



Percutaneous Management of Venous Insufficiency

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DISCLOSURES

- I HAVE NO RELEVANT DISCLOSURES RELATED TO THIS PRESENTATION

Why Do It?



Common reason for referral

Presumptive diagnosis is CHF

Most common etiology is not CHF

Treat with techniques we are comfortable with

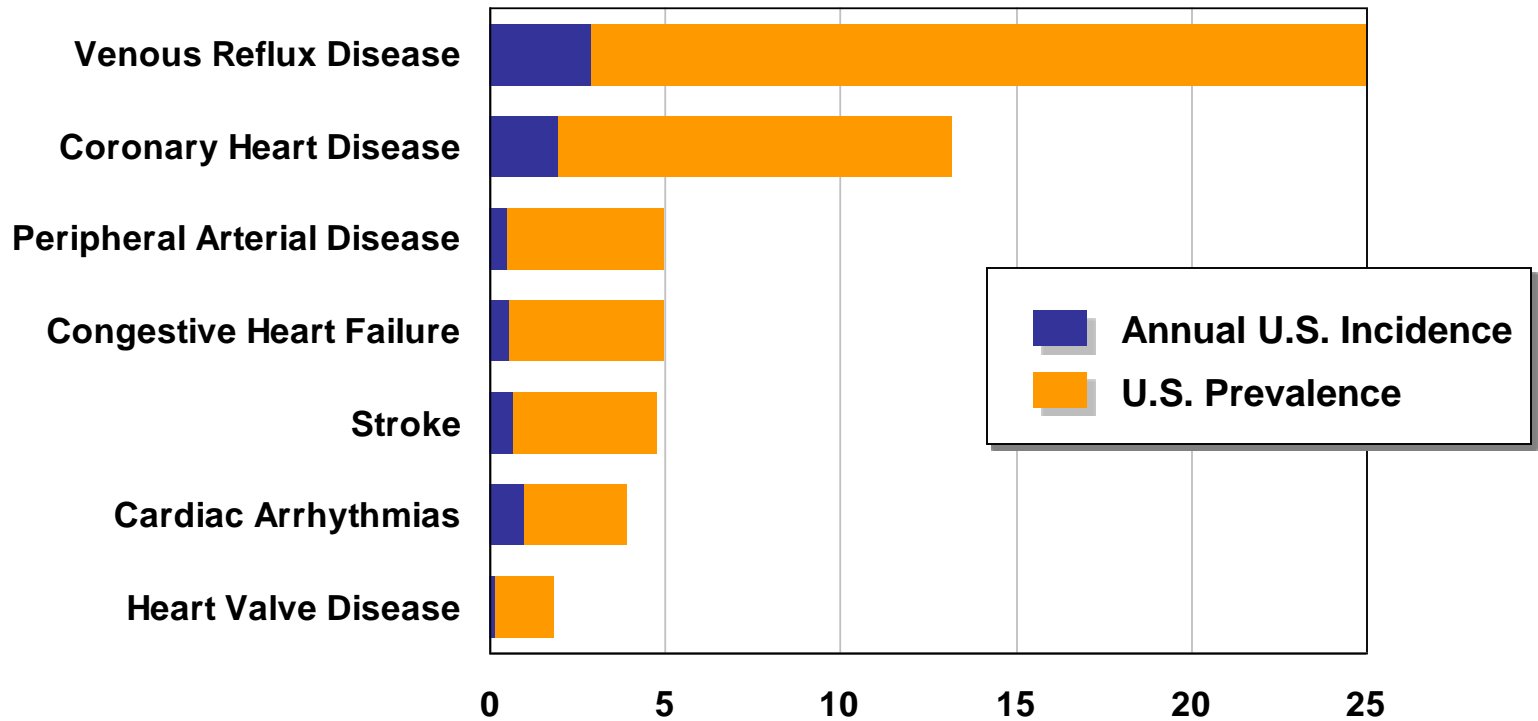
Not Just Cosmetic

- **Discomfort and pain**
- **Loss of working days and disability**
- **Deterioration of health-related quality of life**
- **Loss of limb**
- **Life expectancy**



Prevalence and Etiology of Venous Insufficiency

Venous reflux disease is 2x more prevalent than coronary heart disease (CHD) and 5x more prevalent than peripheral arterial disease (PAD)¹



Millions



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Prevalence and Etiology of Venous Insufficiency



Of the estimated 25 million people with symptomatic superficial venous reflux:

- Only 1.7 million seek treatment annually
- Over 23 million go untreated

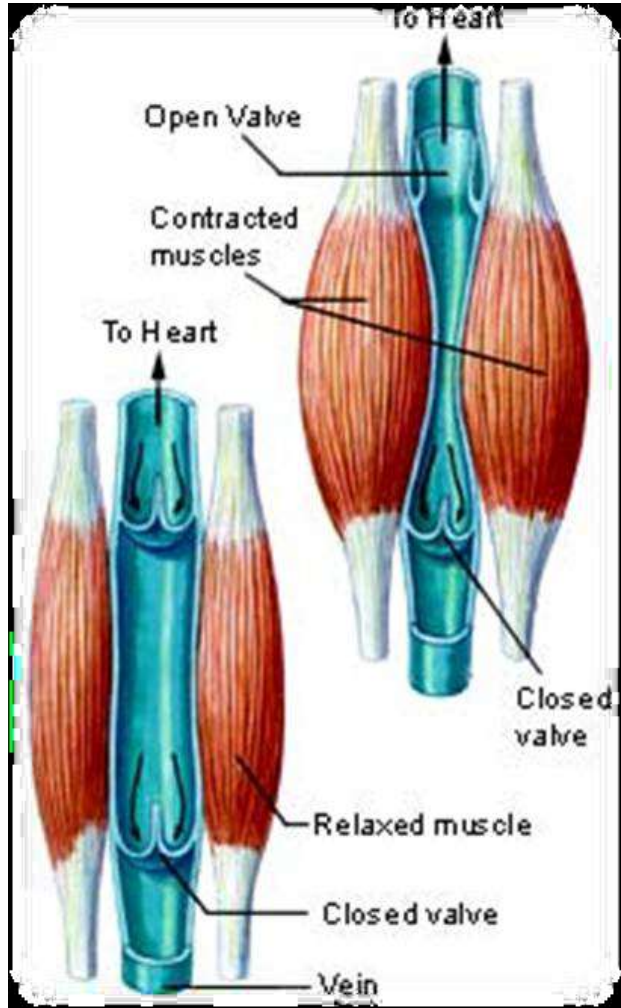
Prevalence by Age and Gender

<u>Age</u>	<u>Female</u>	<u>Male</u>
20 - 29	8%	1%
40 - 49	41%	24%
60 - 69	72%	43%

Risk Factors for Varicose Veins and Chronic Venous Insufficiency

- Older age
 - Family history
 - DVT
 - History of phlebitis
 - Obesity
 - Standing occupation
 - Pregnancy
 - Female gender
-
- Other possible risk factors: Smoking, hypertension, oral contraceptives or hormone replacement therapy, physical activity, constipation
 - ***Not consistently supported by research***

How Do the Leg Veins Work?



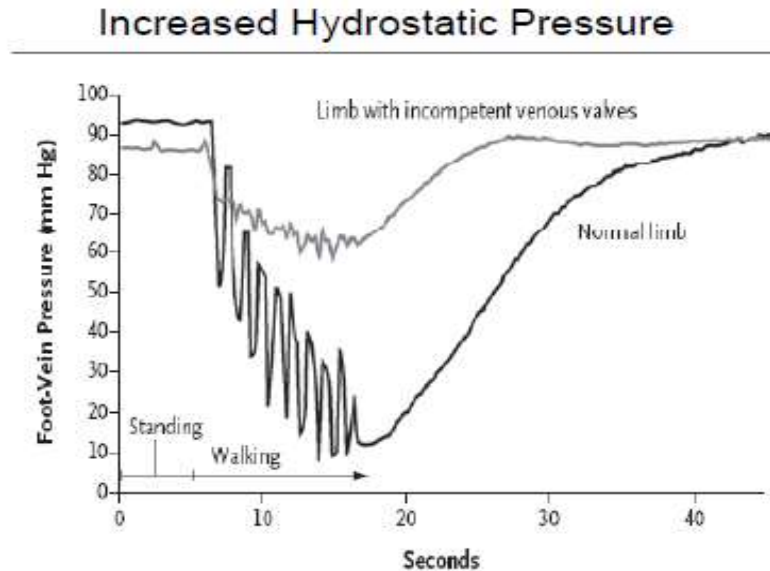
Venous Physiology

–Normal functioning calf pumps are capable of emptying 40% to 60% of their volume with one muscle contraction

–7 to 12 steps will decrease venous pressure from 100mmHg to 22mmHg

Pathogenesis of Venous Stasis Ulceration

- Anatomical Problem
 - Obstructive pathology
 - Reflux pathology
 - Superficial
 - Deep
 - Perforator disease
 - Peripheral vascular disease (PVD)
- Associated Factors
 - Biomechanical abnormalities of foot and ankle
 - Arterial perfusion
 - Pulmonary hypertension



Tassiopoulos AK, et al. Current Concepts in Chronic Venous Ulceration. *European Journal of Vascular and Endovascular Surgery*, 2000; 227-232.



Mechanisms involved in venous hypertension

Systemic inflammatory response

Leukocyte trapping and activation

Eventual damage to vessel

Endothelium

Resulting in:

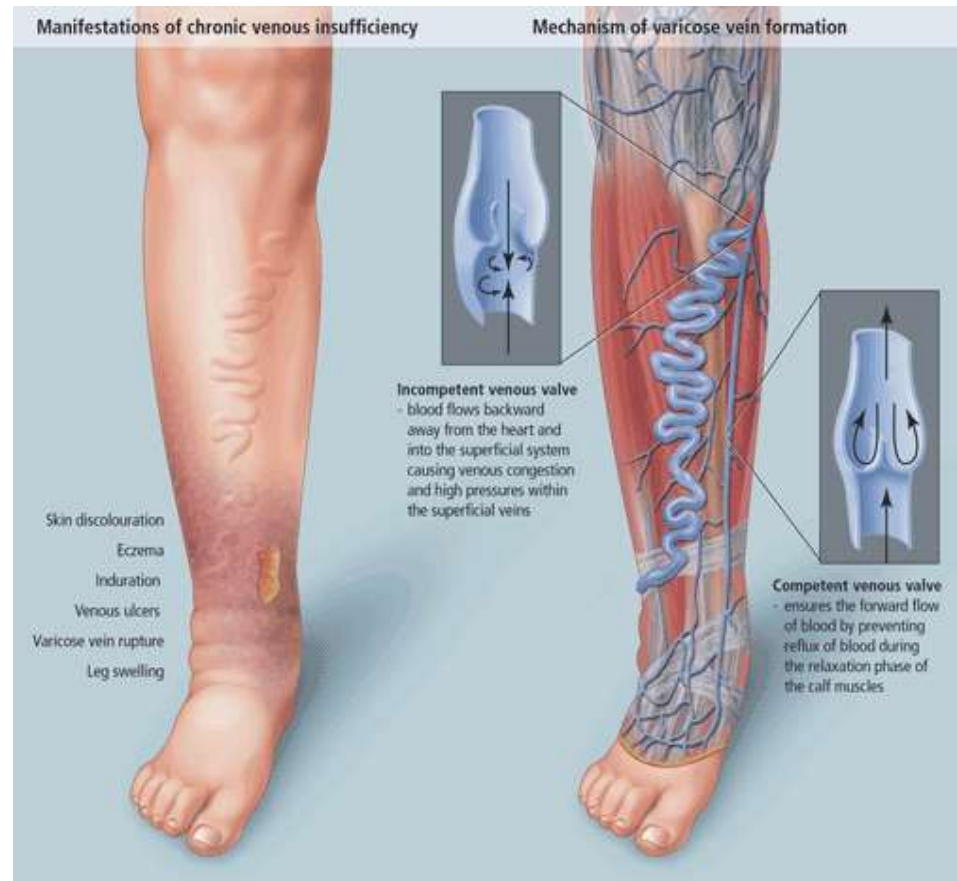
Elongation

Dilation

Valvular incompetence

Collagen deposition in the wall

Shear stress alterations



History of Present Symptoms

- **Aching**
- **Heaviness (standing, prolonged sitting)**
- **Pain**
- **Burning (venous neuropathy)**
- **Itching (cutaneous inflammation, hemosiderin deposition)**
- **Use of analgesics**
- **Swelling**
- **Numbness**
- **Complications –ulcers, thrombosis, bleeding, cellulitis**

Medications

- **Oral contraceptives**
- **Exogenous Hormone Therapy**
- **Statins**
- **Anticoagulant agents including:
inhibitors of clotting factor synthesis,
inhibitors of thrombin, and antiplatelet
drugs**
- **Pain medications related to symptoms**

Social History/Family History

- **Tobacco use**
- **Type of Occupation**
- **Travel history**
- **Prolonged immobility during air or car travel**
- **Thrombophilia**
- **Venous Disease**
- **History of perioperative venous thrombi**

Past Medical History/Past Surgical History

- **Thrombophlebitis**
- **Deep Venous Thrombus**
- **Back Pain**
- **Pregnancy**
- **PAD**
- **History of lower extremity trauma**
- **Co-morbidities: CHF, Cancer, Renal disease**
- **Previous vein procedures**
- **Previous orthopedic surgery**
- **Prior pelvic procedures**
- **Placement of IVC Filter**
- **Procedures that can precipitate lower extremity edema (GSV harvest, lymph node excision, etc)**

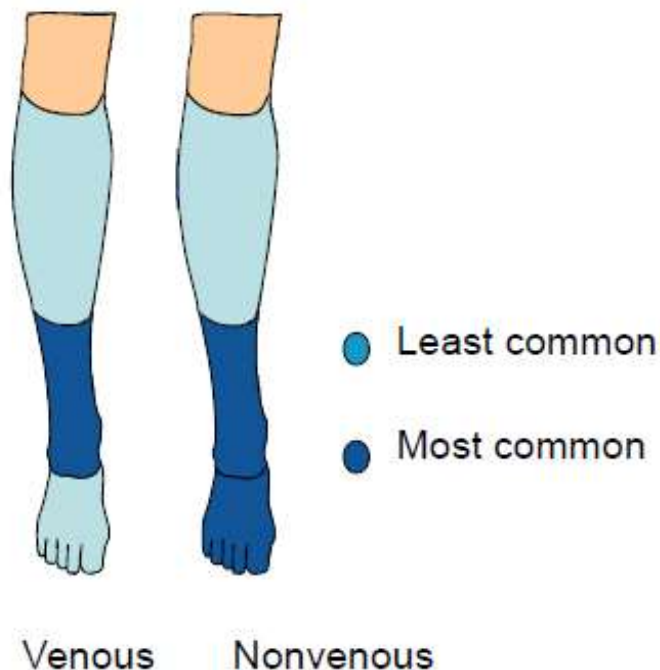
Physical Examination – Arterial? Venous? Both? Other?



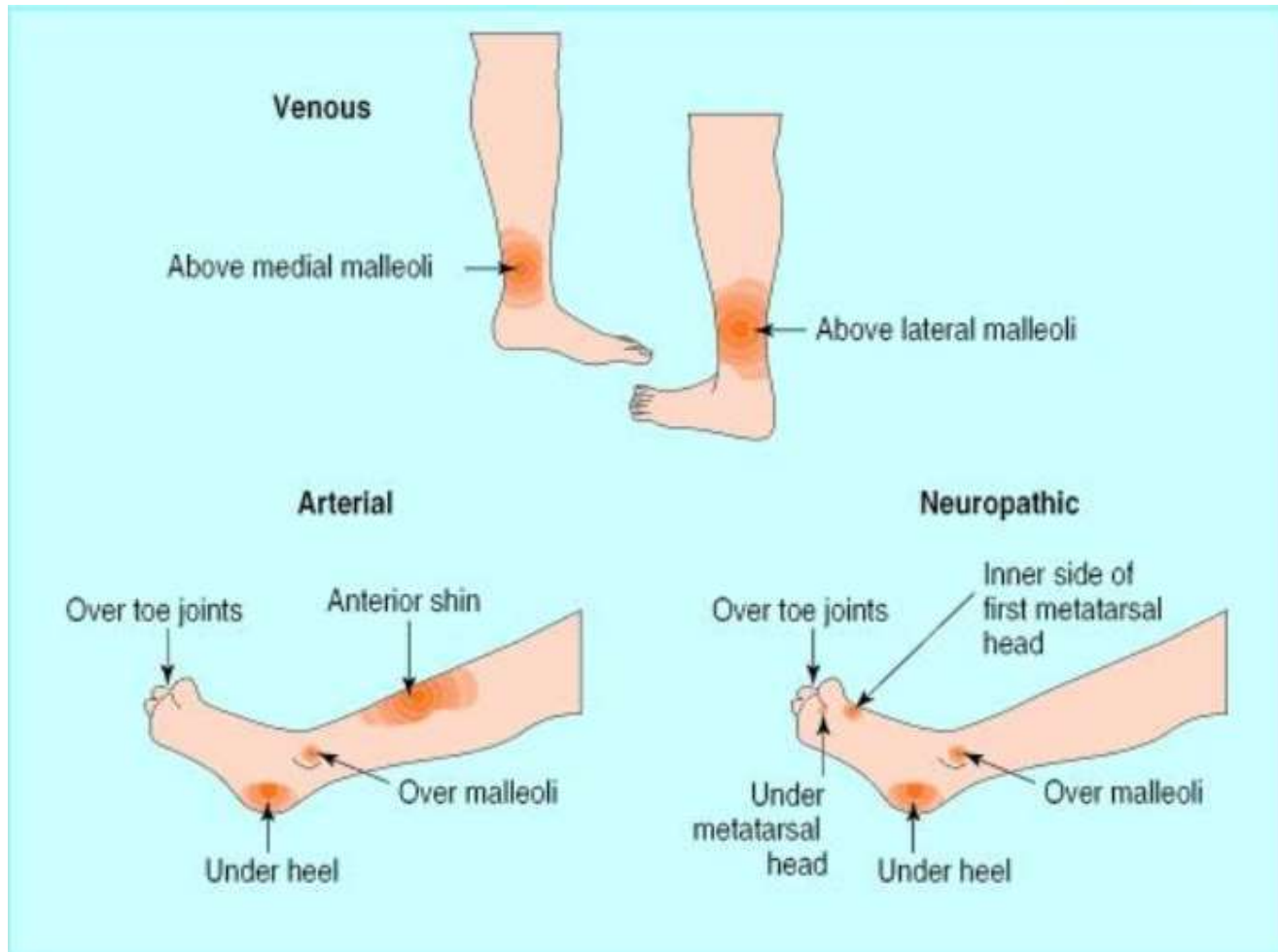


Incidence of Chronic Leg Ulcers

Etiology	Approx. Incidence (%)
Venous insufficiency	60-80
Arterial insufficiency	20
Rheumatoid arthritis	10
Diabetes/neuropathic	5
Multifactorial	10-20



Cornwall JV, et al. Leg ulcers: epidemiology and aetiology. *Br J Surg*, 1986;73:693-6





Characteristic	Arterial Ulcer	Venous Ulcer	Neuropathic Ulcer
Location	Toes or foot	Malleolus or metatarsal	Often on sole
Appearance	Irregular margin, cool, cyanotic	Pink base, may have exudate, irregular	Punched out appearance, red, deep, often infected
Foot Temperature	Cold	Warm	Warm and Dry



Characteristic	Arterial Ulcer	Venous Ulcer	Neuropathic Ulcer
Pain	Pain, usually severe	Mild	Absent
Arterial Pulses	Absent	Present	Present
Veins	Collapsed	Dilated varicosities edema	Dilated



Characteristic	Arterial Ulcer	Venous Ulcer	Neuropathic Ulcer
Sensation	Variable but usually decreased	Present	Loss of sensation, reflexes, & vibration sense
Calluses	Absent or rare	Absent	Present
Bone deformities	Absent	Absent	Often present

- **CEAP**
- **Descriptive classification**
 - » **Clinical**
 - » **Etiologic**
 - » **Anatomic**
 - » **Pathophysiologic**



C0	No visible or palpable signs of venous disease
C1	Telangiectases or reticular veins
C2	Varicose veins
C3	Edema
C4a	Pigmentation or eczema
C4b	Lipodermatosclerosis or atrophie blanche
C5	Healed venous ulcer
C6	Active venous ulcer

- C1: telangiectasias or reticular veins



- C2: varicose veins



- C3: edema



- C4a: pigmentation or eczema



- C4b: lipodermatosclerosis or atrophie blanche





- C5 Healed Venous Ulcer



- C6 Active Venous Ulcer



E in CEAP = Etiology

- **Congenital**
- **Primary**
- **Secondary**
 - Present since birth
 - Undetermined etiology
 - Post-thrombotic

A in CEAP = Anatomic Distribution

- **Superficial** **Great and small saphenousveins**
- **Deep** **Cava, iliac, gonadal, femoral, profunda, popliteal, tibial**
- **Perforators** **Thigh and leg perforating veins**

P in CEAP = Pathophysiological

- **Reflux**
- **Obstruction**
- **Combination**
 - **Axial and perforating veins**
 - **Acute and chronic**
 - **Valvular dysfunction and thrombus**

Information you need from your Ultrasound Examination

- **Presence/absence reflux in the GSV and SSV**
 - Record in milliseconds
- **Location, size and reflux of perforators**
 - Record in milliseconds
- **Competency and patency of deep venous system**
- **Evidence of recanalization of deep venous system**
- **Aneurysmal segments**
- **Tortuosities**
- **Competency of duplicate vessels and normal variants**
- **Cutoff value for reflux in the saphenous veins of >500 milliseconds, >350 milliseconds for perforators**

Treatment





- Conservative treatment is standard of care, even for recurrent or non-healing VUs

Leg Elevation



Unna Boot



Compression Stockings



Apligraf®



Compression & wound care treat the symptom,
not the underlying cause of venous ulcers

Apligraf is a registered trademark of Organogenesis Inc.




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Compression Therapy Contraindications

- **May include:**
 - **Severe arterial insufficiency**
 - **Cutaneous infections**
 - **Wet dermatoses**
 - **Diabetic microangiopathy**
 - **Congestive heart failure**

Compression Therapy

- **Decreases ambulatory venous hypertension**
 - Precise mechanism has yet to be elucidated
- **Graduated**
 - Strongest at the ankle and decreasing in the proximal direction
- **Pressure ranges measured by determining the force that is necessary to stretch the ankle part of the stocking in transverse direction**

- 
- **Proper fitting**
 - **Education and reinforcement**
 - **Use of devices to aid application of stockings**

Note: Insurance companies will not cover procedures without documented conservative management

Conservative Management

- **Regular ambulation/exercise**
- **Lower extremity elevation**
- **Avoid prolonged sitting or standing**
- **Decrease BMI**
- **Prophylaxis during travel**

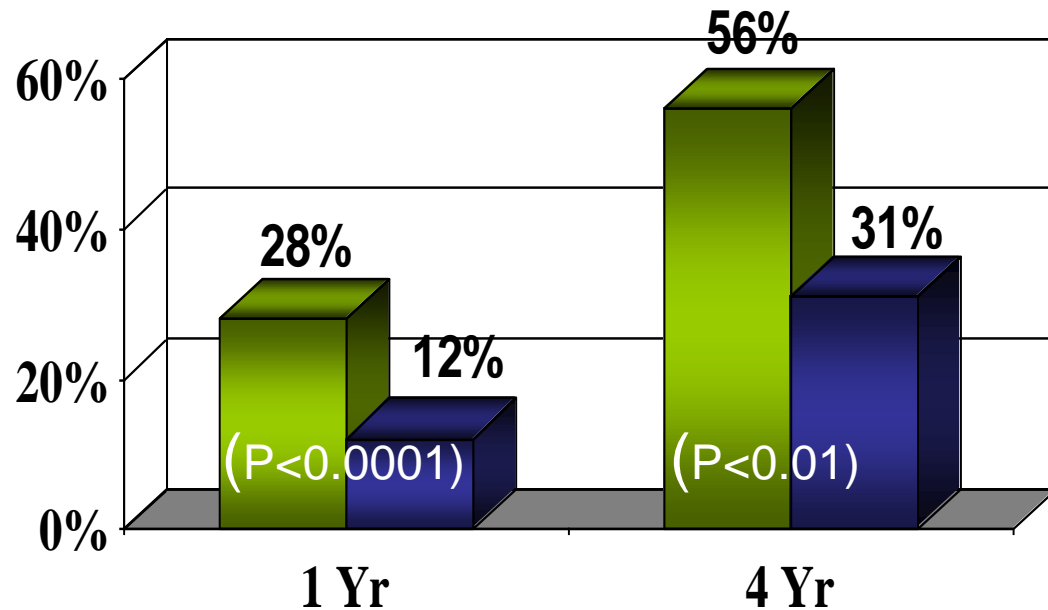
Limitations of Conservative Treatment

500 patients (CEAP 5 or 6)

Ulcer healing rates at 3 years were 89% in the compression group alone and 93% in the ablation and compression groups (P=0.73)

- Compression + surgery (vein stripping) more effective than compression alone

Venous Ulcer Recurrence (ESCHAR RCT)^{5,6}



■ Compression ■ Compression + Surgery

Chronic venous ulcer: minimally invasive treatment of superficial axial and perforator vein reflux speeds healing and reduces recurrence.

Retrospective review of 86 patients with 95 ulcers:

–Group 1 – compression alone

–Group 2 – axial/perforating vein ablation & compression

•Results:

–***Rates of healing were faster with ablation*** 9.7% vs. 4.2%
wound area reduction per week (P=0.001) ***and fewer ulcer recurrences*** 27.1% vs. 48.9% (P<0.015)

Benefits of Surgically Correcting CVI

■ Reduce recurrence

- 4 year recurrence rate 56% compression group, 31% compression plus surgery ($P < 0.01$)⁶
- 3 and 5 year recurrence with perforator surgery 8% and 18% respectively⁷

■ Faster healing

- Median heal time: 63 day compression group, 31 days surgical group, ($P < .005$)⁸

● Improve quality of life

- SFJ 36 questionnaire: surgical group better than compression group ($P < .05$)⁸

Consensus Guidelines

Wound Healing Society



- “superficial venous ablation ... can be useful in decreasing the recurrence of venous leg ulcers”⁹

American Venous Forum



- “We recommend superficial venous surgery to decrease ulcer recurrence in patients with superficial venous reflux”¹⁰

American College of
PHLEBOLOGY



- “Endovenous thermal ablation is the new standard of care”¹¹

Ablation



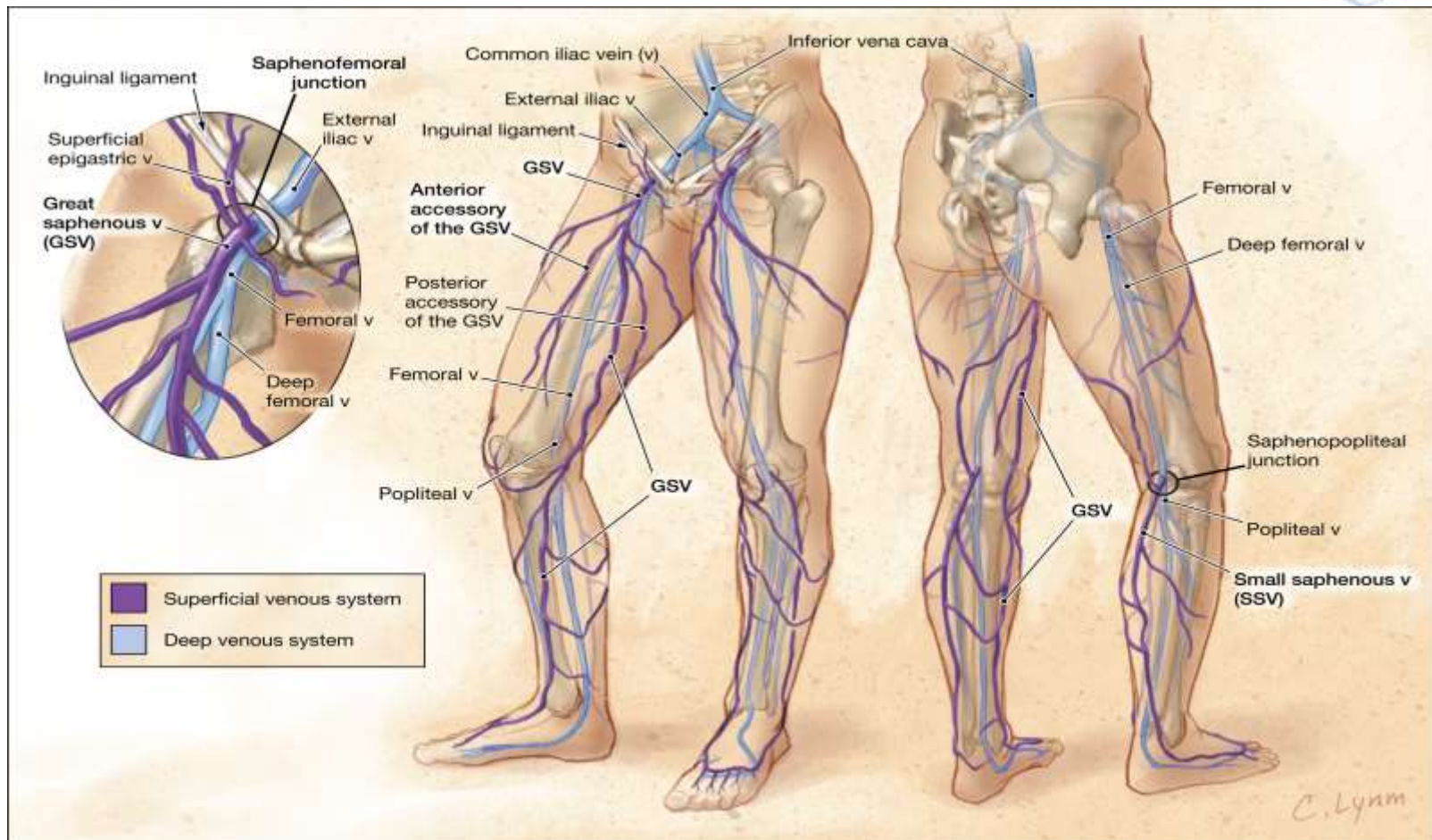
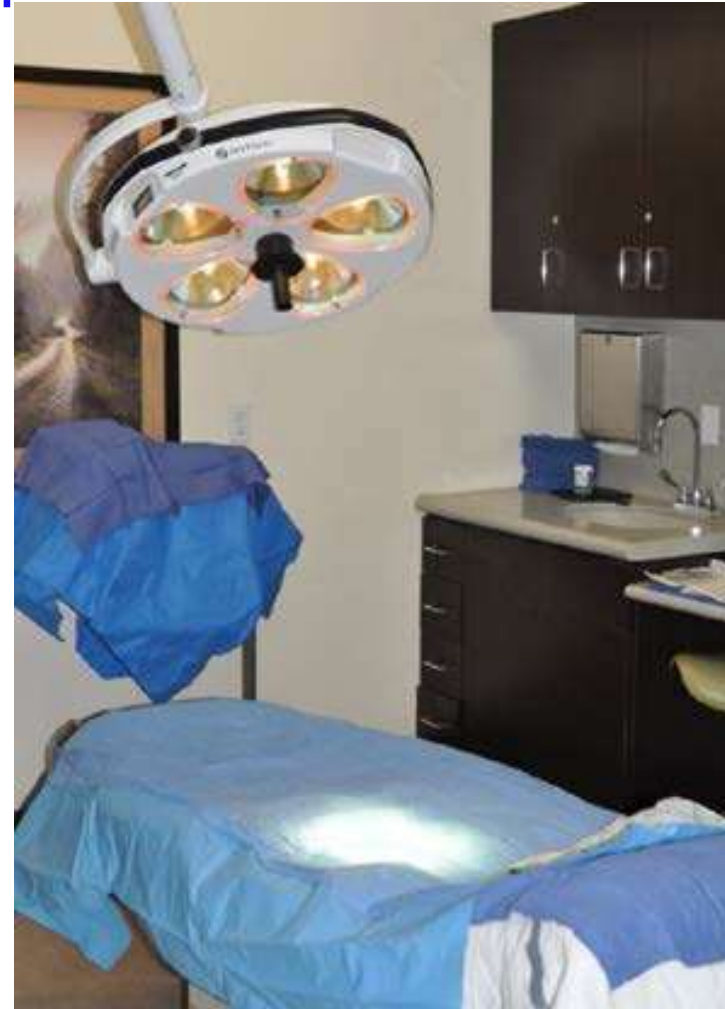


Figure Legend:

The GSV, anterior accessory branch of the GSV, and the SSV are common sources of axial reflux (see Figure 2) in the lower extremity that can lead to the development of varicose veins and associated symptoms. These veins can be treated by ligation or stripping or by endovenous ablation.

Room Preparation – Atmosphere

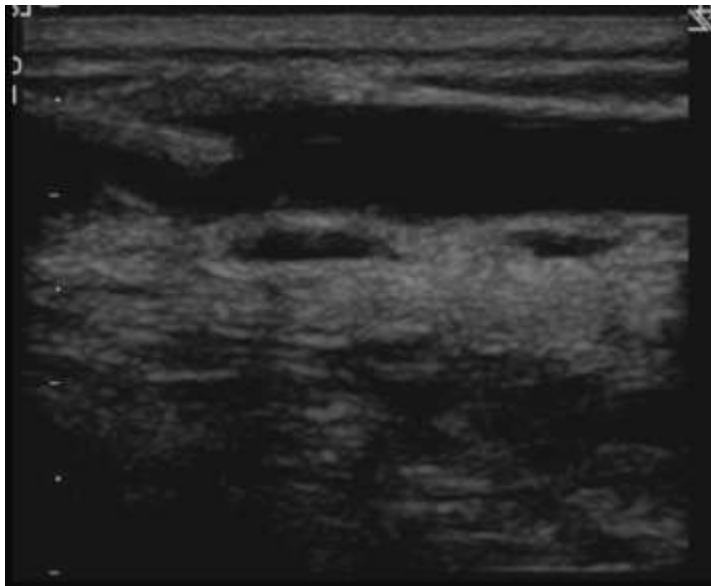
- Adequate room temperature to prevent venospasm
 - Comfort measures
- Light music in the background





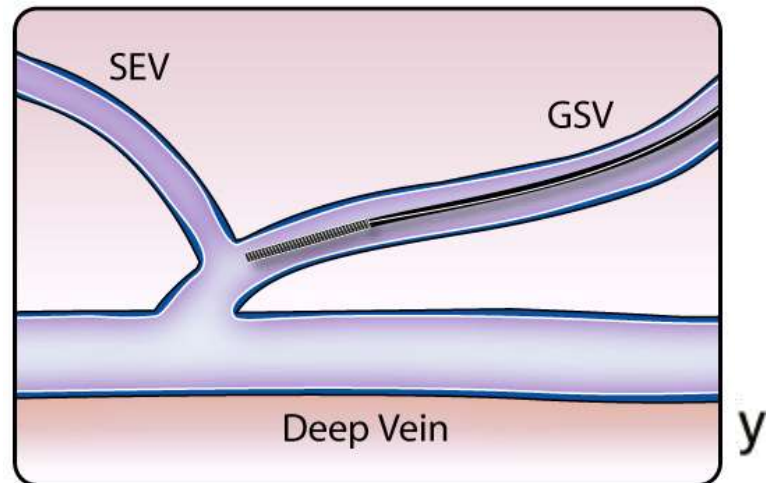
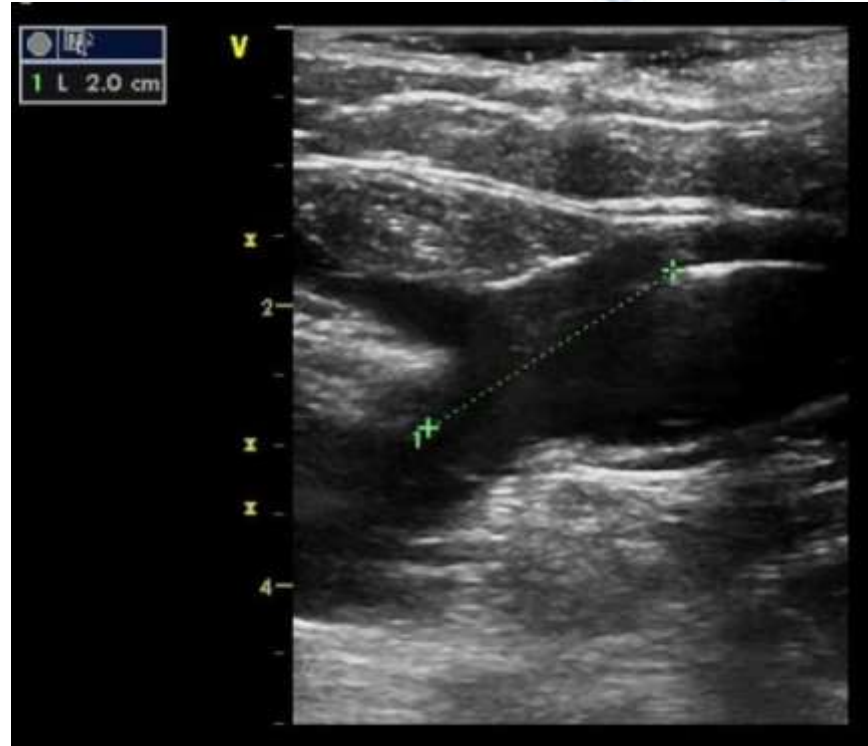
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Access



Access





Tumescent Anesthesia

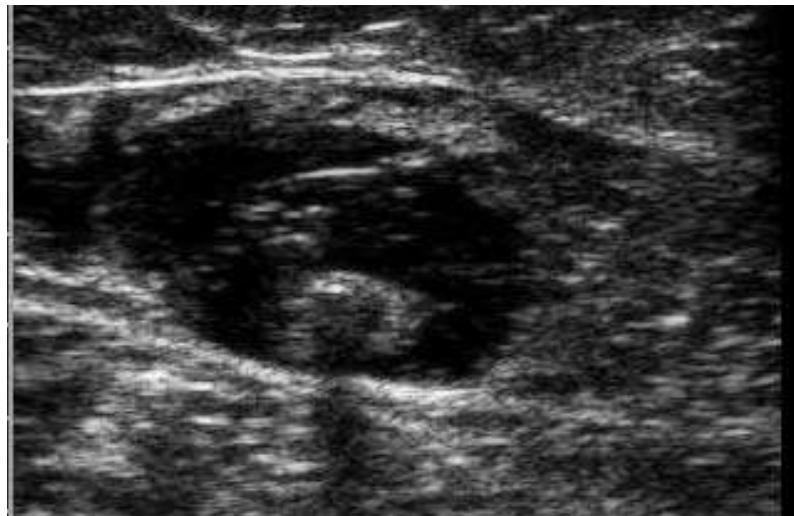
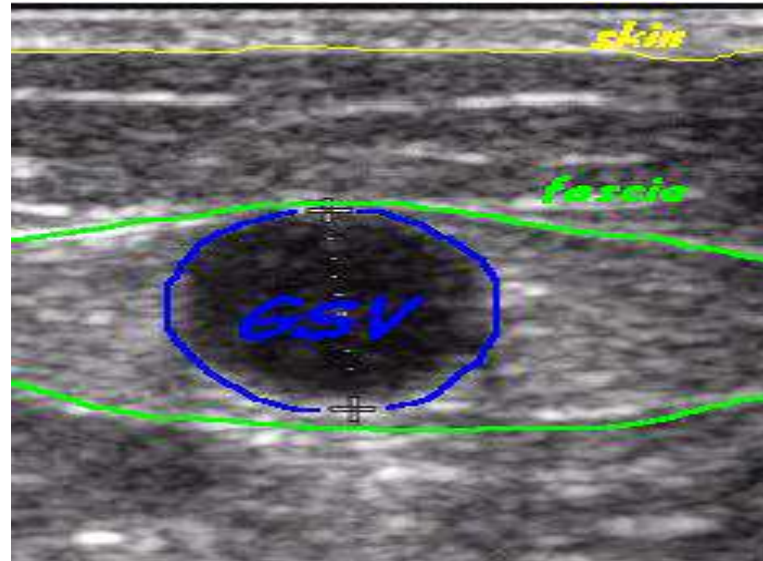


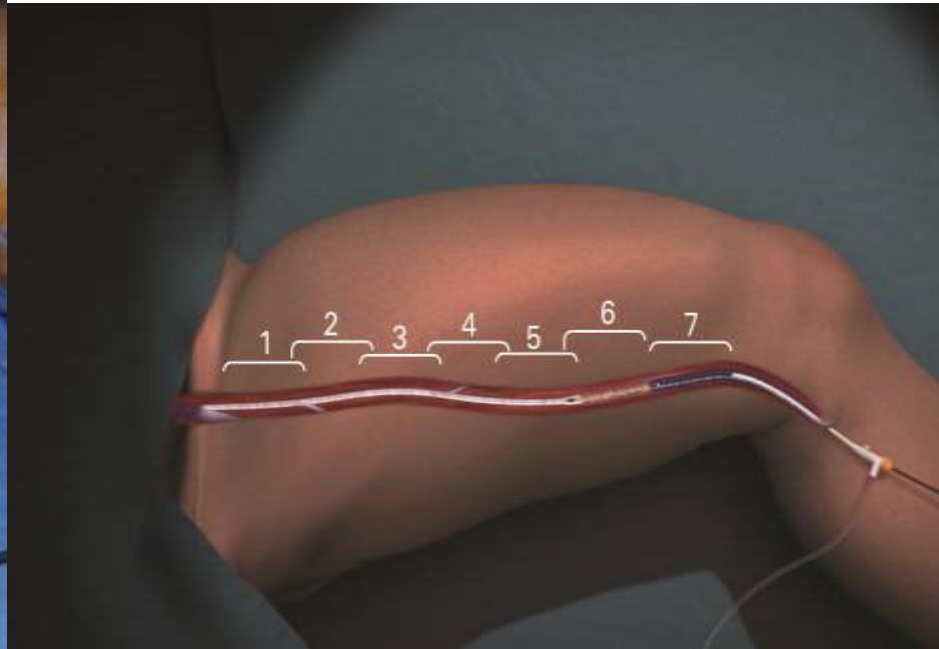
- Purposes
- Provides anesthesia to create a painless procedure
- Acts as a heat sink to focus thermal energy more directly to vein wall
- Protects surrounding tissues from thermal injury
- Dilute local anesthetic or saline
- Recommended volume 10cc/cm of vein to be treated
- >1cm circumferential ring around vein

Tumescent Fluid Preparation

- Typical solution 1% lidocaine with epinephrine (adrenaline) (1:100,000)
- Sterile, injectable normal (physiological) saline (0.9%)
- Sodium bicarbonate (8.4%)

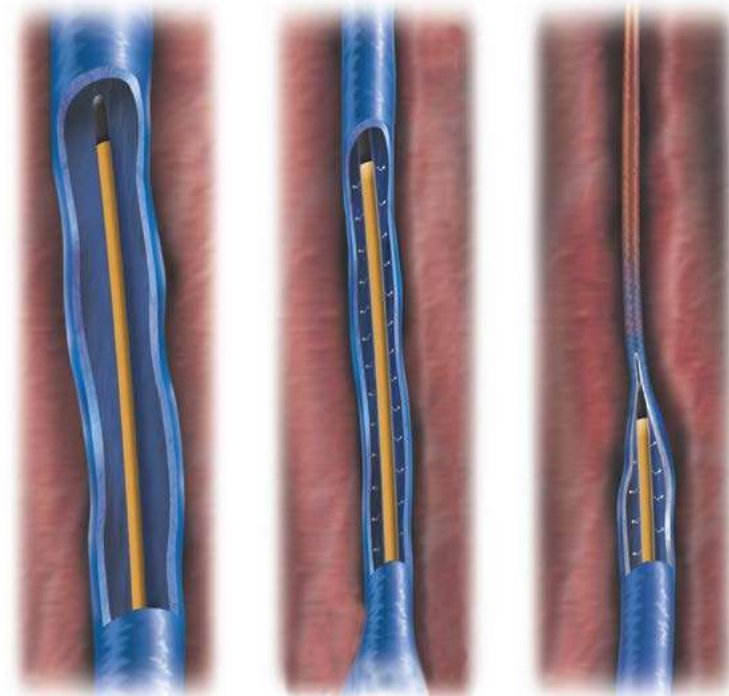






RFA

- **Acutely:**
 - **Endothelial denudation**
 - **Thrombus formation**
 - **Thickened vein walls**
 - **Neutrophil inflammation**
-
- After 6 weeks: Abundant new collagen with fibrosis of the vein wall and encroachment on the vein lumen with persistent closure



Disposable catheter
inserted into vein

Vein heats
and collapses

Catheter withdrawn,
closing vein

Sample Post Operative Management



- Post procedure
- Compression to minimize discomfort and assist in finalizing complete closure of vein
- Exchange for thigh high or pantyhose graduated elastic compression stocking (at least 20-30mmHg) worn for 7 – 14 days
- Recheck ultrasound to exclude DVT within 72 hours
- Venous insufficiency study in 4 weeks to ensure closure

Laser vs. RFA

RECOVERY Trial : A comparison of the patient experience between those treated with the ClosureFAST™ Catheter vs. 980nm Endovenous Laser

- Six center, single-blinded randomized trial
- 69 patients; 87 limbs treated (46 CLF; 41 EVL)
- Patient follow up at 2, 7, 14, and 30 days after treatment

Laser vs. RFA

RECOVERY Trial: Summary

- Compared to 980 nm laser ablation, at 14 days, treatment with RFA produced significantly:
- Less pain $p < 0.0001$
- Less bruising $p < 0.0001$
- Less tenderness $p = 0.0005$
- Greater improvement in VCSS scores $p = 0.0035$
- Better global quality of life scores $p = 0.045$



Puggioni et al 2005: Retrospective review of 92 patients, 130 limbs

All had: symptomatic varicose veins by CEAP criteria
Women
Clinical Presentation: C2-4
Etiology: primary



EVLT
↓
Veins of all sizes:
14 W; 810nm; 3mm/s
withdrawing speed

RFA
↓
Veins 2 - 12mm:
Temp 82- 90; 3cm/min
withdrawing speed

Puggioni A, Kalra M, Carmo M, Mozes G, Gloviczki P. Endovenous laser therapy and radiofrequency ablation of the great saphenous vein: analysis of early efficacy and complications. J Vasc Surg. 2005 Sep;42(3):488-93.





EVLT and RFA analysis of early complications: Puggioni et al 2005

<i>Complication</i>	<i>EVLT (%)</i> <i>(n = 77)</i>	<i>RFA (%)</i> <i>(n = 53)</i>	<i>P</i>
Urinary retention	1 (1.3)	0	0.99
Thrombophlebitis	4 (5.2)	0	0.15
Cellulitis	2 (2.6)	0	0.51
Excessive pain	3 (3.9)	3 (5.7)	0.69
Hematoma	1 (1.3)	0	0.99
Edema	2 (2.6)	1 (1.9)	0.51
Total	13 (16.8)	4 (7.6)	0.2

EVLT, Endovenous laser therapy; *RFA*, radiofrequency ablation.

- EVLT was associated with a somewhat higher occlusion rate, but post-op complications were more frequent
- All patients should undergo early post-operative duplex to rule out proximal extension of thrombus, exclude distal DVT, and confirm occlusion



Thank You