

Management of Chronic Venous Insufficiency

Jon C. George MD, MBA, FACC, FSCAI, FAHA, FSVM

Director, Complex Interventions

Interventional Cardiology and Endovascular Medicine

Pennsylvania Hospital

Philadelphia, PA



2 0 2 3
Cors
at the
Shore

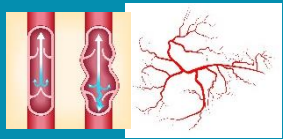
Disclosures

- Consultant
 - Abbott Vascular
 - Boston Scientific
 - Medtronic
 - Philips
 - Siemens



Chronic venous disease and chronic venous insufficiency

- Definition
- Chronic venous diseases (CVDs) refer to other chronic conditions that are related to or caused by veins that have become diseased or abnormal and can include the following¹:



Varicose and spider veins



Leg swelling and pain



Phlebitis



Leg skin changes



Leg ulcers



Chronic Venous Insufficiency (CVI)



Vascular malformation

CVI is defined as venous hypertension of the lower extremities causing signs and symptoms (CEAP classes 3-6).²

Note: Patients with CEAP Class 0 may not have any symptoms, but can still have venous reflux or obstruction and, therefore, CVD.²

Did you know these important facts?

- CVI is a significant public health problem in the United States

~150,000

New patients diagnosed with CVI each year¹

~\$500 Million

Cost associated to care for these patients each year equaling approximately 2% of the United States (US) total healthcare¹

70%

- The number of lower extremity ulcers are venous²
- Prevalence of venous ulcers has doubled in the last 20 years²



2 0 2 3
**Cors
at the
Shore**

Prevalence of venous reflux disease

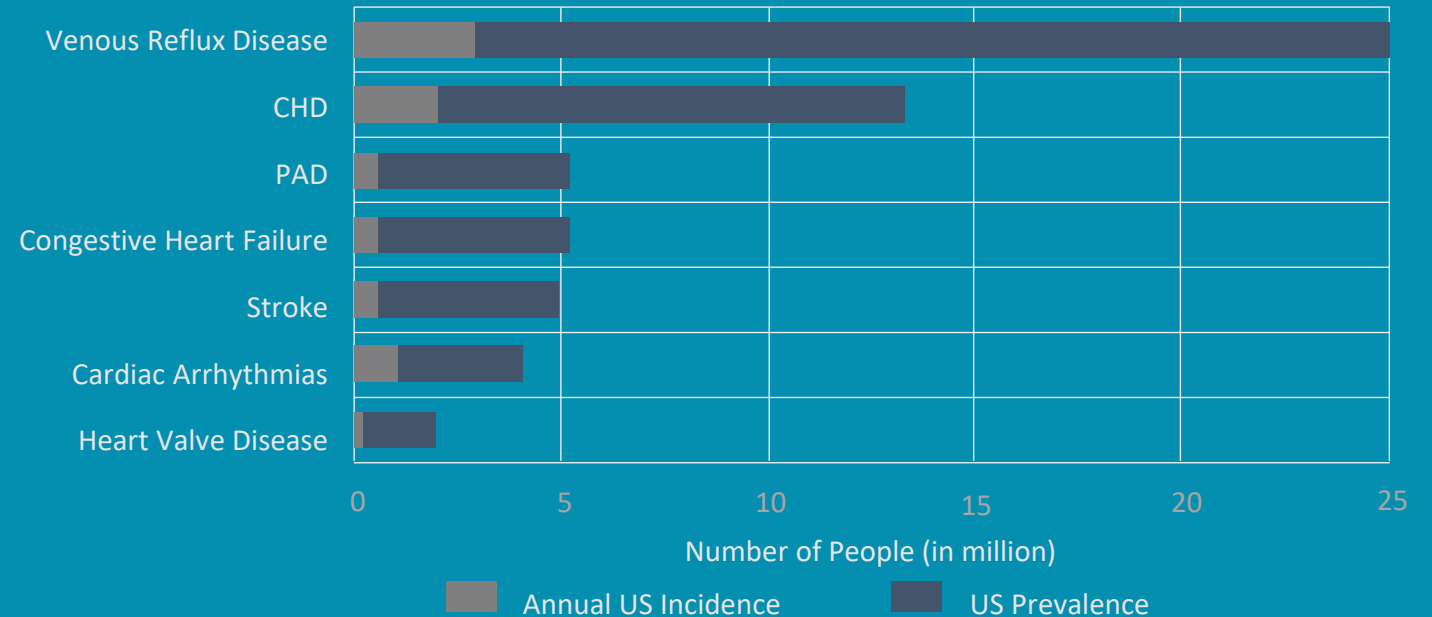
- Prominent Disease State Comparison

More than **30 million** Americans suffer from varicose veins or a more serious form of venous disease called CVI

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



2023
Cors
at the
Shore



Varicose veins and associated CVD in the US

1

Venous ulcers are¹:



Underrecognized

and



Undertreated

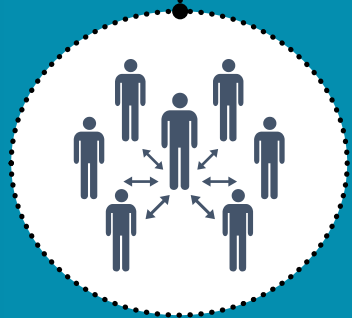
2

Pacific Vascular Symposium 6:

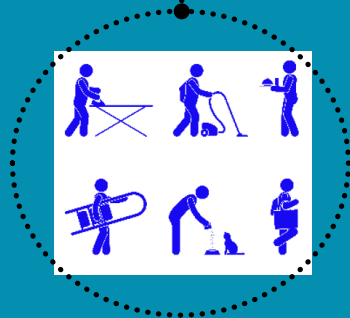
Develop plan to reduce incidence of venous ulcers in the US by 50% within 10 years²

Measuring the quality of life in patients with venous ulcers³

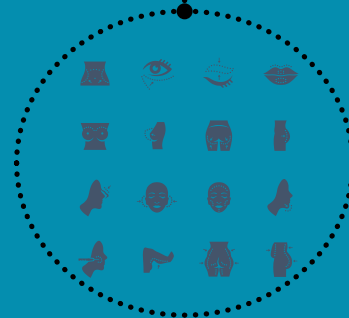
Venous ulcer questionnaire^a and Short-form health survey (SF-36) identified 4 areas of impact



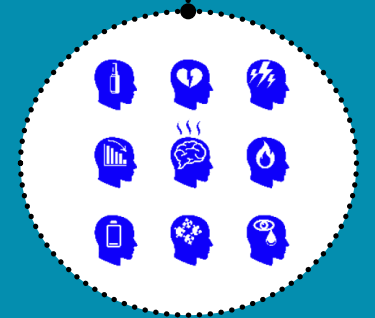
Social function



Domestic activities











Cosmesis



Emotional status

Risk factors for varicose veins and CVI

	Older age	Deep vein thrombosis	
	Family history	History of phlebitis	
	Obesity	Pregnancy	
	Standing occupation	Female gender	



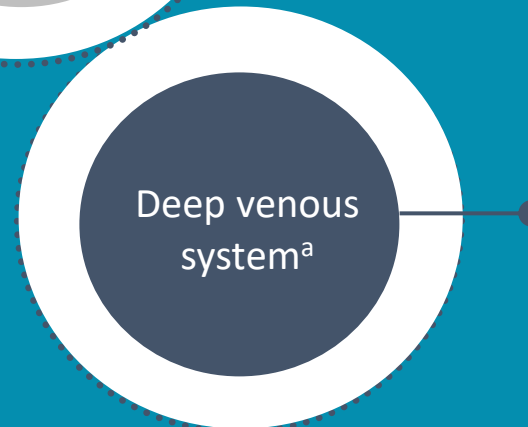
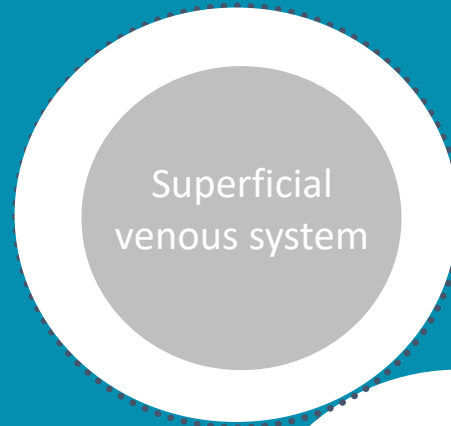
Venous system

Venous system is classified into superficial and deep venous system.^{1,2}

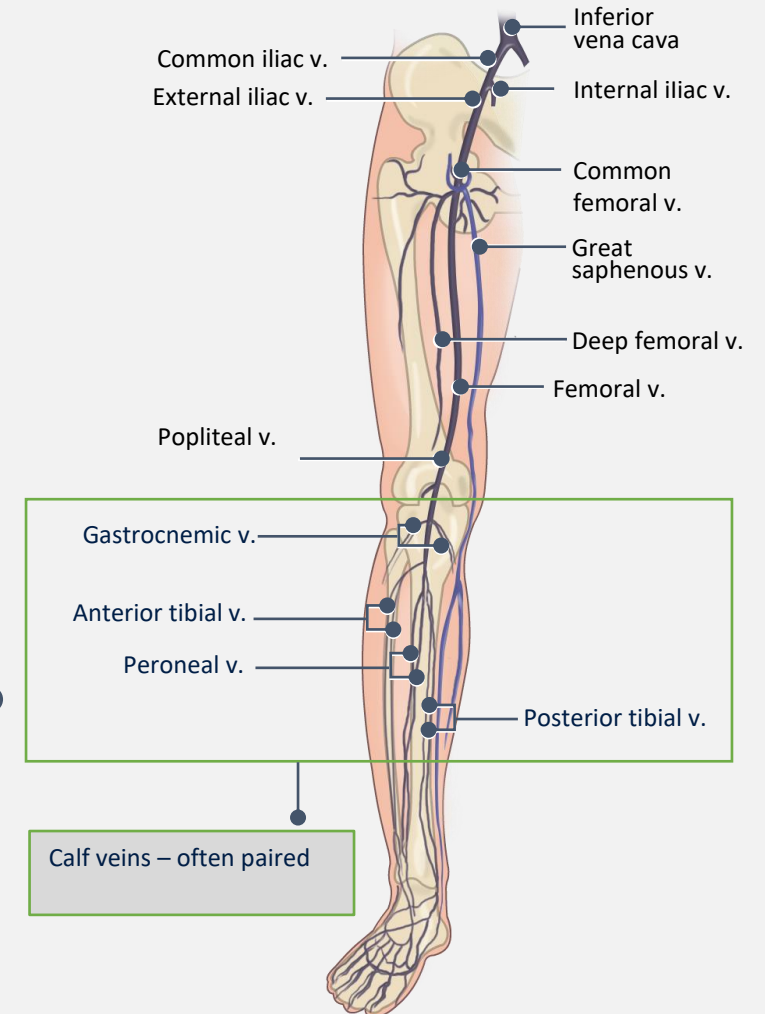
Superficial Venous System¹



- Dominant superficial axial veins
 - Great saphenous vein (GSV)
 - Small saphenous vein (SSV)
- Intersaphenous communicating vein (vein of Giacomini) connecting GSV to SSV via posterior thigh circumflex via the extension of SSV
- Lateral venous system (lateral subdermal venous plexus) – superficial veins of lateral leg



Deep Venous System^{a,2}



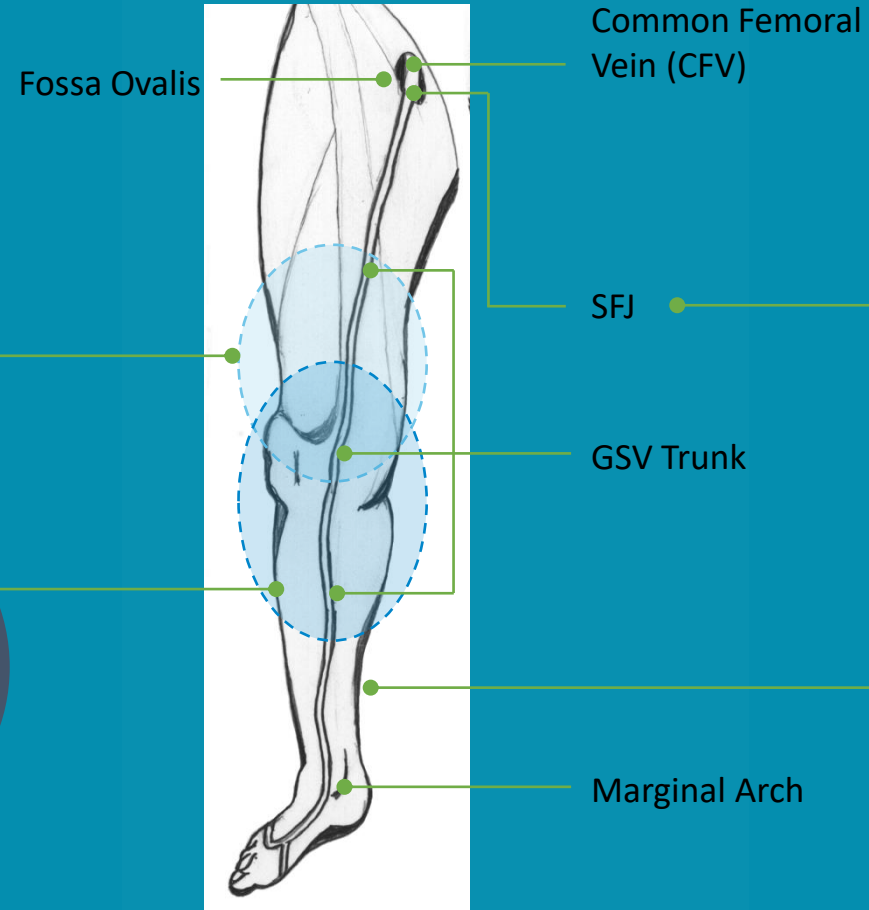
^aIt is imperative to determine the patency and COMPETENCY of the deep venous system.³

Great saphenous vein

Longest vein in the body¹

Often runs a superficial subcutaneous course from mid-thigh knee²

Areas of aplasia/hypoplasia a common in the lower thigh, knee, and calf³



May enter and exit the saphenous sheath at various locations²

Numerous normal variants at saphenofemoral junction (SFJ)²

Often duplicated²
(Calf: 25%; Thigh: 8%)

Closely associated with saphenous nerve below mid-calf²

Image courtesy of Nicos Labropoulos, MD.



2 0 2 3
Cors
at the
Shore

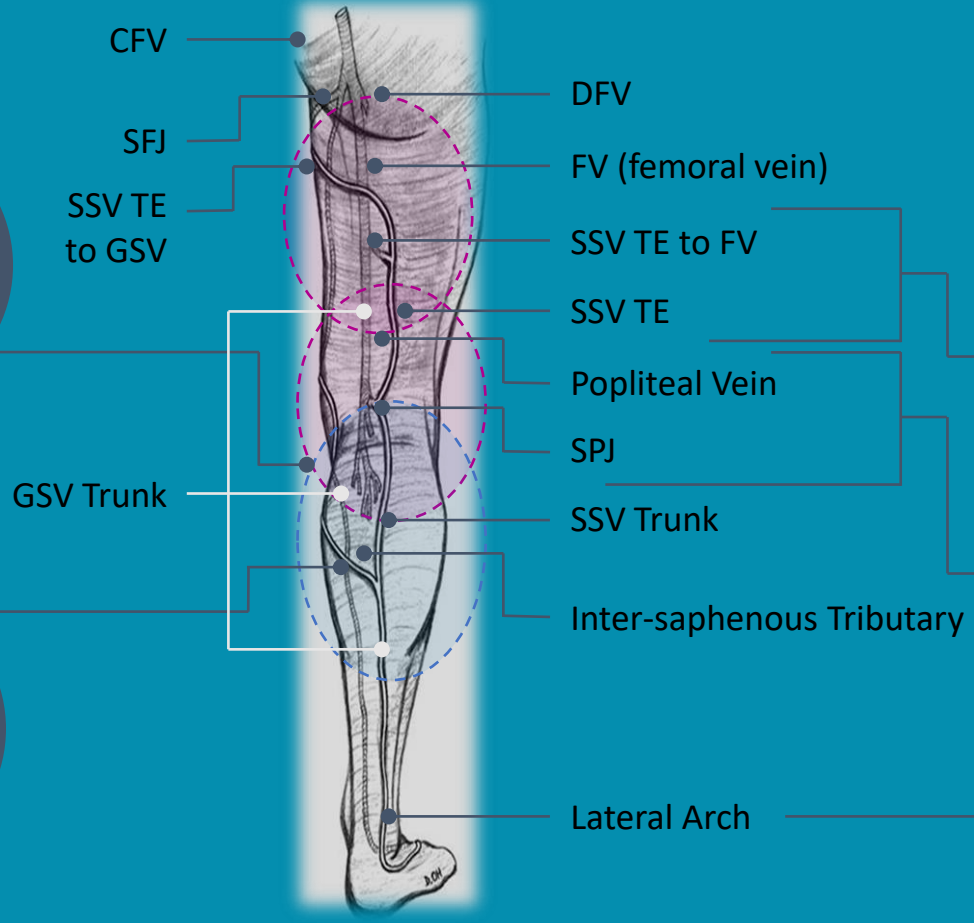
Small saphenous vein

Within the fascial space (saphenous sheath)¹

May connect with the GSV in the medial lower leg¹

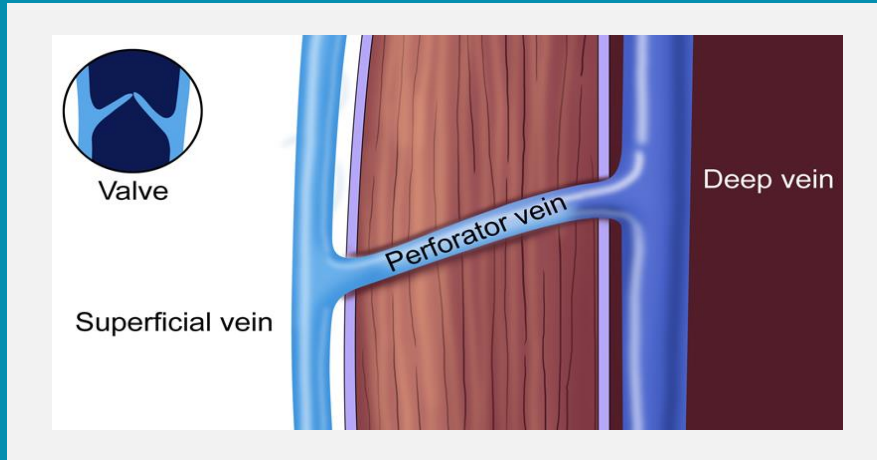
Travels up calf between 2 heads of gastrocnemius muscle¹

SSV duplication: 2.2%²

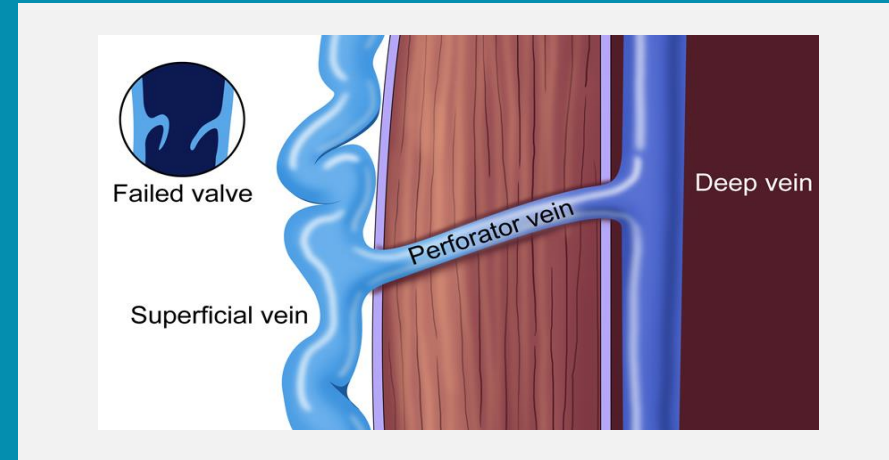


- May have thigh extension (TE) and may directly connect to GSV or deep veins of the thigh¹
- May have multiple terminations.²
 - Four types of SSV termination with at least 9 variations
- Usually drains into SPJ¹
 - Typically drains into popliteal vein at the SPJ
- Begins posterior to the lateral malleolus¹
 - Closely associated with the sural nerve below the mid-calf¹

Communicating veins and perforating veins



Communicating veins



Perforating veins

- Perforator veins connect a superficial vein to a deep vein (crossing fascial plane)²
- Often hundreds of perforating veins in each leg (most of which are sonographically occult)²
- Pathologic:¹
 - >3.5 mm in size
 - Outward flow
 - >500 ms duration
 - Located beneath chronic venous stasis skin changes/ulcer



Relationship between fascia and veins of the lower extremity

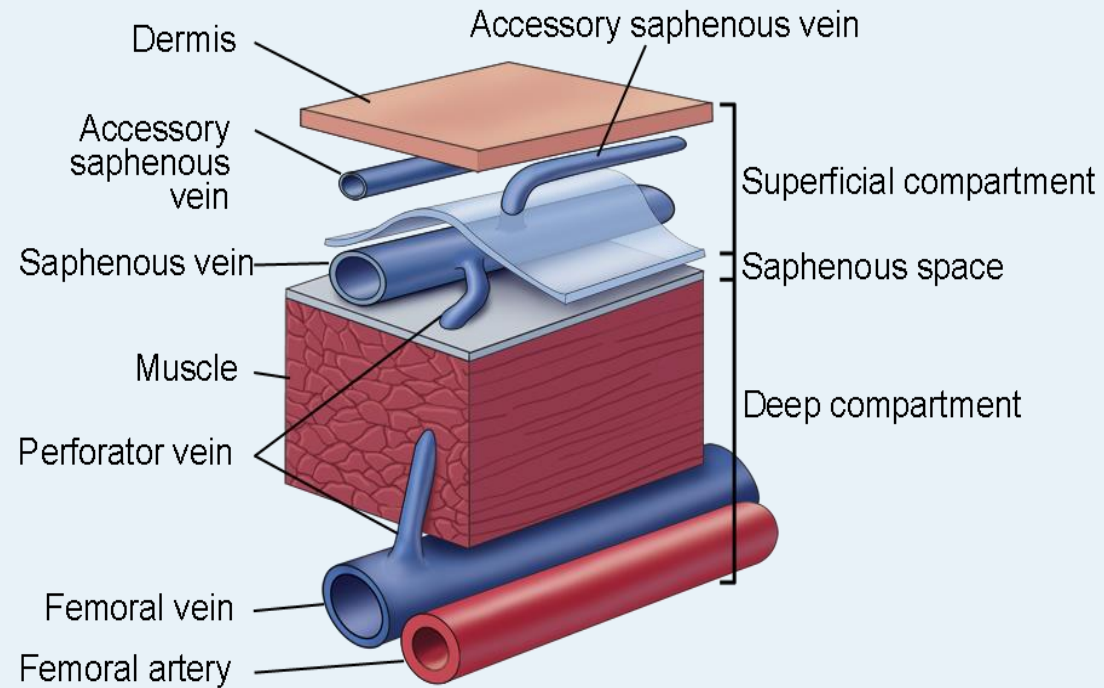


Image courtesy of Nicos Labropoulos, MD



Venous system

- Physiology

Criteria for veins to move blood and overcome hydrostatic, intrathoracic, and intra-abdominal pressures^{1,2}

1
Be unobstructed

2
Have functional
one-way valves

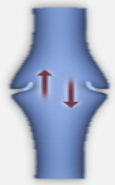
3
Be supported by
effective muscle
pumps



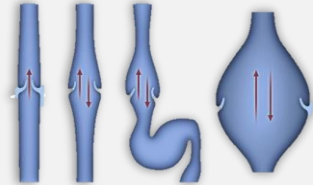
Progression of venous disease

1

Primary diseases



Wall changes prior to reflux¹



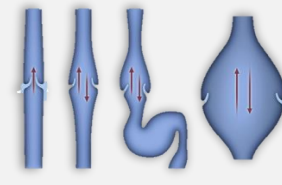
Venous reflux development¹

2

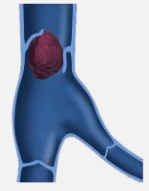
Secondary diseases



Valve destruction¹



Venous reflux development¹



Obstruction¹



Foot and calf muscle pump dysfunction¹



Hemodynamic worsening of the limbs¹



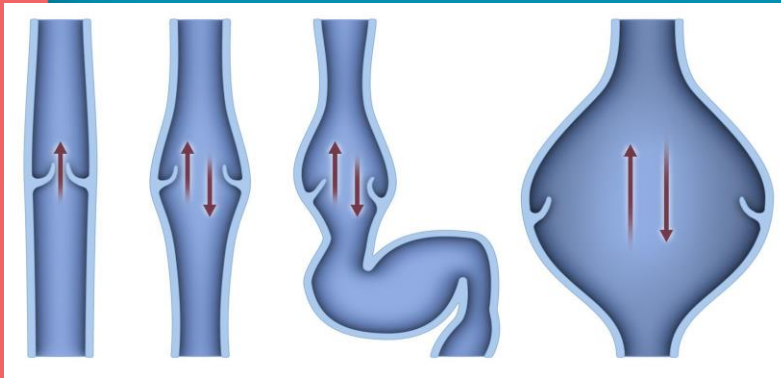
Local perivascular soft tissue responses²



Skin damage¹



Reflux development



Primary venous reflux¹⁻³

- It was assumed that reflux develops in a retrograde fashion¹
- It appears to be a local or multifocal process in addition to or separate from a retrograde process²
- It can occur in any superficial or deep vein of the lower limbs, but is more frequent in the former²



Saphenous veins and tributaries are often involved in asymptomatic individuals and in those who have prominent or varicose veins.²



C in CEAP: clinical features

C0	No visible or palpable signs of venous disease
C1	Telangiectasias or reticular veins
C2	Varicose veins
C2r	Recurrent varicose veins
C3	Edema
C4	Changes in skin and subcutaneous tissue secondary to chronic venous disease
C4a	Pigmentation or eczema
C4b	Lipodermatosclerosis or atrophie blanche
C4c	Corona phlebectatica
C5	Healed venous ulcer
C6	Active venous ulcer
C6r	Recurrent active venous ulcer



C in CEAP: clinical features

Description of C1: Telangiectasias or reticular veins



Telangiectasias

Image courtesy of Jennifer Heller, MD.



Reticular veins

Image courtesy of Michael Singh, MD.



2 0 2 3
Cors
at the
Shore

C in CEAP: clinical features

Description of C2: Varicose veins



Image courtesy of Michael Singh, MD.



Image courtesy of Jennifer Heller, MD.

C in CEAP: clinical features

Description of C3: Edema

Description of C4: Changes in skin and subcutaneous tissue secondary to chronic venous disease



Edema

Image courtesy of Jennifer Heller, MD.



Lipodermatosclerosis

Image courtesy of Michael Singh, MD.

C in CEAP: clinical features

Description of C3: Edema

Description of C4: Changes in skin & subcutaneous tissue secondary to chronic venous disease



Pigmentation and Eczema



Hemo lipodermatosclerosis

C in CEAP: clinical features

Description of C5: Healed venous ulcer



Healed Venous Ulcer

Image courtesy of Michael Singh, MD.



2 0 2 3
Cors
at the
Shore

C in CEAP: clinical features

Description of C6: Active venous ulcer

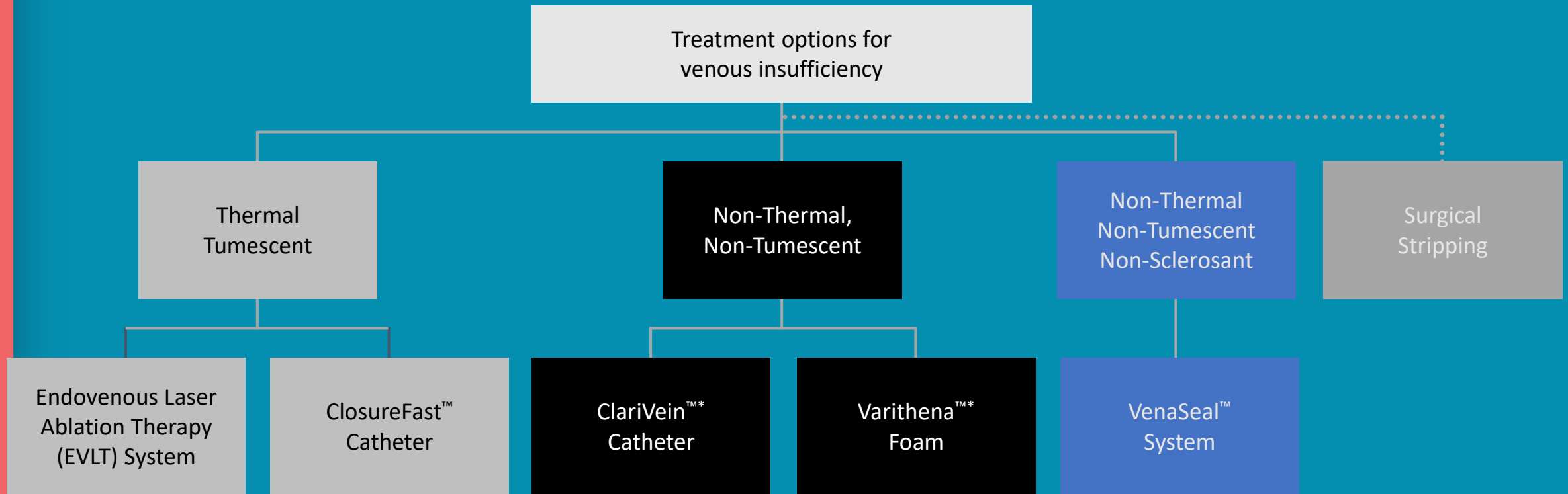


Image courtesy of Michael Singh, MD.



2 0 2 3
Cors
at the
Shore

Current treatment modalities



Examples of Conservative Therapies^a:

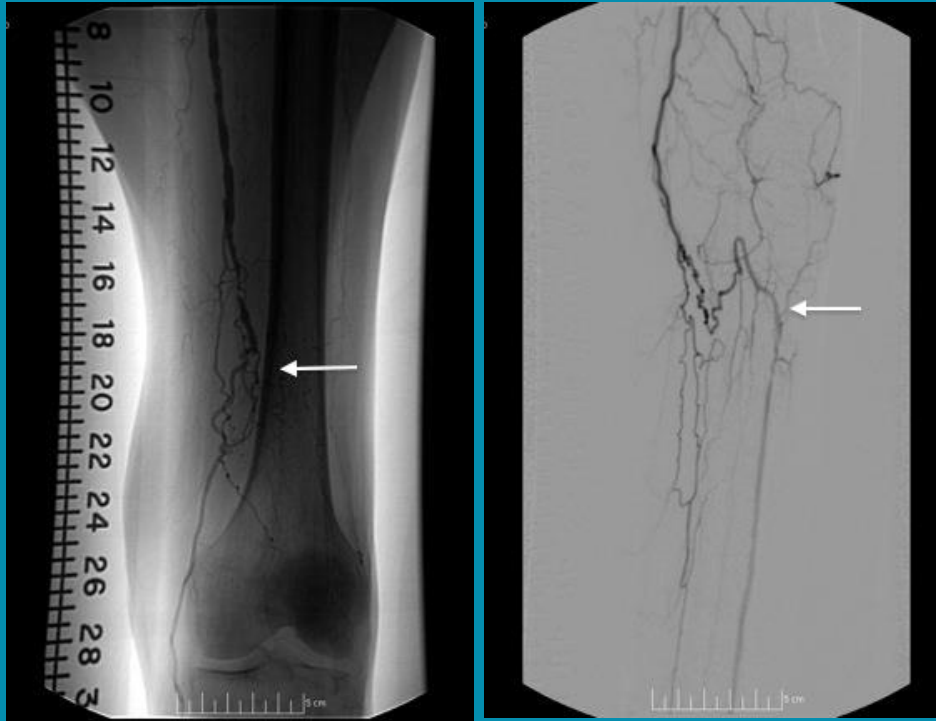
Exercise, leg elevation, compression stockings, use of NSAIDS, or Unna boot (for ulcers)

*often required by private insurance payors for treatment approval



2 0 2 3
Cors
at the
Shore

80 yo F with CLI of LLE and ABI – 0.43



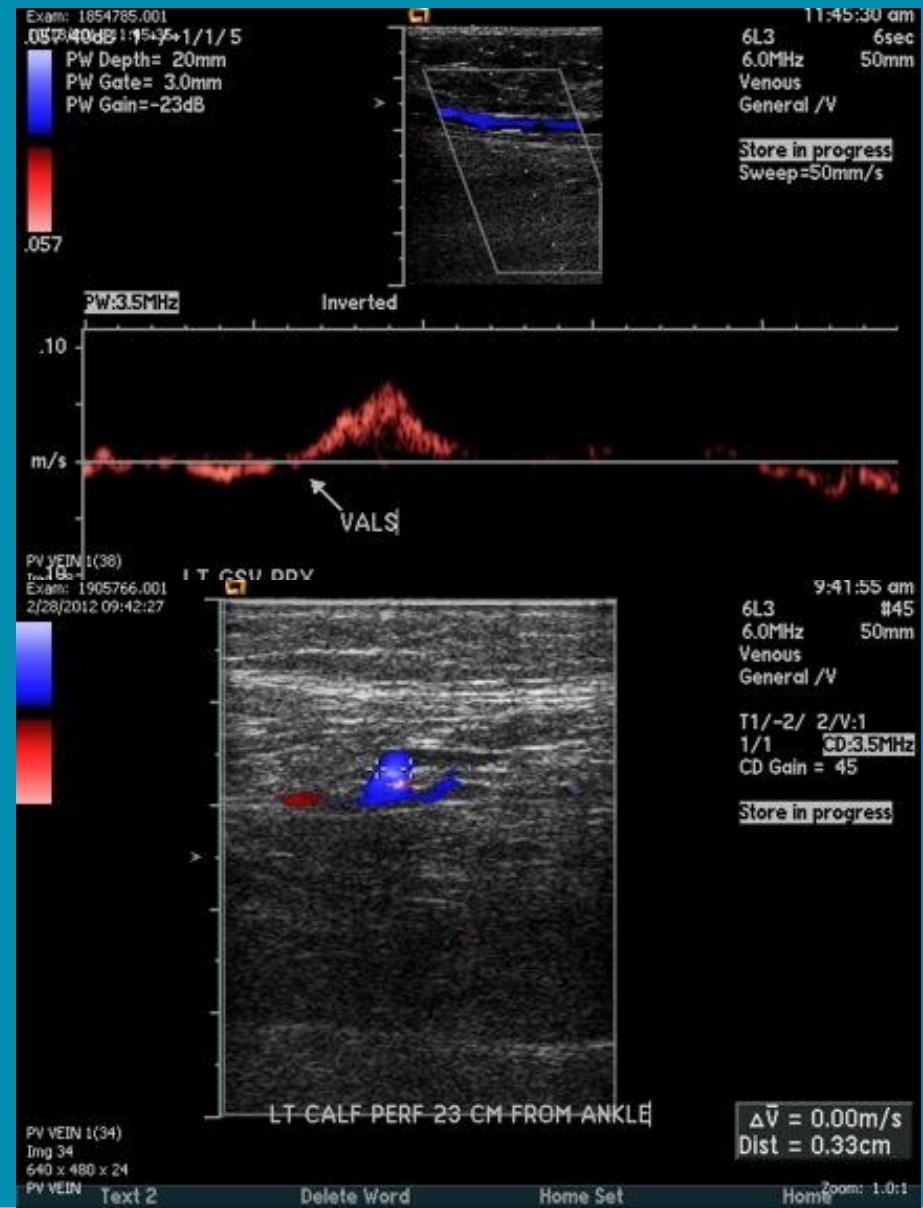


2 0 2 3
**Cors
at the
Shore**

Baseline U/S Findings

Summary:

- Severe reflux in L GSV in proximal, mid, and distal segments with flow above baseline up to 1.7 seconds
- Severe reflux in L SSV with flow above baseline up to 1.2 seconds
- Incompetent perforating vein in L ankle measuring 0.33 cm



Treatment

RFA L GSV

RFA L SSV

RFA L ankle
perforator



2 0 2 3
Cors
at the
Shore

Goal

October 2022

Bucket List

Mt Everest
Base Camp



2 0 2 3
Cors
at the
Shore



Acclimation and Hypoxia



2 0 2 3
Cors
at the
Shore

Success



@jcgeorgemd



2 0 2 3
Cors
at the
Shore



Summary

- Chronic venous disease is prevalent and underdiagnosed
- Chronic venous insufficiency is the cause of significant impairment of quality of life
- Venous ulcerations are often misdiagnosed as arterial ulcers
- Venous insufficiency is easily diagnosed with venous reflux studies
- Management of venous insufficiency includes a wide array of conservative, thermal, and non-thermal therapies

