Current and New Data on Morbidity and Mortality Risks after LE Thrombectomy/Embolectomy for ALI: Open and Endo: Is it Less than in the Past and Why?

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Acute Limb Ischemia in “Broad Strokes”

- Incidence: 14 per 100,000 population per year
- Comprises: ~10% of procedures seen in an average vascular unit
- Natural History
  - In absence of intervention ~2/3 of patients eventually require major amputation
  - With intervention 10-30% 30 day major amputation rate

Etiology of ALI

- Thrombosis
- Embolism
- Native thrombosis
- Trauma (including iatrogenic)
- Reconstruction/graft thrombosis
- Peripheral aneurysm with embolus or thrombosis

5-Year- All Cause Mortality

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>0</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral Cancer</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CAO</td>
<td>21%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>28%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAD</td>
<td>30%</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Lower Extremity</td>
<td>39%</td>
<td></td>
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</tr>
<tr>
<td>ALI</td>
<td>63%</td>
<td></td>
<td></td>
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</tbody>
</table>

* CAO defined as previous MI or exertional angina.
† Stroke defined as ischemic stroke.
* Year mortality in 65-75 age group.

Source: Weitz, Ljungman, Hartmann, Hunt and ACS.

CAD defined as previous MI or exertional angina.
Stroke defined as ischemic stroke.
Year mortality in 65-75 age group.

Source: Weitz, Ljungman, Hartmann, Hunt and ACS.

Norgren et al. TASC II J Vasc Surg 2007

BEST-CLI Trial Co-Chair
- Supported by NHLBI: 1U01HL107407-01A1
Goals of Treatment

- **Primary:**
  - Restore perfusion to the extremity
- **Secondary:**
  - Identify and correct underlying lesions
  - Anticipate and treat reperfusion
- **Tertiary:**
  - Identify and correct embolic source if present

Revascularization

**Endovascular**

- Pharmacological Catheter Directed Thrombolysis
- Infusion
- Pulse-spray
- Percutaneous Mechanical Thrombectomy
  - Aspirational
  - Hydrodynamic
  - Ultrasound-based
  - Microfragmental
  - Pharmaco-mechanical
  - Angioplasty/stenting/stentgrafting of underlying or responsible lesions

**Surgical**

- Procedures
  - Balloon Thromboembolectomy
  - Bypass
  - Endarterectomy

EVIDENCE SUMMARY

Open surgical or endovascular revascularization for acute limb ischemia

John C. Wang, MD, FACS, Anne H. Kim, MD, and Viktor K. Kudryap, MD, FACS (Cleveland, Ohio)

An acute limb ischemia (ALI) is one of the most common vascular emergencies with high risk for limb loss if it is not treated promptly. Revascularization is the treatment of choice and surgical revascularization has been the standard of care. However, recent advances in endovascular therapy have shown comparable outcomes. This study aimed to compare endovascular and surgical revascularization techniques. Systematic review was performed with emphasis on study of presentation, study design, revascularization techniques, limb salvage and mortality rates, and complications. The literature search was performed using PubMed, Cochrane, and Embase databases. Articles were included if they were written in English or Russian. A total of 2999 articles were identified, 563 abstracts were read, and 68 articles were reviewed. Patients undergoing endovascular therapy had a lower 30-day mortality rate compared to surgical therapy. However, the limb salvage rate was similar between the two groups. The study concluded that endovascular therapy is a safe and effective option for the treatment of ALI, with comparable outcomes to surgical therapy. Given the relative equivalence, endovascular therapy should be considered as the initial treatment for ALI in the absence of contraindications.

Open Surgery (OS) vs. Endovascular Therapy (ET):

- Composite 30 day mortality higher with OS: 12.1 vs. 6.7%
- Similar short term survival
- Similar 1 year limb salvage rate
- ET may reduce need for OS
- ET a/w more bleeding
- OS a/w increased morbidity related to surgical cxs

Given relative equivalence, ET should be used as initial treatment of ALI if there is no contraindication

Embolectomy

Objective

- To determine perioperative morbidity and develop a risk prediction model for post-operative mortality after lower extremity embolectomy
Methods

- NSQIP database query 2005-2012
  - Included
    - Emergent, unilateral, lower extremity embolectomy
  - Excluded
    - Chronic limb ischemia
    - Bilateral embolectomy
    - Non emergent cases
    - Concurrent bypass

Demographics

1749 patients
Mean Age 68 +/- 15 years
48% male

DM 24%
CHF 11%
CDPD 13%
PAD 19%
TIA/CVA 24%
Hypertension 72%
BMI >30 kg/m² 29%
Functionally dependent 35%

Procedural Details

Level of embolectomy
- 70% iliofemoral
- 17% popliteal
- 12% multilevel

Concurrent Fasciotomies 18%

Perioperative (30 day) Outcomes

- MI/Cardiac Arrest 5%
- Pulmonary complications 16%
- Wound complications 8%
- Return to OR 26%
- Death 14%
- Length of stay 10 +/- 12 days
- Readmission 16%

Independent Predictors of 30 day Mortality

- Functional Dependence (OR 4.35, 95% CI 3.07-6.16, p<.001)
- CRF (OR 3.08, 95% CI 1.81-5.26, p<.001)
- Steroid Use (OR 2.21, 95% CI 1.24-4.09, p=.008)
- Age >70 (OR 2.05, 95% CI 1.47-2.97, p<.001)
- Recent MI/angina (OR 2.06, 95% CI 1.32-3.23, p=.002)
- CHF (OR 1.64, CI 1.04-2.59, P=.035)
- Male gender (OR 1.41, 95% CI 1.00-1.99, P=.05)

30 Day Mortality Risk Prediction Model

Characteristic
- Functionally dependent
- Chronic renal insufficiency
- Steroid use
- Age >70 years
- CHF
- Recent MI/angina
- Male gender
- COPD
30 Day Mortality Risk Prediction Model and Score

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Points</th>
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<tbody>
<tr>
<td>Functionally dependent</td>
<td>5</td>
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<tr>
<td>Chronic renal insufficiency</td>
<td>4</td>
</tr>
<tr>
<td>Age &gt; 70 years</td>
<td>3</td>
</tr>
<tr>
<td>DM</td>
<td>2</td>
</tr>
<tr>
<td>Recent MI/angina</td>
<td>2</td>
</tr>
<tr>
<td>Male gender</td>
<td>1</td>
</tr>
<tr>
<td>COPD</td>
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</table>

Risk level

- Low (2%-5%): 0-2
- Moderate low (6%-12%): 3-6
- Moderate (13%-20%): 7-9
- Moderate high (21%-50%): 10-11
- High (>50%): 12

COPD: Chronic obstructive pulmonary disease, MI: Myocardial infarction

Conclusions

- Emergent lower extremity embolectomy has high morbidity, mortality and resource utilization
- In patients with ALI requiring embolectomy, functional dependence and CRF were highly associated with increased perioperative mortality
- Our scoring system can help inform consent process and alternative treatment decisions such as providing palliative care