Complex Femoral Popliteal Disease: My Approach in the Claudicant

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UCSF Vascular Symposium 2019

Disclosures

• Research – WL Gore, Medtronic, Cook, Phillips
• Consultant – Endologix
Epidemiology

- Claudication affects 5% of men and women between ages 55 and 74
- Increasing prevalence with age affecting up to 20% at age 70
- Comorbidities associated with PAD:
  - Hypertension
  - Coronary Artery Disease
  - Diabetes
  - Obesity
  - CKD

Treatment of Claudication

- Medical management
- Medical management
- Medical management
- Endovascular Intervention/Open Bypass
Medical management of claudication

- Smoking cessation
- Management of hypertension – with ACE inhibitor or ARB
- Multidisciplinary management of diabetes with target HbA1c <7% and meticulous foot care
- Weight loss
- Statin therapy
- Antiplatelet therapy
- Exercise
- Cilostazol

Medical Management of PAD

Active smoking in claudicants undergoing lower extremity bypass predicts decreased graft patency and worse overall survival

- Retrospective analysis of all LEB performed for claudication in VSGNE 2003-2016
- Active smoking is independently associated with decreased 2-year primary patency, increased long-term mortality
Medical Management of PAD

**Adherence to lipid management guidelines is associated with lower mortality and major adverse limb events in patients undergoing revascularization for chronic limb-threatening ischemia**

Thomas F. X. O’Donnell, MD,1 Sarah E. Deeney, MD, MPH,2 Jeremy D. Darling, BA,1 Katie E. Shean, MD,1 Murray A. Mittleman, MD, DrPH, b,c Gabrielle N. Yee, BS,3 Matthew R. Dernbach, BS,2 and Marc L. Schermerhorn, MD,4 Boston, Mass

- Retrospective single institution study: 1019 limbs from 931 patients with 380 day follow up
- Lower mortality (HR, 0.73; 95% CI, 0.60-0.99, P<.05)
- Lower MALE rate (HR 0.71; 95% CI, 0.51-0.97, P<.05)

**Medical Management of PAD**

**Long-term outcomes of a randomized clinical trial of supervised exercise, percutaneous transluminal angioplasty or combined treatment for patients with intermittent claudication due to femoropopliteal disease**


- Randomized controlled trial: 139 patients with 5 year follow up
- PTA, Supervised exercise, and PTA + Supervised exercised showed no significant clinical difference in long term QoL, walking distance
Reversal of Lower-Extremity Intermittent Claudication and Rest Pain by Hydration

Samuel Fernández,1,2 Juan Carlos Paredes,1,3,4* Fabián Moscovich,5,6 and Camilo Palmieri,1,7
 Buenos Aires and CABA, Argentina, Ann Arbor, Michigan

- Prospective pilot study: 36 patients
- Disabling claudication (<100m) for more than 5m

Operative Management of Claudication

JVS 2012; 55(4): 1001-1007

Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

Jeffrey J. Siracuse, MD, Kristina A. Giles, MD, Frank B. Pomposelli, MD, Allen D. Hamdan, MD, Mark C. Wyers, MD, Elliot L. Chaikof, MD, PhD, April E. Nedeau, MD, and Marc L. Schermerhorn, MD, Boston, Mass

- Retrospective single institution study
- 218 patients: 113 bypass, 105 PTA/S between 2001-2009
Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

### Table I. Demographics and comorbidities

<table>
<thead>
<tr>
<th></th>
<th>Bypass (113 patients)</th>
<th>Primary angioplasty/stent (105 patients)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>68 (±11.2)</td>
<td>69 (±11.3)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Males</td>
<td>68% (77)</td>
<td>63% (66)</td>
<td>NS</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>39% (44)</td>
<td>41% (43)</td>
<td>NS</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>NS</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>7% (8)</td>
<td>0% (0)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>12% (14)</td>
<td>7% (7)</td>
<td>NS</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>36% (41)</td>
<td>35% (37)</td>
<td>NS</td>
</tr>
<tr>
<td>Hypertension</td>
<td>66% (75)</td>
<td>78% (82)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Previous stroke</td>
<td>8% (9)</td>
<td>9% (9)</td>
<td>NS</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.0 (±0.46)</td>
<td>1.07 (±0.34)</td>
<td>NS</td>
</tr>
<tr>
<td>Renal transplant</td>
<td>1% (1)</td>
<td>3% (3)</td>
<td>NS</td>
</tr>
<tr>
<td>Former tobacco</td>
<td>36% (41)</td>
<td>44% (47)</td>
<td>NS</td>
</tr>
<tr>
<td>Current tobacco</td>
<td>29% (33)</td>
<td>22% (23)</td>
<td>NS</td>
</tr>
<tr>
<td>Hypertension</td>
<td>59% (67)</td>
<td>50% (53)</td>
<td>NS</td>
</tr>
<tr>
<td>Aspirin</td>
<td>77% (90)</td>
<td>90% (&lt;.01)</td>
<td></td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>23% (26)</td>
<td>96% (&lt;.01)</td>
<td></td>
</tr>
<tr>
<td>Warfarin</td>
<td>4% (5)</td>
<td>6% (6)</td>
<td>NS</td>
</tr>
<tr>
<td>Statin</td>
<td>62% (70)</td>
<td>69% (70)</td>
<td>NS</td>
</tr>
<tr>
<td>β-blocker</td>
<td>75% (85)</td>
<td>55% (&lt;.01)</td>
<td></td>
</tr>
</tbody>
</table>

NS, Not significant.

### Table II. TASC II classification of lesions

<table>
<thead>
<tr>
<th>TASC II Class</th>
<th>Bypass (113 patients)</th>
<th>Primary angioplasty/stent (105 patients)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>17% (19)</td>
<td>40% (42)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>B</td>
<td>34% (38)</td>
<td>47% (49)</td>
<td>NS</td>
</tr>
<tr>
<td>C</td>
<td>36% (40)</td>
<td>10% (11)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>D</td>
<td>13% (16)</td>
<td>3% (3)</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

NS, Not significant; TASC, Trans-Atlantic Inter-Society Consensus.
Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

Table III. Lower extremity runoff

<table>
<thead>
<tr>
<th>Runoff</th>
<th>Bypass (112 patients)</th>
<th>Primary angioplasty/stent (105 patients)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 vessel disease</td>
<td>40% (45)</td>
<td>27% (28)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>1 vessel disease</td>
<td>30% (34)</td>
<td>35% (37)</td>
<td>NS</td>
</tr>
<tr>
<td>2 vessel disease</td>
<td>24% (27)</td>
<td>27% (28)</td>
<td>NS</td>
</tr>
<tr>
<td>3 vessel disease</td>
<td>5% (6)</td>
<td>11% (12)</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, Not significant.

Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

Table IV. Outcomes/complications

<table>
<thead>
<tr>
<th></th>
<th>Bypass</th>
<th>Primary angioplasty/stent</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay (mean days)</td>
<td>3.9 (2-11)</td>
<td>1.2 (1-3)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>1%</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>0</td>
<td>4%</td>
<td>NS</td>
</tr>
<tr>
<td>Wound infection</td>
<td>16%</td>
<td>0%</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Renal failure &gt;20% increase in creatinine</td>
<td>3%</td>
<td>3%</td>
<td>NS</td>
</tr>
<tr>
<td>Return to operating room</td>
<td>3%</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Bleeding complication</td>
<td>2%</td>
<td>1%</td>
<td>NS</td>
</tr>
<tr>
<td>Hematoma</td>
<td>0</td>
<td>2%</td>
<td>NS</td>
</tr>
<tr>
<td>Postoperative occlusion</td>
<td>2%</td>
<td>0</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, Not significant.
Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

**Freedom From Restenosis**
- C-D Lesions: HR 4.2 (1.7–10.8); P < .01
- No Difference in TASC A-B

**Freedom From Symptoms at Last Followup**
- PTA/S intervention HR 3.9 (1.5–10.0); P < .01
- A-B Lesions: HR 2.5 (1.3–4.7); P < .01

**Freedom From Symptom Recurrence**
- C-D Lesions: HR 3.9 (1.5–10.0); P < .01
- A-B Lesions: HR 2.5 (1.3–4.7); P < .01

**Freedom From Reintervention**
- Predictor of reintervention:
  - PTA/S intervention HR 2.5 (1.4–4.4)
  - TASC D HR 3.7 (3.5–9)
  - Statin Use HR 0.58 (0.35–0.97)
Results for primary bypass versus primary angioplasty/stent for intermittent claudication due to superficial femoral artery occlusive disease

**Freedom From Symptom Recurrence**
- C-D Lesions: HR 3.9 (1.5-10.0); P .01
- A-B Lesions: HR 2.5 (1.3-4.7); P .01

**Freedom From Reintervention**
- PTA/S intervention HR 2.5 (1.4-4.4)
- TASC D HR 3.7 (3.5-9)
- Statin Use HR 0.58 (0.35-0.97)
Summary

• No difference in long-term survival between bypass vs PTA/S

• Bypass patients:
  – more likely to remain free from claudication symptom recurrence at 3 years
  – more likely to have freedom from symptoms at last follow up
  – more likely to have freedom from restenosis (TASC C-D lesions)

• PTA/S patients:
  – No difference in outcomes between angioplasty vs stent
  – Lower complication rate (wound infections) compared to bypass

Endovascular or Open First?

From the Society for Clinical Vascular Surgery

Patient selection and perioperative outcomes of bypass and endovascular intervention as first revascularization strategy for infrainguinal arterial disease

Thomas C. F. Bodelewes, MD, a,b Jeremy D. Darling, BA,a Sarah E. Deery, MD, a,b,c Thomas F. X. O’Donnell, MD, a,b,c Alexander B. Pothof, MD, a,c Katie E. Shean, MD, a Frans L. Moll, MD, PhD,b and Marc L. Schermerhorn, MD, a
Boston, Mass, and Utrecht, The Netherlands

• Retrospective cohort study 2011-2014 NSQIP Targeted Vascular Module
• 5,998 1st time infrainguinal revascularization: 2196 claudicants, 1183 bypass-first, 1013 endo-first
Patient selection and perioperative outcomes of bypass and endovascular intervention as first revascularization strategy for infrainguinal arterial disease

![Graphs showing MACE and SSI outcomes](image)

**Table IV.** Adjusted associations between first-time revascularizations and postoperative outcomes in patients with chronic limb-threatening ischemia (CLTI) and claudication

<table>
<thead>
<tr>
<th>Thirty-day outcomes</th>
<th>Endovascular-first strategy (vs bypass-first)</th>
<th>CLTI</th>
<th>P value</th>
<th>Claudication</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td>0.4–0.9</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Surgical site infection</td>
<td></td>
<td>0.1</td>
<td>0.1–0.2</td>
<td></td>
<td>0.4</td>
<td>0.2–0.95</td>
<td>.04</td>
</tr>
<tr>
<td>Bleding</td>
<td></td>
<td>0.4</td>
<td>0.3–0.5</td>
<td></td>
<td>0.3</td>
<td>0.2–0.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unplanned return to the operating room</td>
<td></td>
<td>0.7</td>
<td>0.5–0.8</td>
<td></td>
<td>0.6</td>
<td>0.4–0.9</td>
<td>.03</td>
</tr>
<tr>
<td>Secondary revascularization</td>
<td></td>
<td>1.6</td>
<td>1.0–2.3</td>
<td></td>
<td>1.7</td>
<td>0.9–3.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Unplanned readmission</td>
<td></td>
<td>0.8</td>
<td>0.7–0.9</td>
<td></td>
<td>0.6</td>
<td>0.4–0.8</td>
<td>.001</td>
</tr>
</tbody>
</table>

CI: Confidence interval; MACE: major adverse cardiovascular event; MALE: major adverse limb event; OR: odds ratio. Boldface P values represent significance (P < .05).

*Adjusted for age, gender, tissue loss, race, smoking, hypertension, diabetes, congestive heart failure, renal insufficiency, preoperative dialysis, chronic obstructive pulmonary disease, type of procedure, dependent functional status, elective procedure.

*Adjusted for age, gender, race, smoking, diabetes, renal insufficiency, type of procedure.

*Too few events.
Summary

• Morbidity—but not mortality—benefit of endovascular intervention first vs bypass
• Lack of evidence to support a clear advantage of either approach over the other
• For those with relatively short life expectancy, benefits of first-time endo intervention over bypass
Viabahn?

Randomized comparison of percutaneous Viabahn stent grafts vs prosthetic femoral-popliteal bypass in the treatment of superficial femoral arterial occlusive disease

John Kedora, MD, Stephen Hohmann, MD, Wilson Garrett, MD, Cary Munschaur, BS, Brian Theune, MD, and Dennis Gable, MD, Dallas, Tex

- 1 year patency 74% vs 74%
- JVS 2007

Drug Eluting Stent Improves Long Term Patency

Durable Clinical Effectiveness With Paclitaxel-Eluting Stents in the Femoropopliteal Artery

5-Year Results of the Zilver PTX Randomized Trial

Michael D. Dake, MD; Gary M. Ansel, MD; Michael R. Jaff, DO; Takao Ohki, MD; Richard R. Saxon, MD; H. Bob Smouse, MD; Lindsay S. Machan, MD; Scott A. Snyder, PhD; Erin E. O’Leary, PhD; Anthony O. Ragheb, PhD; Thomas Zeller, MD; on behalf of the Zilver PTX Investigators

- 5 year follow up of randomized controlled trial for DES vs PTA
- 474 patients, 238 in PTA group, 236 in DES
Paclitaxel-Eluting Stent Improves Long-Term Patency

My Approach to the Claudicant

- **TASC A + B**: PTA
- **TASC C**: Medical Management
- **TASC D**: Bypass (rarely) PTA (very rarely)
- **DCB**
- **DES vs Supera**

*Figure 3. Five-year primary patency outcomes comparing overall DES (primary DES + provisional DES) and standard and non-translated BMS.*

*Table: Kaplan-Meier estimates of primary patency, values represent lesion.*
Risk of Death Following Application of Paclitaxel-Coated Balloons and Stents in the Femoropoliteal Artery of the Leg: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Konstantinos Katsanos, MD, PhD, MSc, EBR; Stavros Spiliopoulos, MD, PhD; Panagiotis Kitrou, MD, PhD; Miltiadis Krokidis, MD, PhD; Dimitrios Karnabatidis, MD, PhD

- Meta-analysis of randomized control trials
- 28 RCTs with total 4,663 patients
- Showed increased risk of all-cause mortality starting at 2y
- Demonstrates dose-relationship of paclitaxel + all-cause mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>Paclitaxel Events Total</th>
<th>Control Events Total</th>
<th>Risk Ratio</th>
<th>RR</th>
<th>95%-CI</th>
<th>Weight (fixed)</th>
<th>Weight (random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>THUNDER.97</td>
<td>12 48</td>
<td>8 54</td>
<td>1.69</td>
<td>23.9%</td>
<td>26.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZILVER-PTX 9,19</td>
<td>42 297</td>
<td>12 177</td>
<td>2.09</td>
<td>47.7%</td>
<td>46.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN.PACT SFA 10,56</td>
<td>24 184</td>
<td>7 103</td>
<td>1.92</td>
<td>28.5%</td>
<td>26.8%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fixed effect model
- 529 334
- Risk Ratio: 1.94 [1.28; 2.96] 100.0% -
- Weight (fixed) 1.93 [1.27; 2.53] -- 100.0%

Random effects model
- Heterogeneity: $I^2 = 0%$, $Q = 0$, $p = 0.92$

Figure 2. Random effects forest plot of all-cause death at 2 years. Pooled point estimate was expressed as risk ratio (RR).

Figure 3. Random effects forest plot of all-cause death at 4 to 5 years. Pooled point estimate was expressed as risk ratio (RR).
4/8/19

Risk of Death Following Application of Paclitaxel-Coated Balloons and Stents in the Femoropopliteal Artery of the Leg: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Konstantinos Kataneses, MD, PhD; Mis, EBR; Stamatis Spiliopoulos, MD, PhD; Panagiota Kithau, MD, PhD; Miltiadis Krokidis, MD, PhD; Dimitros Karabirtides, MD, PhD

DCB/DES Increases Risk of All-Cause Mortality

Correction to: Durable Clinical Effectiveness With Paclitaxel-Eluting Stents in the Femoropopliteal Artery 5-Year Results of the Zilver PTX Randomized Trial

In the article by Dake et al, “Durable Clinical Effectiveness With Paclitaxel-Eluting Stents in the Femoropopliteal Artery 5-Year Results of the Zilver PTX Randomized Trial,” which published online before print March 11, 2016, and appeared in the April 12, 2016 issue of:

DCB/DES Increases Risk of All-Cause Mortality

Additionally, the following sentence from the ‘Safety’ section is incorrect:

“The 5-year all-cause mortality rate was 13.6% (10.2% for the primary DES group and 16.9% for the PTA group, P=0.03), and no deaths were adjudicated as procedure or device related.”

The authors regret that the numbers for the two groups were inadvertently reversed. The sentence should read:

“The 5-year all-cause mortality rate was 13.6% (10.2% for the primary DES group and 16.9% for the PTA group, P=0.03), and no deaths were adjudicated as procedure or device related.”
Drugs Are Bad…

My Approach to the Claudicant

- **TASC A + B**: PTA
- **TASC C**: Medical Management
- **TASC D**: Bypass (rarely) PTA (very rarely)

- **PTA**: Good result
- **Supera vs BMS**: Poor result
- **No further intervention**: Good result
Summary

- Optimizing medical management is the first and primary approach to treatment of patients with claudication
- Revascularization for intermittent claudication should be reserved for selected patients and treatment should be individualized
- Selection of patients based on TASC classification for treatment
- Limit use of DES or DCB in claudicants due to increased risk for all-cause mortality