Approach to the Diagnosis and Treatment of Lower Extremity Edema

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So, there I am in office seeing a 67 y/o woman with HTN and CAD s/p ptca. There’s 2+ swelling on the L and trace to 1+ on the R.

Questions:
Does she need to see a vein specialist?

If unsure what steps should I take to make that determination?
If she doesn’t need a referral what “simple” management steps should be taken?

It is seen all the time in the office and most of us are unsure what to do. We don’t want to over refer.
Approach to the Patient with Edema

What is the mechanism
How severe is the swelling
Where is the swelling
Has there been a gait change
Medications?
Sodium intake?
Is there lymphedema?
What is the Mechanism of Edema?
Examples

- **Increased capillary pressure**
  - Retention of salt and water (renal failure, mineralocorticoid excess)
  - Venous pressure elevation (CHF, TR, pericardial disease, venous obstruction, reflux)
  - Decreased arteriolar resistance (hyperthermia, medications)

- **Decreased plasma proteins**
  - Protein loss (nephrotic syndrome, protein-losing gastroenteropathy)
  - Failure to produce proteins (cirrhosis, protein or calorie malnutrition)

- **Increased capillary permeability**
  - Allergies, toxins, infections, scurvy, ischemia

- **Blockage of lymph return**
  - Mechanical, malignancy, infections, surgery, radiation
How Severe is the Swelling?

- Interstitial volume must increase significantly (> 7 lbs) before edema is evident.
- Once present, small additional changes can lead to disproportionate increase in severity.
- Location (mid-shin, mid-thigh, sacrum) rather than 4-point scale, more practical and reproducible.
- Change in weight, how clothes fit, may be helpful.
Grading of Edema

+1  
There is a barely detectable 2mm depression. Not easily seen but can be felt. Immediate rebound.

2+  
There is a 4mm deep pit. A few seconds to rebound.

3+  
There is a 6mm deep pit. 10-12 seconds to rebound.

4+  
There is an 8mm deep pit (very deep). >20 seconds to rebound.
Where’s the Swelling?

- **Cardiac**: Foot and ankle, sacrum
- **Venous**: Foot and ankle, spares the toes
- **Lymphatic**: Pits poorly, involves the toes
- **Lipedema**: Spares foot and toes
- **Anasarca**: Includes trunks, sacrum, face, arms, ascites, pleural effusion
Change in Gait?
Musculovenous pump
Calf Muscle Pump
Calf Muscle Pump Function

- Foot and calf muscles act to squeeze the blood out of the deep veins
- One way valves allow only upward and inward flow
- During muscle relaxation, blood is drawn inward through perforating veins
- Superficial veins act as collecting chamber
“Deck-Chair Legs”

Immobile patients

- Armchair existence
- Sleep in chair
- Edema, erythema and blistering

Chronic venous insufficiency may be difficult to distinguish from chronic venous hypertension due to stasis, venous obstruction, or reflux without a standing duplex ultrasound evaluation.
Change in Medications?

- NSAIDs (5-25%)  
  - Increase tubular reabsorption of sodium  
  - Decrease responsiveness to diuretics  
  - COX 2 mechanism, so Cox 2-inhibitors also cause edema
- Hormonal (steroids, estrogens, mineralocorticoids, leuprolide)
- Chemotherapy (docetaxel, pramepexole, cisplatin)
- Rosiglitazone/pioglitazone
- Minoxidil

Medications, con’t

- Anticonvulsant: gabapentin, pregabalin
- Mineralocorticoids: fludrocortisone
- Antiparkinson: pramipexole, ropinirole
- Calcium channel blockers (15-22%)
  - especially amlodipine, nifedipine
  - ↓ in arteriolar resistance unmatched in the venous circulation
  - ACE-inhibitor, nitrate combinations may help

Cho, S., American Journal of Medicine, Nov 2002
Change in Sodium Intake?

- Take a specific dietary history, including bread, processed chicken, sandwiches, condiments
- OTC’s effervescent, antacids, laxatives and nonsteroidal anti-inflammatory drugs (NSAIDs).
  - 1.2 million in UK on soluble forms: 16% ↑ MI, CVA and 28% ↑ risk HTN

Lymphedema

- Disruption or obstruction of the lymphatic pathways
  - Surgical (vascular, trauma, orthopedic procedures)
  - Radiation
  - Tumors that spread to lymph nodes
    - Breast cancer
    - Melanoma
    - Genitourinary
    - Gynecologic
- Dynamic insufficiency in which the lymph flow exceeds the transport capacity of the intact lymphatic system
Is there Lymphedema?

Stemmer Sign (or Stemmer's Sign)

Thickened skin fold at the base of the second toe.
Positive when tissue cannot be lifted but only be grasped as a lump of tissue
Negative when it is possible to lift the tissue normally.
Congenital Lymphedema (Milroy’s Disease)

- Primary lymphedema
- Hypo or aplasia of lymphatics
- Edema is non-pitting
- More common in women
- Leg most frequently affected

Pretibial myxedema

- infiltration of dermis with mucin in Graves disease
- may be seen in hypothyroidism due to reduced breakdown of hyaluronic acid

Thyroid acropachy: clubbing due to new periosteal bone formation

Exophthalmos

Lipidema

- Bilateral, symmetrical fat deposition in the extremities
- The feet are not involved
- Occurs exclusively in females
- Nonpitting and feels like adipose tissue
- Diuretics and compression are of little value

From Spittell, “Clinical Vascular Disease”
Klippel-Trenaunay Syndrome

- Varicose veins and hypertrophy of the leg
- Clinical triad of muscular and bony hypertrophy of an extremity with hemangiomas

*From Spittell, “Clinical Vascular Disease***
Some Important Consideration…
Multifactorial Causes……Multifactorial Approach to Treatment

- Most patients have a combination of disorders
- More than one treatment method will be required for most patients
Mainstay of Treatment
Four Legged Stool

- Compression stockings
- Elevation of the legs
- Calf pump muscle exercises
- Sodium restriction
Diuretic Therapy

- Consider last, not first
  - E.g. address cause, medications, weight, sodium intake
- Never be used as sole therapy
- Follow weight, leg circumference, electrolytes after 1-2 weeks
- Reduced dosage for maintenance therapy (PRN preferable)
- Discontinue if no clear benefit
Sodium Restriction

- 2000 mg sodium diet
- Compliance is generally poor
- Use handouts (e.g. American Dietetic Association- can get off their website)
- Review adherence at follow up visits
- AHA salt for patient education materials
Foot Pump

- Gait training, lymphedema therapy
- Heel-toe walking
- Seated/standing calf raises
- Gel insoles
- Adaptive compression devices
- Peristaltic (roller) pumps
Compression Therapy

- Provides a gradient of pressure, highest at the ankle, decreasing as it moves up the leg
- Reduces reflux of blood
- Improves venous/lymphatic outflow
- Increases velocity of blood flow to reduce the risk of blood clots
- Increases tissue oxygenation and reduces inflammation

Photo courtesy of Juzo
Graduated compression is not the same as T.E.D. hose

- T.E.D.s are meant for non-ambulatory, supine patients
- T.E.D.s are indicated to decrease the incidence of thrombosis
- T.E.D.s do not provide sufficient pressure for ambulatory patients
What about this Patient?  
Too much to put in an email….  

- Laboratory testing  
- Electrocardiogram  
- Chest X ray  
- Echocardiogram  
- Sleep study  
- Duplex ultrasound for deep vein disease and deep venous reflux  
- Standing duplex ultrasound for superficial vein disease  
- CT venograms, venography, IVUS
Summary: Consider...

- Gait/calf-muscle pump function
- Gravitational forces
- Groin lymphatic compression (overlapping pannus i.e. excessive adiposity interfering with terminal lymph collectors)
- Snoring, daytime somnolence, airway anatomy
- Dietary sodium excess
- Medications-calcium channel blockers, NSAIDs, rosiglitazone, Alka-Seltzer, gabapentin