Lower Extremity Revascularization Using Directional Atherectomy: 12 Month Prospective Results of the DEFINITIVE LE Study

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**Purpose:**
Evaluate the safety and effectiveness of directional atherectomy (DA) for treatment of peripheral arterial disease.

**Methods:**
- Multi-center, prospective, single-arm study; includes duplex and angiographic core lab imaging review and clinical events committee (CEC) adjudication of adverse events
- 800 patients with 1022 lesions treated between April 2009 and April 2011
- Primary endpoints:
  - Claudicants (Rutherford 1 – 3)
    - Primary patency at 12 months was defined as duplex ultrasonography (DUS) measurement of the peak systolic velocity ratio (PSVR) value ≤ 3.5 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 treated segment (PSVR ≤ 2.4 was used to report values in the manuscript)
  - Critical limb ischemia (CLI) patients (Rutherford 4 – 6)
    - Freedom from major unplanned amputation (defined as above the metatarsal region that was unanticipated before the index procedure) of the target limb through 12 months
- 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
  - Pre-specified hypothesis: use of directional atherectomy on treatment of claudicants with diabetes would be non-inferior to claudicants without diabetes
Results:
- Levels of calcification were the same between claudicant and CLI patients (37.1%; p = 1.000) while there were more occlusions in the CLI arm (29.9% vs 17.4%; p < 0.001)

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</td>
<td>20.6% (n = 598)</td>
<td>27.9% (n = 201)</td>
<td>22.4% (n = 799)</td>
<td>0.039</td>
</tr>
<tr>
<td>Device success (core lab)**</td>
<td>75.9% (727)</td>
<td>72.1% (269)</td>
<td>74.9% (996)</td>
<td>0.218</td>
</tr>
<tr>
<td>Post-device stenosis**</td>
<td>23.9% ± 13.1 (727)</td>
<td>25.6 ± 13.8 (269)</td>
<td>24.3 ± 13.3 (996)</td>
<td>0.073</td>
</tr>
<tr>
<td>Procedure success (core lab)**</td>
<td>91.3% (738)</td>
<td>83.0% (277)</td>
<td>89.1% (1,015)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Post-adjunctive stenosis**, ^^</td>
<td>18.0 ± 11.0 (278)</td>
<td>20.9 ± 12.3 (81)</td>
<td>18.6 ± 11.4 (359)</td>
<td>0.045</td>
</tr>
</tbody>
</table>

**Lesion level characteristics
^^Includes only lesions that had adjunctive therapy after directional atherectomy

- Predictors of greater procedural success were female gender, SFA lesions, smaller diameter stenosis, absence of calcification, and shorter lesion length
- Rate of distal embolization requiring treatment was 1.6%; rate of perforation requiring treatment was 4.1%

Patency rates (Kaplan-Meier Analysis) and limb salvage

<table>
<thead>
<tr>
<th></th>
<th>Claudicants (n = 598)</th>
<th>CLI (n = 201)</th>
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<tbody>
<tr>
<td>Primary patency</td>
<td>78%</td>
<td>71%</td>
</tr>
<tr>
<td>Secondary patency</td>
<td>89%</td>
<td>88%</td>
</tr>
<tr>
<td>Limb salvage</td>
<td>NR</td>
<td>95%</td>
</tr>
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- In moderate length lesions (5.0 – 9.9 cm), patency rates were 83% in the SFA, 74% in the popliteal artery and 88% in the infrapopliteal artery
- Patency rates in longer lesions ≥ 10 cm were 65% in the SFA and popliteal arteries
- Complete wound healing at 12 months for those patients with CLI was 72%
  • Comparable to rates seen in bypass studies of CLI patients
Primary patency of diabetics and non-diabetics

- Diabetics primary patency = 77% (n=418), non-diabetics primary patency = 78% (n=431; p=0.98)
- Directional atherectomy satisfied the non-inferiority hypothesis comparing diabetics with non-diabetics with a p value of < 0.001

Discussion:

- Directional atherectomy was successful at debulking to ≤ 30% diameter stenosis in lesions up to 20 cm long with selective adjunctive PTA
- Low bailout stenting rate (3.2%) is lower than the rates of PTA arms of recent stent studies (40–50%)
- While direct comparisons between trials cannot be made, patency rates from this study are similar to those patency rates in clinical studies of second-generation nitinol stents in the SFA

Authors’ Conclusion:
The DEFINITIVE LE study demonstrates that directional atherectomy is safe and effective for treatment of both CLI patients and claudicants, whether or not they are diabetic.

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