

**ART OF SKIN**  
MD  
Art of Skin MD  
Solana Beach, CA

# Dermatologic Cosmetic Surgery III: Treatment of Leg Veins

**ABCS Board Review**  
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## Disclosure

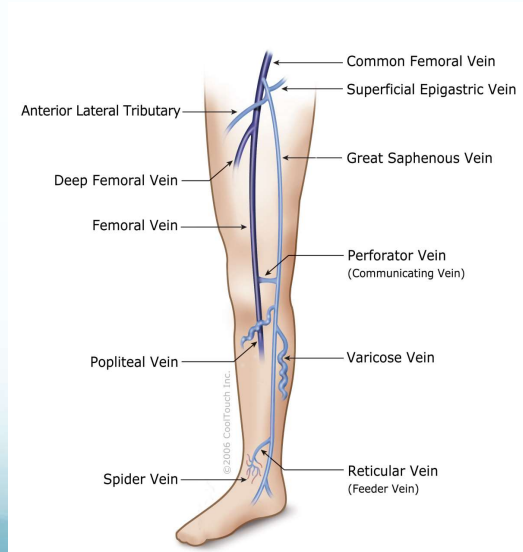
- Galderma: speaker, physician trainer, clinical investigator, advisory board member
- Allergan/Kythera: speaker, trainer, clinical investigator, advisory board member
- Merz: advisory board member
- Lumenis: speaker, physician trainer
- Lutronic: speaker, consultant
- BTL: speaker, clinical investigator

## Topics for Discussion

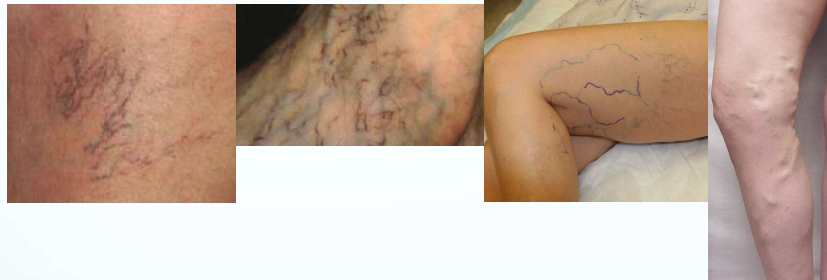
- Basic vein anatomy
- Sclerotherapy
- Endovenous laser ablation

## Vein Anatomy

# Venous System



# Vein Categorization



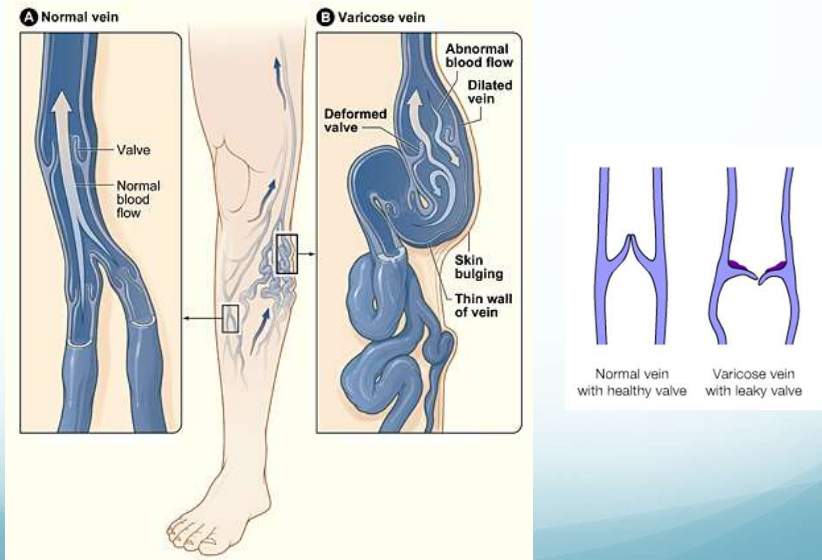
Telangiectasias

Venulectasias

Reticular Veins

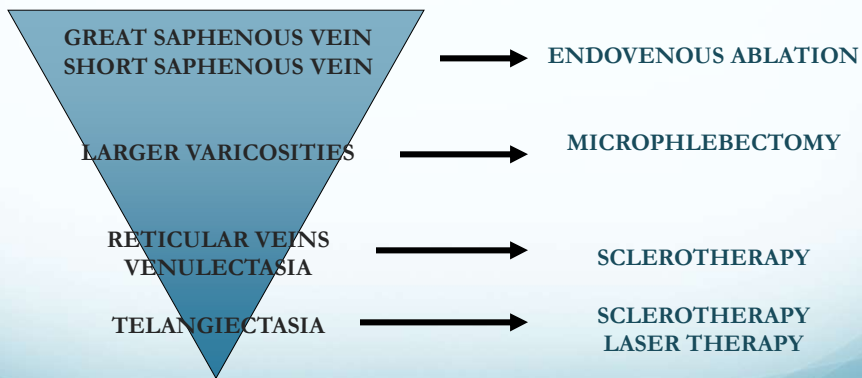
Varicose Veins

# Leaky Valves = Varicose Veins



## Treatment is Algorithmic

Everything is connected in a hierarchical way  
Therapy must start from a top down approach



# Sclerotherapy

## Sclerotherapy: Introduction

- Injection of vessels with foreign substance, leading to vessel wall damage (endothelial damage), and subsequent vessel occlusion
- Vessel size is most significant prognostic factor in treatment success
- Sclerosants used:
  - Hypertonic saline (typically small vessels)
  - Glycerin (typically small diameter vessels, <1 mm)
  - Detergents (sodium tetradecyl sulfate, polidocanol)
    - Lower concentration for small vessels
    - Higher concentrations for larger vessels
- Complications
  - Pain, hyperpigmentation, telangiectatic matting, skin ulceration, urticaria, superficial thrombophlebitis, arterial injection (skin necrosis/slough + pain), nerve damage/paresthesias, migraines, DVT, PE, air embolism with foam (scintillating scotomata, TIA, CVA)

## Hypertonic saline

- First used to sclerose varicose veins in 1920s
- MOA: osmotic agent—nonspecific destruction of all cells
- Advantages: no allergenicity
- Disadvantages:
  - **PAIN** at injection site
  - Nonspecific destruction of tissues→**ULCERATION**
  - Muscle cramps
  - Ineffective on varicose veins
- Maximum dose: 20 mL/session
- Application: telangiectasias, venulectasias

## Glycerin

- Sugar solution, often prepared as 72% glycerin 2:1 with 1% lido with epi
- MOA: chemical irritant to vessel wall
- Advantages: Low incidence of side effects
  - Hyperpigmentation or skin necrosis exceedingly rare
- Disadvantages:
  - Local discomfort at injection site
- Maximum dose: 10 mL of pure solution
  - Overdose: hematuria
- Application: telangiectasias, venulectasias

## Detergents: Sodium Tetradecyl Sulfate (STS) & Polidocanol

- Detergent, often foamed
- MOA: soap is destructive to endothelium
- Foam sclerotherapy (Tessari technique)
  - Allows lower effective concentration of sclerosant to be used
  - Extravasated foam better tolerated
  - Allows direct contact with endothelial wall
  - Displacement of blood, increased vasospasm
  - Easy identification of solution during procedure
- Disadvantage of Foam:
  - **Screen for PFO: visual disturbances, TIA/CVA**

## Sodium Tetradecyl Sulfate (STS)

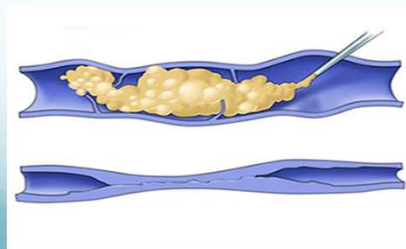
- FDA-approved in 1946 for varicose vein treatment
- Advantages:
  - Very mild discomfort on injection
- Disadvantages:
  - Solution is light-sensitive
  - **Foamed solution + PFO: visual disturbances, TIA, CVA**
  - **Skin ulceration** with solution extravasation
  - **Hyperpigmentation** with increasing concentrations
- Maximum dosage: 10 mL/session
- Clinical applications:
  - Larger veins at higher concentrations (1-3%)
  - Smaller reticular veins (0.25-0.5%)
  - Telangiectasias (0.1-0.3%)

# Polidocanol

- FDA-approved in 2010 for spider and reticular vein treatment
- Advantages:
  - Virtually painless injection—anesthetic effect of compound
  - Injected into skin without ulceration
  - Very low risk of hyperpigmentation
  - Low risk of allergic reaction
- Disadvantages:
  - **Foamed solution + PFO: visual disturbances, TIA, CVA**
  - Transient urticaria and pruritus
- Maximum dosage: less than 2 mg/kg per session (28 cc of 0.5% solution)
- Clinical applications:
  - Varicose veins (1-4% concentration)
  - Telangiectasias (0.25-0.75% concentration)

# Foam Sclerotherapy

- Can be made from a detergent sclerosant
- Increase efficacy of sclerosant in larger vessel
- Bubbles displace blood → increase contact time between sclerosant and vein endothelium
- Lower concentration and volume can be used compared to liquid

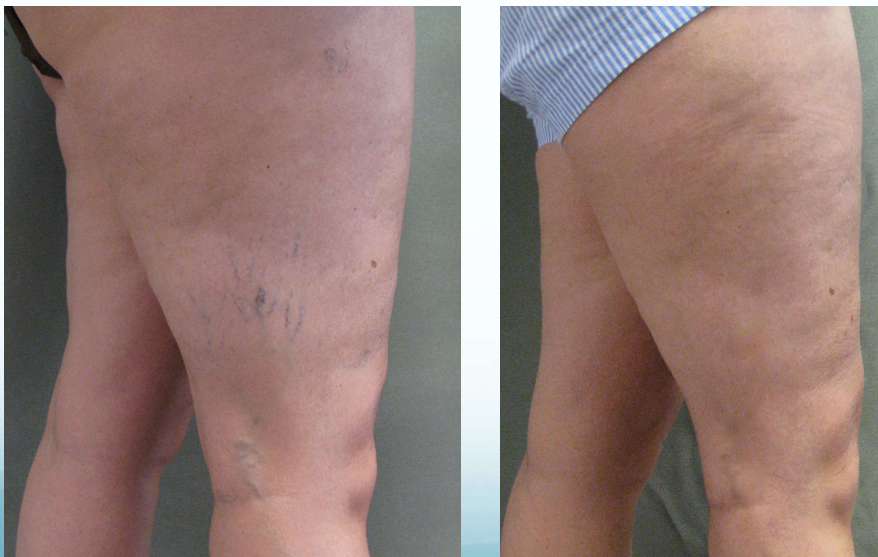




## Sclerotherapy



## Asclera®



## Sclerotherapy



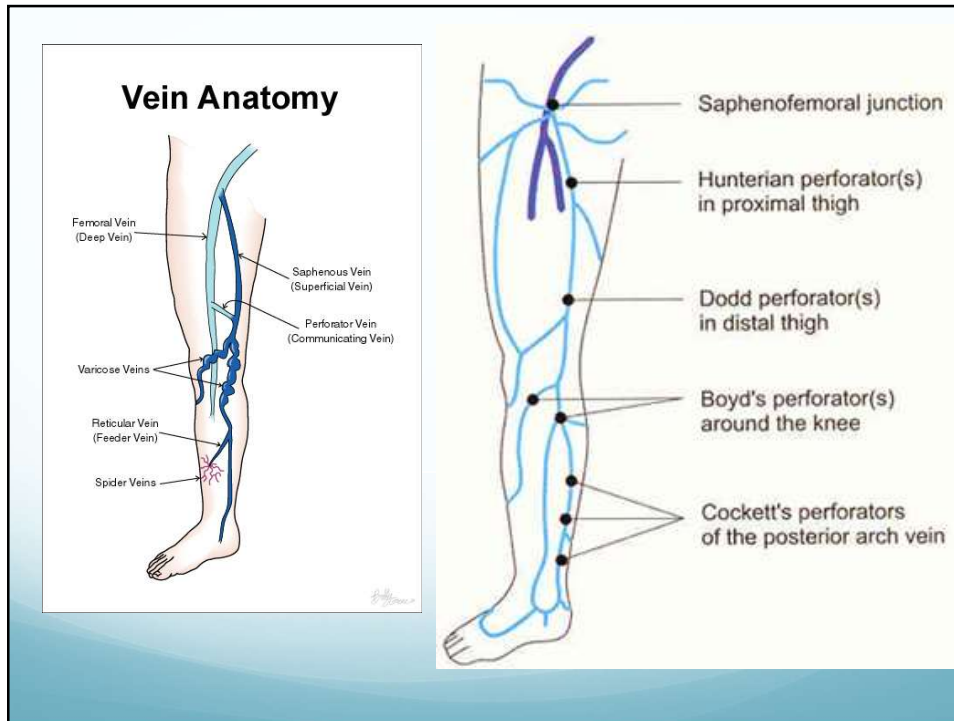
## Sclerotherapy with IPL



## Sclerotherapy with IPL



## Endovenous Laser Ablation



### Closure of the Great Saphenous Vein

<u>PROCEDURE</u>	<u>ADVANTAGES</u>	<u>DISADVANTAGES</u>
<b>Stripping and Ligation</b>	•Gold standard in the past	•General anesthesia •Neuralgia
<b>Foam Sclerotherapy</b>	•Low cost	•?Efficacy
<b>Electrocoagulation</b>	•Early technique (1950s)	•???
<b>Radiofrequency VNUS Closure</b>	•Minimally invasive	•Cost
<b>Intravascular Lasers</b> •810, 940, 980, 1064, 1320, 1470, 1500		

## Traditional Ligation and Stripping with avulsion of varicose tributaries



## Endovenous Ablation: Indications

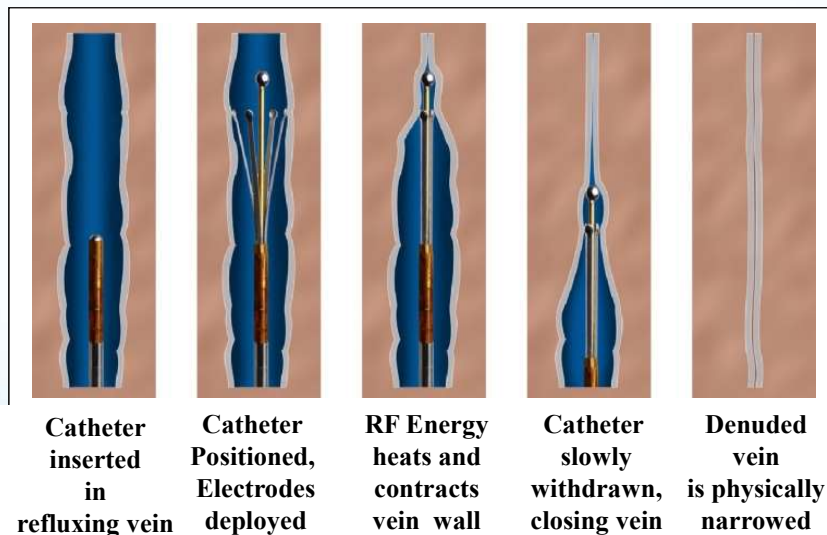
- Ambulatory patients
- Signs:
  - Bulging varicose veins
  - +/- venous insufficiency (edema, dermatitis, pigmentation of lower leg, lipodermatosclerosis, venous ulceration, spontaneous hemorrhage)
- Symptoms:
  - Leg heaviness, aching, fatigue, night cramps, pruritus, restless leg syndrome
- Diagnostic findings:
  - Ultrasound findings: Incompetence of GSV
  - Minimal tortuosity of GSV (permits sheath/catheter placement)

# Endovenous Ablation: Contraindications

- Absolute
  - Inability to ambulate
  - Implanted device (Pacemaker, Internal defibrillator)
  - Allergy to local anesthetic
- Relative
  - Vein < 2mm diameter
  - Hypercoaguable state
    - Recent venous thromboembolism
  - Leg infection
  - Lymphedema
  - Peripheral arterial insufficiency
  - Poor general health
  - Pregnancy

# Radiofrequency Ablation

## VNUS Closure<sup>®</sup> Procedure



**A Minimally Invasive Alternative to Ligation & Stripping**

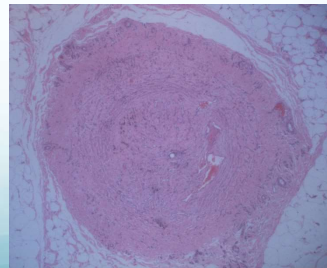
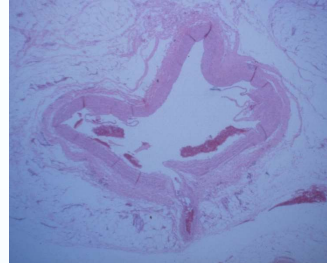
### Non-Expanding Heating Element

- No expanding electrodes
- Vein wall is brought to catheter
  - Perivenous tumescent infiltration
  - External compression required during treatment
  - Reverse Trendelenburg essential
- The vein wall conducts heat
  - Collagen in vein wall conducts heat
  - Adipose tissue and tumescent infiltration insulates surrounding tissue against heat

# Collagen Contraction

Controlled heating of the vein wall causes:

- Shortening and thickening of collagen fibers
- Vein lumen diameter shrinkage
- Fibrotic sealing of the vessel



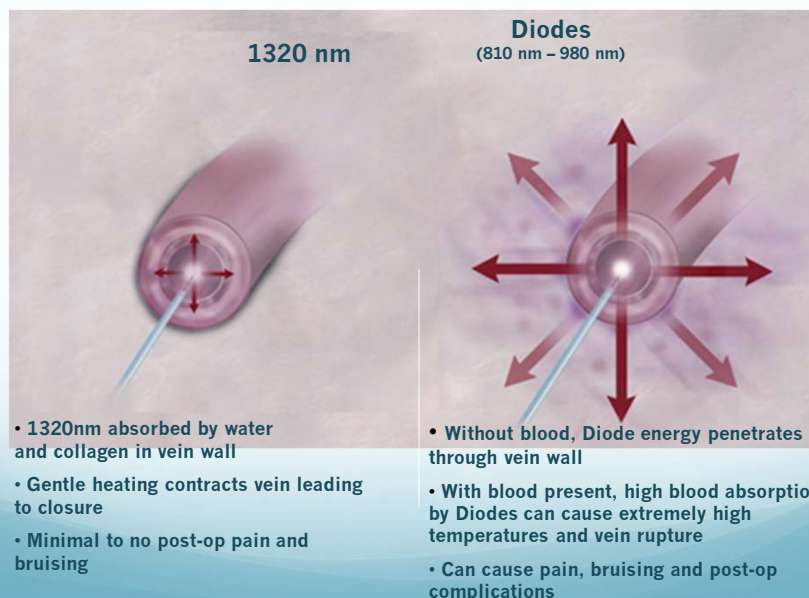
# Endovenous Laser Ablation



## Endovenous Delivery of Thermal Energy

- Larger veins need more energy
  - More energy = more adverse effects
  - Less energy = recanalization
- Amount of energy dictated by wavelength
  - <1320 nm absorbed by Hb/RBC and conducted to vein wall
    - MOA: laser generates steam by heating blood within vein → temperature rise causes vein wall injury → fibrotic occlusion of vessel wall
  - 1320 nm absorbed by water/endothelial cells
    - Collagen/vessel wall injured directly rather than by heating blood

## 1320nm vs. Diodes



## EVLT Technique

- GSV identified through U/S duplex or Doppler
  - U/S guided
  - External marking with manual identification
- Anesthetize access point; Venipuncture of GSV with U/S guidance
- Guide wire (confirm placement), introducer sheath with dilator over guide wire
- Guide wire and dilator removed, laser threaded through sheath to insertion of SFJ, sheath removed
- Tumescant anesthesia (avg. 700ml) to fill fascial sheath enclosing GSV
- Slow withdrawal of laser tip (2cm from SFJ)
- +/- ambulatory phlebectomy



## Outcomes of EVLT Treatment

- 90-100% closure at 12 month follow-up according to clinical studies
  - 83-90% at 2-5 years for RF ablation (VNUS)
- >70% patients resume daily activities within 24 hours
- Compression stockings typically worn for 1 week

# 1320nm CTEV to GSV



Pre-Op



4 months post-op







## Possible Adverse Events of EVLT

- Pain/tenderness 72 hours post-op
- Bleeding: bruising or hematoma
- Swelling
- Lymphocele
- Cellulitis
- Superficial venous thrombosis
- Hyperpigmentation
- Skin ulceration
  - Thin patients, males, superficial GSV
- Paresthesias

## Purpura following EVLT Procedure



The Use of a New Endovenous Laser Device: Results of the 1500 nm Laser.  
Vuysteke, et al Las Surg Med 2009 (in press)

## Diomed 4 months post-op: Hyperpigmentation



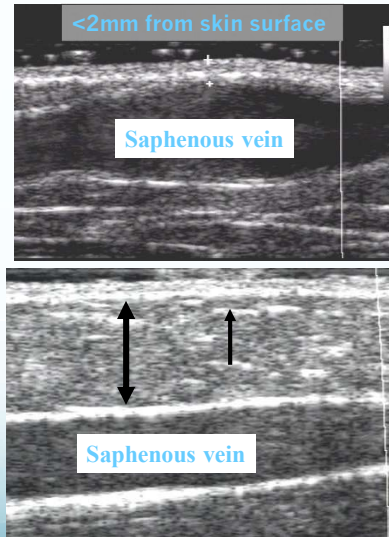
## Avoiding Skin Burns

### Probable risk factors:

- Males
- Thin or muscular legs
- Vein <10 mm of skin

### Prevention

- Saline or dilute lidocaine infiltration
  - Heat sink effect
  - Increases distance between vein & dermis
- Tumescent anesthesia



## Cutaneous Burn from Diomed 810nm EVLT @ 48 Hours



Good luck!

[www.acs-algorithms.com](http://www.acs-algorithms.com)