Diabetic Foot Update - Interventional Procedures in PAD of the Lower Extremity

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3 December 2011
Objectives

• What types of interventions are available?
• Who should be offered intervention?
• What are the goals of intervention?
Available interventions

- Medical
- Minimally invasive
- Surgical
Peripheral Vascular Disease

Treatment

- Severity of Symptoms:
  - Claudication
  - Rest Pain
  - Gangrene

- Invasiveness:
  - Medical Management
  - Minimally Invasive Treatment
  - Surgical Intervention
Medical Intervention

• Risk modification
  – Stop smoking
  – Control diabetes
  – Control hypertension
  – Lipid control
• Supervised exercise
• Anti platelet therapy
Surgical Interventions

• Acute limb ischemia
  – Thrombectomy
• Chronic ischemia
  – Endarterectomy
  – Bypass
    • Proximal
    • Infra inguinal
• Sympathectomy
• Amputation
Acute Limb Ischemia

- Sudden onset (less than 2 weeks)
- Rest pain
- Decreased sensation
- Motor loss
- Absent / weak pulses by Doppler
- Implies thrombus with or without underlying PVD
Minimally Invasive Intervention-Acute Limb Ischemia

- Thrombolysis
- Thrombectomy (with or without adjuvant thrombolysis)
- Adjunctive procedures
  - Angioplasty
  - Atherectomy
  - Stent placement
Thrombolysis

• Catheter directed infusion of thrombolytics
  – Slowest method of re-establishing flow
  – Hours to days
  – Higher risk of bleeding complication

• Assisted methods
  – Pulse spray
  – Power Pulse – Angiojet (Possis device)
  – Ultrasound – EKOS device
Thrombectomy

- Simple – nested catheters, aspiration
- Mechanical
  - Angiojet – uses Bernoulli effect to break up and aspirate thrombus
  - Trellis
    - Isolate segment of thrombosed vessel
    - Inject thrombolytic
    - Macerate thrombus
    - Aspirate
  - Arrow Thrombectomy Device (Treretola), Cleaner
Peripheral Vascular Disease

Treatment - Pre & Post Thrombolysis
Chronic PVD / Critical Limb Ischemia

- Chronic symptoms – greater than two week duration
- Critical limb ischemia
  - Ischemic rest pain
  - Ischemic ulcer(s)
  - Gangrene
Minimally Invasive Intervention

- Recanalization
  - Luminal
  - Subintimal
  - Laser
- Atherectomy
  - Rotational
    - Rotoblator
    - Diamondback
  - Cutting
    - Simpson Atherocath
    - Silverhawk
  - Laser
Diamondback Asymmetric Atherectomy

Pre

Post
Diamonback- SFA
Subintimal Recanalization and Angioplasty

- Guidewire to enter subintimal plane
- Retry into true lumen
- PTA to create a new subintimal channel
- Useful in fem-pop segment, however....
RLE Claudication at 50 feet - MRA
Minimally Invasive Intervention

• Angioplasty
  – POBA (plain old balloon angioplasty)
  – Cutting balloons
  – Cryo angioplasty

• Stents
  – Bare metal
  – Drug eluting
  – Covered
Peripheral Vascular Disease

Treatment - Minimally Invasive Techniques

- Balloon dilatation
- Percutaneous Transluminal Angioplasty
Peripheral Vascular Disease

Treatment - Minimally Invasive Techniques

- Stent expansion by a balloon catheter over a guidewire
Peripheral Vascular Disease

*Treatment - Minimally Invasive Techniques*

- Post PTA/stent placement
Recanalization
Recanalization - Primary Stent Placement
Peripheral Vascular Disease

Aorto/Iliac Disease
Peripheral Vascular Disease

Aorto/Iliac Disease
Peripheral Vascular Disease

Aorto/Iliac Disease - Pre & Post

PTA/Stent
Covered Stent

Wallgraft™ Endoprosthesis
(Boston Scientific Vascular)

Outside:
Braided PET Graft

Inside:
Braided Elgiloy Stent with Pt-Ni Tracer Wires
Covered Stent

VIABAHN Endoprosthesis

(WL Gore Associates)

nitinol exoskeleton
MRA
Angio – Occluded Rt SFA
Wire Recanalization
Angioplasty 5mm X 100 mm
RLE - post stent
Distal Protection
ACC/AHA Guideline for the Management of PAD: Treatment of Claudication

Confirmed PAD Diagnosis

- No significant functional disability
  - No claudication treatment required.
  - Follow-up visits at least annually to monitor for development of leg, coronary, or cerebrovascular ischemic symptoms.

- Lifestyle-limiting symptoms
  - Supervised exercise program
    - Three-month trial
    - Preprogram and postprogram exercise testing for efficacy

- Pharmacological therapy: Cilostazol (Pentoxifylline)
  - Three-month trial

- Lifestyle-limiting symptoms with evidence of inflow disease
  - Further anatomic definition by more extensive noninvasive or angiographic diagnostic techniques
  - Endovascular therapy or surgical bypass per anatomy

- Significant disability despite medical therapy and/or inflow endovascular therapy, with documentation of outflow PAD, with favorable procedural anatomy and procedural risk-benefit ratio

- Clinical improvement:
  - Follow-up visits at least annually

- Evaluation for additional endovascular or surgical revascularization

Chronic CLI symptoms: Ischemic rest pain, gangrene, nonhealing wound
Ischemic etiology must be established promptly by examination and objective vascular studies.
Implication: Impending limb loss

History and physical examination:
Document lower extremity pulses;
Document presence of ulcers or infection

Assess factors that may contribute to limb risk:
diabetes, neuropathy, chronic renal failure, infection

ABI, TBI, or Duplex
US

Severe lower extremity PAD documented:
ABI less than 0.4; flat PVR waveform; absent pedal flow

Cont’d

No or minimal atherosclerotic arterial occlusive disease

Evaluation of source
(ECG or Holter monitor; TEE; and/or abdominal US, MRA, or CTA);
or venous Duplex

Consider atheroembolism, thromboembolism, or phlegmasia cerulea dolens

ABI=ankle-brachial index; CLI=critical limb ischemia; CTA=computed tomographic angiography;
ECG=electrocardiogram; MRA=magnetic resonance angiography; PVR=pulse volume recording;
TEE=transesophageal echocardiogram; TBI=toe-brachial index; US=ultrasound.

Obtain prompt vascular specialist consultation:
- Diagnostic testing strategy
- Creation of therapeutic intervention plan

Severe lower extremity PAD documented:
- ABI less than 0.4; flat PVR waveform; absent pedal flow

Systemic antibiotics if skin ulceration and limb infection are present

Obtain prompt vascular specialist consultation:
- Diagnostic testing strategy
- Creation of therapeutic intervention plan

Patient is not a candidate for revascularization

Medical therapy or amputation (when necessary)

Ongoing vascular surveillance

Written instructions for self-surveillance

Patient is a candidate for revascularization

Cont’d

ABI=ankle-brachial index; PVR=pulse volume recording.
• Define limb arterial anatomy
• Assess clinical and objective severity of ischemia

Revascularization possible
(see treatment text, with application of thrombolytic, endovascular, and surgical therapies)

Revascularization not possible:
medical therapy; amputation (when necessary)

Ongoing vascular surveillance

Written instructions for self-surveillance

## Two Major Goals in Treating Patients With PAD

<table>
<thead>
<tr>
<th>Limb outcomes</th>
<th>Cardiovascular morbidity and mortality outcomes</th>
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<tbody>
<tr>
<td>• Improved ability to walk</td>
<td>• Decrease in morbidity from non-fatal MI and stroke</td>
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<tr>
<td>– Increase in peak walking distance</td>
<td>• Decrease in cardiovascular mortality from fatal MI and stroke</td>
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### Limb outcomes
- Improved ability to walk
  - Increase in peak walking distance
  - Improvement in quality-of-life (QoL)
- Prevention of progression to CLI and amputation