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 Serosanguinuous 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

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)

Taken from Wound Series Part 4: Lymphedema and Chronic wounds https://ceufast.com/imgs/wd-4-pic-3.jpg
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) dapsone, 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
Calciphylaxis

- 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
Calciphylaxis

• 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
Calciphylaxis
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?
References


