So You’ve Got a Hole in Your Leg… What is it?
Differential Diagnosis of Lower Leg Ulcers

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Prevalence
- Approximately 3.2 million Americans (1/800) are affected by leg ulcers
  - 70-80% Venous Insufficiency
  - 5-10% Arterial Insufficiency
  - 5% Diabetes / Neuropathy
  - 5% Other

The Obesity Epidemic

Pathophysiology of PAD
- A progressive systemic disease associated with changes in the arterial vessels:
  - Arteriosclerosis - ↑ thickening and ↓ elasticity
  - Atherosclerosis - ↑ plaque formation

Conditions Associated with PAD
- Coronary disease
- Carotid artery occlusion
- Abdominal aortic aneurysm
- Congestive heart failure
- COPD
- Hypertension
- Diabetes mellitus
- End-stage renal disease
- Hyperparathyroidism
- Hypercholesterolemia & hypertriglyceridemia
- Coagulopathies
- Homocysteinemia

Arterial Ulcer Characteristics
- Location - Between toes, tips of toes over phalangeal heads, malleolous
- Size - Small “punched out” partial to full thickness
- Wound Bed - Dry, pale pink to gray-yellow may be necrotic
- Drainage - Usually minimal unless infected
- Surrounding skin - Assess for integrity, infection, no staining
- Pain - Painful
Claudication & PAD
- Pain is associated with exercise-induced muscular ischemia
- "Angina" of the leg.
- Only associated with the calf, thigh or buttock
- Relieved within several minutes of rest, not with positional changes
- Reproducible by further exercise
- Pain typically one level below occlusion

Rest Pain
- Classically at night
- Mainly located in the forefoot
- Associated with elevation of foot in the bed
- Remove the assistance of gravity for forward blood flow
- "Hanging foot" sign

Diagnostic Testing
- Non-invasive
  - ABI's and TBI's
  - Waveforms (PVR's)
  - Segmental pressures
  - Transcutaneous Oxymetry (TcPO2)
  - Skin Perfusion Pressure
  - Laser Doppler
- Invasive
  - CTA
  - MRA
  - Angiography

Comprehensive Management
- Reduce or eliminate cause
  - Improve perfusion
  - Manage comorbidities
  - Pharmacotherapy
  - Smoking cessation
  - Optimize wound environment
    - Wound bed prep
    - Moist wound environment
    - Protection

Chronic Venous Insufficiency and Ulceration

*I'm wrapping it tightly to keep the ankle from swelling.*
Prevalence and Demographics

- 1 to 1.5% of US population
- >500,000 VLU in any given year
- 40% of pts have first ulcer before age 50 and 13% before age 30
- Of those ulcers that heal, 1 year recurrence as high as 70%
- Loss of 2 million workdays annually
- Direct treatment costs $2,500 per month in US
- $2.5 Billion in annual healthcare costs

Venous Anatomy

Calf Muscle Pump

- Incompetence of valves in superficial, perforator and/or deep veins all result in retrograde flow, resulting in varicosities.
- Above leads to venous hypertension
- Persistently high hydrostatic pressures in superficial venous system distend thin walled veins and capillaries.
- Pressure eventually overcomes osmotic gradient leading to leakage of fluid and plasma into surrounding tissues. ie, EDEMA!

Clinical Features of CVI

- Edematous legs are the hallmark...
- Worse after prolonged standing or activity
- Improved after rest and elevation
- Begins with feet and ankles and progresses up the leg as venous hypertension (and time) progress.
- Varicosities frequently develop
- Heavy aching discomfort, improves with bed rest

Pathophysiology of CVI

- Hyperpigmentation due to hemosiderin deposition from extravasated blood
- Chronic inflammation and fibrosis of skin
- Lipodermatosclerosis: Inverted champagne bottle appearance due to fibrosis/lipodermatosclerosis of distal calf and ankle
- Dermatitis of anterior shin and ankle with warmth and inflammation. Frequently mistaken for cellulitis.
Typical Presentations

- Major complication of unrecognized, untreated or poorly treated chronic venous insufficiency
- Accounts for largest group of lower extremity ulcers in developed countries; as high as 76%
- 61% report first ulcer before age 65
- 40% report first ulcer before age 50
- 54% report ulcer duration >1 year
- 72% report recurrent ulceration

Pathogenesis of Venous Ulcers

- Valvular incompetence within the perforating veins connecting superficial and deep veins
- Ambulatory Venous Hypertension: Failure of the venous pressure to decrease during ambulation
- Capillary distention and increased permeability of large molecules into the skin
- Fibrin Cuff Theory
- WBC Trapping Theory

Clinical Features

- Almost always below the knee
- Majority above medial malleolus
- Lateral, tibial and calf also common locations
- True venous foot ulcers are RARE
- Irregular but well defined borders
- Usually no undermining
- Wound bed usually displays friable, congested, purple granulation tissue with epithelial islands
- Yellow drainage dries to form fibrinous slough

Clinical Features

- Surrounding skin usually indurated, eczematous, inflamed and hyperpigmented
- Black eschar, necrosis, tendon, or bone exposure rarely seen with pure venous ulcers
- Pain is usually relieved with elevation
- If ulcer is exquisitely painful, must search for underlying vasculitic or arterial component or for involvement of underlying periosteum (osteo).
- Frequently traumatic in origin, then fail to heal due to CVI

Top 3
Atrophie Blanche
- Blanchable purple nets of livido reticularis on lower leg from knee down
- Tiny purpuric papules
- Exquisitely painful ulcerations
- Slow healing leaves small depressed white scars with a stellate pattern studded with “nubbins” of red capillaries
- Tissue may become fibrotic and inflexible

Lyde, C. Dermatologic Therapy, 2001

Post-Phlebitic Syndrome
- Common cause of venous insufficiency and ulceration post DVT.
- Occlusion in deep system forces fluid to superficial veins.
- Prominent varicosities
- Compression, not closure

Venous Potpourri
Treatment

- VASCULAR WORKUP!
- COMPRESSION-GOLD STANDARD
- ELEVATION!
Vascular Workup

- Venous dopplers to assess for venous reflux and DVT. Do not compress if acute DVT. Need to ask for reflux study or you will only get "no DVT."

- Arterial dopplers with PVR’s, ABI’s and TBI’s. ABI’s >.8 for 4 layer and >.6 for 3 layer wraps. Interpret ABI’s in diabetics with caution!

- TCOM’s: Assesses oxygenation of skin but will not give adequacy of flow for compression

Compression Therapy

- Clear evidence that compression is superior to no compression for healing of venous ulcers.

- Cochrane Review: 7 RCT’s in support!
  - Multi-component systems are more effective than single-component systems.
  - Multi-component systems containing an elastic bandage appear more effective than those composed mainly of inelastic components.

Compression Therapy

- Short Stretch: Lower resting pressures and higher working pressures. Patient must be ambulatory.

- Unna’s Boot: Medicated bandage which stiffens as it dries. Wrapped with Coban or Ace.

- Long Stretch: Higher resting pressures and lower working pressures (multilayer)

- Adjustable leggings and Velcro closure garments

Compression Stockings

- After edema is well controlled and ulcers healed

- Prescription gradient stockings

- Off the shelf or custom fit – pull-up or zippered

- Coordinate removal of final compression wrap with placement of appropriate gradient stocking

- Uncontrolled venous edema will return in less than 48 hrs if compression wrap not immediately followed by stockings.

Adequate compression documented in 17.1% of cases in database of major US wound care registry!!!
Conclusion

- As population ages, CVI will continue to account for > 70% of LE wounds.
- Challenge is to treat in a cost-effective manner.
- Compression therapy must be viewed as mainstay of treatment.
- Compression will effectively heal 86% of wounds.
- Unfortunately MANY practitioners continue to treat with topical therapy alone.

Lymphedema

As described by Dr. Hettrick

- Chronic condition characterized by abnormal accumulation of fluid (lymph) leading to swelling (edema) as a result of an anatomical alteration in the lymphatic system

Diabetic Foot Ulcer

Clinical Characteristics

- Most commonly on plantar surface of feet
- Typically over met-heads and bony prominences
- Thick surrounding and overlying callous
- Plantar surface frequently insensate
- Ulcers often develop without patient awareness
WAGNER CLASSIFICATION

- **Grade 0**: Skin intact
- **Grade 1**: Superficial ulceration without penetration to deeper tissues
- **Grade 2**: Full thickness penetration
- **Grade 3**: Deep tissue involvement with Osteomyelitis and/or abscess
- **Grade 4**: Localized periwound gangrene
- **Grade 5**: Generalized gangrene of foot

Motor Neuropathy

- Leg muscle weakness
- Foot muscle atrophy
- Fat pad atrophy
- Digital weakness and instability
- Increased peak pressures due to deformities
- Ulceration

Sensory Neuropathy

- Diabetic sensory polyneuropathy
- Nerve edema
- Increased risk of wounding due to L.O.P.S.
- Unable to feel pressure or pain over prominences or with trauma

Autonomic Neuropathy

- Faulty sweat gland activity
- Dry, fissured skin leads to ulceration and infection
- Uncontrolled dilation of blood vessels due to decreased nerve tone affecting small arteries

Treatment Priorities

- Vascular evaluation
- Radiographic evaluation
- Assessment of infection
- Wound bed preparation (D.I.M.E.S)
- Strict and proper offloading
- Moist wound care
- Advanced Products
- HBOT
Atypical and Less Common Wound Etiologies

- All told these make up a very small portion of what we see
- Important to recognize as they may be manifestation of more serious pathology
- If a wound looks ‘funny’, it probably is
- If no progress in 8 – 12 weeks – biopsy is appropriate
- If your treatment plan is dependent on biopsy, do it right away

Marjolin’s Ulcer

- Ulcerating Squamous Cell Carcinoma arising in previously traumatized area
- First described in 1828 by French surgeon Jean-Nicolas Marjolin
- This case is 62 year old female with longstanding chronic venous ulceration

Rheumatoid Ulcer

- Systemic autoimmune disorder of unknown etiology
- Leg ulcers in 8-10% of patients
- Control of underlying disease process of paramount importance

Scleroderma (C.R.E.S.T.)

- Autoimmune disorder of unknown etiology
- Ulcers usually over digits, pre-tibial area and bony prominences
- Subcutaneous calcification makes epithelialization difficult
- Occlusive dressings and moist wound care

Vasculitis

- Inflammation of blood vessels of unknown etiology
- Thrombosis of capillaries leading to local tissue hypoxia
- Biopsy proves the diagnosis
- In this case; Leukocytoclastic vasculitis

Basal Cell Carcinoma

- Most benign of all cutaneous malignancies
- Fair skinned individuals with prior sun exposure
- Biopsy and refer for Mohs or Plastic Surgery
**Pyoderma Gangrenosum**

- Painful ulcers of varying depth and size
- Purulent wound bed and black-blue edge
- Most commonly associated with underlying autoimmune disease or malignancy
- Pathergy

**Acne Conglobata**

- Uncommon and severe form of acne characterized by borrowing, tunneling and interconnecting lesions.
- Scars may be keloidal or atrophic

**THANK YOU!**