Purpose:
Evaluate the effectiveness of directional atherectomy (DA) for treatment of peripheral arterial disease in infrapopliteal lesions at one year.

Methods:
- DEFINITIVE LE was a multi-center, prospective, single-arm study; includes duplex core lab, angiographic core lab, and clinical events committee (CEC) to adjudicate adverse events.
- Full cohort = 800 patients with 1022 lesions treated between April 2009 and April 2011
  - Infrapopliteal cohort = 145 patients with 189 lesions
- Primary endpoints:
  - Claudicants (Rutherford 1 – 3)
    - For this analysis primary patency at 12 months was defined as duplex ultrasonography (DUS) measurement of the peak systolic velocity ratio (PSVR) value ≤ 2.4 at the target lesion(s) with no clinically-driven reintervention within the target segment, defined and monitored by the CEC as reintervention to ≥ 50% diameter stenosis in the presence of recurrent symptoms or an asymptomatic 70% stenosis in the target segment.
  - CLI patients (Rutherford 4 – 6)
    - Freedom from major unplanned amputation of the target limb through 12 months (above the metatarsal region that was unanticipated before the index procedure).
- Other secondary endpoints:
  - Device success, procedural success, patency in CLI patients, secondary patency, major adverse event rate at 30 days and 12 months, improvement in Rutherford Classification, ABI and WIQ, amputation free survival in patients with claudication, wound healing.
Results:
Claudicant and CLI patients with infrapopliteal lesions were demographically similar except that CLI patients had higher rates of both diabetes and arrhythmia (p = 0.012 and p = 0.019, respectively). CLI patients were more likely to have calcified lesions, occlusions, and restenotic lesions. Claudicants were more likely to have lesions in the tibioperoneal trunk.

Procedure characteristics / acute outcomes
Device success defined as ≤ 30% residual stenosis in target lesions after directional atherectomy.

Procedure success defined as ≤ 30% residual stenosis in target lesions after directional atherectomy and adjunctive interventions.

<table>
<thead>
<tr>
<th></th>
<th>Claudicants</th>
<th>CLI</th>
<th>All</th>
<th>P value of Claudicant vs CLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embolic protection (Spider™FX embolic protection device only)</td>
<td>16.0% (12/75)</td>
<td>21.4% (15/70)</td>
<td>18.6% (27/145)</td>
<td>0.522</td>
</tr>
<tr>
<td>Device success (core lab)**</td>
<td>72.7% (64/88)</td>
<td>66.7% (62/93)</td>
<td>69.6% (126/181)</td>
<td>0.420</td>
</tr>
<tr>
<td>Post-device % stenosis</td>
<td>25.7% ± 14 (88)</td>
<td>28.0% ± 15 (93)</td>
<td>26.9% ± 14 (181)</td>
<td>0.301</td>
</tr>
<tr>
<td>Procedure success (core lab)**</td>
<td>85.7% (78/91)</td>
<td>82.3% (79/96)</td>
<td>84.0% (157/187)</td>
<td>0.555</td>
</tr>
<tr>
<td>Post-procedure % stenosis**</td>
<td>20.9% ± 10 (91)</td>
<td>23.4% ± 12 (96)</td>
<td>22.2 ± 11 (187)</td>
<td>0.116</td>
</tr>
</tbody>
</table>

**Lesion level characteristics

- Patients with stenoses rather than target lesion occlusions had greater procedural success (0.004), and patients without hyperlipidemia also had higher procedural success
- Adjunctive stenting = 1.6%; flow-limiting dissections = 2.8%; distal embolization = 2.8%

12-month follow-up outcomes

<table>
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<tr>
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<th>P value of Claudicant vs CLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom from CD-TLR</td>
<td>95.4%</td>
<td>86.6%</td>
<td>91.2%</td>
<td>0.09</td>
</tr>
<tr>
<td>Limb salvage</td>
<td>100.0%</td>
<td>93.8%</td>
<td>97.1%</td>
<td>0.03</td>
</tr>
<tr>
<td>Freedom from MAE (KM)</td>
<td>86.0%</td>
<td>72.6%</td>
<td>79.6%</td>
<td>0.03</td>
</tr>
</tbody>
</table>

- Primary patency at 12 months was 84.0%, secondary patency was 92.1%. Primary patency was similar between claudicant and CLI patients (p = 0.11).
- Complete wound healing at 12 months for those patients with CLI was 68.2%
- MAEs at 1 year included 30 CD-TVRs, 4 unplanned major amputations, and 6 deaths (none of which were related to the study device or procedure, as adjudicated by the CEC)
- Patients with a history of arrhythmia and renal insufficiency had higher rates of restenosis (p = 0.032 and p = 0.019, respectively), as did elderly patients (p = 0.014)
Discussion:
- Results yielded promising technical and clinical outcomes for directional atherectomy when treating both CLI and claudicants with infrapopliteal lesions
- While direct comparisons between trials cannot be made, patency rates from this study are similar to those patency rates in clinical studies of DES in focal lesions and DCB in diffuse lesions

Authors’ Conclusion:
The DEFINITIVE LE trial demonstrates that directional atherectomy is safe and effective for treatment of infrapopliteal lesions. Randomized trials are needed to compare directional atherectomy to DES and DCB.

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