LOWER EXTREMITY WOUND CARE IN THE PERSON WITH DIABETES.

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Objectives

◊ Discuss critical elements of the physical examination for an acute foot infection in the person with diabetes

◊ Describe the steps in treating acute foot wounds in the person with diabetes

◊ Describe oral antibiotic therapy in acute wounds

◊ Discuss five topical preparations/medications to assist for local wound healing

◊ Describe principles of offloading, optimal wound care and adjunct therapies in moving from acute care to chronic care management.
DIABETES FAST FACTS

- 30 million in the US or 9.3% of the population
- 8.1 million are undiagnosed
- 7th leading cause of death in the US
- Diabetes kills more people annually than breast cancer and AIDS combined.

American Diabetes Association
www.diabetes.org/diabetes-basics/statistics/#sthash.Zw0OwJc0.dpuf
DIABETES IN NEW MEXICO

• > 161,700 New Mexicans (9.2 percent) have diabetes
• Approximately 17% over age 40
• Hispanic (42%) and Native American (10%) populations are at much greater risk
• Deadly: 6th leading cause of death in New Mexico
  • 4th highest in the nation for diabetes-related deaths
• Financial Burden: $1.53 billion

http://hsc.unm.edu/about/features/archives/diabetes.shtml
PREVALENCE OF DIABETIC FOOT ULCERS

• Up to 25 percent will experience an ulcer or wound at some point.
  
  • Singh, Armstrong, Lipsky. J Amer Med Assoc 2005

• More than half of all foot ulcers will become infected, requiring hospitalization and 20% of infections result in amputation.
  
  • Lavery, Armstrong, et al. Diabetes Care 2006
IMPACT OF DIABETES ON THE LOWER EXTREMITY

- **Neuropathy** - causes numbness, burning or tingling and diminishes sensation in the feet

- **Peripheral Arterial Disease** - affects tibial and pedal arteries

- **Structural Deformities**
  - Hallux valgus/rigidus
  - Equinus
  - Digital Deformities
  - Charcot
Risk Factors For Foot Ulcers

- Previous amputation
- Past foot ulcer history
- Peripheral neuropathy
- Foot deformity
- Peripheral vascular disease
- Visual impairment
- Diabetic nephropathy (especially patients on dialysis)
- Poor glycemic control
- Cigarette smoking
EARLY DETECTION IS KEY

A simple foot exam can reveal the first signs and symptoms of diabetes, and identify more serious complications that could potentially lead to lower-limb amputations.
HOLISTIC APPROACH

- Optimal glucose control/nutrition
- Effective local wound care
- Infection control
- Pressure relieving strategies
- Restoring pulsatile blood flow
Dermatologic

Skin
Turgor-Texture-Temp-Atrophic
Erythema
Rash
Hyperkeratosis
Ulcer
Callus
Calluses/blistering: hemorrhage into callus

Nails
Thick               Fungal
Long                Ingrown

Neurological

Protective Sensation

Musculoskeletal

Deformity, e.g., claw toes, prominent metatarsal heads, Charcot joint

CHECK THEIR SHOES
10-g monofilaments
Monofilaments, sometimes known as Semmes-Weinstein monofilaments, were originally used to diagnose sensory loss in leprosy. Many prospective studies have confirmed that loss of pressure sensation using the 10-g monofilament is highly predictive of subsequent ulceration.

◊ It is recommended that four sites (1st, 3rd, and 5th metatarsal heads and plantar surface of distal hallux) be tested on each foot.

IPSWICH TOUCH TEST IpTT

◆ Ask the patient to close their eyes.
◆ Lightly touch the tips of the first, third and fifth toes of both feet with the examiner's index finger for 1-2 seconds.
◆ Ask the patient which toe is being touched
◆ Do not push harder if they do not feel it and only touch each toe once.
◆ Reduced foot sensation using this test is generally defined as there being ≥ 2 insensate areas.

Vascular examination

Pedal hair

Capillary refill

Pulses

Claudication

Rest Pain

Varicosities

Temperature

Due to the high estimated prevalence of PAD in patients with diabetes, a screening ABI should be performed in patients >50 years of age who have diabetes.

A screening ABI should be considered in people with diabetes <50 years of age who have other PAD risk factors (e.g., smoking, hypertension, hyperlipidemia, or duration of diabetes >10 years).
<table>
<thead>
<tr>
<th>Feature</th>
<th>Neuropathic</th>
<th>Ischemic</th>
<th>Neuroischemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensation</td>
<td>Sensory loss</td>
<td>Painful</td>
<td>Degree of sensory loss</td>
</tr>
<tr>
<td>Callus/necrosis</td>
<td>Callus present and often thick</td>
<td>Necrosis common</td>
<td>Minimal callus Prone to necrosis</td>
</tr>
<tr>
<td>Wound bed</td>
<td>Pink and granulating, surrounded by callus</td>
<td>Pale and sloughy with poor granulation</td>
<td>Poor granulation</td>
</tr>
<tr>
<td>Foot temperature and pulses</td>
<td>Warm with pulses (bounding)</td>
<td>Cool. Absent or weak pulses</td>
<td>Cool. Absent or weak pulses</td>
</tr>
<tr>
<td>Other</td>
<td>Dry skin and fissuring</td>
<td>Delayed healing</td>
<td>High risk infection</td>
</tr>
<tr>
<td>Typical Location</td>
<td>Weight-bearing areas of the foot, such as metatarsal heads, the heel and over the dorsum of</td>
<td>Tips of toes, nail edges and between the toes and lateral borders of the foot</td>
<td>Margins of the foot and toes</td>
</tr>
</tbody>
</table>
Is it infected?
Now what?
Choices
Superficial infections *cellulitis, cellulitis* involving blisters and shallow ulcers) are typically caused by *S. aureus* or beta-hemolytic streptococci.

Infections of ulcers that are chronic or previously treated with antibiotics may be caused by aerobic Gram-negative bacilli, *S. aureus* or Streptococci.

Deep soft tissue infections, *osteomyelitis*, and gangrene are more often polymicrobial, including aerobic gram-negative bacilli and anaerobes (anaerobic streptococci, *Bacteroides fragilis* group, *Clostridium species*), but *Staphylococcus aureus* is also common as single pathogen.

Infections And Antibiotics

Patients with mild infections can be treated in outpatient settings with oral antibiotics that cover skin flora including streptococci and *Staphylococcus aureus*.

Agents such as cephalexin, dicloxacillin, amoxicillin-clavulanate, or clindamycin are effective choices. If methicillin-resistant *S aureus* (MRSA) infection is suspected, then clindamycin, trimethoprim-sulfamethoxazole, minocycline, or linezolid may be used.

If gram-negative aerobes and/or anaerobes are suspected, dual drug treatment with trimethoprim-sulfamethoxazole plus amoxicillin-clavulanate or clindamycin plus a fluoroquinolone such as levofloxacin or moxifloxacin may be used.

SINGLE-drug regimens with activity against streptococci and staphylococci (MSSA)

Cephalexin or

Dicloxacillin or

Amoxicillin-clavulanate or clindamycin

TWO-drug regimens with activity against streptococci and MRSA

Clindamycin or
Linezolid or
Penicillin or cephalexin or dicloxacillin
PLUS
Trimethoprim-sulfamethoxazole or doxycycline

TWO-drug regimens with activity against streptococci, MRSA, aerobic gram-negative bacilli and anaerobes

Trimethoprim-sulfamethoxazole
PLUS
Amoxicillin-clavulanate
-OR-
Clindamycin
PLUS
Ciprofloxacin or levofloxacin or moxifloxacin

WOUND DRESSINGS
WHAT THEY ARE

- Films
- Hydrocolloids
- Foams
- Hydrogels
- Hydrofibers
- Alginates
- Collagens
- Pastes, Powders

- Contact Layers
- Debriding agents
- Gauzes/Impregnated gauzes
- Combinations
- Specialty products
  - NPWT
  - Medihoney
  - Iodosorb / Iodoflex
Common topical antimicrobial agents

Common topical antimicrobial agents that may be considered for use as an adjunctive therapy for foot infections in diabetes

**Silver** — dressings containing silver or silver sulphadiazine

**Iodine** Impregnated dressings

**Medical-grade honey** — gel, ointment or impregnated dressings
IODOFLEX AND IODOSORB

• Claims
  • Provides sustained antimicrobial activity
  • Effectively reduces the bacterial load, including MRSA
  • Helps to prevent new pathogen invasion
  • Removes loose slough and debris to clean the wound bed
  • Manages excess exudate in highly exuding wounds
  • Creates a moist wound environment
  • Accelerates healing in leg ulcers

Sibbald RG, Leaoer DJ, Queen D. Iodine Made Easy. Wounds International 2011; 2(2):
Negative Pressure Wound Therapy

Removes Fluid
Promotes a moist wound healing environment
Helps draw wound edges together
Helps promote perfusion
Helps protect the wound environment
Removes infectious material
MEDIHONEY® dressings, a unique line of dressings containing Active Leptospermum Honey from New Zealand, possess unique qualities that make them ideal for the management of chronic and acute wounds and burns. A strong and growing evidence base – including several large scale randomized controlled studies – have shown that

- MEDIHONEY® dressings are effective on hard-to-heal wounds and burns, in addition to helping to débride wounds and keeping wound beds clean of necrotic tissue.

Adapted from:
EpiFix® Amniotic Membrane Allograft is intended for homologous use in the treatment of acute and chronic partial- and full-thickness wounds for the reduction of scar tissue formation, modulation of inflammation, and enhancement of healing.

Common methods to offload pressure on the foot include:

- bed rest
- the use of a wheel chair
- crutches
- total contact casts
- felted foam
- half shoes
- therapeutic shoes
- custom splints
- and removable cast walkers
Off load

Contact Cast is Gold Standard
PREVENTION AND REMISSION STRATEGIES

• Patient education
• Diabetic Foot Exam
• Recognizing ischemia and PAD
• Palliative
• Shoes
• Inserts
• Bracing

Boulton, ADA, Comprehensive Risk Exam, 2008
Blood Glucose Levels

It all starts here. An elevated blood sugar level stiffens the arteries and causes narrowing of the blood vessels. The effects of this are far-reaching and include the origin of wounds as well as risk factors to proper wound healing.

Poor Circulation

Narrowed blood vessels lead to decreased blood flow and oxygen to a wound. An elevated blood sugar level decreases the function of red blood cells that carry nutrients to the tissue. This lowers the efficiency of the white blood cells that fight infection. Without sufficient nutrients and oxygen, a wound heals slowly.

Diabetic Neuropathy

When blood glucose levels are uncontrolled, nerves in the body are affected and there is a loss of sensation. When neuropathy occurs people cannot feel a developing blister or infected wound. LOPS is a huge risk factor. People with diabetes are frequently unaware that this loss has occurred.
Immune System Deficiency

Diabetes lowers the efficiency of the immune system. A high glucose level causes the immune cells to function ineffectively, which raises the risk of infection for the patient. Studies indicate that particular enzymes and hormones that the body produces in response to an elevated blood sugar are responsible for negatively impacting the immune system.

Infection

With a poorly functioning immune system, there is a higher risk for developing an infection. Infection raises many health concerns and also slows the overall healing process.

Left untreated, infection can heighten the risk of developing gangrene, sepsis or a bone infection like osteomyelitis.
Nutrition

Lower carbohydrate and higher protein

Need insulin to metabolize and utilize protein

1.25 to 1.5 g protein/kg body weight
to achieve a positive nitrogen balance

Renal function should be regularly assessed

Adapted from: Lynn Grieger, Nutrition and Wound Care *Today’s Dietitian* Vol. 11 No. 8 P. 12
Starting at the distal edge of the callus, progressively reduce the thickness of the callus.

Increased tissue viability
Reduced liability to fissuring and ulceration
Chemical or enzymatic debriding agents are pharmacological agents used to loosen and remove nonviable tissue from wounds.

Eschar or slough necrotic tissue debridement:
- Eschar needs to be scored so that the collagenase can penetrate.

Conservative debridement agents that are easy to understand and may be used in many settings.
<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Definition</th>
<th>Treatment recommendations</th>
<th>Suggested follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No LOPS, no PAD, no deformity</td>
<td>• Patient education including advise on appropriate footwear</td>
<td>Annually (by generalist and/or specialist)</td>
</tr>
<tr>
<td>1</td>
<td>LOPS ± deformity</td>
<td>• Consider prescriptive or accommodative footwear.</td>
<td>Every 3-6 months (by generalist and/or specialist)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consider prophylactic surgery if deformity is not able to be safely accommodated in shoes. Continue patient education.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PAD ± LOPS</td>
<td>• Consider prescriptive or accommodative footwear.</td>
<td>Every 2-3 months (by specialist)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consider vascular consultation for combined follow-up.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>History of ulcer or amputation</td>
<td>• Same as category 1</td>
<td>Every 1-2 months (by specialist)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consider vascular consultation for combined follow-up if PAD present.</td>
<td></td>
</tr>
</tbody>
</table>