Why Is This Leg So Swollen?
“Determining the Proper Diagnosis”

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Disclosure Slide

None related to this Presentation
The Swollen Limb

- A common problem for physicians
- There are a number of different causes
- Not a disease - a sign of an underlying disorder
- It may be a minor disorder or a serious problem
Mechanisms for the Swollen Limb

- Venous and lymphatic pathology
- Volume overload
- Increased capillary permeability
- Lowered oncotic pressure
- Obstruction
Symptoms of Patient with Swollen Legs

- May be vague/subtle in addition to swelling:
  - stiffness
  - achiness
  - heaviness
  - soreness or pain
  - tightness of their shoes
# The Swollen Limb

## History - Acuity of Onset

<table>
<thead>
<tr>
<th>Acute onset</th>
<th>Gradual onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DVT</td>
<td>• Lymphedema</td>
</tr>
<tr>
<td>• Cellulitis</td>
<td>• Lipedema</td>
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<tr>
<td>• Compartment syndrome</td>
<td>• Chronic venous insufficiency</td>
</tr>
<tr>
<td>• Gastrocnemius muscle rupture tear</td>
<td>• Systemic process</td>
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<td></td>
<td>• Medication(s)</td>
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</table>
The Swollen Limb

History

• When did it begin? Was it acute or gradual? Does it improve over night?
• Is it painful? (DVT, SVT, gastrocnemius tear, cellulitis, compartment syndrome)
• Is there evidence of cardiac, renal or liver disease or does the patient have fever or chills (cellulitis) or weight loss?
• Are there predisposing conditions? (prolonged car or plane trip, recent immobility, surgery, pregnancy, hormone therapy, trauma)
• What medication(s) is the patient taking?
Swollen Legs

Physical Exam

- Appearance of the skin (reddened, brownish, bruised, purple-blue)
- Inspect groins for enlarged lymph nodes
- Inspect feet - looking for tinea pedis
- Absence/presence of Stemmer’s sign
- Examine pulses
Swollen Legs

Physical Exam

• Unilateral or Bilateral
• Location of the swelling
  - pitting or non pitting
  - involvement of the foot
  - involvement of calf/thigh in absence of foot /ankle swelling
Diagnosis of Swollen Legs

- Blood tests (CBC, chemistry profile, thyroid, ANA, serum albumin, BNP, D-dimer)
- Urinalysis - for proteinuria
- Chest x-ray
- Duplex ultrasound, venography
- CT and MR imaging
- Echocardiogram and ECG
- Lymphoscintigram
Causes of a Unilateral Swollen Limb

- Acute DVT
- CVI
- Cellulitis
- Abscess
- Osteomyelitis
- Charcot’s joint
- Popliteal cyst
- Popliteal artery entrapment
- Trauma
- Compartment syndrome

- Vascular anomalies
- Thermal injury
- Tumors
- Dependency
- Disuse
- Gastrocnemius rupture
- Revascularization
- Retroperitoneal fibrosis
- Hemihypertrophy
- Factitial
Iliofemoral DVT
Phlegmasia Cerulea Dolens

Phlegmasia cerulea dolens - Triad of edema, cyanosis and pain
Generally due to an underlying cancer or other hypercoagulable states

May-Thurner Syndrome - compression of left common iliac vein by right common iliac artery
More common in women 2nd 4th decade
Superficial Venous Thrombosis

Increased warmth, erythema, induration and tenderness along the GSV, SSV, or varicosities. May have a palpable cord.
Strep and staph most common agents. Patients have “skipped” lesions. Search for a portal of entry (tinea pedis) - treat with antibiotics and aggressive risk factor modification (meticulous skin care, control edema).
Charcot Deformity

Chronic Charcot mid-foot deformity

Develops in up to 7.5% of patients with diabetic peripheral neuropathy
May lead to mid foot collapse with plantar deformity, ulceration and if not treated - infection and amputation
Popliteal Artery Entrapment Syndrome

Unilateral or Bilateral

Abrupt occlusion of left popliteal artery and a saccular patent right popliteal artery aneurysm

Right popliteal aneurysm

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Popliteal (Baker’s) Cyst

Seen with knee inflammation (arthritis or cartilaginous tear)
U/S: Anechoic, crescent shaped
If ruptures – acute limb swelling and pain
Cystic Adventitial Disease

Usually Unilateral

MRI image shows fusiform mass of high signal intensity at the posterior aspect of the popliteal artery.

MRI image shows intramural crescentic mass of low signal intensity compressing the arterial lumen.
Trauma or Injury

Brown Recluse Spider Bite
Klippel Trenaunay Syndrome

Hemi-hypertrophy

Clinical triad of capillary malformations, varicose veins or venous malformations and muscular limb hypertrophy
Gastrocnemius Muscle Tear

Rupture medial head of gastrocnemius muscle sometimes referred to as or “Tennis Leg.” Men > females, Age – 4th to 6th decade “Scimitar Sign”
Revascularization

Can occur following surgery for critical limb ischemia. Due to increased intravascular pressure affecting the damaged capillary membrane from severe ischemia. Also increased permeability allowing egress of the plasma proteins from the intravascular space leading to leg swelling and at bullae formation.
Factitial

May be due to repetitive application of a constrictive band or tourniquet. “Intentional” Underlying psychological symptoms
Unusual Causes

- Neurofibromatosis - tumor
- Iatrogenic – Nursing home patient wrapped incorrectly
## Causes of Bilateral Swollen Limbs

<table>
<thead>
<tr>
<th>Causes</th>
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<tbody>
<tr>
<td>Congestive heart failure</td>
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<tr>
<td>Cirrhosis</td>
</tr>
<tr>
<td>Protein deficient states</td>
</tr>
<tr>
<td>Acute glomerulonephritis</td>
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<tr>
<td>Cushing’s syndrome</td>
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<tr>
<td>Vena caval obstruction</td>
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<tr>
<td>Pregnancy</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Lipedema</td>
</tr>
<tr>
<td>Dependency</td>
</tr>
<tr>
<td>Pretibial myxedema</td>
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<tr>
<td>Drug-induced</td>
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<tr>
<td>Idiopathic cyclic edema</td>
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</table>
Swollen Legs - Bilateral

History
Vena Caval Obstruction
Pregnancy and Obesity
Chronic Venous Insufficiency (CVI)

- Often overlooked, underappreciated
- More than 6 million US adults have venous skin changes
- 1% of US adults have venous ulcer
- 25 million have varicose veins

Ulcers are shallow, irregularly shaped, with rounded edges and usually have a good granulating base

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Chronic Venous Insufficiency

- Persistent ambulatory venous hypertension
- Symptoms range from asymptomatic to severe pain or discomfort to leg or venous stasis ulcers
  - cramping, fatigue, heaviness, itching or throbbing
- Diagnosis - noninvasive testing
• Pitting edema
• Ulceration
• Lipodermatosclerosis
• Corona phlebectatica (Ankle flare)
• Atrophie blanche
Treatment – CVI
Reduce Symptoms and Prevent Progression

- Healthy lifestyle (ideal body weight, bariatric surgery)
- Compression leg garments
  - 20-30 mmHg for CEAP class C_2-C_3
  - 30-40 mmHg for C_4-C_6
  - 40-50 mmHg for recurrent ulcers
  - Contraindicated in patients with ABI <0.5
- Wound and skin care
- Pharmacologic therapy
  - Horse chestnut seed extract for leg edema
  - Pentoxifylline may improve healing rates
- Exercise (improve calf muscle pump)
- Endovenous interventions

<table>
<thead>
<tr>
<th>CEAP Clinical Classification</th>
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<tbody>
<tr>
<td>C_0 – No visible signs of disease</td>
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<tr>
<td>C_1 – Telangiectasia or reticular veins</td>
</tr>
<tr>
<td>C_2 – Varicose veins</td>
</tr>
<tr>
<td>C_3 – Edema</td>
</tr>
<tr>
<td>C_4 – Pigmentation, lipodermatosclerosis</td>
</tr>
<tr>
<td>C_5 – Healed ulcer</td>
</tr>
<tr>
<td>C_6 – Active ulcer</td>
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Lymphedema

- Abnormal accumulation of interstitial, protein-rich fluid
Lymphedema - Physical Exam

- Onset often insidious, unilateral and painless
- Edema initially soft and pitting, later fibrotic
- Dorsal (buffalo) hump
- Positive Stemmer’s sign
- Exaggerated skin creases
- Squaring of toes
- Peau d’orange, late sign
# Lymphedema

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary (More Common)</th>
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<tbody>
<tr>
<td>Congenital (Age &lt; 1yr)</td>
<td>Chronic venous insufficiency</td>
</tr>
<tr>
<td>Lymphedema Praecox (Age 1-35 years)</td>
<td>Filariasis</td>
</tr>
<tr>
<td>Lymphedema Tarda (Age &gt; 35 years)</td>
<td>Recurrent infection</td>
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<tr>
<td>More common in females</td>
<td>Surgery involving lymphatics</td>
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<tr>
<td>Can manifest at birth to early 40s</td>
<td>Radiation therapy</td>
</tr>
<tr>
<td>Family history</td>
<td>Malignancy</td>
</tr>
<tr>
<td></td>
<td>Trauma</td>
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</tbody>
</table>

Lymphedema - Diagnosis

- Diagnosis - clinical
- Radionuclide lymphoscintigram
- Duplex - exclude other diagnosis
- MRI without contrast
- CT to exclude underlying pathology
- MR lymphangiogram (for reconstructive candidates)

Int. Angiology. 2010;29(5)454-470
Lymphology 2008;41:1-10
Lymphedema

Elephantiasis nostras verrucosa
Papulonodular and hyperkeratotic lesions
Lymphedema - Treatment

- Meticulous skin care
- Treat cellulitis
- Physical therapy and manual lymph drainage (MLD)
- Compression stockings
- Intermittent pneumatic compression
- Exercise: swimming, bicycling
- Education
- Surgery
Pseudosarcoma

Massive Localized Lymphedema or Pseudotumors.
Extreme localized enlargement of the limb (usually medial thigh) but may involve inguinal region or scrotum.
Phlebolymphedema

Women > men
Venous hypertension and lymphedema
Corona phlebectatica, ankle hyperpigmentation, pitting edema

Bittenbender PM, Dean SM. Phlebolymphedema in Dean and Satiani eds. Color Atlas and Synopsis of Vascular Disease 2014, p. 333-336
Phlebolympheidema

- Chronic venous insufficiency causes venous hypertension, excessive capillary filtration of fluid into the interstitial space.
- Lymphatic transport initially compensates for excess fluid but eventually becomes overwhelmed leading to 2º lymphedema.
Phlebolymphedema

- Diagnosis (history and physical exam)
- Women > men
- May be bilateral or unilateral
- Imaging
  - Duplex ultrasound
    - (venous incompetency or obstruction)
  - CT or MRV (iliofemoral occlusions)
  - Intravascular Ultrasound or IVUS (may detect central venous obstruction missed by other testing)

Phlebolymphedema - Treatment

- Treat lymphatic and venous systems
- Ideal body weight, skin care, compression
- Endovenous Interventions
  - treat venous occlusions (balloon angioplasty and stenting)
  - treat superficial and/or perforating venous reflux (with endovenous laser therapy, radiofrequency ablation or foam sclerotherapy)
- Gradient compression stockings, decongestive therapy and lymphatic pumps

Massive Localized Lymphedema or Pseudotumors

- Incidence may be increasing due to increase in obesity in Western countries.
- Also known as pseudosarcoma(s)
- Extreme localized enlargement of the limb (usually medial thigh) but may involve inguinal region, scrotum or upper arm
- Results from lymphatic fluids and its associated inflammatory tissue changes

Massive Localized Lymphedema or Pseudotumors

- Generally single masses but may be multiple
- Mass is pendulous, peau d’orange appearance
- May develop frequent bouts of cellulitis
- Treatment surgical
- Weight reduction, physical therapy, compression, manual lymph drainage
- Recurrence common

J Clin Pathol 2009;62:808-811
Hum Pathol 2000;31:1162-1168
Lipedema

Almost exclusively found in women
Truncal-lower extremity mismatch. “Ankle cutoff sign”
Lipedema
Not a Rare Disease

• Defined: Edema, “fluid in the fat”
• Also known as: Painful fat Syndrome, Piano legs, Stove pipe legs
• Almost exclusively found in women
• Onset: puberty, pregnancy, menopause (presumably hormonal)
• May be familial
• Clinical diagnosis (grossly under-diagnosed or confused with lymphedema)
• Patients may suffer psychological issues (depression, embarrassment, social disgrace)

Length of stove pipe worn over legs to protect fishermen against fangs of rattlesnakes lurking among the rocks

Adv Skin & Wound Care 2010;23: 81-92
Am J Med Genet 2010;152(4)970-976
Lipedema

- Disproportionate lower extremity involvement (bilateral, symmetrical, grossly enlarged buttocks, thighs, calves)
- Spares the foot; stops at the ankle: “Ankle Cut-Off or Cuff Sign”
- Upper body relatively normal, but may involve shoulders, arms to carpus

Adv Skin & Wound Care 2010;23:81-92
Br J Dermatology 2009;161:980-986
Lipedema

- Non-pitting edema
- Pain, tenderness on pressure
- Fat pad sign at medial ankle
- Hypothermia of the skin
- Fat bulges inside thighs lead to abrasions
- Abduction of legs leads to misaligned joint axis (orthopedic problems)
- Lipedema can convert to *Lipolympathedema*
Treatment of Lipedema

- Compression stockings and complex decongestive therapy (CDT)
  - results depending on involvement of the lymphatic system
  - may not be tolerated by the patient (painful)
- Exercise
- Healthy eating
  - resistant to dieting, exercise patient frustrated and demotivated
- Psychological counseling
- Lymph sparing tumescent liposuction or water jet-assisted liposuction (not covered by most health insurance companies)
- Bariatric surgery

Adv. Skin & Wound Care 2010;23:81-92
Lipolymphedema

- Lipedema that progresses to lymphedema
- Rare but likely increasing due to increases in obesity
- Believed resulting from fat deposition causing damage to lymphatics and capillary system

Courtesy of Steve Dean

Lipolymphedema - Diagnosis and Treatment

- Clinical diagnosis (positive Stemmer’s sign)
- Lymphoscintigraphy – to define lymphatic damage
- Duplex ultrasound – correctable venous disease
- Diet (bariatric surgery) weight control essential
- Complete decongestive physiotherapy (manual lymph drainage, bandages, skin care)
- Custom garments, CircAid, LegAssist or Farrow wraps

Lipolymphedema

Thighs, hips and inguinal region affected
Ankle cut off sign
Feet no longer spared
Lipolymphedema - Diagnosis and Treatment

- Clinical diagnosis (positive Stemmer’s sign)
- Lymphoscintigraphy – to define lymphatic damage
- Duplex ultrasound – correctable venous disease
- Diet (bariatric surgery) weight control essential
- Complete decongestive physiotherapy (manual lymph drainage, bandages, skin care)
- Custom garments, CircAid, LegAssist or Farrow wraps

Phlebolipedema

- Chronic venous insufficiency and lipedema
- Hyperpigmentation, ankle cut off sign
Phlebolioplymphedema
Pseudotumor/massive localized lymphedema and lipedema and CVI

Slide courtesy of Steve Dean, DO
Chronic filarial lymphedema

Elephantiasis (chronic lymphedema) due to infection with *Wuchereria bancrofti*

Edema initially pitting, but changes to a woody edema with thickening of subcutaneous tissue and hyperkeratosis.

*Photo: courtesy of Apra Sood, MD*
Peripheral Arterial Disease

Rest Pain and Dependency – Critical Limb Ischemia
Drug-induced Leg Swelling

- Calcium channel blockers (nifedipine and amlodipine)
- Corticosteroids (prednisone)
- Pregabalin (lyrica) and Neurontin (gabapentin)
- Estrogens and oral contraceptives
- MAO (monoamine oxidase inhibitor) and tricyclic antidepressants
Localized myxedema or thyroid dermopathy generally found on the anterior shins. Almost always associated with Grave’s disease, Females > males.
Unilateral or Bilateral

Unilateral
- R/O DVT
- Anticoagulation
  - Yes
  - Fever or increased WBC?
    - Yes
    - Cellulitis or other infection
      - Antibiotic treatment
      - Yes
      - Initiate symptomatic treatment
      - No
      - Consider MRI
    - No
    - Popliteal cyst or gastroc tear
      - Antibiotic treatment
      - Yes
      - Initiate symptomatic treatment
      - No
      - Consider MRI
  - No
  - Pain?
    - Yes
    - Continue anticoagulation
    - No
    - Postphlebitic syndrome?
      - Yes
      - Continue anticoagulation
      - No
      - R/O cancer
      - Detailed history, Pelvic and Rectal exam
      - Yes
      - Continue anticoagulation
      - No
      - R/O DVT

Bilateral
- Detailed History, Physical Exam
- Urine dipstick
- Obvious findings of CHF
- R/O concurrent cardiac and hepatic disease
- Creatinine, Electrolytes, Albumin, Cholesterol, PT, Liver enzymes, TSH, Chest X-ray, Cardiac echo
- Consider renal biopsy
- Initiate appropriate therapy
- Follow up abnormalities
  - Renal disease
  - Occult CHF
  - Cirrhosis
  - Hypothyroidism
  - Other
  - Initiate appropriate therapy

Chertow G. Approach to the patient with edema. Braunwald E, Golman L, eds. Primary Cardiology. 2nd ed.