Evaluation and Treatment of Diabetic Foot Ulcerations

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Disclosure Statement

I have no financial interests to disclose in regards to this lecture.

Causes of ulcerations

• Peripheral sensory neuropathy
• Ischemia
• Sensorimotor neuropathy
• Mixed neuroischemia
History is Made!

HISTORY

- Who?
  - Who has been treating?
- What?
  - What has been done?
  - What has not been done?
- When?
  - When did it develop?
- Where?
- How?
  - How did it start?

PHYSICAL EXAM

- Neurological
  - Sensory neuropathy
  - Motor neuropathy
  - Autonomic neuropathy
- Vascular
  - Pulses
- Dermatological
  - Texture, turgor & temperature
PHYSICAL EXAM

- Musculoskeletal
- Foot structure
- Deformities
- Mobility
- Ulceration
- Location
- Depth
- Appearance
Dermatological

- Skin condition
- Turgor, tone
- Edema
  - Pitting vs. non-pitting
- Erythema
- Cellulitis
- Temperature
- Ischemia
- Charcot
VASCULAR

- Pulses
  - Palpable vs. nonpalpable
- Noninvasive studies
  - PVR’s
  - ABI’s
  - TcPO2
- Arteriography
  - DSA
  - MRA
Neuroischemic

Neuroischemic
Neuropathic

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Musculoskeletal

- Deformities
  - Bunion, hammertoes
  - Plantarflexed metatarsals
  - Prior surgery/amputations
- Mobility
  - Limited joint mobility
  - Nerves, et.al.
  - Boulton, et.al.
- Charcot Foot
  - rockerbottom foot

Musculoskeletal

- Foot Structure
  - Pes cavovarus
    - Rigid vs. flexible
  - Pes planovalgus
    - Rigid vs. flexible

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Ulcer Evaluation

- Location
  - Forefoot, Midfoot, Rearfoot
  - Weightbearing vs. non-weightbearing
- Depth
  - Superficial vs. Deep
  - Structures involved
  - Classification
- Drainage
  - Serous
  - Serosanguinous
  - Purulent

Ulcer Evaluation

- Microbiology
  - Odor
  - Color
  - Drainage
  - Prior Antibiotic treatment
- Special Studies
  - X-rays
  - Bone scans
  - CT scans
  - MRI

UT Diabetic Wound Classification System

- A
  - Pre or postulcerative lesion (epithelialized)
  - Superficial, not involving tendon, capsule or bone
  - Penetrates to tendon or capsule
  - Penetrates to bone

- B
  - Infection

- C
  - Ischemia

- D
  - Infection and Ischemia

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Peak Pressures Under the Diabetic Foot

*: p < 0.05

Controls  Diabetes  Neuropathy

Yeves 1991
The Effect of Callus Removal on Dynamic Plantar Foot Pressures in Diabetic Patients

Clinical observation suggests that excessive foot elevation frequently occurs beneath callus. To determine the effect of callus elevation on areas of high pressure, peak and contact times underneath the foot during active and phasic loading of the foot and ankle were recorded. The peak pressure was recorded by a foot pressure system (1008S) and averaged from a 12.5-cm circular area with applied force of 20 to 200 kg/cm². Data were measured before and after callus elevation at various sites on the foot. These results suggest that callus removal is a feasible method of improving foot pressure in diabetic patients. A significant relationship was observed that indicates a lower peak pressure with callus elevation.

Figure 1: Peak pressures in each of the 43 treatment sites pre and post-callus debridement in 17 diabetic patients.
Probe vs. Scan vs. MRI

- Pham HT. Presentation at ACFAS Scientific Meeting, Orlando, Fla., February, 1998.
Methods
- 211 patients admitted with lower extremity infection
- All pedal ulcers probed with sterile blunt metal probe.
- All bone specimens sent for path & micro

Patient Data
- 177 insulin requiring diabetes
- 27 non-insulin requiring diabetes
- 7 non-diabetics
- All patients with peripheral sensory neuropathy

Results
- Soft tissue debridement & IV antibiotics: 56
- Bone resection & IV antibiotics: 155
Ulcer Location

Results

- Bone probed: 95
  - 88 Osteo
  - 7 No osteo
- Bone not probed: 60
  - 57 No osteo
  - 3 Osteo
### Results

<table>
<thead>
<tr>
<th>Ischemic: Nonpalpable pedal pulses</th>
<th>Rubor, pallor</th>
<th>Skin turgor &amp; temperature</th>
<th>Hair growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-situ saphenous vein</td>
<td></td>
<td></td>
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<tr>
<td>Pop-pedal bypass</td>
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</tbody>
</table>

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