Chronic Venous Insufficiency: Diagnosis & Management

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Background

- Chronic Venous Insufficiency (CVI) affects 25 to 30% of women and 15% of men in US
- Varicose veins are the most recognized manifestation of CVI, affecting 1 out of 5 adults
- Number of studies have estimated that 1% of the adult population will be affected by venous ulceration at some point
- Direct medical cost of CVI in US estimated to be up to $1 billion/year
Venous reflux disease is 2x more prevalent than coronary artery disease (CAD) and 5x more prevalent than peripheral arterial disease (PAD)\(^1\)
Anatomic Considerations

- Lower extremity venous system is unique in its constant need to overcome gravity while returning blood to the heart.

- Normally, the calf pump and vein valve system accomplish this task.

- With CVI, the valves become disrupted by a thrombotic event (secondary), can be congenitally absent/atretic, or can become dysfunctional over time (primary).
Pathophysiology

- Multiple theories, all involve increased venous pressure and damage to the microcirculation
- Increases in capillary hydrostatic pressure are normally offset by the postural vasoconstriction reflex and the functional calf muscle pump
- Both are impaired in severe CVI, and perforator vein valves are often incompetent
Pathophysiology

- In calf pump muscle failure, blood from the deep venous systems transmits pressure to the superficial system, causing increases in filtration pressure and edema

- CVI in obese patients is further exacerbated by lymphatic overload

- Bottom line: saphenofemoral or saphenopopliteal reflux occurs in 85% of patients with varicose veins as result of valvular incompetence
Pathophysiology of Venous Insufficiency

Healthy Vein Valves & Correct Blood Flow

Damaged Vein Valve & Incorrect Blood Flow
Signs & Symptoms

- **SIGNS:**
  Varicose veins, telangiectasias, edema, hyperpigmentation, eczema, lipodermatosclerosis

- **SYMPTOMS:**
  Leg pain (especially after prolonged standing), itching, paresthesias, cellulitis, leg ulcers, restless legs, variceal bleeding, superficial thrombophlebitis

- Compared to arterial disease, symptoms usually improve with leg elevation
Risk factors

- Age
- Female gender
- Pregnancy
- Obesity
- Occupation
- Previous DVT
- Genetics
- Sedentary lifestyle
- Previous injury or surgery
Physical Examination

- Should examine patients standing, noting telangiectasis (dilated venules <1mm), reticular veins (nonpalpable subdermal veins <3mm), and varicose veins (>3mm)

- Also note edema, skin pigmentary changes, ulcers
Diagnostic Testing

- Venous duplex supplements physical exam

- Safe, non-invasive, cost-effective method of determining reflux in the superficial, deep, and perforating veins

- Definition of reflux: retrograde flow lasting >0.5 seconds

- Can also identify thrombophlebitis and venous obstruction from previous thrombosis
GSV reflux on duplex imaging
CEAP Classification

- **Clinical**
  - C0: No visible or palpable signs of venous disease
  - C1: telangiectases or reticular veins
  - C2: varicose veins
  - C3: edema
  - C4: skin changes ascribed to venous disease
    - a. pigmentation or eczema
    - b. lipodermatosclerosis
  - C5: healed venous ulcer
  - C6: active venous ulcer

- **Etiologic**: congenital, primary, secondary or none
- **Anatomic**: superficial, perforator, deep
- **Pathophysiologic**: reflux, obstruction, both or none
Examples of Advanced CVI

- C3 (edema): C4a (hyperpigmentation): C4b (lipodermatosclerosis)
Examples of Advanced CVI

C5 (healed ulcer):

C6 (active ulcer):
Natural History

- Varicose veins constitute a progressive disease that steadily becomes worse

- Most frequent complications include superficial thrombophlebitis, bleeding, and ulcerations

- Treatment is tailored to patient’s age, comorbidities, and severity of symptoms
Conservative Management

• Bandaging has been mode of treatment since time of Hippocrates

• Graduated compression stockings combined with exercise regimen have been shown to control reflux and improve calf muscle pump function

• Compliance with stockings is significant clinical limitation
## Compression Therapy

<table>
<thead>
<tr>
<th>CLASS</th>
<th>PRESSURE</th>
<th>LEVEL OF SUPPORT</th>
<th>INDICATION</th>
<th>CEAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTC</td>
<td>&lt;15 mmHg</td>
<td>Minimal</td>
<td>Asymptomatic, comfort only.</td>
<td>0, 1</td>
</tr>
<tr>
<td>I</td>
<td>15-20 mmHg</td>
<td>Mild</td>
<td>Minor varicosities, tired aching legs, minor swelling.</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>II</td>
<td>20-30 mmHg</td>
<td>Moderate</td>
<td>Moderate to severe varicosities, moderate swelling, phlebitis, following ablation.</td>
<td>3, 4</td>
</tr>
<tr>
<td>III</td>
<td>30-40 mmHg</td>
<td>Firm</td>
<td>Severe varicosities, swelling, management of ulcerations, following DVT, post surgery.</td>
<td>4, 5, 6</td>
</tr>
<tr>
<td>IV</td>
<td>&gt;40 mmHg</td>
<td>Extra firm</td>
<td>Lymphedema.</td>
<td>NA</td>
</tr>
</tbody>
</table>
Conservative Management

- Aside from compression, need to elevate legs to level of heart 30 minutes 3-4 times/day
- Daily walking and simple ankle flexion exercises
- Losing weight
- Taking NSAIDs as needed for inflammation
- Appropriately lubricating with emollients, can use topical steroids for stasis dermatitis
Pneumatic Compression Therapy
Medical Therapy

- **Diuretics** – very overprescribed, should typically only be used when other conditions such as CHF or CKD are contributing to swelling

- **ASA** – seems to accelerate healing of stasis ulcers

- **Pentoxifylline** – competitive nonselective phosphodiesterase inhibitor may also accelerate healing, can be adjunct to wound care and compression

- **Horseshoe chestnut** – placebo-controlled RCTs suggest decrease in lower leg volume and reduction in leg circumference at calf and ankle
Conservative Management

- Compression stockings do not address cosmetic concerns
- REACTIV trial
  - 1,009 CVI subjects
  - Prospectively demonstrated significant improvement in health care-related QOL when managed with surgery or sclerotherapy compared to conservative management
Conservative vs Invasive Therapy

- ESCHAR (Effect of Surgery and Compression on Healing and Recurrence) trial
  - C5, C6 patients randomized to medical therapy (elevation, compression, exercise) or surgical tx of superficial reflux
  - No difference in rates of healing, but dramatic reduction in ulcer recurrence (12 vs 28% at 12 months)
Conservative vs Invasive Therapy

• Another recent RCT (Michaels et al) showed patients randomized to surgery had significant improvement in QOL and symptomatic relief.

• These RCTs provide a grade A recommendation for surgery in addition to conservative tx in patients with VV caused by GSV reflux.
Surgical Techniques

• High ligation of the Greater Saphenous Vein (GSV), +/- stripping

• Endovenous thermal ablation (EVA)

• Ambulatory Phlebectomy
GSV ligation & stripping

- Possible complications include persistent lymphatic leak, prolonged wound healing, wound infection
- May require up to 4 weeks of convalescence
- Neovascularization of SFJ common, and varicose veins may recur in 20 to 60% of patients within 10 years, up to 70% after 10 years
Comparison of EVA vs L&S

- In multiple trials, EVA (using both laser and RFA techniques) found to be equally effective in eliminating reflux, with less pain and shortened time to return to normal activities compared to L&S.

- Two types of energy available:
  - Radiofrequency (RFA)
  - Laser
Radiofrequency Ablation (RFA)

- Catheter has 7cm bipolar electrode on its distal end, can perform segmental ablation
- Mechanism involves electrode making direct contact with the vein wall to deliver RFA
- Contact with the wall results in destruction of the endothelium, occlusion by contraction of the vein wall collagen, and thrombus formation
VNUS Closure® Procedure using the ClosureFAST™ Catheter

Disposable catheter inserted into vein

Vein heats and collapses

Catheter withdrawn, closing vein
Radiofrequency Ablation

• Can be used to close GSV or SSV

• Contraindication include SVT, DVT, venous aneurysm, and abnormal ABIs

• Can be performed in outpatient office setting, depends on local resources

• Pts wear compression for at least one week afterwards, and have a follow-up duplex to rule out DVT
VNUS Closure® Visual Results

Pre-treatment

One week post-treatment*

*Individual results may vary
Endovenous Laser Ablation (ELA)

- Similar to RFA, primary difference is mechanism
- Uses laser energy to form steam bubbles within vein lumen, destroying the endothelial lining
- This causes inflammatory reaction resulting in thrombotic occlusion
Laser Ablation

- Pts also wear compression for at least a week, and have a follow-up venous duplex to assess treated veins and rule out DVT

- Complications for both procedures include vessel perforation, DVT (1-2%), phlebitis, hematoma, infection, skin pigmentation, paresthesias, skin burns
Endovenous Ablation

- General technique similar for either RFA or laser
  - Ultrasound guidance used to access GSV or SSV
  - Tip of catheter positioned 1 cm from SFJ or SPJ
  - Tumescent anesthesia fluid dispensed along with course of the target vein
  - Energy source activated, catheter pulled back along vein to be closed
- Does not have to be performed in hospital setting
Laser vs Radiofrequency

- Efficacy seems to be equivalent in latest RCT
- Laser seems to be associated with more post-procedure pain
- No real difference in cost, often dictated by local resources
Perforators

• Has been source of controversy over when to treat perforators

• Grade 2B evidence to support treatment of “pathologic perforators” in patients with advanced CVI (class C5-6) in the absence of deep venous obstruction

  • large (>3.5 mm)

  • high-volume

  • incompetent (reflux >0.5 seconds)

  • located in affected area of the limb
Perforators

- Treatment options include subfascial endoscopic perforator surgery (SEPS), thermal ablation, sclerotherapy, or US-guided ligation
- RFA catheter now has FDA-approval
- Sclerotherapy works well for smaller veins that do not immediately empty into the deep system
- If perforator too superficial for ablation or too close to the deep system for sclerotherapy, US-guided ligation very useful
Sclerotherapy

- Most commonly used for smaller varicosities
- Defined as introduction of chemical into lumen of a vein to induce endothelial damage that results in thrombosis and fibrosis
- Different agents can be used, compression also important post-procedure
- Complications can include hyperpigmentation, matting, cutaneous necrosis, SVT, anaphylaxis, DVT/PE, and inadvertent arterial injection
Sclerotherapy

• Up to 65% of patients treated may develop recurrent VV within 5 years, especially if saphenous reflux left untreated

• Often requires multiple treatments

• Meta-analysis of trials with long-term follow-up suggest greater long-term benefit with surgery
Recurrence of Varicose Veins

- Need to examine for recanalized veins following ablation, or neovascularization of SFJ
- May need ablation of SSV
- May also have developed accessory saphenous veins or pathologic perforators
- Recurrence more common in patients with postthrombotic syndrome, may need venography +/- IVUS to evaluate for proximal occlusive disease that may need PTA/stenting
Summary

- CVI is extremely common, with a high morbidity and cost burden to our healthcare system.

- Newer technologies offer less invasive treatment options.

- Goal is to improve symptoms and prevent ulcerations, unfortunately no cure.

- Remember that venous duplex helps guide treatment decisions, many patients will be best treated with conservative measures.
Remember

Don’t let these.....

Become this.....
References


