FRONTLINE VASCULAR CARE 2025

SPECTRUM VASCULAR & GENERAL SURGERY 光谱外科与血管专科

FARRER PARK HOSPITAL

Chronic Venous Disease Essentials: Diagnosis and Modern Management

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COMFORT · FAIRNESS · VALUE

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CHRONIC VENOUS DISEASE

VEIN-TERM Transatlantic Interdisciplinary Consensus:

- Chronic venous disease (CVD) is defined as:
  - any morphological and functional abnormalities of the venous system of long duration manifest either by symptoms and/or signs indicating the need for investigation and/or care
- Chronic venous insufficiency (CVI) is reserved for:
  - Advanced CVD – C3-C6
    - Edema
    - Skin changes
    - Venous ulcers

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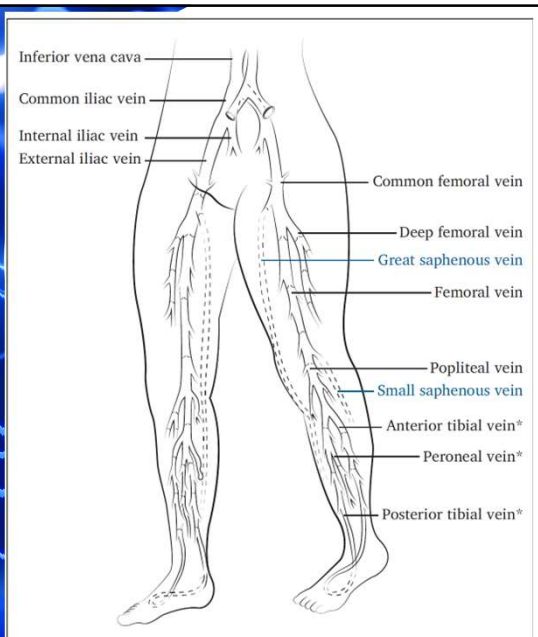

Figure 3. Anatomy of the deep veins and the main superficial veins (great saphenous vein and small saphenous vein) of the lower limbs. *Appears usually as paired veins.

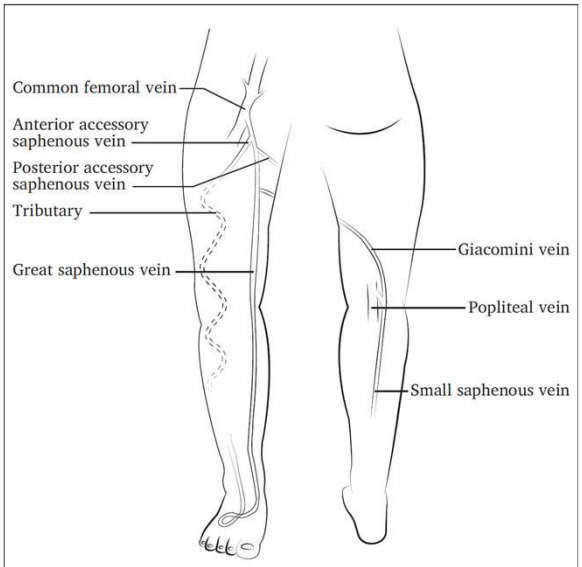

Figure 4. Anatomy of the main accessory saphenous veins and Giacomini vein (intersaphenous vein connecting the small saphenous vein with the great saphenous vein). In the presence of a Giacomini vein, the saphenopopliteal junction may be present or absent.

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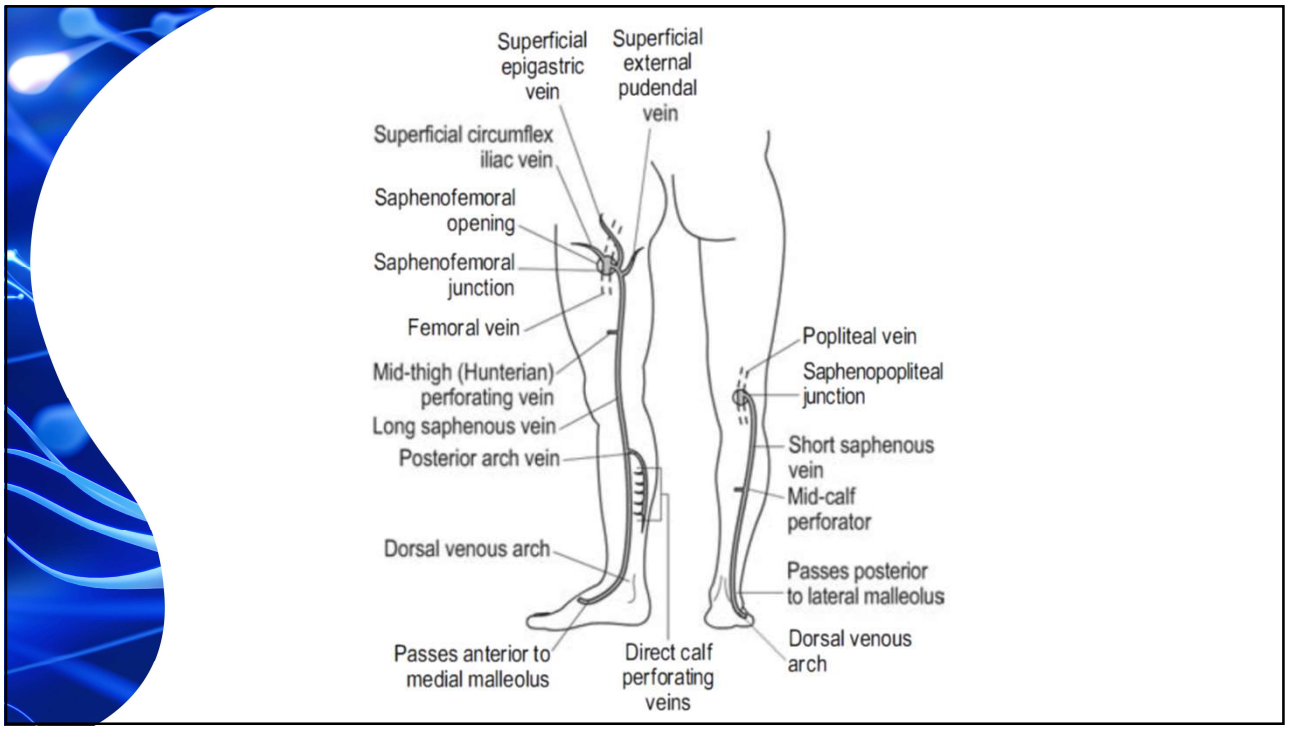

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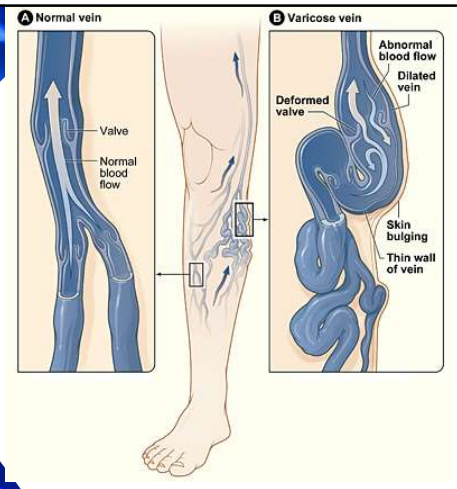

- Dilated, tortuous, and prominent veins of the superficial venous system
- Distribution of the ~~long~~ great and ~~short~~ small saphenous veins

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Prevalence of early stages of CVD is high

clinical stages	Europe Eastern 70.1%	Latin America 68.1%	Western Europe 61.7%	Asia 51.9%	Africa 5.5%
C0s	31.9 %	31.9 %	38.4 %	48.7 %	NA
C1	19.0 %	25.2 %	21.4 %	18.4 %	NA
C2	21.3 %	19.2 %	15.4 %	13.7 %	NA
C3	17.5 %	13.4 %	15.8 %	13.6 %	NA
C4	9.5 %	9.3 %	7.4 %	5.0 %	NA
C5	2.1 %	2.5 %	1.2 %	0.6 %	NA
C6	0.8 %	1.5 %	0.4 %	0.7 %	NA

51.8 years Average age

70.7% Female predominance

CVD: Chronic Venous Disease Adapted from: Vuylsteke ME, et al. Angiology. 2018;69(9):779-785; Salim S, et al. Global Ann Surg. 2021;274(6):971-976. NA not available data

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Awareness of CVD in Singapore remains poor
2021 YouGov survey

Prevalence of CVD

(Varicose Veins)

1 in 3[1]

3 in 4[1]

(Did not seek or intent to seek medical help)

1. https://cnalifestyle.channelnewsasia.com/women/varicose-veins-women-treatment-pregnancy-313586

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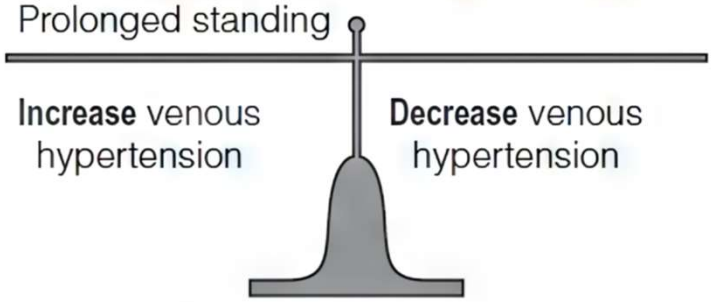
CHRONIC VENOUS HYPERTENSION

Venous reflux
Venous obstruction
Obesity
Prolonged standing

Calf muscle pump
Limb elevation
Compression hosiery



Increase venous hypertension

Decrease venous hypertension

Figure 17.1 • Factors affecting venous hypertension.

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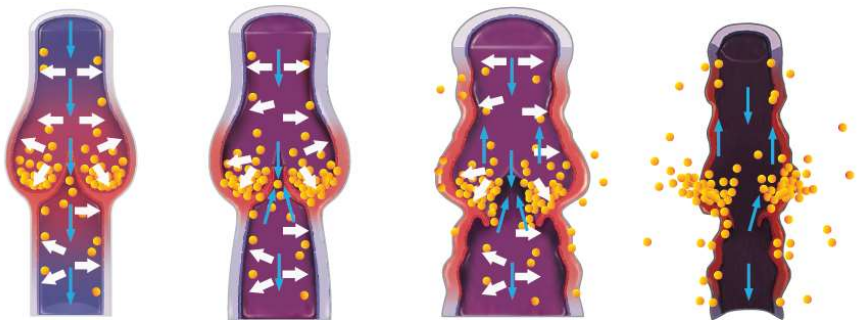
Chronic Venous Disease is due to chronic inflammation



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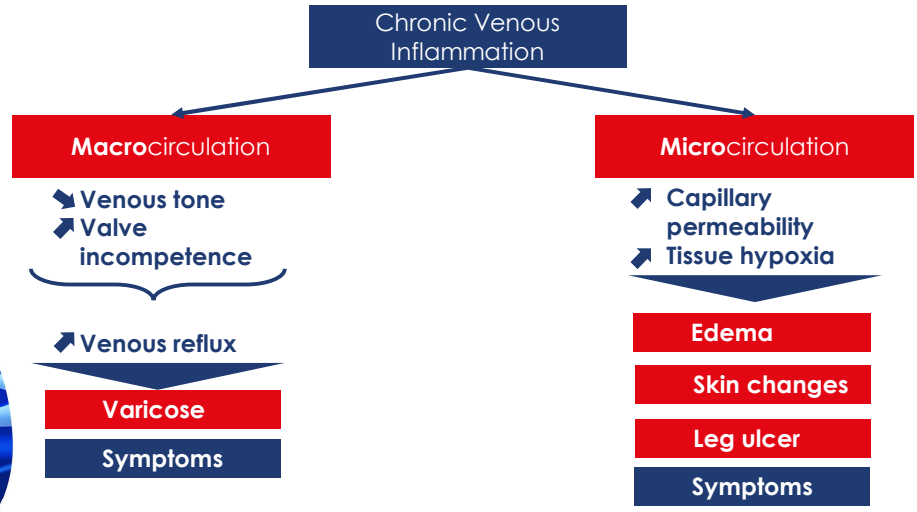
Chronic venous inflammation impacts Macrocirculation & Microcirculation



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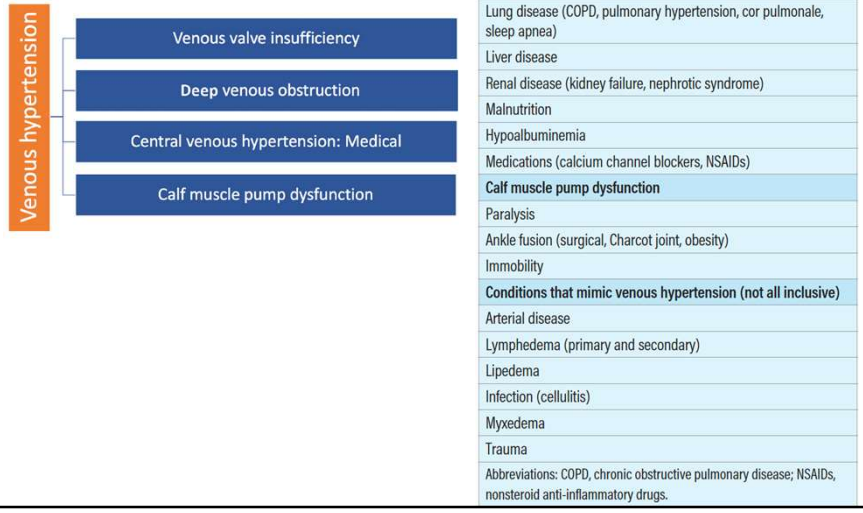

TABLE 1. CAUSES OF VENOUS HYPERTENSION

Venous
Superficial valve reflux
Deep valve reflux
Deep venous obstruction (postthrombotic or compressive)
Central venous hypertension
Obesity
Heart failure (diastolic or systolic)
Lung disease (COPD, pulmonary hypertension, cor pulmonale, sleep apnea)
Liver disease
Renal disease (kidney failure, nephrotic syndrome)
Malnutrition
Hypoalbuminemia
Medications (calcium channel blockers, NSAIDs)
Calf muscle pump dysfunction
Paralysis
Ankle fusion (surgical, Charcot joint, obesity)
Immobility
Conditions that mimic venous hypertension (not all inclusive)
Arterial disease
Lymphedema (primary and secondary)
Lipedema
Infection (cellulitis)
Myxedema
Trauma

Abbreviations: COPD, chronic obstructive pulmonary disease; NSAIDs, nonsteroid anti-inflammatory drugs.

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ETIOLOGY / CAUSES

- Primary
  - Reflux and valvular incompetence arises in the venous system from nonobstructive causes
    - Hereditary
    - Hormonal
    - Connective tissue disorders
- Secondary
  - Intravenous: Incompetence arises in deep venous system (usually due to prior thrombosis)
    - Deep veins obstructed → perforators dilate and become incompetent
  - Extravenous
- Congenital

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CEAP Classification System and Reporting Standard Revision 2020

C (Clinical Manifestations), **E** (Etiology), **A** (Anatomic Distribution), **P** (Pathophysiology)

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
C6	Active venous ulcer
C6r	Recurrent active venous ulcer

JVS-VL Journal of Vascular Surgery Venous and Lymphatic Disorders

Lurie et al. *J Vasc Surg Venous Lymphat Disord, May 2020*

@JVascSurg @TheJVascSurg

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Table IV. The 2020 revision of CEAP: Summary of etiologic (E) classification

E class	Description
E_p	Primary
E_s	Secondary
E_{si}	Secondary – intravenous
E_{se}	Secondary – extravenous
E_c	Congenital
E_n	No cause identified

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Table V. The 2020 revision of CEAP: Summary of anatomic (A) classification

A class			
A_s	Superficial		
	Old	*New*[a]	*Description*
	1.	Tel	Telangiectasia
	1.	Ret	Reticular veins
	2.	GSVa	Great saphenous vein above knee
	3.	GSVb	Great saphenous vein below knee
	4.	SSV	Small saphenous vein
		AASV	Anterior accessory saphenous vein
	5.	NSV	Nonsaphenous vein
A_d	Deep		
	Old	*New*[a]	*Description*
	6.	IVC	Inferior vena cava
	7.	CIV	Common iliac vein
	8.	IIV	Internal iliac vein
	9.	EIV	External iliac vein
	10.	PELV	Pelvic veins
	11.	CFV	Common femoral vein
	12.	DFV	Deep femoral vein
	13.	FV	Femoral vein
	14.	POPV	Popliteal vein
	15.	TIBV	Crural (tibial) vein
	15.	PRV	Peroneal vein
	15.	ATV	Anterior tibial vein
	15.	PTV	Posterior tibial vein
	16.	MUSV	Muscular veins
	16.	GAV	Gastrocnemius vein
	16.	SOV	Soleal vein
Ap	Perforator		
	Old	*New*[a]	*Description*
	17.	TPV	Thigh perforator vein
	18.	CPV	Calf perforator vein
A_n	No venous anatomic location identified		

[a]New specific anatomic location(s) to be reported under each P (pathophysiologic) class to identify anatomic location(s) corresponding to P class.

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Table VI. The 2020 revision of CEAP: Summary of pathophysiologic (P) classification

P class	Description
P_r	Reflux
P_o	Obstruction
$P_{r,o}$	Reflux and obstruction
P_n	No pathophysiology identified
**Advanced	New abbreviations for specific A anatomic location(s) to be reported under each P Pathophysiologic class to identify anatomic location(s) corresponding to P class.

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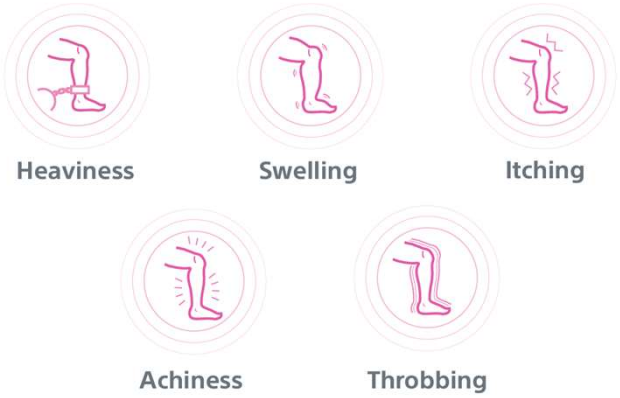
HISTORY

- HASTI symptoms:
  - Heaviness
  - Achiness
  - Swelling
  - Throbbing
  - Itching
- Pain
  - Burning
  - Throbbing
  - Cramping
  - Aching
  - ? Venous claudication



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HISTORY

- Leg fatigue
- Rash / Ulcers
- Varicosities
- NO SYMPTOMS

- Differentiate from orthopaedic & arterial disorders
- Abdominal mass?
- Prior abdominal/pelvic surgery

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HISTORY

- Early onset may suggest a congenital abnormality such as Klippel-Trenaunay syndrome
- Occupation
- Prior DVT, immobilization, thrombophlebitis, bleeding episodes
- Family history present in over 1/3 of patients.
- Previous VV surgery and result (20% recurrent)
- OCP use
- Hypercoagulability
- Any arterial disease / intermittent claudication / tissue loss → cannot use Grade 2 compression stockings

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SYNDROMES ASSOCIATED WITH VARICOSE VEINS

- Klippel-Trenaunay-Weber syndrome
  - Vascular malformations / Varicose veins in unusual position, classically over lateral aspect of thigh
  - Port-wine stains
  - Bony/soft-tissue hypertrophy of limb
  - Peripheral edema as deep venous system may be abnormal

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Syndromes associated with varicose veins

- Parkes-Weber syndrome
  - Multiple arteriovenous fistulae with risk of cardiac failure
  - Limb hypertrophy

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PHYSICAL EXAMINATION

- Distribution of VV
  - GSV
  - SSV
- Skin discolouration
- Eczematous changes
- Lipodermatosclerosis
- Ulceration
- Haemorrhage
- Thrombophlebitis

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	Performed competently	Performed but NOT fully competent	Not Performed or incompetent
1. Wash your hands			
2. Introduce yourself to the patient and explain what you are about to do			
3. Expose the patient and stand the patient up			
4. Inspect bilateral lower limbs, looking for any scars, swelling, venous ulcers, pigmentation and varicose veins.			
5. Look at back of legs for distribution of ssv			
6. Palpate for tenderness, temperature and evidence of perforator defects of varicose veins			
7. Examine for pedal edema			
8. Palpate for SFJ and saphena varix			
9. Cough impulse for SFJ			
10. Tap test at SFJ			
11. Tourniquet test			
12. Trendelenburg test if SFJ incompetent			
13. Perthes test			
14. Palpate for lower limbs' pulses			
15. Auscultate over veins			
16. Thank the patient and cover up			
17. Request to complete the exam with an abdominal, external genitalia and Doppler assessment over SFJ/ SPJ			

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C1

Telangiectasia = less than 1mm veins seen on skin surface of the skin; tree branches with short, jagged lines.

Reticular veins = 1-3 mm diameter dilated veins, flatter and less twisted than telangiectasia

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C2 GREAT SAPHENOUS VEIN

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C2 SMALL SAPHENOUS VEIN

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C3 EDEMA

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C4A LIPODERMATOSCLEROSIS
C4B ATROPHIE BLANCHE

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C4c CORONA PHLEBECTATICA

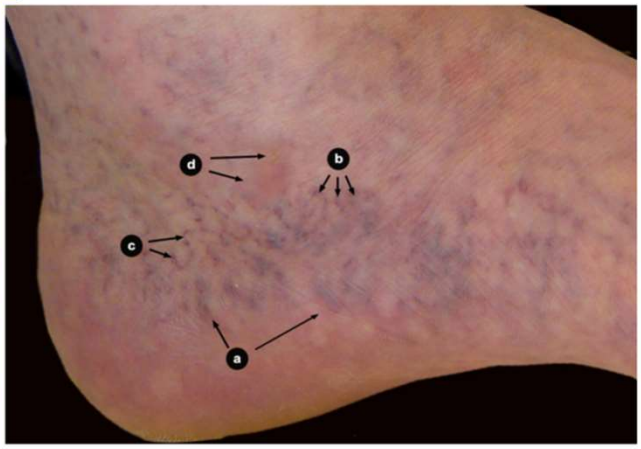

Fig. 5. The 4 components of corona phlebectatica together (clinical aspect). a=venous cups (veins) b=blue telangiectases (intradermal veinules). c=red telangiectases (superficial veinules) d=stasis spots (capillaries). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

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SUPERFICIAL THROMBOPHLEBITIS

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C5 HEALED ULCER

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C6 VENOUS ULCERATION

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INVESTIGATIONS

- Hand-held continuous wave Doppler
- US Venous Duplex
  - LSV reflux (>0.5s) / SFJ incompetence
  - SSV reflux / SPJ incompetence
  - Deep venous reflux / DVT
  - Diameter of veins > 3mm
- Ankle brachial pressure index / Toe pressures
- US Arterial Duplex if mixed arteriovenous ulcer
- Biopsy if long-standing ulcer

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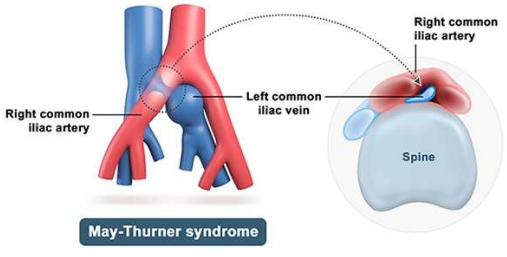
INVESTIGATIONS

- Abdominal US / CTV / MRV for suprainguinal pathology
  - History: previous extensive DVT, VTE
  - Clinical findings: C3 – C6, abdominal wall collaterals
  - Duplex ultrasound findings: absence of phasic flow in common femoral vein, post-thrombotic fibrosis
- May-Thurner?
- Cancer?
- Baby?



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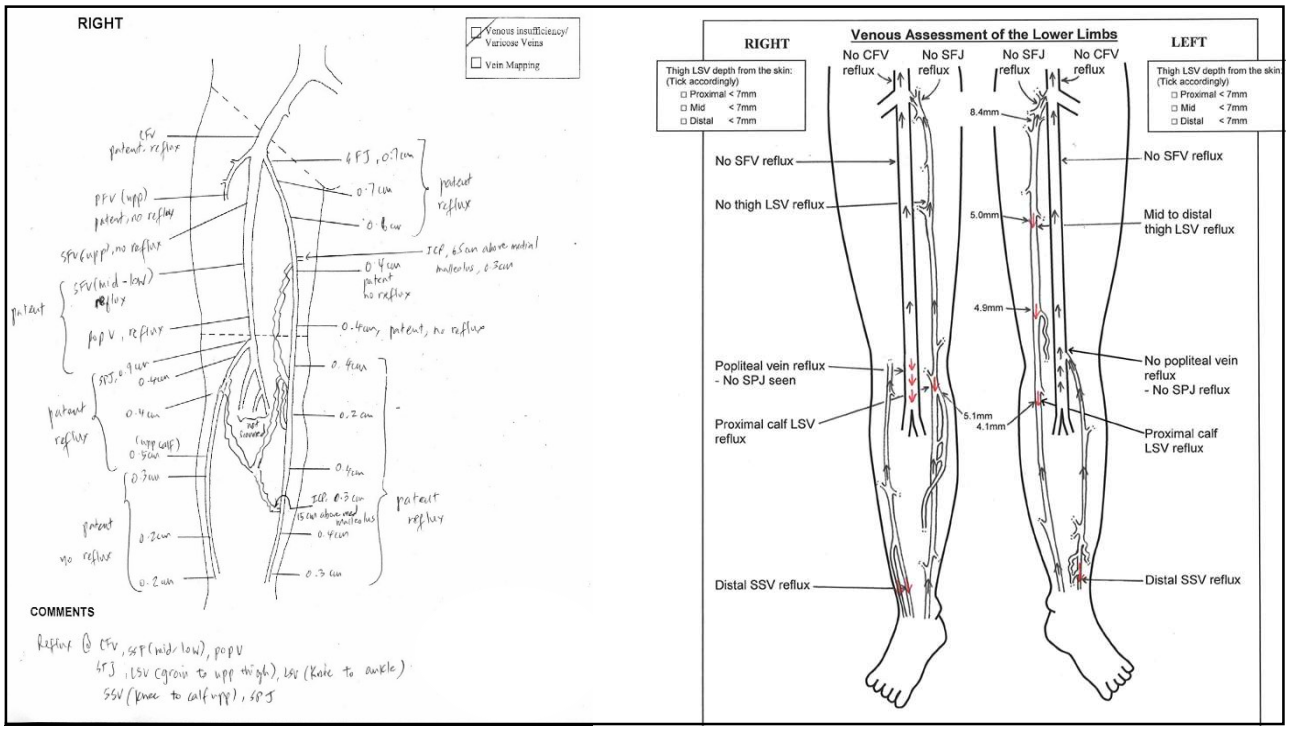

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TREATMENT OPTIONS

- Conservative
  - Lifestyle advice
    - Regular exercise ~ 30 minutes every day
    - Maintain a Healthy Body Weight
    - Quit Smoking
    - Give Up the Sedentary Lifestyle + Add regular movements to your routine.
    - Keep Your Legs Elevated for 10-15 minutes every day
    - Avoid Excessive Salt or Sodium Consumption
    - Refrain from Wearing Tight Clothing and High Heels
    - Avoid excessively long and hot showers
- Compression stockings/bandaging
- Phlebotonics / Venoactive drugs

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Compression therapy

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COMPRESSION STOCKINGS

AEGLE SCIENTIFIC
BAUERFEIND®
sigvaris

- Action:
  - Remedies impaired calf muscle pump
  - Reduces venous reflux
  - Improves venous outflow
- Provides a gradient of pressure
  - highest at the ankle, decreasing upwards
  - 70% reduction just below knee
- Beneficial effect lasts only as long as they are worn
- Compliance is a major problem

- **C1-C2: At least 15 mmHg at ankle**
- **C3-C6: 20-40 mmHg**

Compression Class	Pressure
1	18-21 mmHg
2	23-32 mmHg
3	34-46 mmHg
4	>49 mmHg

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TRIVIA!

What Giraffes Can Teach Us About Compression Therapy

Giraffes do not suffer from edema — even though the distance between a giraffe's heart and feet is twice that of humans. Why?

Because a giraffe's skin is extremely tough, fibrous and non-elastic, it creates a rigid sleeve that maximizes the effect of every muscle movement — big and small, moving and resting — to optimize venous return.[1,2]

A compression system designed with materials that work together to create a rigid sleeve, much like giraffe skin, to consistently provide the right amount to compression to reduce edema and optimize venous return, define an ideal compression system.

Compression therapy mimics the giraffe's skin

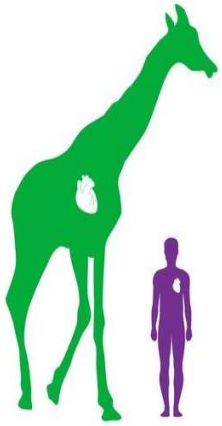

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Table 7. Contraindications to compression treatment (modified with permission from Rabe *et al.*, 2020[74])
Severe lower extremity atherosclerotic disease with ABI < 0.6 and/or ankle pressure < 60 mmHg
Extra-anatomic or superficially tunnelled arterial bypass at the site of intended compression
Severe heart failure, NYHA Class IV
Heart failure NYHA Class III and routine application of compression devices without clinical and haemodynamic monitoring
Confirmed allergy to compression material
Severe diabetic neuropathy with sensory loss or microangiopathy with the risk of skin necrosis*

ABI = ankle brachial index; NYHA = New York Heart Association; NYHA Class IV: fatigue, palpitations, dyspnoea and/or angina at rest; NYHA Class III: ordinary physical activity causes undue fatigue, palpitations, dyspnoea and/or angina - comfortable at rest.
* May not apply to inelastic compression exerting low levels of sustained compression pressure (modified compression).

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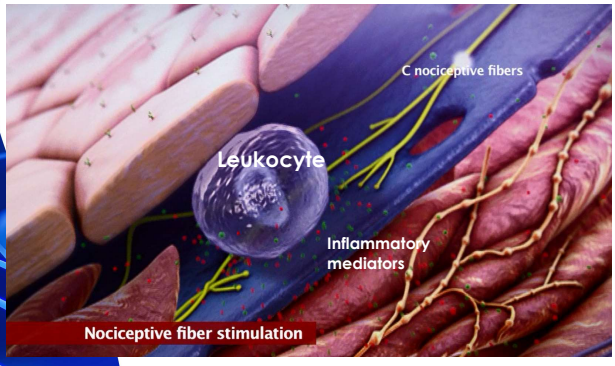
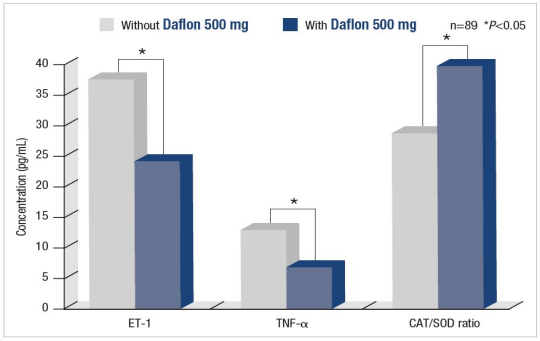
DAFLON REDUCES INFLAMMATORY MARKERS AND RESTORES THE ANTIOXIDANT IMBALANCE





By reducing inflammatory markers concentration, Daflon reduces the stimulation of C-nociceptive fibers and therefore pain.

Stanek A, Brzezicka M, Urbanek T, Stepniewski M, Kucharzewski M. Effect of micronized purified flavonoid fraction therapy on endothelin-1 and TNF-α levels in relation to antioxidant enzyme balance in the peripheral blood of women with varicose veins. Curr Vasc Pharmacol. 2015;13(6):801-808.

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MPFF has the highest number of strong recommendations for the improvement of symptoms, signs, and quality of life in CVD

Strength of recommendations based on magnitude of effects on individual symptoms or signs vs side effects

	MPFF	Ruscus	Oxerutins	HCSE	Calcium dobesilate
Pain	Strong	Strong	Strong	Strong	Weak in view of the possibility of inducing agranulocytosis
Heaviness	Strong	Strong	Strong	-	
Feeling of swelling	Strong	Strong	-	-	
Functional discomfort	Strong	-	-	-	
Cramps	Strong	Weak	Strong	Strong	
Leg redness	Strong	-	-	-	
Skin changes	Strong	-	-	-	
Edema	Strong	Strong	Weak	Strong	
Quality of life	Strong	-	-	-	
Paresthesia	Weak	Strong	-	-	
Burning	Weak	-	-	-	
Leg fatigue	-	Strong	-	-	
Pruritus	-	Weak	-	Strong	

Nicolaides A, Kakkos S, Baekgaard N et al. Int Angiol 2018, June;37(3):232-254

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MPFF has the highest level of evidence among VADs for the healing of leg ulcers (grade A)

Grade A or B levels of evidence for the effects of the main medications on the healing of leg ulcers

	MPFF	Pentoxifylline	Sulodexide	Hydroxyethyl rutosides
Healing of leg ulcers	Grade A	Grade A	Grade A	Grade B

⊗ No available data for Ruscus, HCSE or calcium dobesilate

Nicolaides A, Kakkos S, Baekgaard N et al. Int Angiol 2018, June;37(3):232-254

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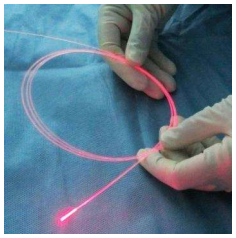
TREATMENT OPTIONS

- Endovenous Thermal Ablation – gold standard
  - Radiofrequency Ablation (RFA)
  - Endovenous Laser Therapy (EVLT)



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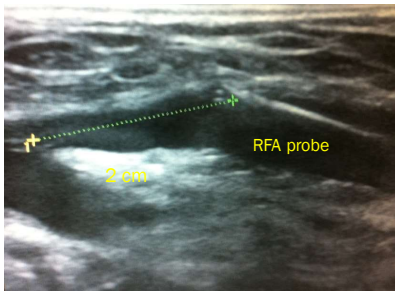
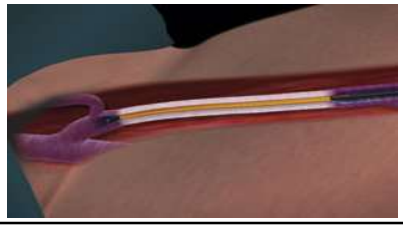
RFA : Probe positioning





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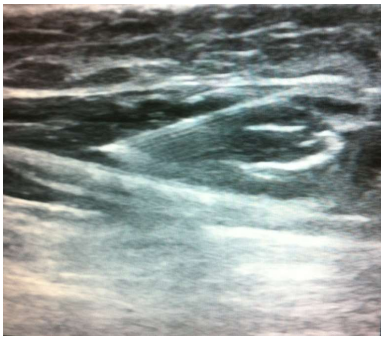
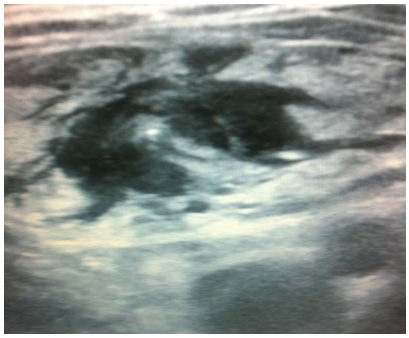
Giving the Tumescent Anesthesia





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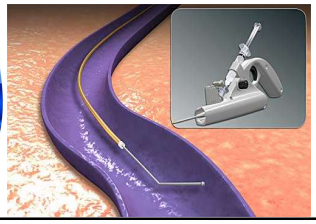
TREATMENT OPTIONS

- Non-Thermal, Non-Tumescent Ablation
  - MechanicO Chemical Ablation (MOCA) – Clarivein, Fleibogrif
  - Non-Sclerosant / Cyanoacrylate-based - Venaseal



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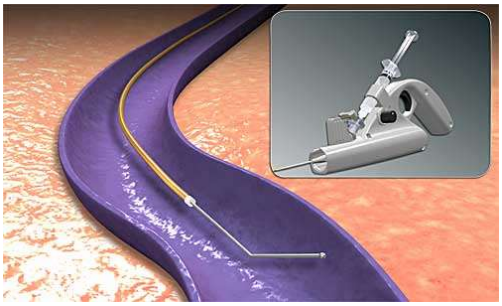
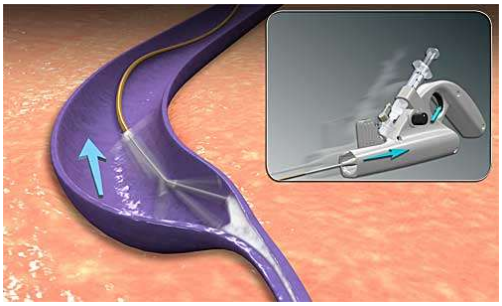
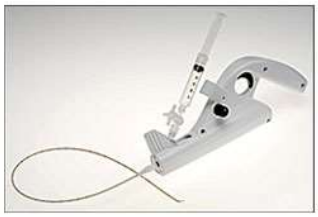
MOCA- MechanicO Chemical Ablation





The Non-Thermal Vein Ablation System

- **Safe & effective**
- **Excellent clinical results**
- **No thermal ablation - No risk of thermal injury**
- **No nerve damage / paraesthesia**
- **No tumescent anesthesia**
- **Minimal discomfort and minimal bruising**



Self-contained disposable system - no capital equipment expenditure or maintenance costs.

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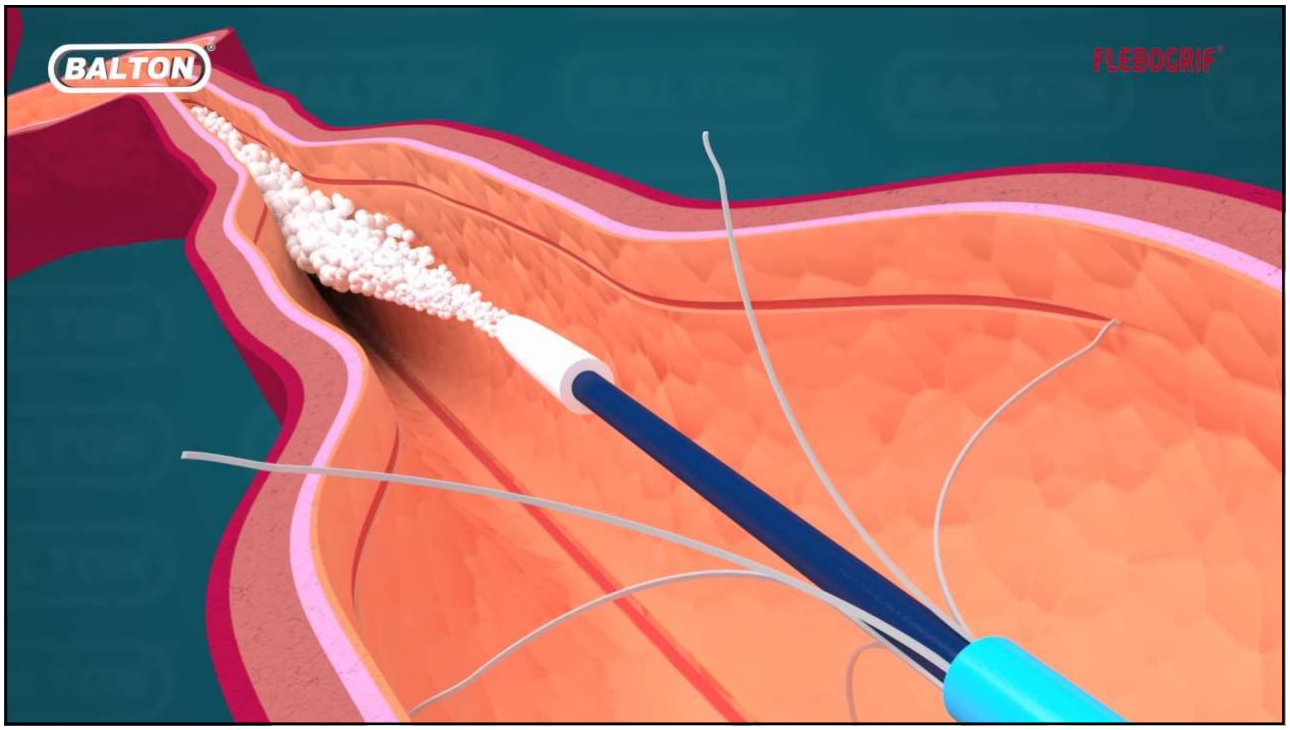

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VENASEAL™ CLOSURE SYSTEM

CYANOACRYLATE ADHESIVE TO CLOSE THE DISEASED VEIN SAFELY AND EFFECTIVELY

- Proprietary catheter engineered to be inert to adhesive – "doesn't stick"
- Proprietary dispenser assembly designed to deliver a precise amount of adhesive in 3 sec.

DC00003906

8 Proebstle, T et al., The european multicenter cohort study on cyanoacrylate embolization of refluxing great saphenous veins. JVS: Venous and Lymphatic Disorders 2014; Accepted for publication.

Medtronic

55

VENASEAL

- Closure rates comparable to current endothermal treatments
- No use of tumescent anaesthesia
- No risk of thermal injury
- Postprocedure compression stockings generally not required
- Rapid return to normal activity
- Recurrence
- 5% at 5 years
- 10% recurrence at 10 years

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TREATMENT OPTIONS

- Open Surgery
  - SFJ ligation, LSV stripping, MSA
  - SPJ ligation

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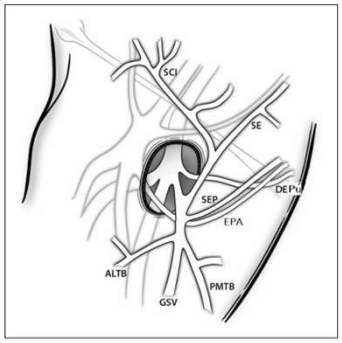

Figure 1. The classic appearance of the saphenofemoral junction (original drawing by Emma Wray and electronically processed into digital images by Andrea Thompson).
SCI: superficial circumflex iliac; SE: Superficial Epigastric; SEP: superficial external pudendal; DEP: deep external pudendal; EPA: external pudendal artery; ALTB: anterolateral thigh branch; PMTB: posteromedial thigh branch; GSV: great saphenous vein.

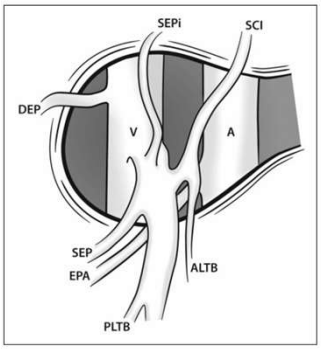

Figure 2. An anatomical variation showing SCI and ALTB tributaries as a confluence of veins draining into the GSV (original drawing by Emma Wray and electronically processed into digital images by Andrea Thompson).
SEPi: superficial epigastric; SCI: superficial circumflex iliac; DEP: deep external pudendal; SEP: superficial external pudendal; EPA: external pudendal artery; ALTB: anterolateral thigh branch; PLTB: Posterolateral Thigh Branch.

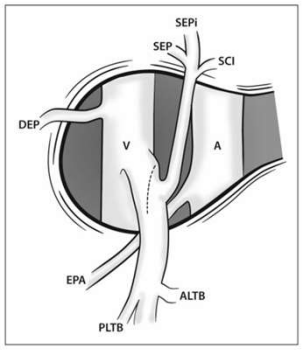

Figure 3. An anatomical variation showing SCI, SEPi and SEP as a confluence of tributaries draining into the GSV (original drawing by Emma Wray and electronically processed into digital images by Andrea Thompson).
SEPi: superficial epigastric; SCI: superficial circumflex iliac; DEP: deep external pudendal; SEP: superficial external pudendal; EPA: external pudendal artery; ALTB: anterolateral thigh branch; PLTB: Posterolateral Thigh Branch.

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TREATMENT OPTIONS

- Injection sclerotherapy (US guided)
  - Foam sclerosant superior to liquid
  - Postoperative recurrence of veins
  - Below knee varicosities if the GSV and SSV are not involved

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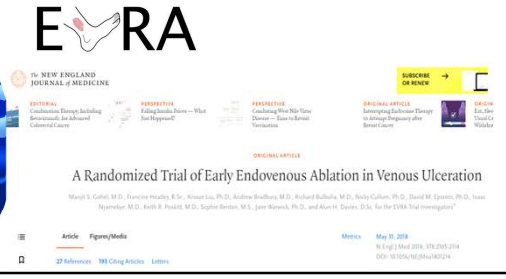
TREATMENT OPTIONS

- For patients with venous ulceration,
- Superficial venous ablation results in
  - Reduced risk of recurrent ulceration
  - Shorter ulcer healing time



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COMPLICATIONS OF SURGERY

- Anaesthetic complications
- Wound complications
  - Infection / Cellullitis
  - Hyper/hypopigmentation
  - Scarring
- Bruising/Hematoma
- Phlebitis
- Nerve injury <1%
- DVT
- Recurrence
- Hypersensitivity

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CLINICAL VIGNETTE

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MIXED ARTERIOVENOUS ULCER
PHLEBOLYMPHEDEMA

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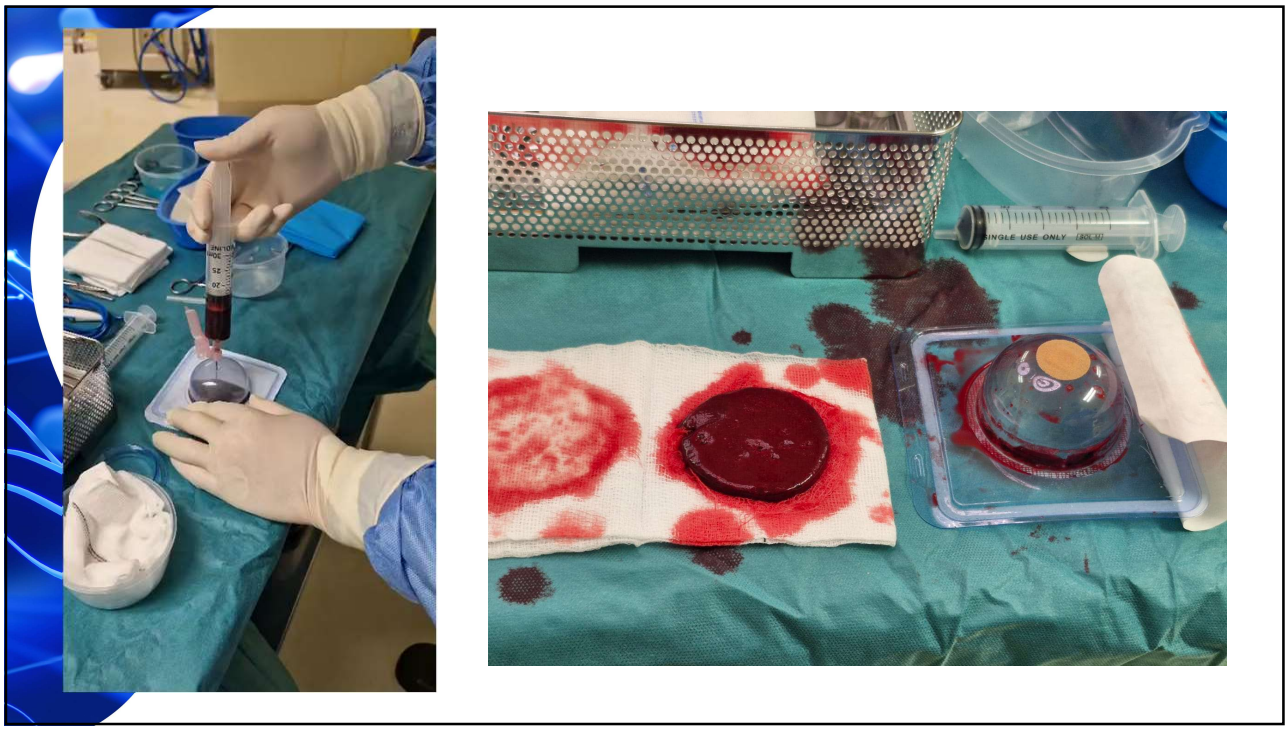

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Table 1. CEAP Classification - Clinical, Etiologic, Anatomic, Pathophysiologic

C-Clinical Class	Characteristics*	
0	No clinical findings or symptoms	E-Etiology**
1	Telangiectasia or reticular veins	C Congenital
2	Varicose veins	S Secondary
3	Edema, only due to a venous etiology	P Primary
4	(a) Pigmentation and/or eczema	A-Anatomy**
	(b) Lipodermatosclerosis, atrophie blanché	S Superficial (Great and short saphenous systems as well as any branch varices)
5	Prior ulceration, dermatitis	P Perforator (Veins that communicate between the superficial and deep systems)
6	Active ulceration	D Deep (Calf veins and sinuses, popliteal, femoral, iliac veins and vena cava)
A, S	Subscript: Asymptomatic, Symptomatic	P-Pathophysiology**
Date	Date of investigation	R Reflux
Level	Level of investigation (I, II, III)	O Obstruction
		R-O Both
		N** No evident disease**

*Complaints are expected to be related to venous insufficiency and are not classified if another etiology is present (i.e. edema secondary to heart failure).
**The N subscript indicates no evidence of disease. It is applicable to E, A, and/or P of CEAP.

Class 1: Telangiectasia. Class 2: Varicose vein. Class 3: Edema. Class 4: Pigmentation / Eczema. Class 5: Healed Ulcer. Class 6: Venous Ulcer.

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FRONTLINE VASCULAR CARE 2025

FARRER PARK HOSPITAL

Question & Answer

COMFORT · FAIRNESS · VALUE

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