COMPREHENSIVE META-ANALYSIS OF ENDOVASCULAR VERSUS BYPASS FOR CRITICAL LIMB ISCHEMIA: IS BYPASS OBSOLETE?

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Conflicts of interest

- Nothing to disclose
Treatment synergies

Anatomical factors (stenoses, run-off, vein, etc)

Clinical factors (comorbidities, age, etc)

Bypass  Angioplasty
## Arguments

<table>
<thead>
<tr>
<th>Crural Angioplasty</th>
<th>Femorodistal bypass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities eligible</td>
<td>Eligibility varies</td>
</tr>
<tr>
<td>Variable access options</td>
<td>Standard anatomical approach</td>
</tr>
<tr>
<td>Native vessels recanalization</td>
<td>Vein conduit necessary</td>
</tr>
<tr>
<td>Low complication rate</td>
<td>High complication rate</td>
</tr>
<tr>
<td>Demanding interventional skillset</td>
<td>Demanding surgical skillset</td>
</tr>
<tr>
<td>May be repeated multiple times</td>
<td>Revision very difficult</td>
</tr>
<tr>
<td>Maintains bypass options</td>
<td>Burns angioplasty options</td>
</tr>
<tr>
<td>2-3 vessels recanalization</td>
<td>Single line of flow to the foot</td>
</tr>
</tbody>
</table>
Infrapopliteal angioplasty


Primary patency

Limb salvage

Bypass 66-76%

Bypass 82-84%
Infrapopliteal angioplasty vs distal bypass

279 limbs in 243 patients → 125 propensity matched limb pairs

Complications: 21·6% versus 36·0% in surgical bypass; P=0·041
Hospital stay: 5 versus 18 days in surgical bypass; P=0·001

Endovascular-first or bypass-first for CLI?

Recommendation 35. Choosing between techniques with equivalent short- and long-term clinical outcomes

In a situation where endovascular revascularization and open repair/bypass of a specific lesion causing symptoms of PAD are associated with equivalent short- and long-term symptomatic improvement, endovascular techniques should be used first [B]
In-hospital mortality (1,797,885 cases)

Claudication

Bypass versus Endo

US, Nationwide Inpatient Sample, 1,797,885 patients

In-hospital mortality (1,797,885 cases)

Women versus men; \( p < 0.01 \)

- 0.5% vs 0.2% after angioplasty or stenting for intermittent claudication
- 1.0% vs 0.7% after open surgery for intermittent claudication
- 2.3% vs 1.6% after angioplasty or stenting for CLI
- 2.7% vs 2.2% after open surgery for CLI

US, Nationwide Inpatient Sample, \( 1,797,885 \) patients
Medicare propensity matched 5,928 endo vs 5,928 bypass

### 30-day outcomes

**Reduced mortality with ENDO**

<table>
<thead>
<tr>
<th>Patients</th>
<th>Endo (n = 5928)</th>
<th>Open (n = 5928)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amputation or mort.</td>
<td>7.4</td>
<td>8.9</td>
<td>0.002</td>
</tr>
<tr>
<td>Amputation</td>
<td>2.5</td>
<td>2.7</td>
<td>0.416</td>
</tr>
<tr>
<td>Mortality</td>
<td>5.3</td>
<td>6.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Patients with claudication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amputation or mort.</td>
<td>1.8</td>
<td>2.5</td>
<td>0.215</td>
</tr>
<tr>
<td>Amputation</td>
<td>0.1</td>
<td>0.3</td>
<td>0.239</td>
</tr>
<tr>
<td>Mortality</td>
<td>1.7</td>
<td>2.2</td>
<td>0.366</td>
</tr>
<tr>
<td>Patients with CLI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amputation or mort.</td>
<td>9.3</td>
<td>11.2</td>
<td>0.005</td>
</tr>
<tr>
<td>Amputation</td>
<td>3.3</td>
<td>3.5</td>
<td>0.580</td>
</tr>
<tr>
<td>Mortality</td>
<td>6.5</td>
<td>8.3</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Medicare propensity matched
5,928 endo vs 5,928 bypass

Amp-free survival

Overall survival

HR = 0.84 (0.79-0.89)

Meta-analysis methods

- PubMed (MEDLINE), EMBASE, AMED, and Scopus searched with the PRISMA process
- Frequentist Meta-analysis of Endovascular versus Surgical Bypass for Severe/Critical Limb ischemia
- Random effects model – LOG HAZARD SCALE (time-to-event analyses)

Katsanos K, Work in progress
**Limb salvage**

30 studies - 29688 cases

14523 endovascular versus 15165 surgical bypass

(1 randomized, 5 propensity matched, 4 multivariable adjusted, 20 unadjusted cohorts)

HR (95%CI): 0.74 (0.62-0.87)
HR (95%CI): 1.05 (0.94-1.17)
Conclusions

- ENDO first approach in all patients
- Early benefit of reduced mortality
- Late benefit of improved limb salvage
- No difference in overall patient survival
- Randomized studies pending?
Thank You
Amputation Free Survival

Summary meta-analysis plot [random effects]

- Arvela 2010: 0.73 (0.49, 1.11)
- Zdanowski 1997: 0.99 (0.88, 1.11)
- Faglia 2006: 0.84 (0.59, 1.20)
- Kudo 2006: 0.90 (0.61, 1.34)
- Dosluoglu 2008: 1.07 (0.54, 2.13)
- Chong 2009: 1.36 (1.06, 1.76)
- Dorigo 2009: 1.63 (0.70, 3.79)
- Casella 2010: 0.95 (0.46, 1.96)
- Bradbury 2010: 1.02 (0.81, 1.29)
- Soderstrom 2010: 0.89 (0.68, 1.14)
- Varela 2010: 1.05 (0.39, 2.86)
- Faglia 2011: 0.48 (0.25, 0.92)
- Korhonen 2011: 1.14 (0.87, 1.50)
- Chan 2014: 0.59 (0.35, 1.01)
- Soga 2014: 0.88 (0.63, 1.23)
- Katib 2015: 0.95 (0.64, 1.41)
- CRITSCH 2016: 0.91 (0.70, 1.19)
- Patel 2016: 1.54 (0.94, 2.51)
- Darling 2017: 1.09 (0.94, 1.28)
- Dick 2017: 1.25 (0.83, 1.88)
- Hicks 2017: 0.96 (0.76, 1.22)
- Wiseman 2017: 0.84 (0.80, 0.89)

(combined: 0.97 (0.89, 1.06))