EDEMA: A WOUND ODYSSEY EXPLORING BEYOND VENOUS

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Objectives

- Review general principles of assessing edema
- Consider differential diagnosis of edema
- Discuss treatment options for edema
Odyssey

- a long journey full of adventures
- a series of experiences that give knowledge or understanding to someone

Wound Odyssey

= life as a wound specialist
Edema Exploration

- Definition: a localized or generalized *abnormal* accumulation of fluid in the tissues (WOCN Society, 2005)
- Accumulation of fluid occurs when local or systemic conditions disrupt the equilibrium
Edema occurs when local or systemic conditions disrupt equilibrium.
Edema types

- **Venous edema**
  - Excess *protein poor* interstitial fluid
  - Low viscosity

- **Lymphedema**
  - Excess *protein rich* interstitial fluid
  - Protein denature → chronic inflammation → attracts macrophages → stimulates fibroblasts → excess collagen production → connective tissue proliferation and fibrosis

- **Lipedema**
  - Accumulation of fatty tissue
  - Not true edema, fluid trapped in fat cells
  - Can progress to CVI and lymphedema
Edema impairs wound healing

- +++ extracellular water \(\uparrow\) diffusion distances \(\rightarrow\) \(\downarrow\) tissue pO\(_2\)
- chronic edema \(\rightarrow\) protein deposition in the ECM \(\rightarrow\) diffusion barrier for growth factors and nutrients
- Growth factors and nutrients diluted in edematous fluid

Edema Exploration

- Most common cause of leg edema is venous insufficiency
- 7 million worldwide with LEVD
- 80-90% of leg ulcers are venous

Is it always and only LEVD…

….let’s journey beyond venous

WOCN(2011) Guidelines for Management of LEVD
Edema Exploration

- A patient presents with lower extremity edema...
- Where do you start?
- What are the possible differential diagnoses?
History, history, history

- most important skill in assessing and treating patients
- foundation for the caregiver–patient relationship
- helps you to formulate a differential diagnosis to lead to accurate diagnosis
- focuses your physical examination
- meeting of two experts - the patient & you

History

- History of edema
  - Acute or chronic
  - Unilateral or bilateral
  - Improve with elevation
- History of systemic diseases
- History of sleep apnea
- History of pelvic/abd neoplasm or radiation
- Surgical history
- Pain associated with edema
- Review medications
Edema: acute <72 hours

- **Unilateral**
  - DVT
  - Ruptured Baker’s cyst
  - Ruptured gastrocnemius
  - Compartment syndrome

- **Bilateral**
  - DVT
  - Exacerbation of HF
  - Acute worsening of renal disease
Edema: chronic

- **Unilateral**
  - Venous insufficiency

- **Bilateral**
  - Venous insufficiency
  - Pulmonary hypertension
  - Heart failure
  - Idiopathic edema
  - Lymphedema
  - Drugs
  - Pregnancy
  - Obesity

Common causes
Edema: chronic

- **Unilateral**
  - Secondary lymphedema
  - Tumor, radiation, surgery
  - Pelvic tumor or lymphoma
  - Reflex sympathetic dystrophy

- **Bilateral**
  - Secondary lymphedema
  - Tumor, radiation, surgery
  - Pelvic tumor or lymphoma
  - Renal disease
  - Liver disease
  - Preeclampsia
  - Lipedema
  - Anemia

**Less common causes**
## Edema: chronic

### Unilateral
- Primary lymphedema
  - Congenital, praecox, tarda
- Congenital venous malformations
- May-Thurner syndrome
  - Iliac vein compression syndrome

### Bilateral
- Primary lymphedema
- Protein losing enteropathy, malnutrition, malabsorption
- Restrictive cardiomyopathy
- Beri Beri
- Myxedema

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![Image of iliac artery and vein](image.png)

**Rare causes**
History of systemic diseases

- Heart failure
  - ↑ capillary permeability from venous hypertension
  - ↑ plasma volume

- Renal
  - ↑ increased plasma volume
  - ↓ plasma oncotic pressure from protein loss

- Hepatic
  - ↑ capillary permeability from venous hypertension
  - ↓ plasma oncotic pressure from reduced protein synthesis

- Thyroid
  - Graves disease → pretibial myxedema
  - Hypothyroid → generalized myxedema
History of sleep apnea

- Leads to pulmonary hypertension*
  - Common cause of edema
  - Results in ↑ capillary hydrostatic pressure
- Assess for
  - History of snoring or apnea
  - Daytime somnolence
  - Neck circumference > 17”

* other causes include left heart failure and chronic lung disease
Pulmonary hypertension

- Study of 45 primary care patients with leg edema
  - Clinical impression – 71% with VI
  - Echocardiograms
    - 20% with pulmonary hypertension (>40 mmHg)
    - 22% with borderline (31-40 mmHg)
    - Only 22% with venous insufficiency
- Patients with sleep apnea
  - 93% with edema had ↑ right arterial pressures

Pain with edema

- CVI → aching or heaviness
- DVT → usually painful
- Reflex sympathetic dystrophy → usually painful
- Lymphedema → usually painless
Drugs Related to Leg Edema

- **Antihypertensive drugs**
  - Calcium channel blockers**
  - Beta blockers
  - Clonidine
  - Hydralazine
  - Minoxidil
  - Methyldopa

- **Hormones**
  - Corticosteroids
  - Estrogen, Progesterone, Testosterone

- **Other**
  - Nonsteroidal anti-inflammatory drugs** - ibuprofen, Celebrex
  - Pioglitazone (Actos), Rosiglitazone (Avandia)
  - Antidepressants - Monoamine oxidase inhibitors, trazodone
  - Antivirals – acyclovir
  - Chemotherapeutics - cyclosporine, cyclophosphamide, mithramycin

**Most common**
- **CCB – up to 50%**
  - amlodipine
  - nifedipine
- NSAIDS - ~5%

Ely et al. JABFM (2006) 19(2) 148-160
Primary Lymphedema

- Rare, 3 types based on age
  - Congenital
    - Present birth to 2 years
  - Lymphedema praecox
    - Present 2 to 35 years
  - Lymphedema tarda
    - Present after age 35
Secondary lymphedema

- More common
- Lymphatic obstruction

Causes
- Tumor – lymphoma, prostate, ovarian
- Surgery – CABG, lymphadenectomy
- Radiation therapy
- Infection
  - Bacterial
  - Filariasis
Phlebolymphedema

- A mixed etiology
  - Chronic venous insufficiency
    + Lymphedema

- Venous edema stretches the filaments causing the mini flaps to rupture causing secondary lymphedema
Venous hypertension
Demands Lymphatic system
Interstitial fluid
Proinflammatory state
Tissue fibrosis
Damages valves
Phlebolymphedema
Physical Exam

- Weight, BMI
  - Obesity → CVI, lymphedema, sleep apnea
- Edema distribution
  - Unilateral
  - Bilateral
  - Generalized – systemic
  - Foot – buffalo hump due to lymphedema
Edema types

- **Pitting**
  - Venous insufficiency
  - DVT
  - Heart failure
  - Early lymphedema
  - Low protein fluid
  - Associated with decreased oncotic pressure

- **Non-pitting**
  - Advanced lymphedema
    - High protein fluid
  - Lipedema
    - Increased distribution of adipose tissue
  - Myxedema

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Grading edema

0+ No pitting edema
1+ Mild pitting edema. 2-mm depression that disappears rapidly.
2+ Moderate pitting edema. 4-mm depression that disappears in 10–15 seconds.
3+ Moderately severe pitting edema. 5-mm depression that may last more than 1 minute.
4+ Severe pitting edema. 8-mm depression that can last more than 2 minutes.
Stemmer’s sign

- Diagnostic for lymphedema
- Pinch & lift skin fold @ base of 2\textsuperscript{nd} toe
- Positive stemmer’s sign $\rightarrow$ referral to lymphedema specialist
Positive Stemmer’s sign
- false positives

Negative Stemmer’s sign
- May be false negatives
- Does not exclude lymphedema
Physical Exam

- Skin changes can provide clues
- DVT or cellulitis
  - Increased warmth
- CVI
  - Hemosiderin staining
  - Varicosities
  - Lipodermatosclerosis
- Lymphedema
  - Early stages → doughy
  - Later stages → fibrotic, thickened
  - Papillomatosis, Hyperkeratosis
  - Square shaped toes, deep creases & folds
- Myxedema
  - Dry, thick skin
  - Non-pitting periorbital edema
  - Pre-tibial edema
  - Yellow to orange discoloration over knees, elbows, palms, soles
Physical Exam

- **Systemic disease**
  - Heart failure
    - Jugular venous distention
    - Dyspnea, lung crackles
  - Liver disease
    - Ascites
    - Spider hemangiomas
    - Jaundice
  - Renal disease
    - Proteinuria, oliguria
  - Thyroid
    - Exothalmos, tremor, weight loss

*Pulmonary hypertension and early heart failure → leg edema before clinically obvious*
Diagnostics

- Venous duplex ultrasound to rule out DVT
- ABI to rule out PAD

- Labs to help identify systemic diseases
  - CBC, 'lytes, Cr, glucose, TSH, albumin
  - Serum albumin < 2g/dL → edema
    - liver disease
    - nephrotic syndrome
    - Protein-losing enteropathy
Diagnostics

- CVI – venous duplex
- Acute edema – D-dimer, venous duplex
- Heart failure - BNP, ECG, Echo, CXR
- Liver disease – ALT, AST, bilirubin, PT, alk phos, albumin
- Renal – U/A, creatinine
- Nephrotic syndrome – serum lipids
- Malignancy – abd/pelvic CT scan
- Sleep apnea – sleep study, Echo
Diagnostics

- **Lymphedema**
  - Lymph flow undetectable by ultrasound
  - Lymphoscintigraphy
    - Special type of nuclear medicine imaging
    - Shows absence or delayed filling
    - Provides pictures called scintigrams
  - MR lymphangiography
    - Directly visualizes lymphatic channels
Diagnostics

- Musculoskeletal etiologies
  - Gastrocnemius tear
  - Baker’s cyst
    - MRI
- High clinical suspicion DVT
  - U/S negative
  - MR angiography with venography
- May-Thurner syndrome
  - MR angiography
Treatment

- Guided by underlying etiology
Compression Warning

- Peripheral arterial disease
  - ~ 10% patient with LEVD also have arterial insufficiency
- Peripheral neuropathy
  - Diabetic, idiopathic
- Assess and document
  - ABI's
  - Foot sensation - monofilament

1. WOCN Clinical Practice Guidelines (2001)
Treatments

- **Chronic venous insufficiency**
  - Compression standard of care
  - Elevation
  - Diuretics
    - Limited short term use may be helpful
      - CVI is not a fluid overload state

- **Idiopathic edema**
  - Spironolactone drug of choice
  - Low dose thiazide (Hctz)
  - Avoid loop diuretics
  - Compression not usually helpful
Treatments

- Lymphedema
  - Complex decongestive therapy is the gold standard
    - Manual lymphatic drainage (MLD)
    - Multilayer compression, short stretch, & customized foam inserts
    - Skin and nail care
  - Elevation reduces in very early stages; with progression, no response
    - Compression garments/devices for day and night
  - Pneumatic compression therapy
  - Surgery
    - Severe refractory cases
- Diuretics – no role in treating lymphedema

- Phlebolympghedema
  - Treat both venous and lymphedema
  - If venous managed, ↓ damage to lymph system → lymph capillaries regenerate
Manual Lymphatic Drainage

- High protein edema
  - Compression alone is not effective

- MLD
  - Opens lymphatic capillaries to aid in draining proteins and edema
  - Redirect lymphatic flow to unaffected lymphatics
  - Helps propel lymph by stimulating contraction of lymphangion
It’s about the layers
Treatment

- **DVT**
  - anticoagulation therapy → collaborate with PCP
  - Acute
    - rest & elevation
  - Subacute or chronic
    - Exercise & elevation
    - Short stretch multiplayer compression
    - Long term use of compression socks to ↓ risk of post thrombotic syndrome
      - up to 2 years

- **Medication**
  - Collaborate with provider
  - Discontinue offending medication as able
Treatment

- **Systemic diseases**
  - Collaboration with the specialists
  - Heart failure
    - acute HF treated and stabilized
    - compression
    - Diuretics
  - Renal disease
    - Medical management/dialysis
    - Compression
      - device that allows for variable edema
      - best applied after dialysis
Summary

- Venous insufficiency is the most common cause.
- Women < 50 years idiopathic edema common.
- Under-recognized cause is pulmonary hypertension associated with sleep apnea.
Summary

- Quick and accurate diagnosis is essential to treatment
- Effective treatment improves:
  - Wound healing potential
  - Functional mobility
  - Quality of life*
- Effective treatment decreases complications
  - Cellulitis, pain, recurrent wounds/ulcers
Treating edema is like treating wounds

- Edema may be multifactorial
- Best treated from a multidisciplinary - multispecialty approach
- Optimal results when underlying etiology is identified and treated appropriately
Questions
Thank you
References