

Evaluation and Management of Lower Extremity Ulcerations

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Wound Care Basics

- Principles of Wound Care

- ❖ If it's wet, dry it.

- ❖ If it's dry, wet it.

- ❖ If it's deep, fill it.

- ❖ If it's necrotic, debride it.

Wound Care Basics

- Healthy wound bed.
 - Beefy red granular tissue.
 - Superficial wounds may have flat non-granular appearance.
 - Moist wound bed
 - Intact wound edges
 - Serous or Serosanguinous drainage
 - Minimal to no erythema on the surrounding skin

Wound Care Basics

- Unhealthy wound bed
 - Loose yellow tissue- (slough)
 - Firm or leathery yellow tissue- (biofilm)
 - Dry or wet gangrene -(black eschar)
 - Green slough- (gram negative infection i.e. pseudomonas)
 - Hypergranulation- wound bed above skin level.
 - White/pale pink tissue- decreased arterial supply

WOUND CLASSIFICATIONS

Arterial Ulcers

Arterial Ulcer

- **Approximately 5% of all LE ulcerations in the U.S.**
- **Pathophysiology**
 - Caused by stenosis or occlusion of arterial supply
 - Ischemia causes tissue necrosis
 - Most common in diabetics and smokers

Arterial Ulcer

- **Clinical presentation**

- Intermittent claudication
- Pain at rest with feet at level of heart or above.
- Decreased/absent peripheral pulses
- Cool skin temperature
- Shiny, thin skin.
- Absent hair on the extremity
- Prolonged cap refill
- Dependent rubor

Arterial Ulcer

- Clinical presentation (cont.)
 - Wounds are distal to area of blockage.
 - Often between or on tips of toes, over phalangeal heads, or around areas subject to trauma (malleolus)
 - Edges are “punched out”
 - Pale and dry wound base with no granulation
 - Minimal drainage
 - Dry or wet gangrene often present

Arterial Ulcer



- By Jonathan Moore - Creating the Ideal Microcosm for Rapid Incorporation of Bioengineered Alternative Tissues Using An Advanced Hydrogel Impregnated Gauze Dressing: A Case Series. The Foot and Ankle Online Journal 1 (9): 2., CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=6886430>

Arterial Ulcer

- Work-up
 - Arterial Duplex Ultrasound with ABI
 - Wave forms show patency of arteries/arterioles
 - Ankle-Brachial Index
 - Normal is 0.9-1.3
 - 0.8-0.9 is mild arterial disease
 - 0.5-0.8 moderate arterial disease
 - 0.5 or less is severe ischemia *****avoid compression*****
 - **In office ABI can be done with US doppler/BP cuff**
 - Same side arm and leg using brachial and DP/PT pulse
 - Inflate cuff on arm and ankle until no sound is heard
 - Release pressure noting the first pulse sound
 - Systolic ankle/Systolic brachial

Arterial Ulcer

- Work-up cont.
 - CT Angiogram with run-off
 - Dye injected into vasculature.
 - CT images capture areas of blockage
 - Magnetic Resonance Angiography
 - Most accurate diagnostic
 - With run-off for legs
 - More expensive
 - A study by Yucel et al found that MRA was more accurate in evaluating lower extremity vessels when compared to conventional angiography.

Arterial Ulcer

- Treatment
 - Improve flow
 - Stenting/Angioplasty
 - Bypass surgery
 - Anti-platelets
 - Pentoxifylline
 - Amputation (auto vs surgical)
 - Lipid lowering agents
 - Smoking cessation
 - Improve A1C
 - Analgesics
 - Avoid pressure/injury!!!
 - Keep stable eschar dry and clean

Diabetic Foot Ulcers

Diabetic/Neuropathic

- **Pathophysiology**
 - Chronically elevated blood glucose levels cause damage to nerves and capillaries
 - This leads to a loss of sensation to the lower extremities.
 - No sensation = no pain.
 - Pressure and trauma cause wounds.
 - Shoes (callous)
 - Nails, rocks, heating pads
 - Charcot and other foot deformity (tendinopathy)

Diabetic/Neuropathic Ulcers



By Penn State- Penn State Researchers Develop Topical Treatment for Diabetic Wound Healing <https://invent.psu.edu/success-story/penn-state-researchers-develop-topical-treatment-for-diabetic-wound-healing>

Diabetic/Neuropathic

Classification Systems: Wagner Scale

- **Grade 0** = pre-ulcer lesion, healed ulcer, presence of bony deformity
- **Grade 1** = superficial ulcer without subcutaneous involvement
- **Grade 2** = penetration through the subcutaneous tissue
 - May have exposed bone, tendon, ligament, or joint capsule
- **Grade 3** = deep ulcer with abscess and/or osteomyelitis
- **Grade 4** = ulcer that led to gangrene of the toes and/or forefoot.
 - Amputation likely
- **Grade 5** = ulcer that has caused gangrene of the entire foot.
 - Requires amputation

Diabetic/Neuropathic

- **Work-up**
 - Hgb A1C, CBC, CMP
 - Arterial Duplex with ABI
 - ABI may be falsely elevated due to calcification
 - Monofilament test
 - Wound tissue cultures

Diabetic/Neuropathic

- **Treatment**
 - Improve glycemic control
 - A1C greater than 8% significantly impacts healing
 - Debridement
 - Moisture control (sweat, shoes, gravity)
 - Referral to podiatry
 - Referral to prosthetist for orthotics/diabetic shoes
 - Total Contact Casting
 - Hyperbaric Oxygen Therapy (Wagner 3)

Venous Stasis Ulcers

Venous Stasis Ulcers

- **Most common lower leg wound in the U.S. (70%)**
- **Pathophysiology**
 - Venous hypertension due to damage to veins and/or reduction in muscle pump
 - Incompetent valves cause backflow (reflux)
 - Often form a bulla before ulceration

Pooling of blood → increased pressure → capillary damage, altered lymphatics, inflammation → tissue hypoxia → ulceration

Venous Stasis Ulcers

Risk Factors

- Obesity
- DVT
- Pregnancy
- Incompetent valves
- CHF
- Age
- Sedentary
- Trauma to leg

Venous Stasis Ulcers

- **Presentation**
 - Edema (may be pitting)
 - Hemosiderin staining
 - Wound tends to appear above medial malleolus (Gaiter area)
 - Wound tends to be shallow with irregular borders
 - Wound often has slough
 - Wound edges are often either dry/crusted or macerated
 - Easily infected. Frequent cause of cellulitis.

Venous Stasis Ulcers



Venous Stasis Ulcers

- **Work-up**
 - Venous Insufficiency Doppler
 - Evaluates waveforms
 - Arterial Duplex
 - Ankle Brachial Index
 - Tissue cultures

Venous Stasis Ulcers

Treatment

- Compression (garments or wraps)
- Elevation of feet
- Absorptive dressings (Alginates, foam, etc.)
- Pneumatic pumps
- Diuretics
- Endo-vascular closure

Lymphedema

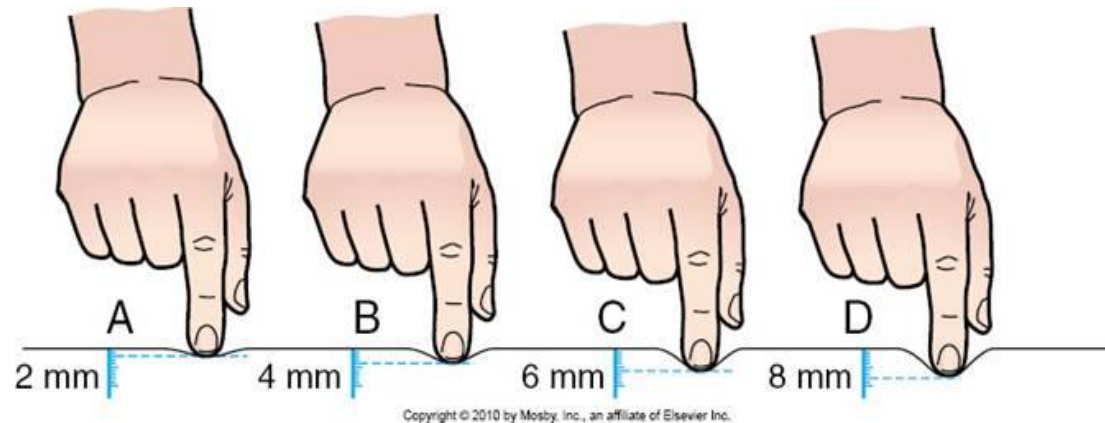
- ***Lymphedema***
 - localized edema due to lymph system failure
 - **Primary**- hereditary or malformation
 - **Secondary**- related to venous disease, trauma/infection, or surgery (cancer)
 - Can cause elephantitis of an extremity
 - Significant skin changes
 - May only affect one limb
 - Kaposi-Stemmer sign- inability to pinch a fold of skin at second toe
 - Treatments are similar to venous stasis disease with the addition of manual lymph drainage.

Lymphedema



Peripheral Edema

- 0) None
- 1+
 - 2mm pit
- 2+
 - 4 mm pit
- 3+
 - 6 mm pit
- 4+
 - 8 mm pit



Lymphedema/Venous Stasis Tx

Compression wrapping



Pneumatic Pumps



Skin changes with edema

Skin changes with edema

Hemosiderin Staining- iron deposition after RBC degradation



Skin changes with edema

Lipodermatosclerosis



Skin changes with edema

- Hyperkeratosis- abnormal thickening of the stratum corneum (scaly/dry)



Skin changes with edema

Papillomatosis- papillary surface elevation
(cobblestone)



Skin changes with edema

- Lymphedema Rubra
 - NOT cellulitis
 - Does not need antibiotics



Atypical Wounds

Pyoderma Gangrenosum

- Exact etiology is unknown. Dysregulation of immune system.
- Diagnosis of exclusion
- Internal organs may be involved, with lungs being the most prevalent.
- Affects 1:100,000 people each year
- Most frequent in 40s and 50s

Pyoderma Gangrenosum

- History
 - Patient may describe the initial lesion as
 - Insect/spider bite
 - A red “bump” (papule)
 - Pustule
 - The lesion progressively gets worse and more painful
 - The pain is often out of proportion to the wound
 - May occur around stoma sites and be mistaken for irritation

Pyoderma Gangrenosum

- History
 - Over 50% of patients with PG have an auto-immune disease.
 - Ulcerative colitis and Chron's Disease most common
 - Less common in RA, psoriatic arthritis, AS, and SLE
 - May also be associated with leukemia and hepatitis
- Pathergy
 - Minor trauma leads to development of ulceration
 - Trauma to ulceration can cause the wound to grow

Pyoderma Gangrenosum

- Presentation
 - Usually in the legs or around a stoma
 - Deep ulceration
 - Violaceous border around the wound
 - Purulent base is common
 - Wound edges are often undermining



Pyoderma Gangrenosum



Pyoderma Gangrenosum

Pyoderma Gangrenosum

- Work-up
 - Diagnosis of exclusion. No true diagnostic
 - Biopsy, wound culture, CBC, CMP, LFT, hepatitis panel
 - Evaluate for auto-immune disease if not previously diagnosed
 - Vascular studies

Pyoderma Gangrenosum

- Treatment
 - Prednisone is first line medication
 - Cyclosporine, TNF-alpha inhibitors (infliximab, adalimumab, etc) dapsons, tacrolimus, and other systemic therapies are second line.
 - Super-potent topical steroids (cromolyn 2%, 5-aminosalicylic acid)
 - Topical tacrolimus (less evidence)
 - IV methylprednisone and immunoglobulin
 - Hyperbaric Oxygen Therapy (limited evidence)
 - GENTLE WOUND CARE- pathergy
 - Methylene blue and crystalline violet dressings
 - Silver sulfadiazine
 - Avoid debridement or surgery unless on steroid therapy

Calciophylaxis

- Poorly understood pathophysiology
 - Most common in chronic renal failure(1-4% ESRD)
 - Obesity, DM, hypercalcemia/phosphatemia
 - Systemic inflammation is also believed to be a predisposing factor
 - Chronic use of corticosteroids
 - Vascular disease, with concurrent use of anticoagulation
- Lesions develop and progress rapidly
 - Usually in lower extremities
 - May develop on hands and torso
 - In men, may have lesion on penis
- Intense pain

Calciophylaxis

- Presentation
 - Early lesions appear with violaceous mottling
 - Become stellate purpuric lesions with central skin necrosis
 - May have internal involvement
 - GI bleeding
 - Infarction
 - Organ failure
- Work-up
 - CBC CMP
 - PTH
 - Coags
 - ANA ANCA to rule out vasculitis
 - X-ray can show vascular calcification
 - Incisional cutaneous biopsy

Treatment

- Poor prognosis
 - Ulceration is considered a late finding
 - 1 year survival rate is 25%
 - 5 year is 17%
- In acute disease, send to hospital
- Dialysis compliance
- Phosphate binders
- calcimimetics
- Parathyroidectomy
- Sodium thiosulfate (limited evidence/off-label)
- Amputation
- No consensus on debridement. Case by case

Calciophylaxis



Dressing Selection

Dressing Selection

■ Bioburden/infection

- Silver dressings
- Cadexomer iodine
- Topical abx (bacitracin, bactroban, gentamicin, etc)
- Betadine/Iodine/Dakin's...DILUTED WITH NS!!!
- Petrolatum impregnated gauze

■ Slough/Biofilm

- Debridement***
 - Santyl
 - Manuka Honey
 - Hydrocolloid (superficial wounds only)

Dressing Selection

- Heavily draining wounds
 - Calcium Alginates, Hydrofibers, and specialty products
- Moderately draining wounds
 - Same as above, foams
- Minimal to no drainage
 - Foam, hydrocolloid, hydrogel, etc.

**Any
Questions?**

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