length.
iv. 4 or 5 French straight or vertebral multipurpose catheter.
v. Balloon catheters (4-5 mm in diameter for popliteal dilatation) & (2-3 mm in diameter for tibial arteries).
vi. Inflation device.

vii. Medications as xylocaine 2%, non-ionic contrast material, heparin, papaverine HCl.
3) Procedure of the peroneal angioplasty

A- Antegrade ipsilateral CFA 6Fr sheath

B- IV heparin.

1- Selective peroneal a. cannulation.
2- Aided by usage of angled tip catheter (e. BERN) placed at the level of the popliteal artery.
3- Hydrophilic angled-tip guidewire to transverse the lesion 0.035 inch (Radiofocus of Terumo) or 0.018 in steerable guidewire (V-18 of Boston Scientific) to traverse the lesion aided by catheter support.
4- Balloon dilatation (e.g Amiral Xtreme of Medtronic).
6- Completion arteriography to confirm satisfactory foot revascularization through the anterior perforating & posterior communicating branches..
4) Post-procedural medications

A- Therapeutic LMWH 1mg/kg SC injection for 2 days.

B- followed by clopidogrel 300 mg loading followed by daily 75 mg for 6 months.

C- Aspirin 75 mg daily indefinitely.
In-line peroneal artery flow to the foot without any residual stenosis >30%, or any evidence of flow-limiting dissection, acute occlusion, or distal embolization.
5- Postoperative follow-up

- At 1, 3, 6, 9 & 12 months.
- Clinical and hemodynamic outcomes are assessed according to the AHA classification (combining ABI & Rutherford-Baker scale).
<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Markedly improved; ABI &gt; 0.9 and no ischemic symptoms</td>
</tr>
<tr>
<td>2</td>
<td>Moderately improved; ABI increase &gt; 0.1 but not normal, and increase by one category</td>
</tr>
<tr>
<td>1</td>
<td>Minimally improved; ABI increase 0.1 but not normal, or increase by one category</td>
</tr>
<tr>
<td>0</td>
<td>No change</td>
</tr>
<tr>
<td>-1</td>
<td>Mildly worse; no category decrease or ABI increase &lt; 0.1</td>
</tr>
<tr>
<td>-2</td>
<td>Moderately worse; one category worse or unexpected minor amputation</td>
</tr>
<tr>
<td>-3</td>
<td>Markedly worse; more than one category worse or unexpected major amputation</td>
</tr>
</tbody>
</table>

*ABI, Ankle-brachial index.*

American Heart Association guidelines for clinical improvement.
Results
### Demographic data

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean 63.5 (50-76)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>19 (82.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>4 (17.4%)</td>
</tr>
<tr>
<td>Ischemic Heart disease</td>
<td>16 (69.5%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20 (86.9%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>11 (47.8%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>14 (60.8%)</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>5 (21.7%)</td>
</tr>
</tbody>
</table>
Clinical presentation according to Rutherford classification

<table>
<thead>
<tr>
<th>Rutherford category</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic rest pain (category 4)</td>
<td>10 (46.8%)</td>
</tr>
<tr>
<td>Minor tissue loss (category 5)</td>
<td>13 (56.5%)</td>
</tr>
<tr>
<td>Lesion</td>
<td>N (%)</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Diffusely diseased or multiple stenotic segments</td>
<td>7 (30%)</td>
</tr>
<tr>
<td>Occlusions</td>
<td></td>
</tr>
<tr>
<td>Mean occlusion length (range)</td>
<td>16 (70%)</td>
</tr>
<tr>
<td></td>
<td>10.5cm (3-15)</td>
</tr>
</tbody>
</table>
AHA clinical improvement after intervention

<table>
<thead>
<tr>
<th>AHA improvement</th>
<th>1 month n</th>
<th>3 months n</th>
<th>6 months n</th>
<th>9 months n</th>
<th>12 months n</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3 points</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+2 points</td>
<td>16</td>
<td>13</td>
<td>15</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>+1 point</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No improvement</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Worse (-1 point)</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Worse (-2 points)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Worse (-3 points)</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number of patients followed</td>
<td>23</td>
<td>23</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>
## Minor complications and MACE

<table>
<thead>
<tr>
<th>Event</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor complications</td>
<td>2 (8.7%)</td>
</tr>
<tr>
<td>MACE Myocardial infarction</td>
<td>2 (8.7%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 (4.3%)</td>
</tr>
<tr>
<td>Death</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>
Kaplan Meier curve for primary patency
Kaplan Meier curve for assisted primary patency
Kaplan Meier curve for secondary patency
Kaplan Meier curve for limb salvage
Discussion
"Angiosome concept"? Despite of its wide acceptance between interventions yet many surgeons may criticize their results.

Dosluoglu et al\(^{11}\) showed that there was no statistically significant difference in the 12-month primary patency or limb salvage of patients with peroneal artery only runoff compared with those with anterior or posterior tibial single-vessel runoff.
• Specific angiosome vessel should be considered when selecting target arteries.
• It is often difficult to recanalize below the knee vessels based on the angiosome concept.
• Thus, in these cases, interventions should focus on vessels that are easy to treat and should establish one straight-line flow to the pedal arch, regardless of the angiosome concept.
Our results, compares nicely to these two landmark studies with our primary patency for peroneal artery revascularization at 12 months 63.2%, assisted primary patency 81%, and limb salvage rate 91.3%.
Conclusion
Among patients with critical limb ischemia, **peroneal artery angioplasty** as a single vessel runoff to the foot is **essential and sufficient** to improve their clinical outcomes and limb salvage rate.
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