Varicose Veins

Steven M. Dean, DO, FACP, RPVI
Associate Professor of Internal Medicine
Department of Internal Medicine
Division of Cardiovascular Medicine
The Ohio State University Wexner Medical Center

Chronic Venous Disease

Definition: A spectrum of signs and symptoms that ranges from spider and varicose veins to chronic venous insufficiency.

Definition

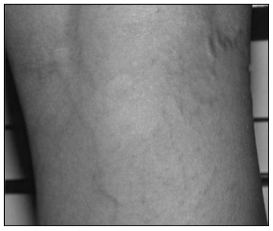
Spider Veins or *Telangiectasias*

- **Non raised dilated intradermal veins/venules**
- **Typically ≤ 1 mm in diameter**
- **Appear earlier than varicose veins**
- **Blue or Red**

Photos courtesy of Dr. Eric Mowatt-Larssen

Reticular Veins

- **Dilated, non-palpable subcutaneous veins**
- **Blue-green**
- **1-3 mm**
- **Sometimes coexist with and "feed" telangiectasias**



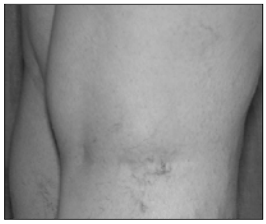


Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

Prevalence

Varicose Veins

- **Dilated, tortuous, *palpable* subcutaneous veins ≥ 3 mm (upright)**
- **Synonyms: varix, varices, varicosities**
- **Involve great and/or small saphenous veins (GSV/SSV) or any superficial vein tributaries**

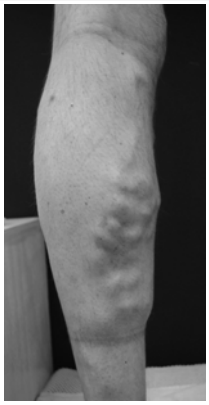


Photo courtesy of Dr. Mowatt-Larssen

Varicose Veins may be found in the teen years

	740 pts 10-12 y/o	518 pts 14-16 y/o	459 pts 18-20 y/o
Varicose Veins	0	1.7%	3.3%

Schultz-Ehrenburg, U et al, Phlebologie. 1992 45(4):497-500

Prevalence of Spider & Varicose Veins

Reference, year	Country	C1 All (%)	C1 M (%)	C1 F (%)	C2 All (%)	C2 M (%)	C2 F (%)
Criqui,** 2003[18]	USA	51.6	43.6	55.9	23.3	15.0	27.7
Jawien,** 2003[19]	Poland	16.5			21.8		
Rabe,** 2003[14]	Germany	59.1	58.4	59.5	14.3	12.4	15.8
Carpentier,*** 2004[15]	France					23.7	46.3
Chiesa,*** 2005[16,17]	Italy	64.8	33.4	69.9	29.4	29.3	29.4*

Rabe E. Identifying and accessing patients with chronic venous disease: the large-scale VCP International Study MEDICOGRAPHIA, Vol 33, No. 3, 2011

Epidemiology

Varicose & Spider Veins

- **Varicose veins occur in 2-3% of teens**
- **Varicose veins occur in ~25% of adults**
- **Spider veins occur in ~ 60% of adults**
- **Spider and varicose veins are 2-3 times more likely to affect females**

Varicose Vein Risk Factors

- **Family history**
- **Age**
- **Pregnancy**
- **Female**
- **Occupation requiring prolonged standing and/or straining**
- **Sedentary occupation and/or lifestyle**
- **Obesity**
- **Height**
- **Neuromuscular disorder**

Varicose Veins are a Hereditary Disorder

134 families examined

The risk of developing varicose veins:

- 89% if both parents had varicose veins
- 47% if one parent had varicose veins
- 20% of neither parent had varicose veins

Autosomal dominant with incomplete penetrance

Cornu-Thenard, A, J Dermatol Surg Oncol 1994 May; 20(5):318-26.

Multiparity: A Risk Factor for Varicose Veins

405 women with varicose veins

- 13% had one pregnancy
- 30% had two pregnancies
- 57% had three pregnancies

Mullane DJ Am J OB Gyn 1952; 63:620

Varicose Veins increase with Age

Age	% of Men with Varicose Veins	% of Women with Varicose Veins
25	3	3
45	11	18
65	38	31

Widmer, et al Peripheral Venous Disorders, 1978

Classification of Varicose Veins 3 potential mechanisms

1. Primary- intrinsic morphological and/or biochemical vein wall abnormality which leads to loss of elasticity; local or multifocal; *most common*
2. Secondary- prior DVT (PTS), deep venous obstruction, AVF, prior STP
3. Congenital- associated with vascular malformations

The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum

"We recommend that primary venous disorders, including *simple varicose veins*, be *differentiated* from secondary venous insufficiency and from congenital venous disorders because the three conditions differ in pathophysiology and management."

Gloviczki et al. *J Vasc Surg* 2011;53:2S-48S.

Anatomy & Physiology

Classification of Varicose Veins 3 potential mechanisms

Photo courtesy of Dr Larssen

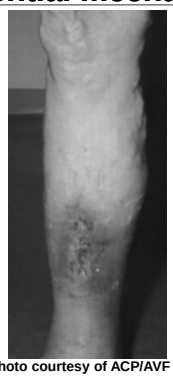
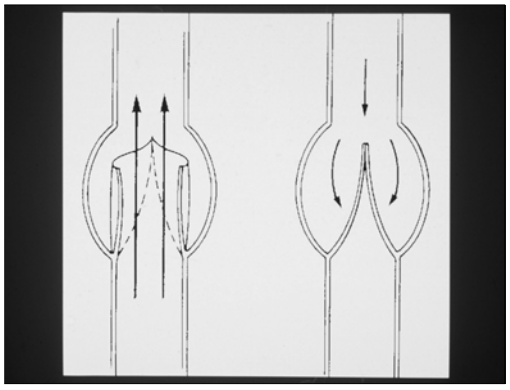


Photo courtesy of ACP/AVF

Competent venous valve

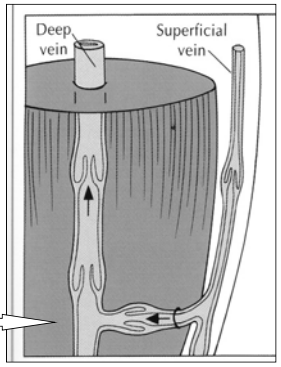


3 types of lower extremity VEINS

Physiologic Blood Flow:

Superficial to Deep Veins

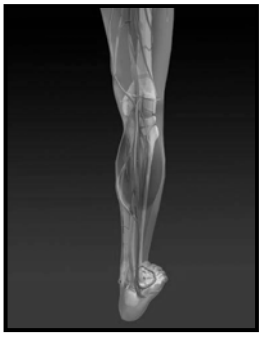
Perforating Vein



"Up & In"

Bradbury & Ruckley. Atlas of Vascular Disease. 2nd edition 2003. Current Medicine, Inc

Superficial venous system



Small saphenous vein

- **-runs from lateral foot up posterior calf**
- **-variations in termination**

Illustration by Linda S. Nye

Superficial venous system

Illustration by Linda S. Nye

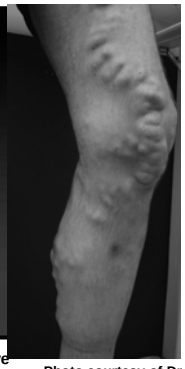


Photo courtesy of Dr Larssen

Great saphenous vein

- **-runs from dorsum of foot medially up leg**
- **-ALTV, PMTV common tributaries**

Perforating or "communicating" veins

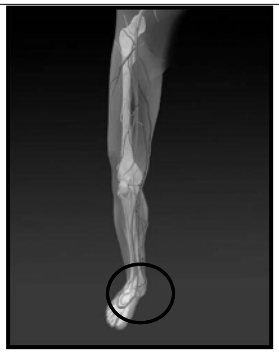


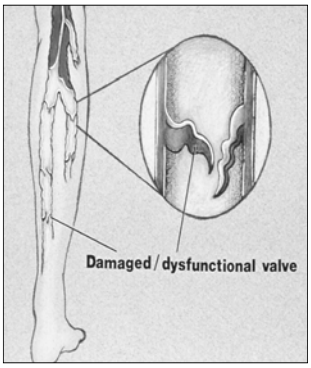
Illustration by Linda S. Nye

- **Hunterian**
- **Dodd**
- **Boyd**
- **Cockett**
- **Gastrocnemius**
- **Lateral thigh (lateral subdermic plexus)**

Macrovascular Pathophysiology

Venous Valvular Dysfunction

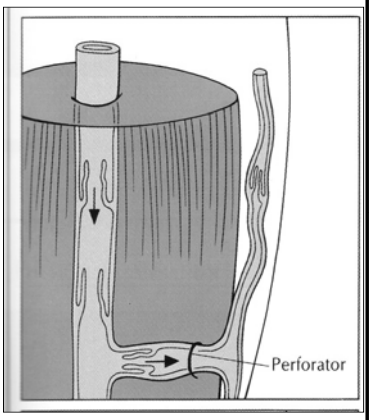
- **Dilation of vein wall prevents opposition of valve leaflets, resulting in *reflux***
- **Valvular fibrosis, destruction, or agenesis results in *reflux***



Pathological Venous Blood Flow

Deep to Superficial Veins

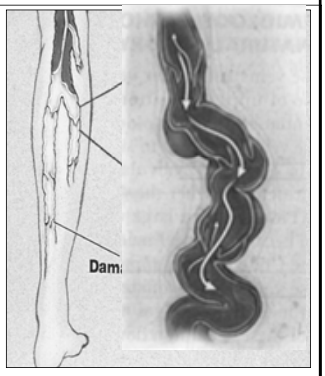
"Down & Out"



Bradbury & Ruckley. Atlas of Vascular Disease. 2nd edition 2003. Current Medicine, Inc

Venous Valvular Dysfunction

- **Dilation of vein wall prevents opposition of valve leaflets, resulting in *reflux***
- **Valvular fibrosis, destruction, or agenesis results in *reflux***



Hamden. JAMA 2012. 308(24): 2612-21

History

Manifestations of chronic venous disease [Varicose veins and CVI]

- Pain
- Stinging
- Burning
- Aching
- Fatigue
- Heaviness
- Throbbing

Exacerbation: dependency heat

Relief: elevation compression

- Swelling
- Pruritus
- Ulcers
- Nocturnal leg cramps
- Restless legs syndrome
- Peripheral neuropathy
- Venous claudication

History

- History of problem: onset, pregnancies, prior DVT, immobilization
- Associated symptoms and relationship to heat, menses, exercise and compression
- Current medications
- Family history
- Previous treatment and result

History: Important!

- Varicose Veins typically cause *focal* pain and other varicose related symptoms.
- Pain and other manifestations *away* from varicose veins (especially when *diffuse*) is suggestive of reflux within the major axial superficial and/or deep veins!
- Isolated varicose and spider veins do not cause significant swelling!

Physical Examination

CEAP: Clinical Classification of Chronic Venous Disease

C_0	No visible or palpable signs of venous disease
C_1	Telangiectases or reticular veins
C_2	Varicose veins
C_3	Edema
C_{4a}	Pigmentation and/or eczema
C_{4b}	Lipodermatosclerosis and/or atrophie blanche
C_5	Healed venous ulcer
C_6	Active venous ulcer

>C3 = CVI

Eklöf B et al. Revision of the CEAP classification for chronic venous disorders: consensus statement. *J Vasc Surg* 2004;40:1248-52.

The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum

1. Clinical examination

For clinical examination of the lower limbs for chronic venous disease, we recommend inspection (telangiectasia, varicosity, edema, skin discoloration, corona phlebectatica, lipodermatosclerosis, ulcer), palpation (cord, varicosity, tenderness, induration, reflux, pulses, thrill, groin or abdominal masses), auscultation (bruit), and examination of ankle mobility.

***Examine patient in the standing position*!**

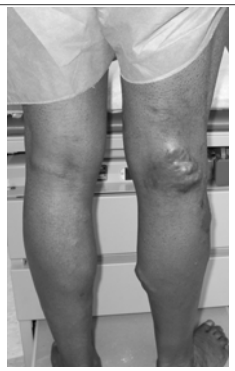
Gloviczki et al. *J Vasc Surg* 2011;53:2S-48S.

Varicose Veins [C2] – Great Saphenous Vein Distribution

- **Most common finding in patients with varicose veins**
- **Varicosities along the medial thigh and calf**

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

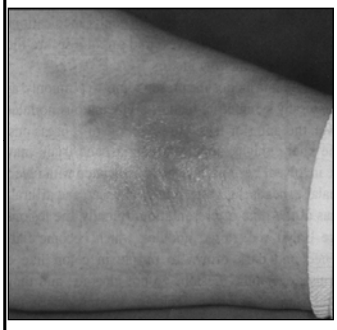
Varicose Veins [C2]– Small Saphenous Distribution



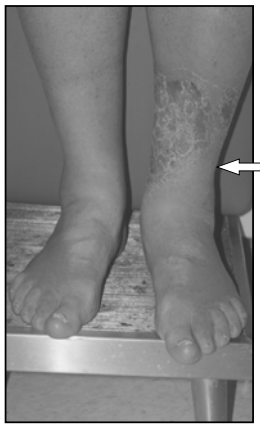
- Less frequent than Great Saphenous involvement
- Varicosities may be seen on the posterior calf and lateral ankle
- Skin changes are seen along the lateral ankle

Photo courtesy of Dr. Marcus Stanbro

Acute Lipodermatosclerosis: [C_{4b}]



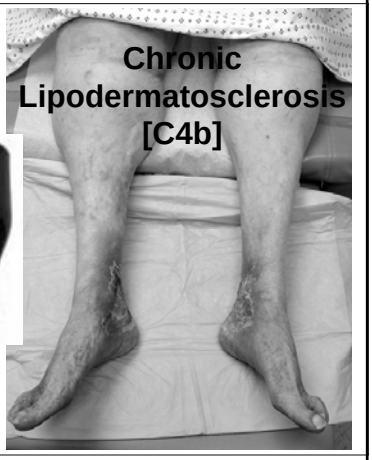
- Acute inflammation within the distal medial calf
- DDX: cellulitis, superficial thrombophlebitis



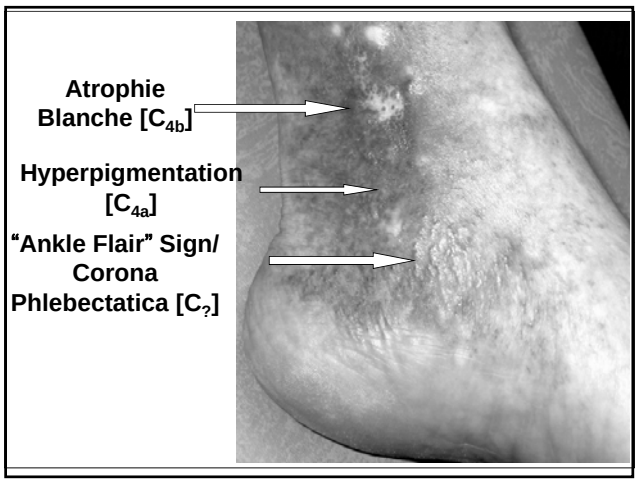
⇐ Swelling [C_3]

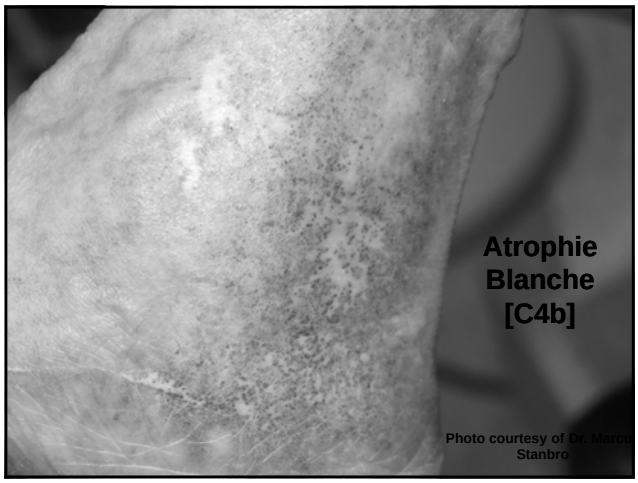
Chronic eczematous stasis dermatitis [C_{4a}]

Inverted "Champagne Bottle" or "Bowling Pin" Legs



Chronic Lipodermatosclerosis [C4b]





Healed ulceration [C5]

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

Stasis Ulcerations [C6]

Unusual presentations

Muscle fascia herniation

Photo courtesy of Dr. Marcus Stanbro

- Frequently confused with varicose veins
- Usually found on the lateral calf
- Bulge disappears with dorsiflexion of the foot
- No flow is audible with continuous-wave Doppler examination

Varicose Veins of Pelvic Origin

- Begin during pregnancy
- Increased symptoms during pre-menstrual period
- May be associated with *pelvic congestion syndrome* (internal iliac and/or gonadal vein reflux)- dysuria; dyspareunia; pelvic heaviness

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

Duplex ultrasonography

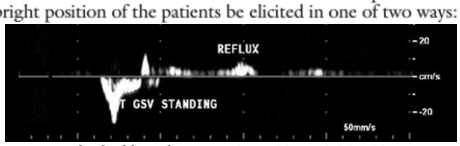
The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum

2. **Duplex scanning**

We recommend that in patients with chronic venous disease, a complete history and detailed physical examination are complemented by duplex scanning of the deep and superficial veins. The test is safe, noninvasive, cost-effective, and reliable.

We recommend that the four components of a complete duplex scanning examination for chronic venous disease should be visualization, compressibility, venous flow, including measurement of duration of reflux, and augmentation.

We recommend that reflux to confirm valvular incompetence in the upright position of the patients be elicited in one of two ways:



Gloviczki et al. *J Vasc Surg* 2011;53:2S-48S.

Varicose Veins: Treatment

Blair Vermilion, MD
Associate Professor of Clinical Surgery
Division of Vascular Diseases and Surgery
The Ohio State University Wexner Medical Center

Therapy with Dr. Vermilion

Venous Disease: Treatment Guidelines

- **Make the correct diagnosis**
  - **History and Physical**
  - **Appropriate testing**
    - **Document any arterial disease**
    - **Document level and degree of reflux**
- **Try conservative methods first**
- **Educate the Patient regarding realistic outcomes and potential complications**
- **Compliance, Compliance, Compliance**

Venous Disease: Treatment Options

- Compression Therapy
- Sclerotherapy
- Surgery
  - Thermal ablation (Laser or Radio Frequency)
  - Phlebectomy
  - "Stripping"
  - SFJ Ligation
- Combination of any and all of the above

Venous Disease: Compression Therapy

- Contraindications for Compression Therapy
  - Diminished Arterial Flow (<70 mm Hg)
  - Acute DVT without sufficient collaterals
  - Severe CHF
  - Undefined, non-venous Ulcers

Venous Disease: Compression Therapy

- Indications for Compression Therapy
  - Chronic Venous Insufficiency
  - Venous Ulcers, Dermatitis
  - Post Sclerotherapy or Surgery
  - Superficial Phlebitis
  - DVT (with anticoagulation)
  - Post Phlebitic Syndrome

Venous Disease: Compression Therapy

- Unna's Boot
  - Calamine lotion and zinc oxide
  - High working pressure
  - Low resting pressure
  - Can be worn at night
  - Use for Dermatitis, Ulcers
  - Can be changed once/week

Venous Disease: Compression Therapy

- Ace Wrap: Bandaging Principles
  - Start at the base of the toes
  - Apply no more than 50% stretch
  - Overlap ~50% to avoid skin pinching
  - Oblique turns (not circular) to minimize constriction
  - Dorsiflex ankle joint when applying bandage
  - Foam padding to protect malleolar or thin-skinned area
  - Graduated pressure is achieved by applying even pressure. Smaller diameter areas have increased pressure with equal tension
  - Increase pressure by applying multiple layers

Venous Disease: Compression Therapy

- 15 to 20 mm Hg
  - Leg fatigue, mild varicies
- 20 to 30 mm Hg
  - Aching, heaviness, mild edema, moderate varicies, post sclerotherapy
- 30 to 40 mm Hg
  - Post phlebitic syndrome, severe edema, lipodermatosclerosis, ulcerations, failure of lower compressions
- 40 to 50 mm Hg
  - Lymphedema, failure of lower compressions

Venous Disease: Compression Therapy

- Gradient support stockings
  - Low working pressure—minimal effect on deep venous return
  - High resting pressure—excellent reflux prevention
  - Uniform application with right size
  - Can be hard to get on
  - Uncomfortable at night due to high resting pressure
  - Great for maintenance and long term treatment
  - Reduces further dilatation of Varicose Veins
  - Examples Sigvaris, Jobst, Medi

Sclerotherapy

- Guidelines
  - Works best if no reflux from truncal veins
  - Treat larger veins first
  - Treat proximal to distal
  - Treat entire vessel
  - Maintain post injection compression
  - Ambulate patient
  - Re-evaluate @ 7 to 10 days
  - Select solution and concentration based on vein size

Venous Disease: Sclerotherapy

- Complications of Sclerotherapy
  - Vasovagal Attack
  - Allergic reaction
  - Skin necrosis
  - Venous thrombosis
  - Arterial Injection/injury
  - Nerve Injection/injury
  - Skin Discoloration (Hyperpigmentation)
  - Telangiectatic matting

Sclerotherapy

- Mechanism:
  - Solution causes irreversible chemical damage to the endothelial cell layer
  - Size of vein and flow in vein are variable therefore results are variable
  - Results in “zones” of injury

Venous Disease: Sclerotherapy

- Contraindications to Sclerotherapy of Varicose Veins
  - Bedridden Patient
  - Severe Arterial Disease
  - Hypercoagulable state
  - Pregnancy
  - Morbid Obesity
  - Poor tolerance of compression hose
  - Allergies to the agents used

Types of Sclerosants

- Detergents:

1. Sodium Morrhuate: Fatty acid extract from Cod liver oil. Can cause extensive necrosis and possible anaphylaxis
2. Ethanolamine Oleate: synthetic and has high viscosity
3. Sotradechol: synthetic FFA, reliable and safe; tends to cause hyperpigmentation in higher concentrations
4. Polidocanol: synthetic FFA; not FDA approved; very safe; rare anaphylaxis and minimal hyperpigmentation
5. Glycerin: very weak and very viscous; rarely causes hyperpigmentation, necrosis or matting

Types of Sclerosants

- Hypertonic and Ionic Solutions:
  1. Hypertonic Saline: not effective in larger veins due to dilution; high incidence of staining and necrosis; painful
  2. Sclerodex: 25% Dextrose + 10%NaCl + phenethyl alcohol; painful and can cause necrosis
  3. Polyiodinated Iodine: Not FDA approved but used some in Europe

EndoVenous Laser Treatment

- Ambulatory procedure
- Can be done in most cases under local, tumescent anesthesia with sedation
- Patients typically resume activity immediately and see results quickly, with minimal chance of scarring, sutures, long hospital stay, lengthy recovery, or surgical complications

EndoVenous Laser Treatment

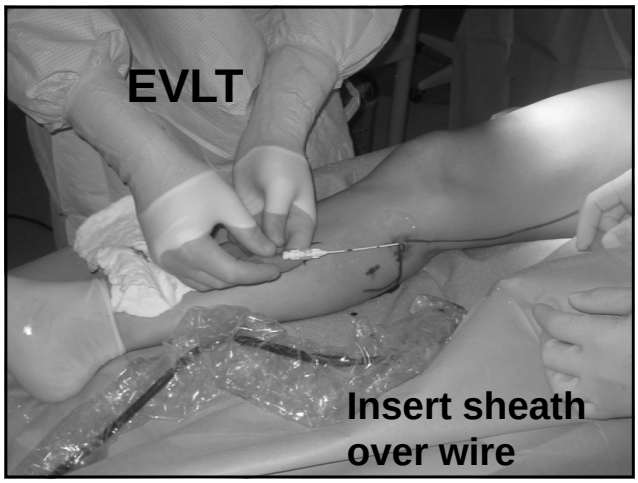
- Results in ablation of treated vein
- The laser introduces thermal energy to the venous tissues, causing irreversible localized venous tissue damage
- Laser energy (most commonly from an 810-nm diode laser) is delivered inside the vein through a bare laser fiber that has been passed through a sheath to the desired location
- The laser is continuously fired (or in pulses) as the laser fiber is gradually withdrawn along the course of the vein until the entire vessel is treated

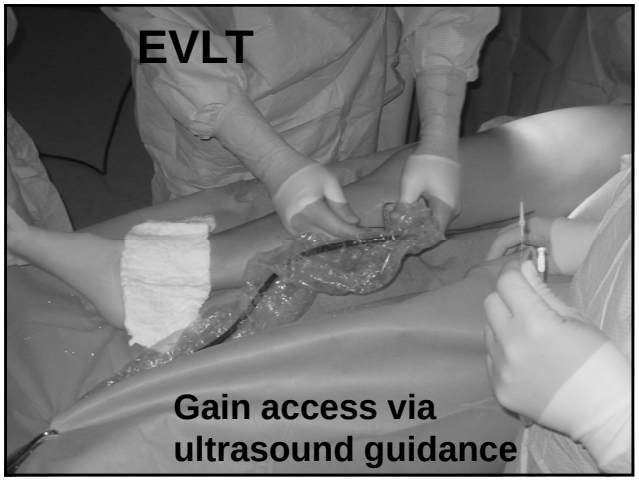
EndoVenous Laser Treatment

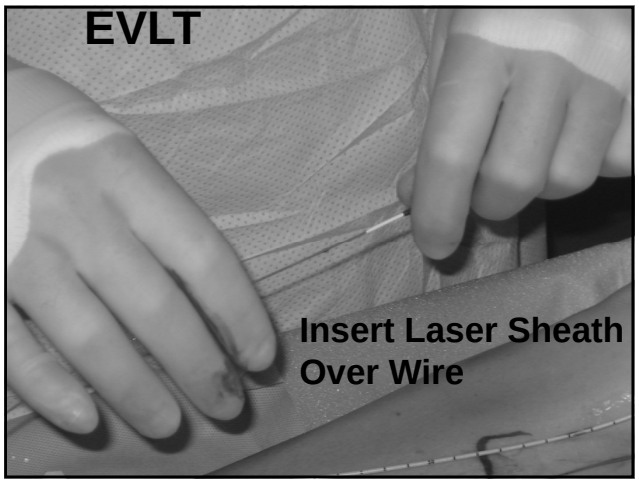
- Disadvantages:
  - 3% failure rate
  - Ecchymosis
  - Paresthesias
  - DVT (1%)
  - Not as effective on larger (>1.5cm.) veins

EndoVenous Laser Treatment

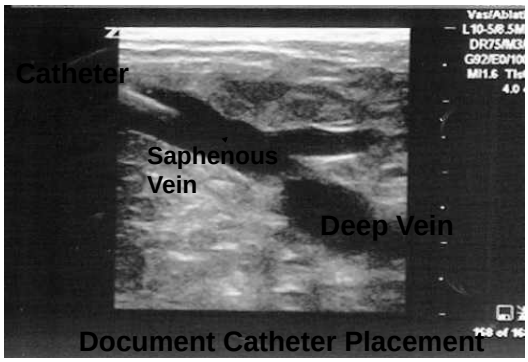
- **Safety Issues**
- **Lasers emit beams of non-ionizing optical radiation**
  - **Eye Hazards: retina/ corneal**
  - **Skin Hazards**
  - **Fire Hazards**



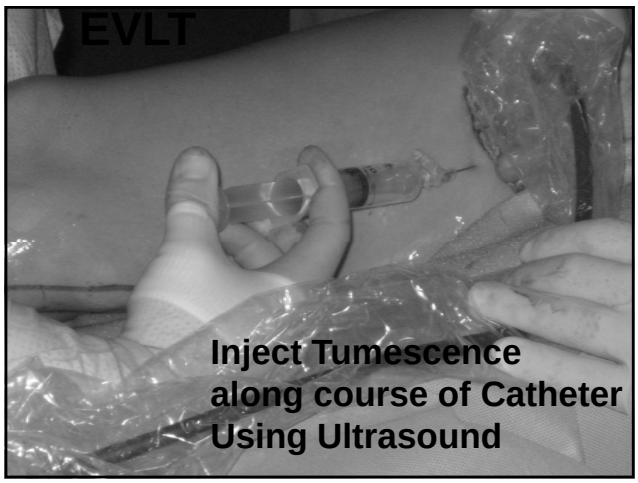




EVLT



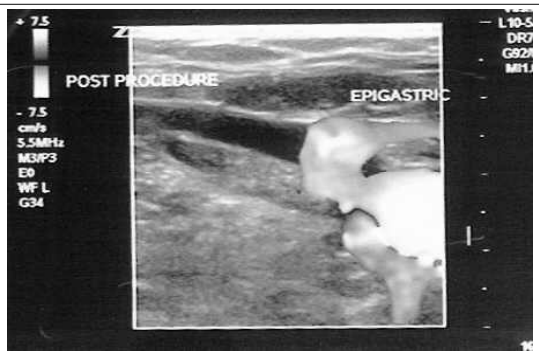
Document Catheter Placement



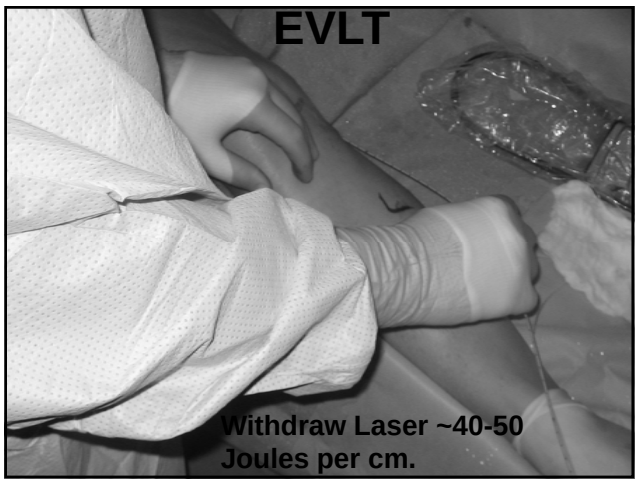
EVLT: Tumescent

Tumescent:
- Provides Anesthesia
- Dissipates heat
- Collapses Vein

EVLT: Post Procedure Ultrasound



Document GSV Ablation



EVLT

Withdraw Laser ~40-50 Joules per cm.

EndoVenous Laser Treatment

- **Case Presentation:**
  - **45 y.o. female, Varicosities**
  - **Sx: Aching, heaviness**
  - **P.E. Visible varicosities**
  - **Conservative Rx failed**
  - **U/S: Reflux GSV to below knee**

EndoVenous Laser Treatment

Next Day

Saphenous Vein Stripping

- "GOLD STANDARD"
- STEPS:
  - Incisions at groin and ankle or lower leg
  - Ligate and divide S-F junction
  - Pass stripper from Lower leg to groin inside vein
  - Tie vein to stripper and pull stripper out, avulsing the vein
- COMPLICATIONS :
  - Hematoma, Wound infection, parasthesia of the saphenous nerve
- OTHER DISADVANTAGES
  - Pain, bruising, time off work, anesthesia, groin incision

EndoVenous Laser Treatment

- **Results of Treatment:**
  - **90% - 98% Resolution of reflux**
  - **85% resolution of Visible Veins**
  - **96% improvement of pre-op symtoms**
  - **Compared to Vein Stripping**
    - **Less costly in ambulatory setting**
    - **Quicker recovery**
    - **Less post-op pain**

Stripping: Varicosity Recurrence

Blomgren	57%	6-10 years
Sarin	35%	21 months
Jones	25%	2 years
Dwerryhouse	23%	5 years

- **Blomgren L, Johansson G, Dahlberg-A, et al. Recurrent varicose veins: incidence, risk factors and groin anatomy. Eur J Vasc Endovasc Surg 2004; 27:269-74.**
- **Sarin S, Scurr JH, Coleridge Smith PD. Stripping of the long saphenous vein in the treatment of primary varicose veins. Br J Surg 1994; 81:1455-8.**
- **Jones L, Braithwaite BD, Selwyn D, et al. Neovascularization is the principal cause of varicose vein recurrence: results of a randomized trial of stripping the long saphenous vein. Eur J Vasc Endovasc Surg 1996; 12:442-5.**
- **Dwerryhouse S, Davies B, Harradine K, Earnshaw JJ. Stripping the long saphenous vein reduces the rate of reoperation for recurrent varicose veins: 5-yr results of a randomized trial. J Vasc Surg 1999; 29:589-92.**

Stab Phlebectomy

- **Office procedure with sedation and/or in conjunction with surgery**
- **Eliminate truncal reflux first**