



# Venous disease

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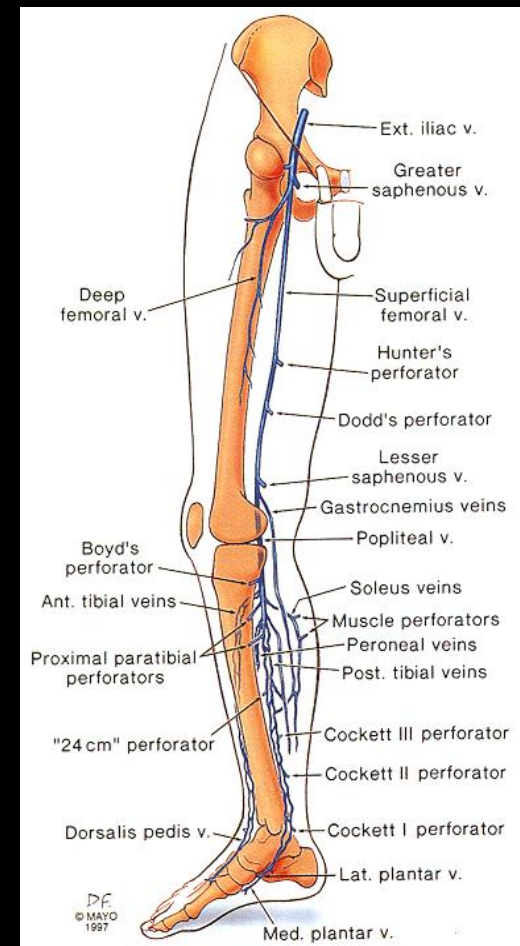
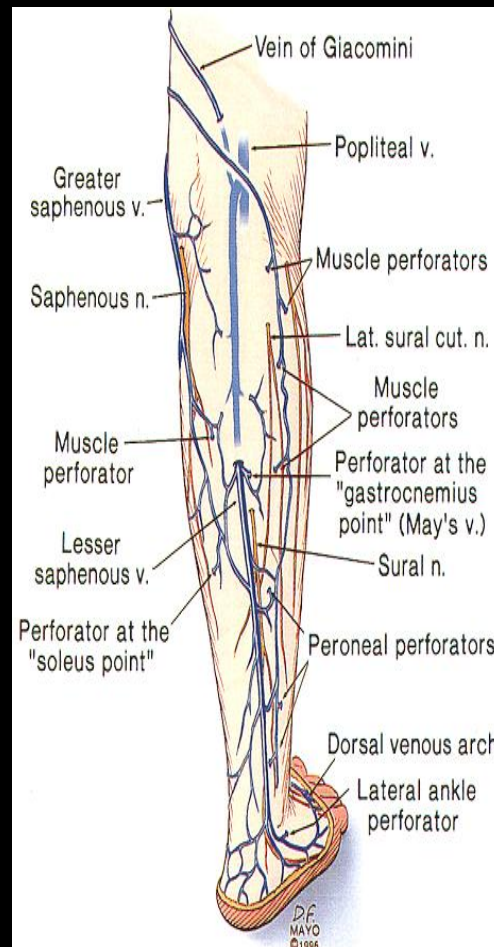
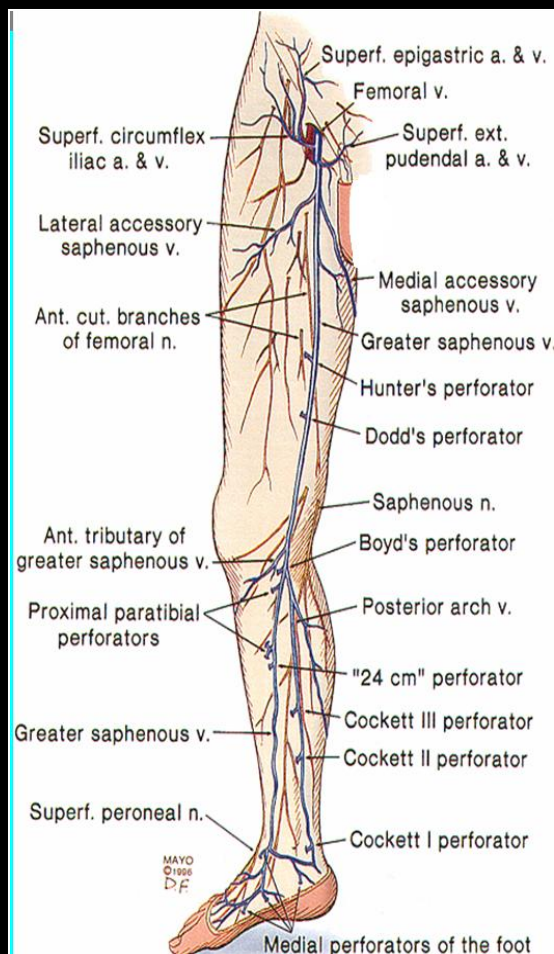
*Assistant professor and Consultant  
Vascular Surgery*

The teams notes are in white boxes

**Original Notes: 428 Surgery Team**  
**Edited by: 429 Surgery Team.. Rafif Mattar**

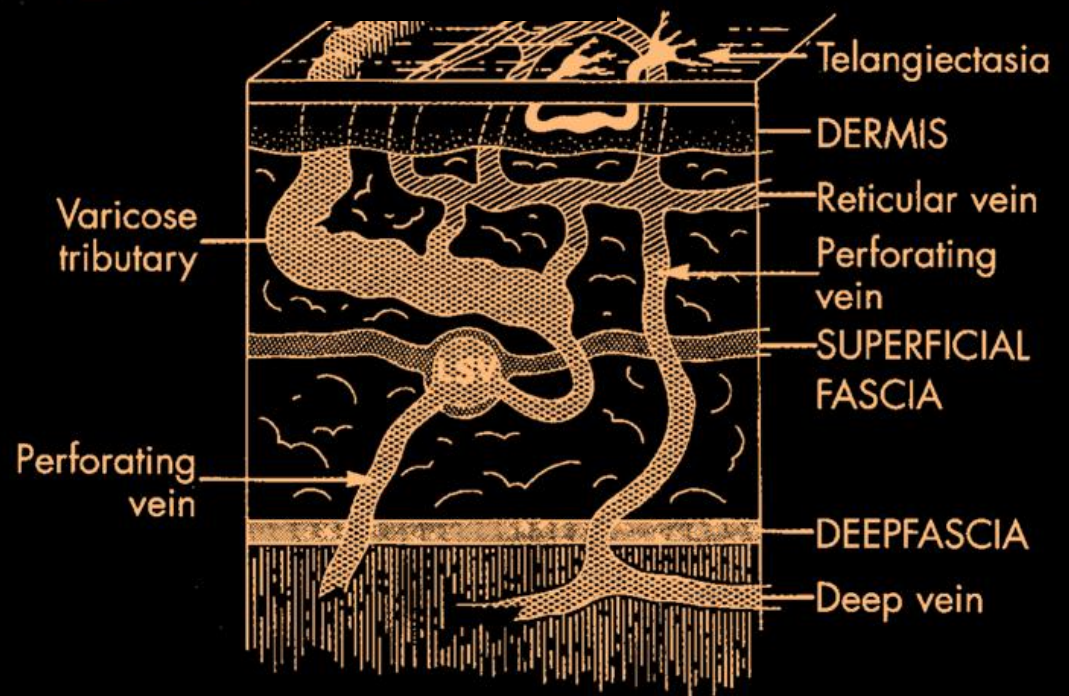
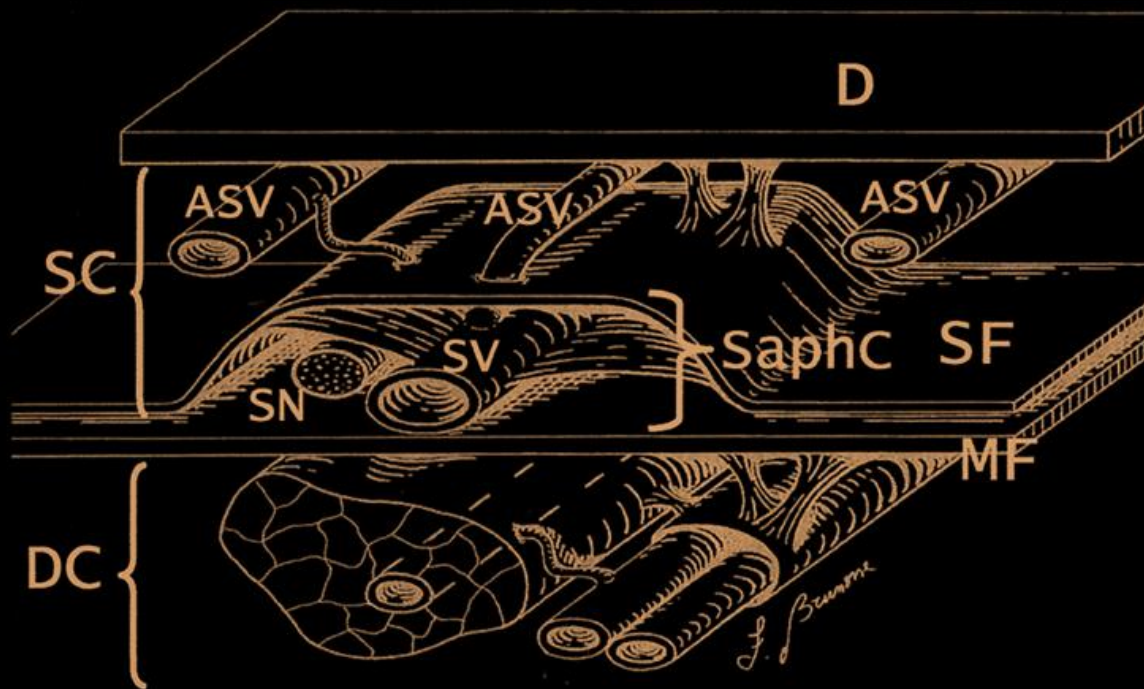


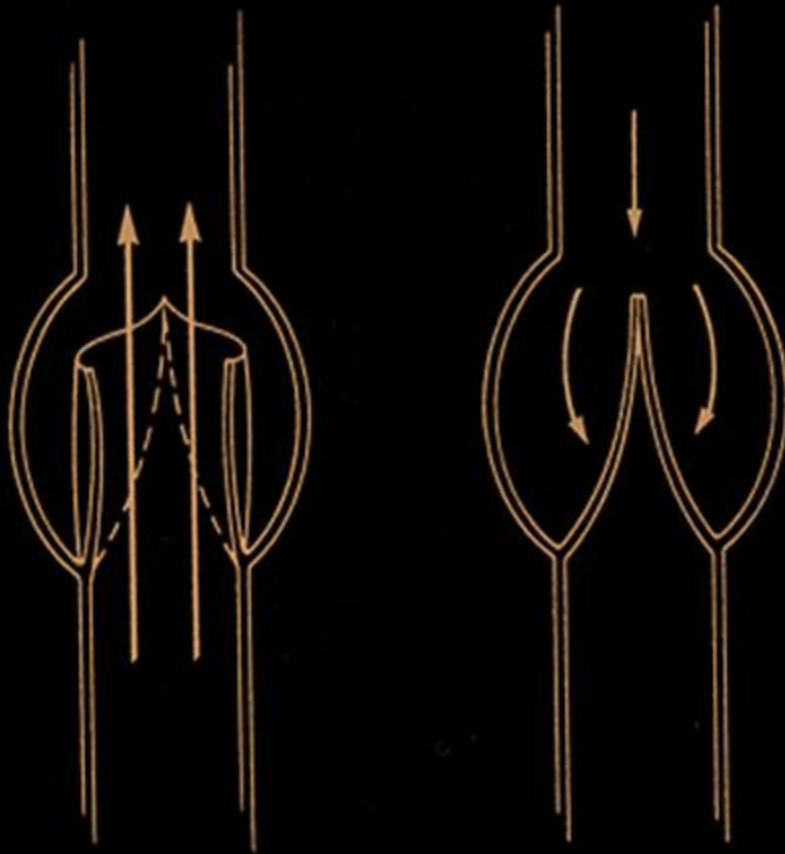
# *Anatomy*



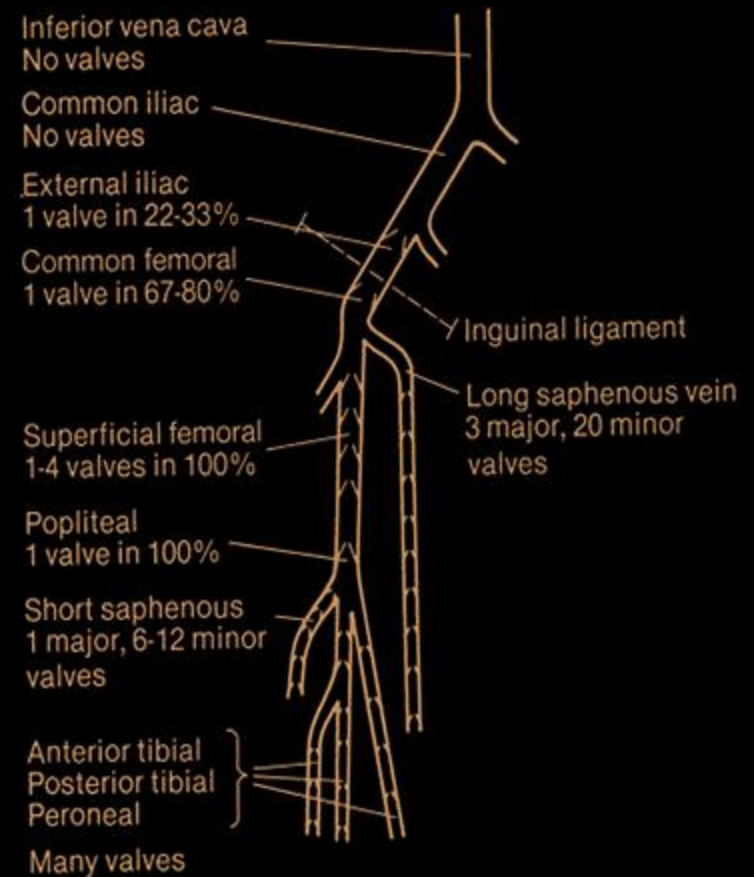
- Venous blood flow of the LL is divided into 3 components: the superficial, communicating, and deep veins.
- The superficial system comprises both the greater and lesser saphenous veins and their tributaries.
- The superficial venous system is connected to the deep venous system through smaller communicating or perforator veins.







- Veins have valves (varying in number). Their job is to prevent blood from refluxing.
- We'll explain the physiology later.





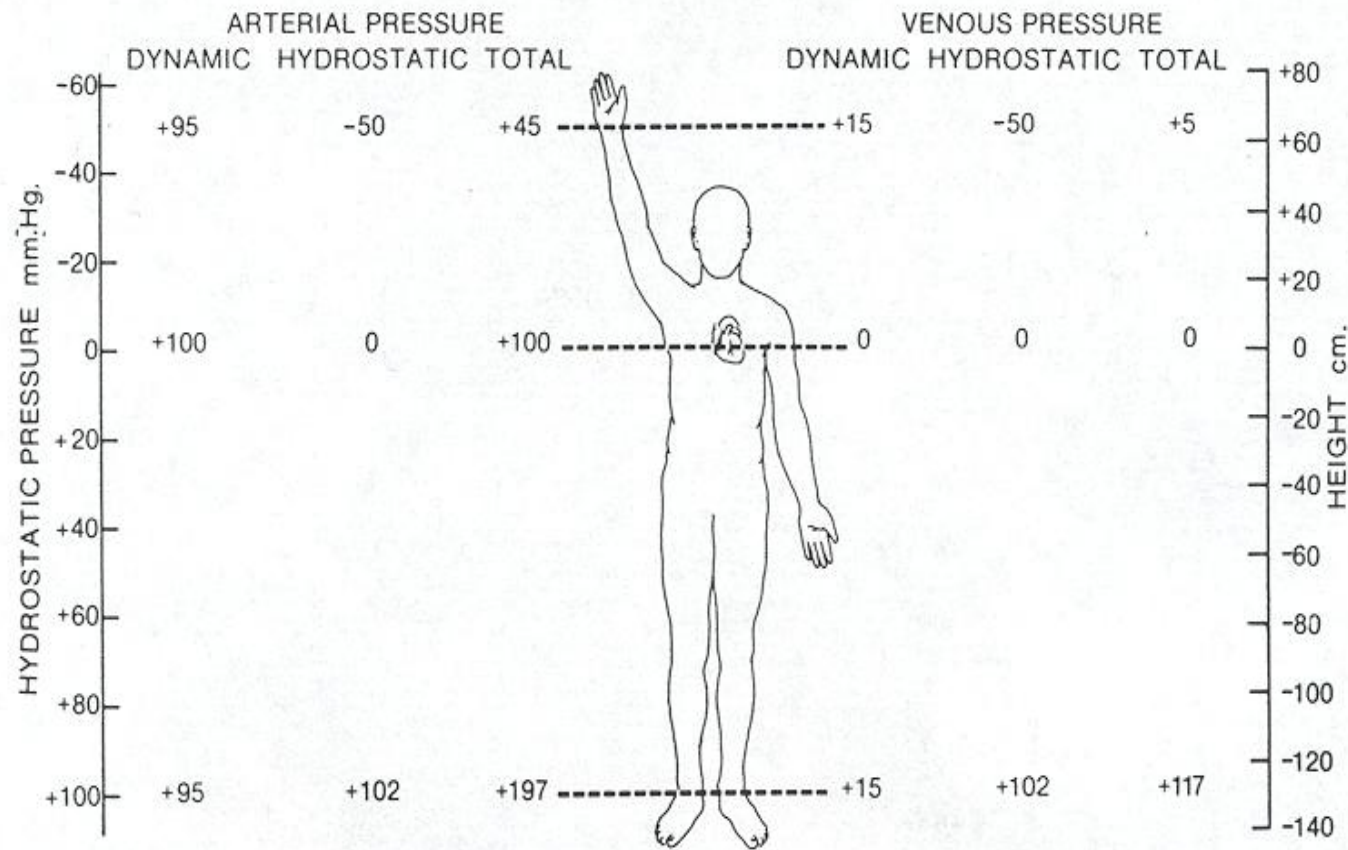






# *Physiology*

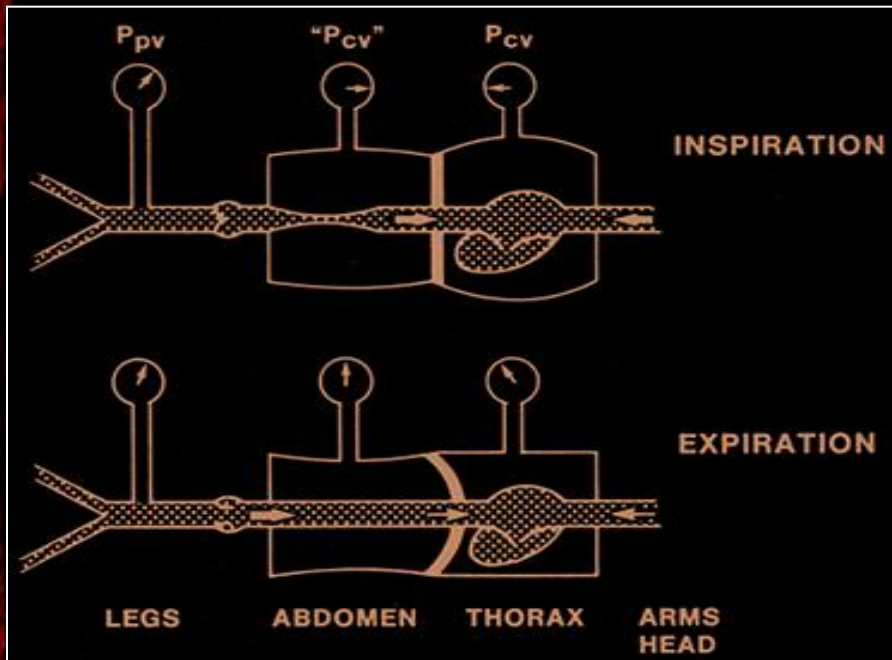




### Summary:

The hydrostatic pressure is (+)ve in LL and (-)ve in UL (compared to the heart).

Note the total pressure in lower limbs and compare it with the upper limb (total pressure of the LL is higher). That's why problems mainly will be in the LL.



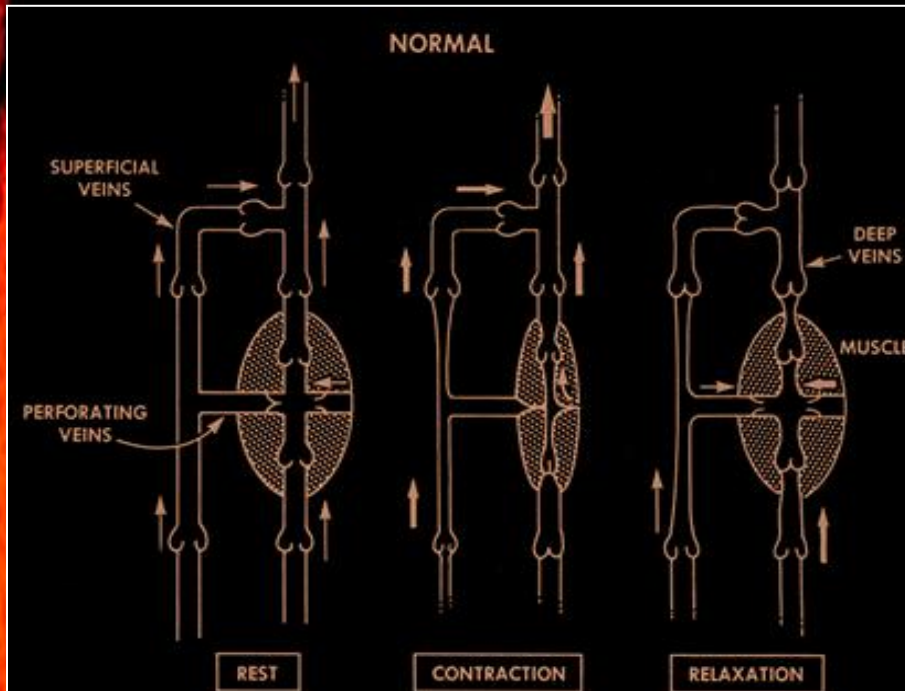
Chest is always (–) ve.

But abdomen:

In expiration diaphragm will go up creating a (–) ve pressure, which will lead to blood sucking to heart, and subsequent blood sucking from the legs.

On inspiration diaphragm will go down, creating a (+)ve pressure which will lead to closure of veins.

That cycle will continue and form a valve like function.



### Calf Muscle Pump

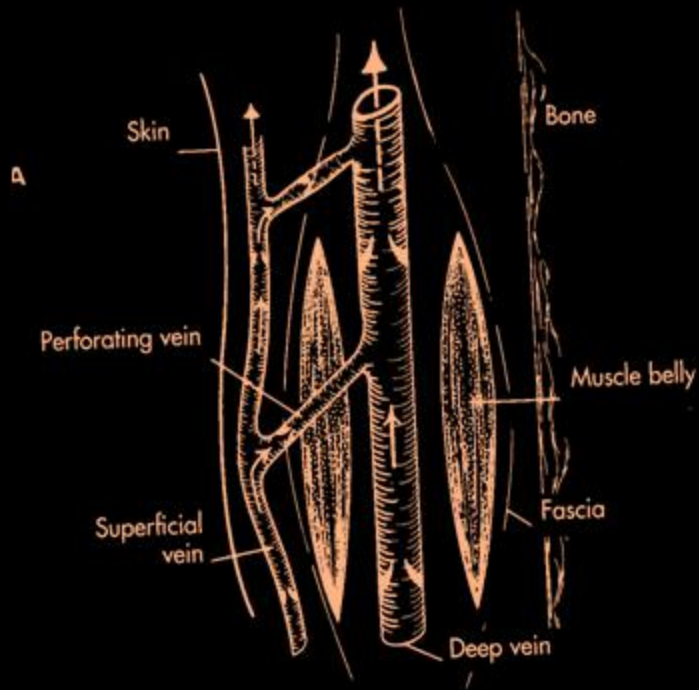
- When calf muscles are at rest, deep veins expand and blood is drawn in from the superficial veins.
- With calf-muscle contraction, blood is forced up the deep veins (opening the valves) towards the heart.

### Movement of blood (Normal):

From superficial to deep.  
From down to up.

# Calf Muscle Pump

Rest



Contraction




# Ambulatory Venous Pressure

<u>Position</u>	<u>mm Hg</u>
Supine	10
Standing	90
Walking*	25

\* 7 steps = maximum effect

- Supine and Walking positions are not a problem (low pressure).
- Standing is a problem (high pressure builds up).





# What is Chronic venous insufficiency?

- The presence of (irreversible) skin damage in the lower leg as a result of sustained venous hypertension.

A vertical strip on the left side of the slide shows a microscopic image of tissue. It features a dense network of red-stained structures, possibly cells or fibers, with prominent black lines or vessels running through them.

# Pathophysiology

Reflux (90%)

Obstruction (10%)

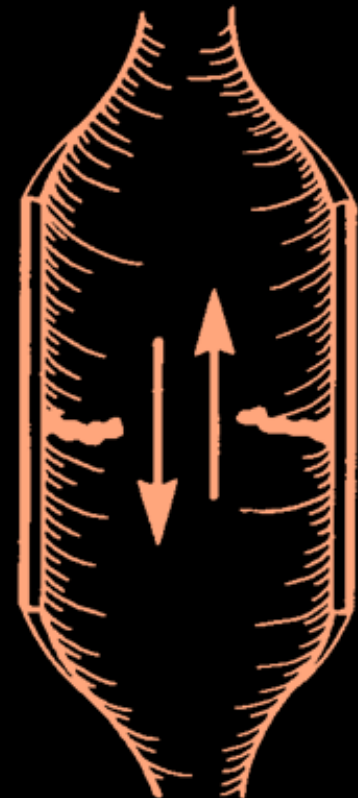


Normal flow  
to heart

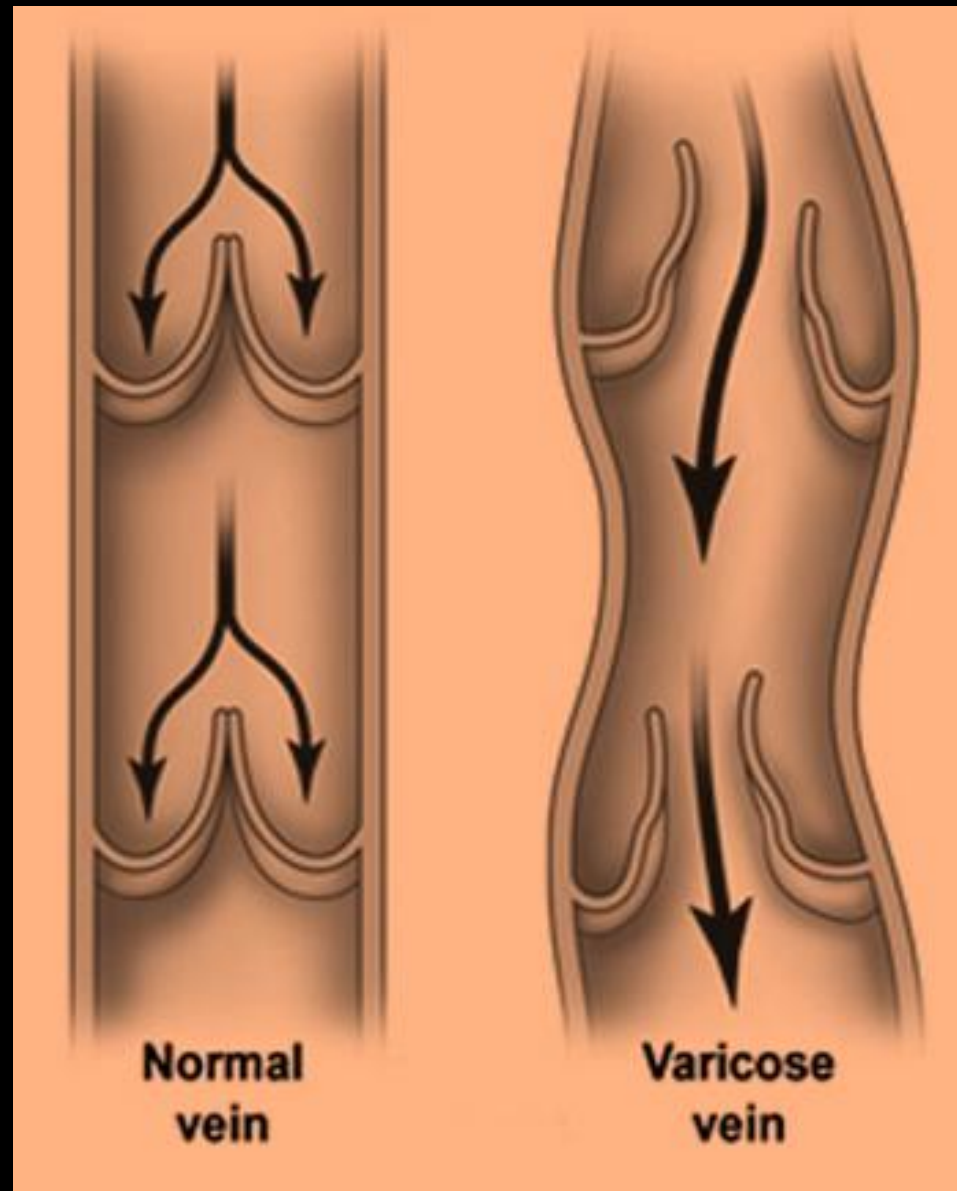
PROXIMAL



Normal  
valve function



Abnormal  
valve function





# SO, What happens to the Venous Pressure?

## NORMALLY:

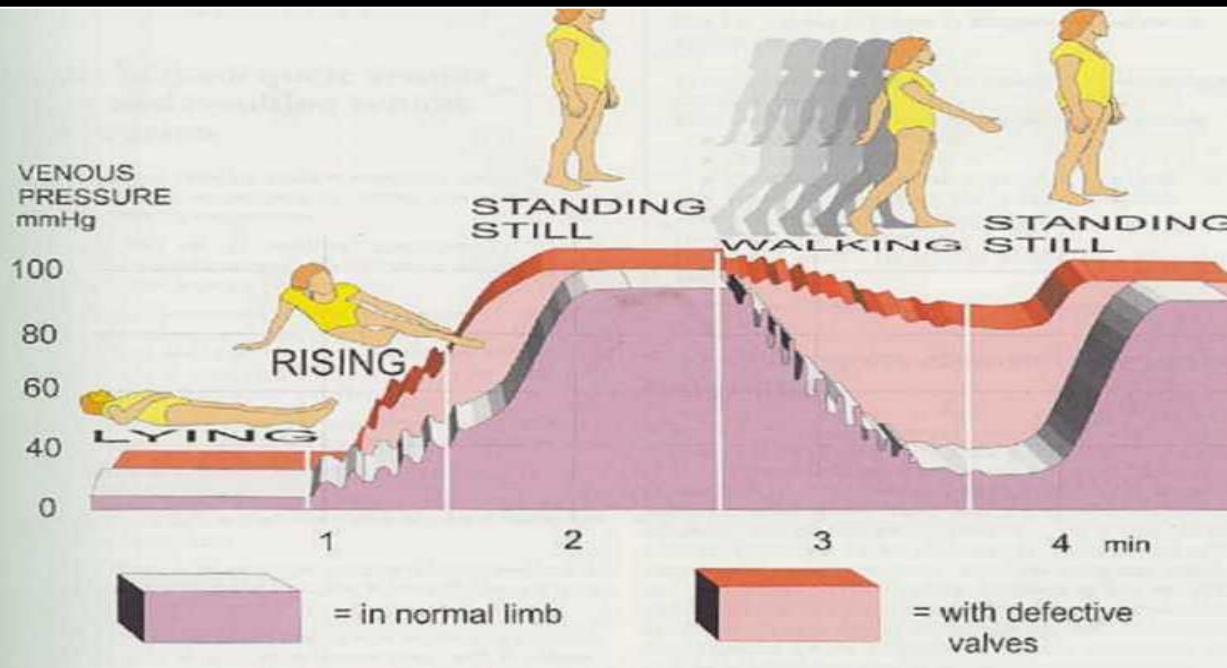
When lying supine, pressure in lower limbs is low (10 mmHg)

When rising, deep veins start pulling blood from superficial veins SLOWLY, so pressure starts to increase gradually.

When standing, deep veins continue to pull blood and pressure increases reaching (90 mmHg)

When walking, calf muscle pump starts working and pushes blood up the vein through the valves, so pressure drops to (25 mmHg). Valves then close, to prevent the pressure from increasing again by preventing the blood from refluxing.

If you stop and stand still, calf pump stops and the deep veins start to pull blood from the superficial veins again, so pressure builds up again.



## IF VALVES DEFECTED:

(1) When rising and standing, blood will reflux from the valve, so the pressure will increase RAPIDLY.

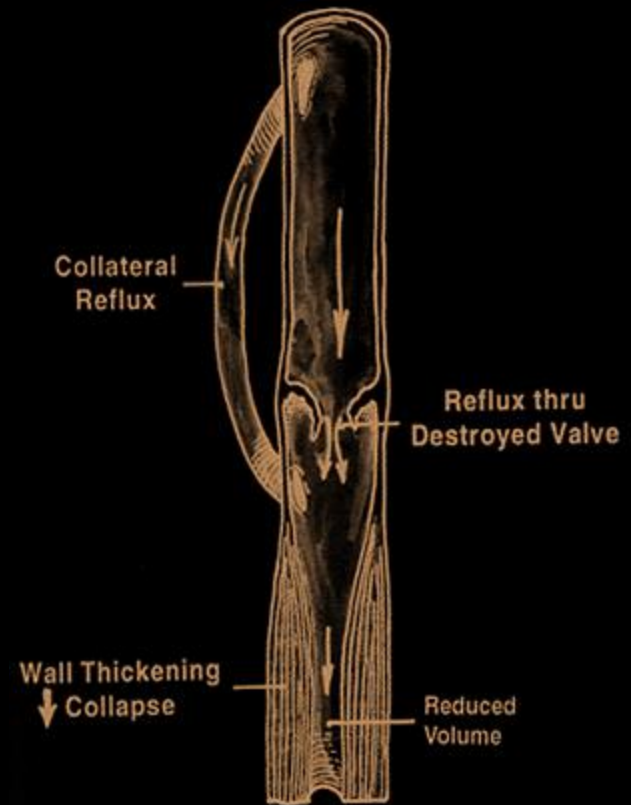
(2) When walking, blood will reflux through the valve, and the pressure remains high.



## Primary Valvular Incompetence “floppy valve”

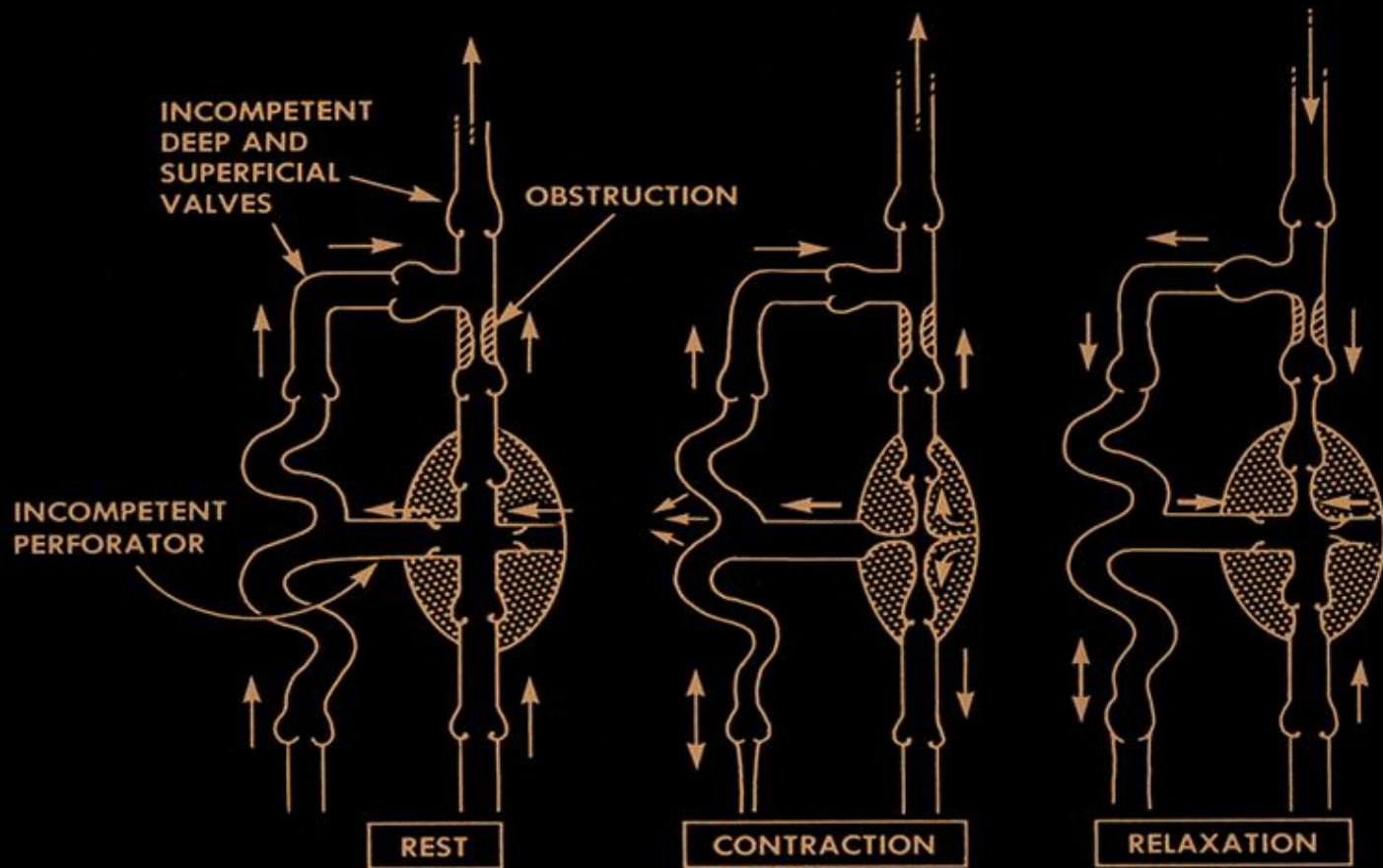


## Secondary Valvular Incompetence



# Primary Valvular Incompetence “floppy valve”

# Secondary Valvular Incompetence



Note: the (down-to-up) and (out-to-in) mechanism is disturbed because of obstruction.



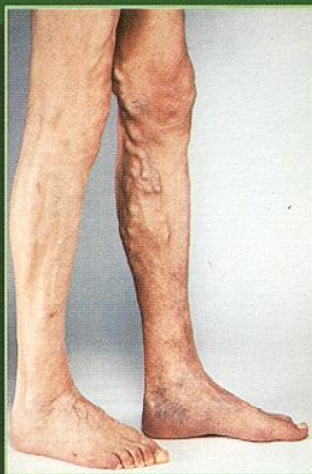
# Evaluation

- History
- Physical Examination
- Investigations:
  - Non-invasive (Doppler/Duplex)
  - Invasive (AVP/ Venography)

# Clinical Presentation



C<sub>1</sub>  
Telangiectasia  
spider veins



C<sub>2</sub>  
Varicose veins



C<sub>3</sub>  
Edema without  
skin changes



C<sub>4</sub>  
Lipodermatosclerosis  
pigmentation, eczema

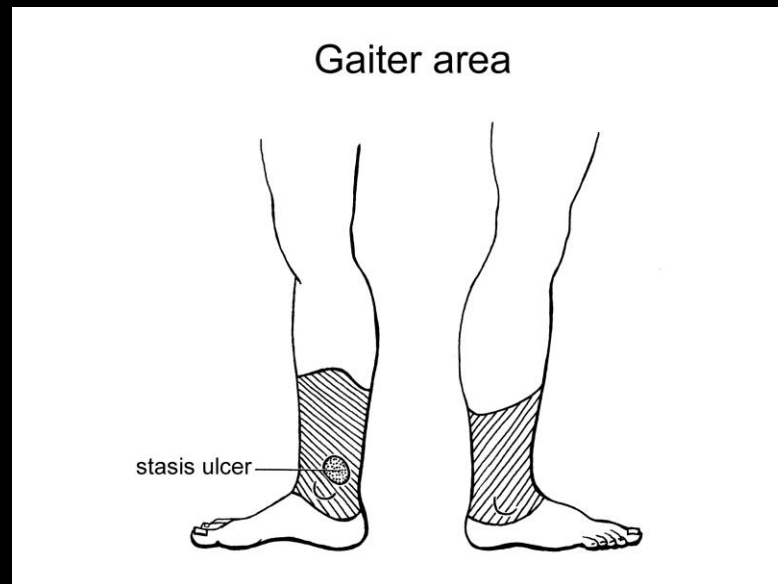


C<sub>5</sub>  
Healed ulcer



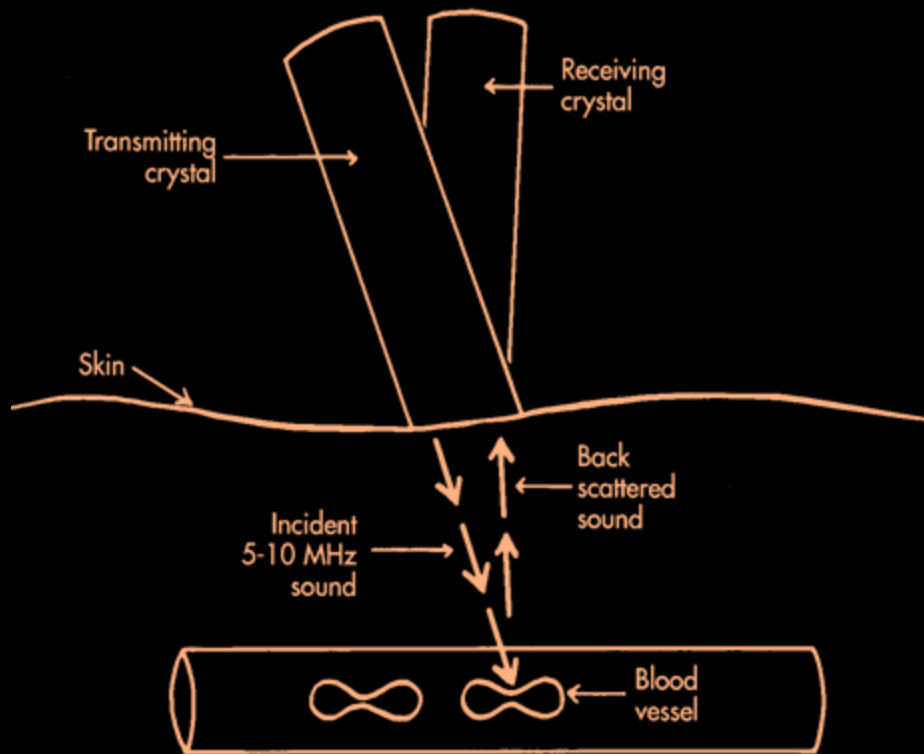
C<sub>6</sub>  
Active ulcer

The **gaiter area** (area around medial and lateral malleolus ) is common site for venous ulceration cuz this area is skin on a bone (no tissue and fat between them) so the blood and inflammatory stuff will go directly from the veins to skin leading to certain manifestation like:  
lipodermatosclerosis, healed ulcer, and active ulcer.



# Doppler

To hear blood flow in veins

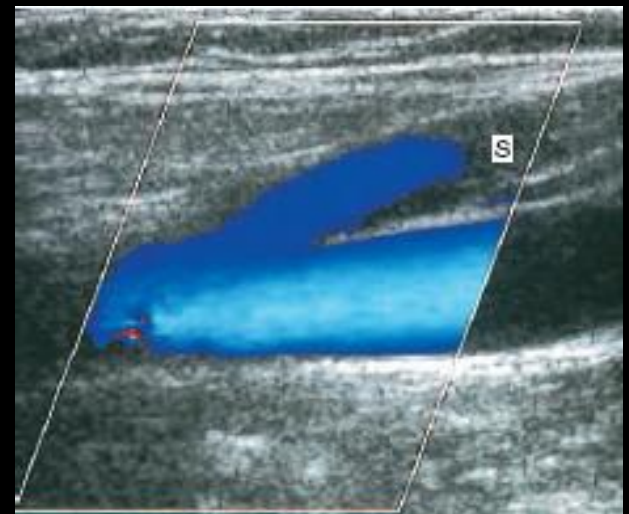
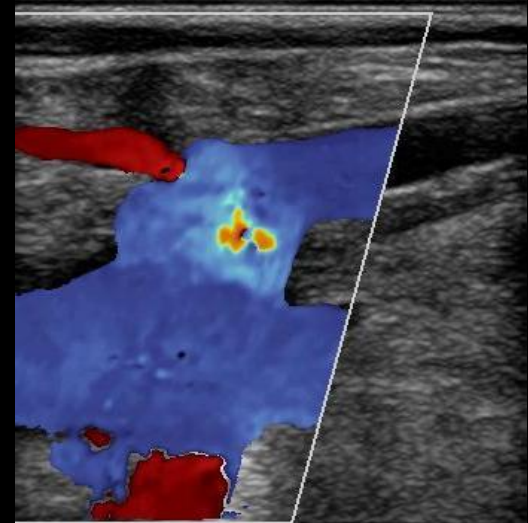


You can detect which valve isn't working, or an obstruction, by listening for abnormalities in the sound of the flow.

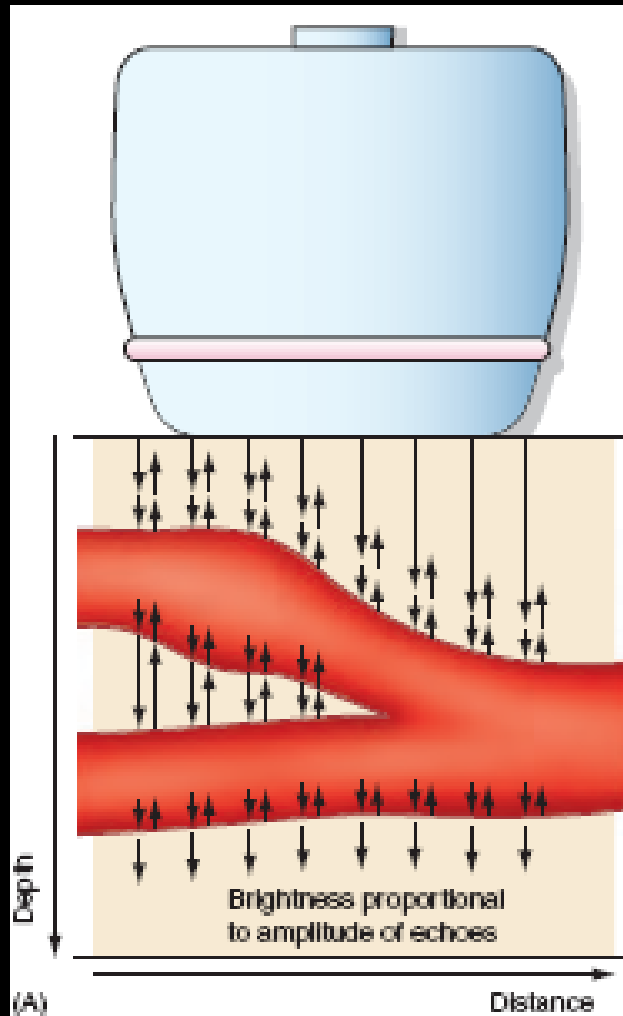


# Duplex-Scanning

A special ultrasound machine that allows visualization of a portion of the venous system. It can determine the direction and speed of blood flow within the veins.



# Duplex-Scanning

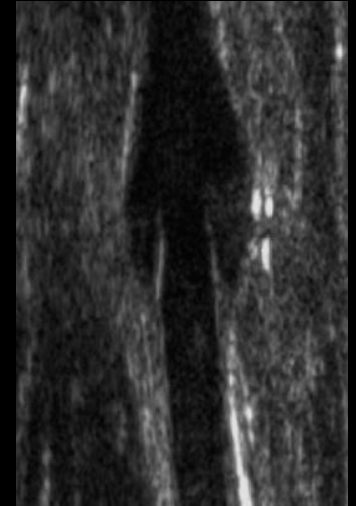
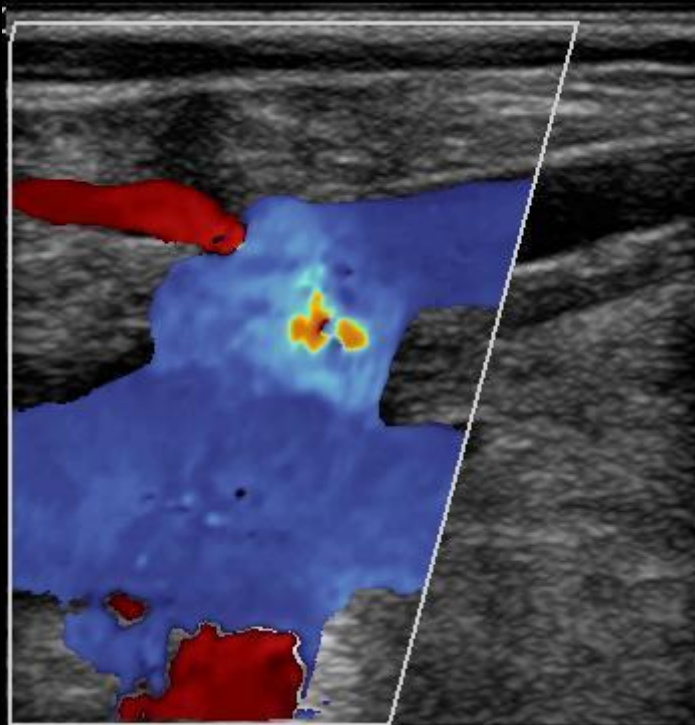




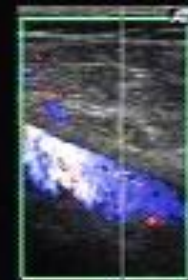




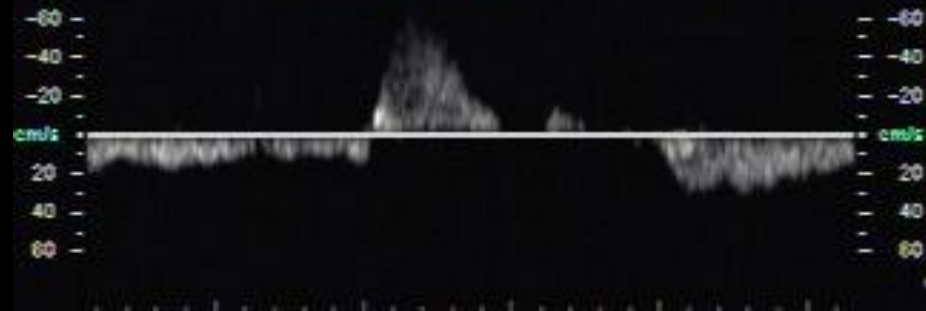
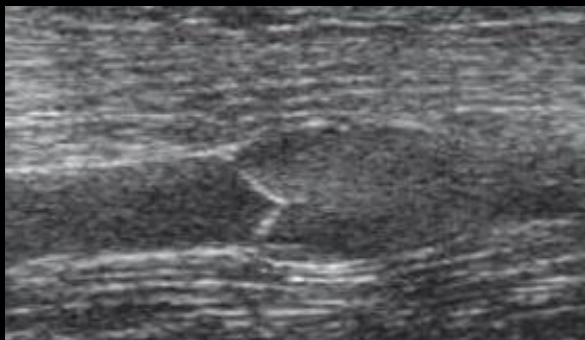
# Duplex-Scanning



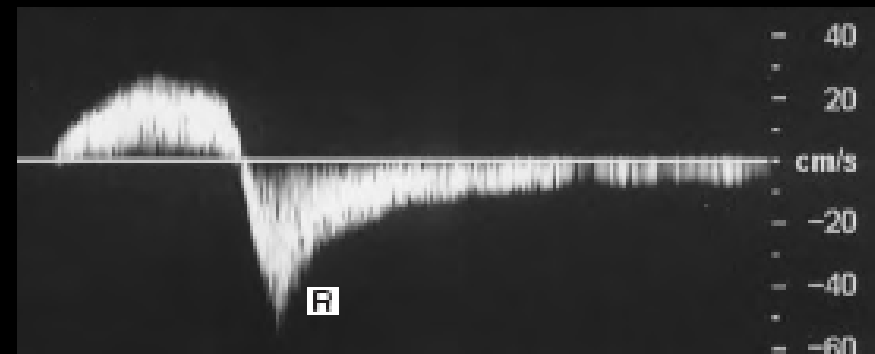
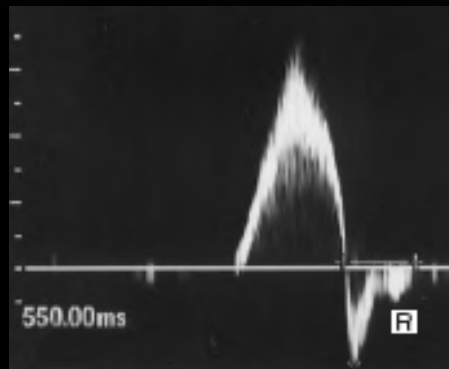
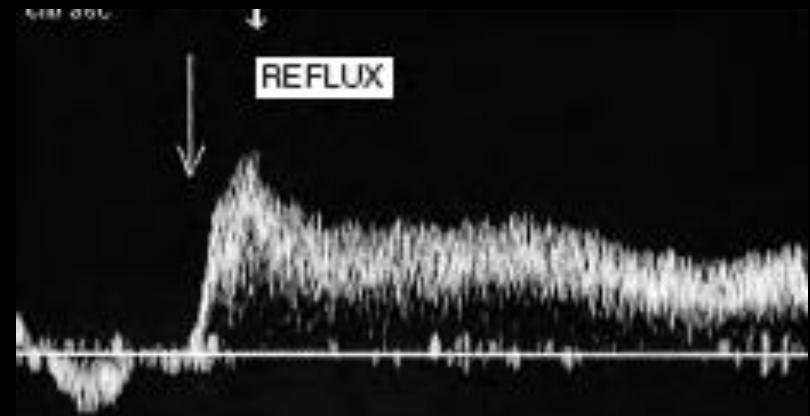
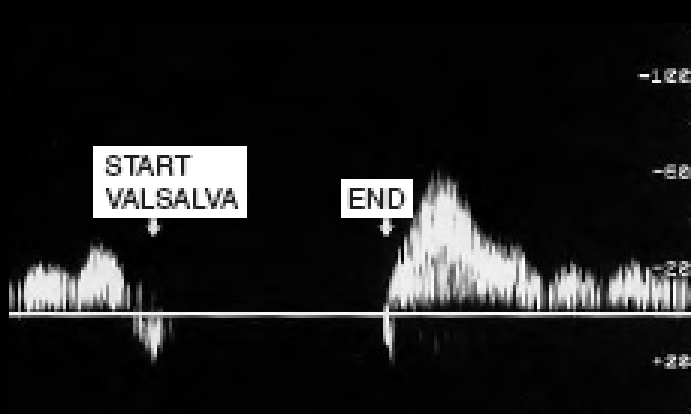
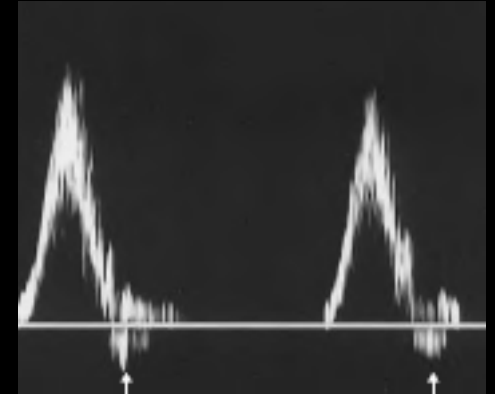
Col 75% Map 3 LEFT  
WF Low  
PRF 700 Hz  
Flow Opt: Med V



SV Angle 70°  
Dop 3.7 cm  
Size 2.0 mm  
Freq 4.0 MHz  
WF Low  
Dop 64% Map  
PRF 2500 Hz

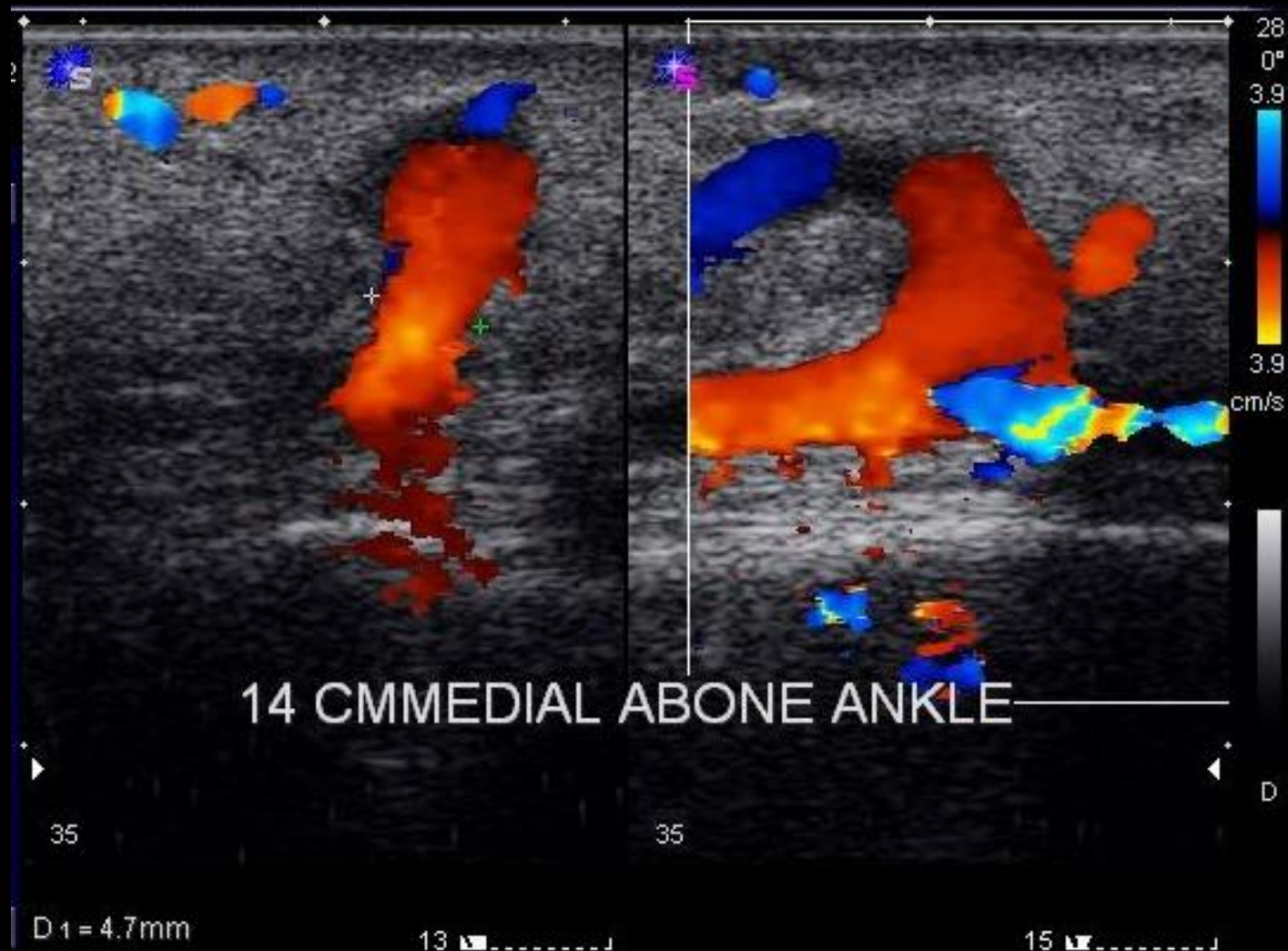


# Duplex-Scanning





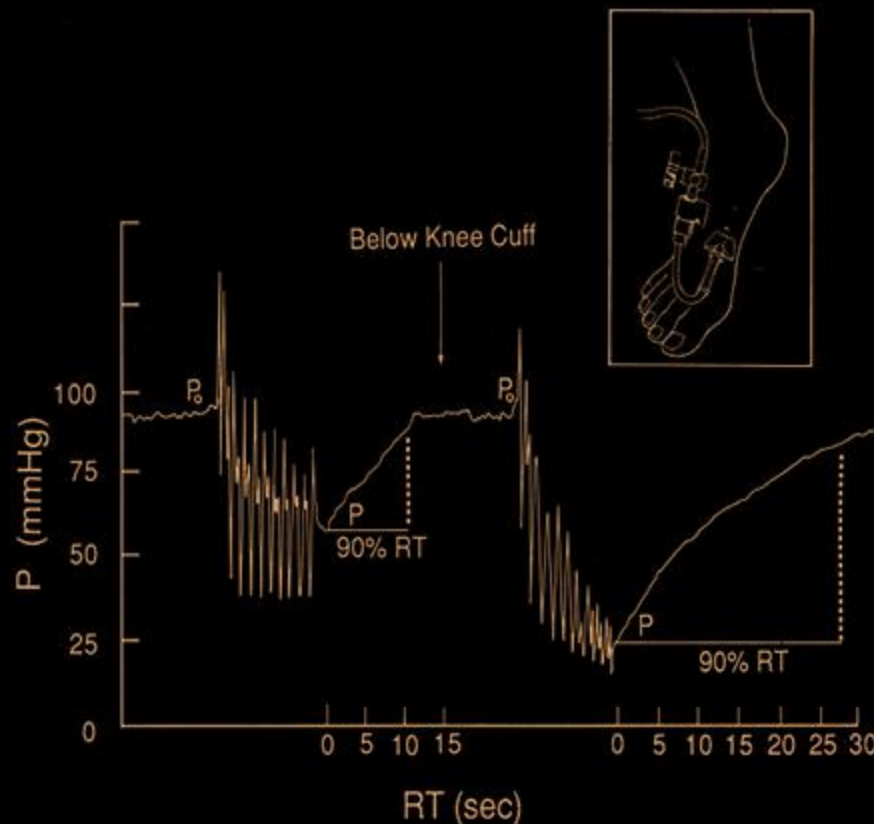
# Incompetent Perforator Vein



# Ambulatory Venous Pressure

Is a test to measure the venous pressure in supine, standing, and walking positions. To compare it with normal changes.

It is performed by placing a small needle into one of the veins on the back of the foot and connecting the needle to a blood pressure measurement machine.



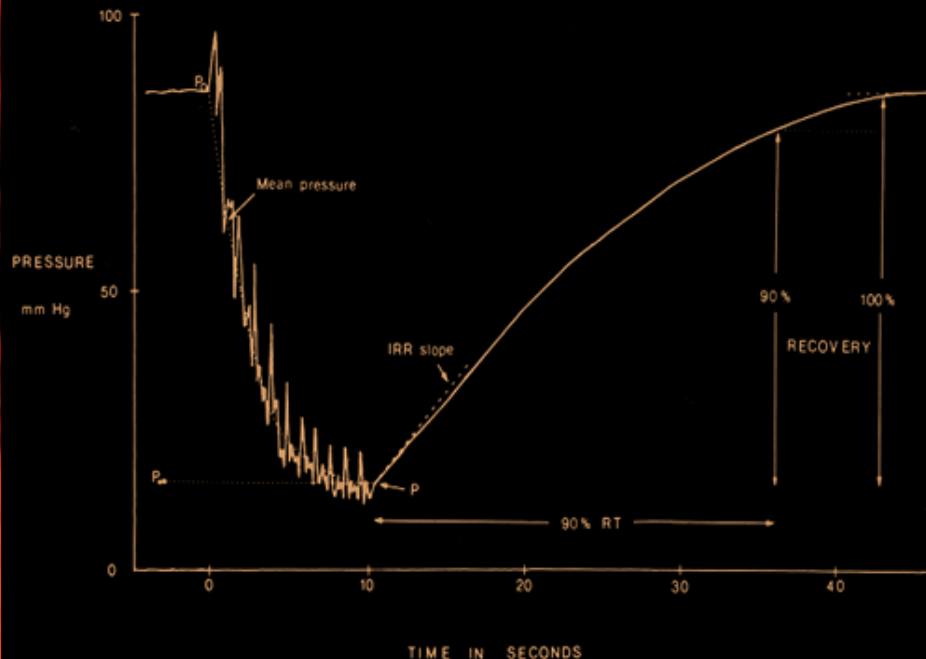
## Reflux

### 20-21gauge Butterfly Needle

- Superficial Dorsal Vein (Foot) or Ankle Vein
- Standing
- Heal Raised
- Measurements



# Ambulatory Venous Pressure



## Interpretation

### Normal:

(when walking)

1- ↓ Pressure 80 - 90mm Hg  
to 20-30 mm Hg

2- or > 50% drop

(then after standing still)

**Venous RF Time:  $\geq 20$  SEC**

**REMEMBER THE PHYSIOLOGY OF VENOUS PRESSURE  
CHANGES WHEN INTERPRETING RESULTS**

# Abnormal AVP

I

Lack of sufficient drop  
in pressure with  
ambulation



**$P < 50\%$**

(pressure doesn't decrease enough on  
walking)

II

Short Venous Refill Time

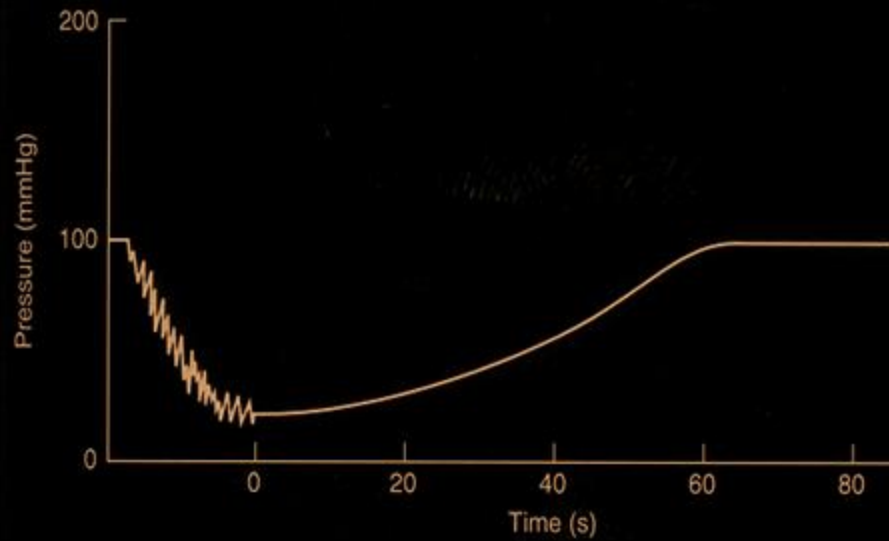
**$VRT < 20 \text{ sec}$**

(considered to fill too fast on standing)

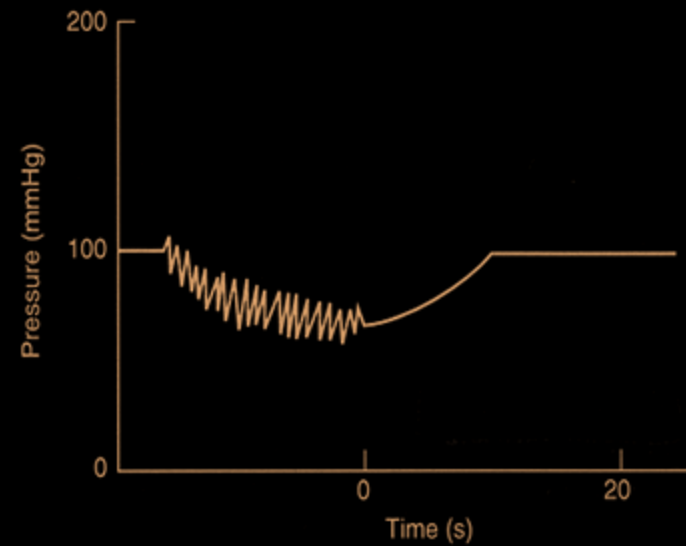
\* Ambulation = walking

# AVP

## Normal



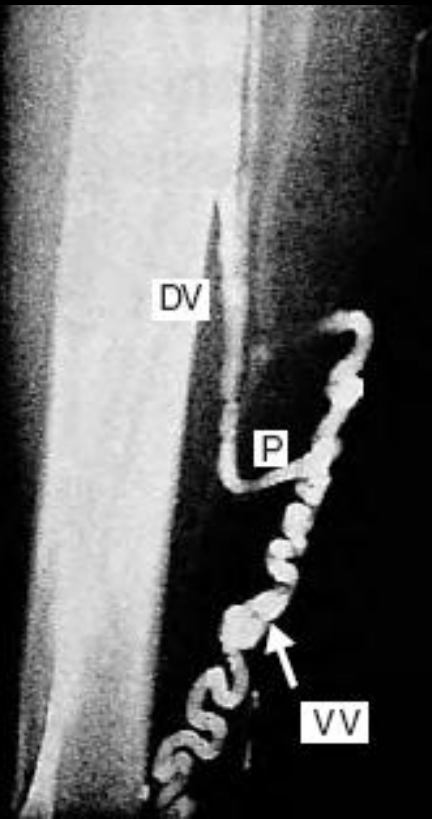
## Deep venous incompetence



# Phlebography

Invasive. Contrast injected to visualize veins.

Not used much nowadays, due to its complications. But still has specific indications.





# Phlebography



# Phlebography





# Treatment

**Principle of treatment:**

restoration of blood pumping towards the heart,  
or else,

remove the problematic vein (provided that there is another functioning vein draining the same area.)

# Treatment

## Some methods:

- **Stocking**: (physical), applies pressure, but its problem is low compliance , although it usually solves the problem.
- **Ablate vein**: chemically or thermally, provided that there is another functioning vein draining the same area.
- **Conventional surgery**: problematic vein tied above and below, then taken out. Not used anymore



# Treatment

Telangiectasias  
& Reticular veins



Stocking and/or Sclero-Rx



# Treatment



Varicose Veins



Stocking  
USG-Sclero-Rx  
EVLT/Surgery



Edema

Cutaneous Ulcer

Local Wound

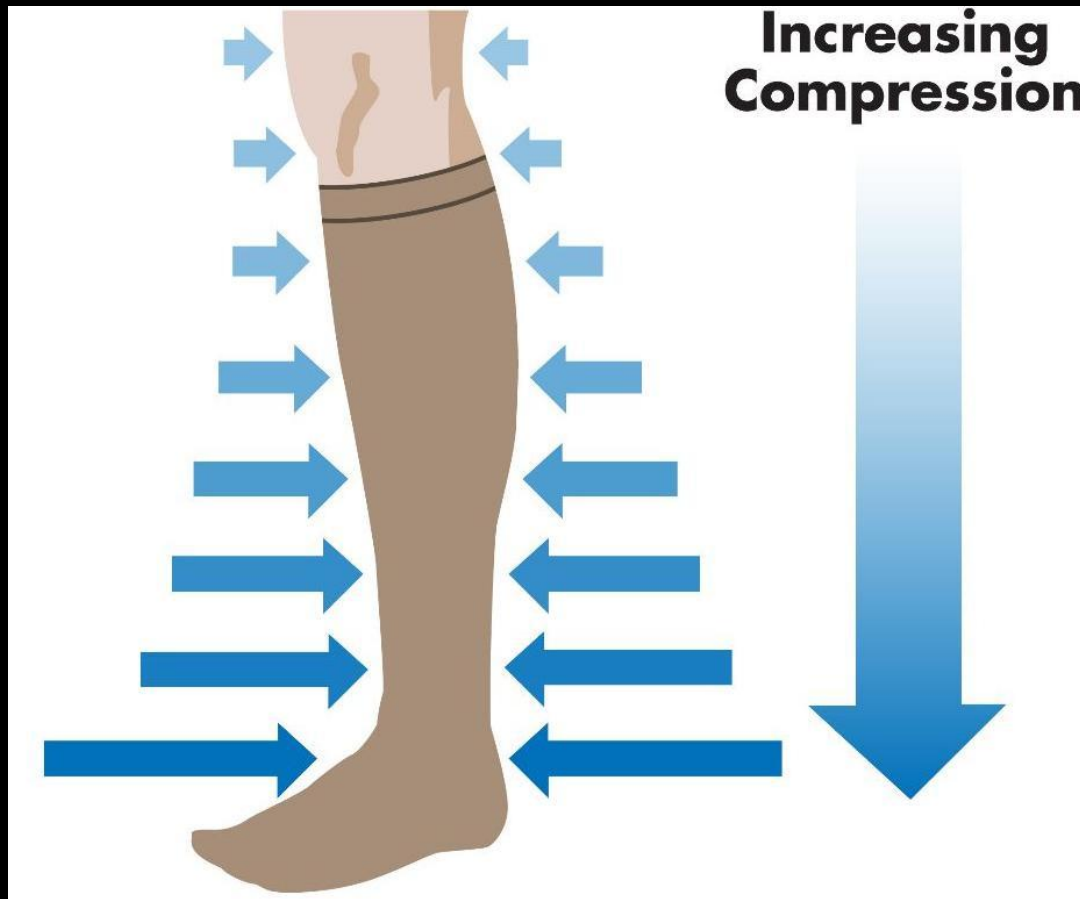


Stocking

USG-Sclero

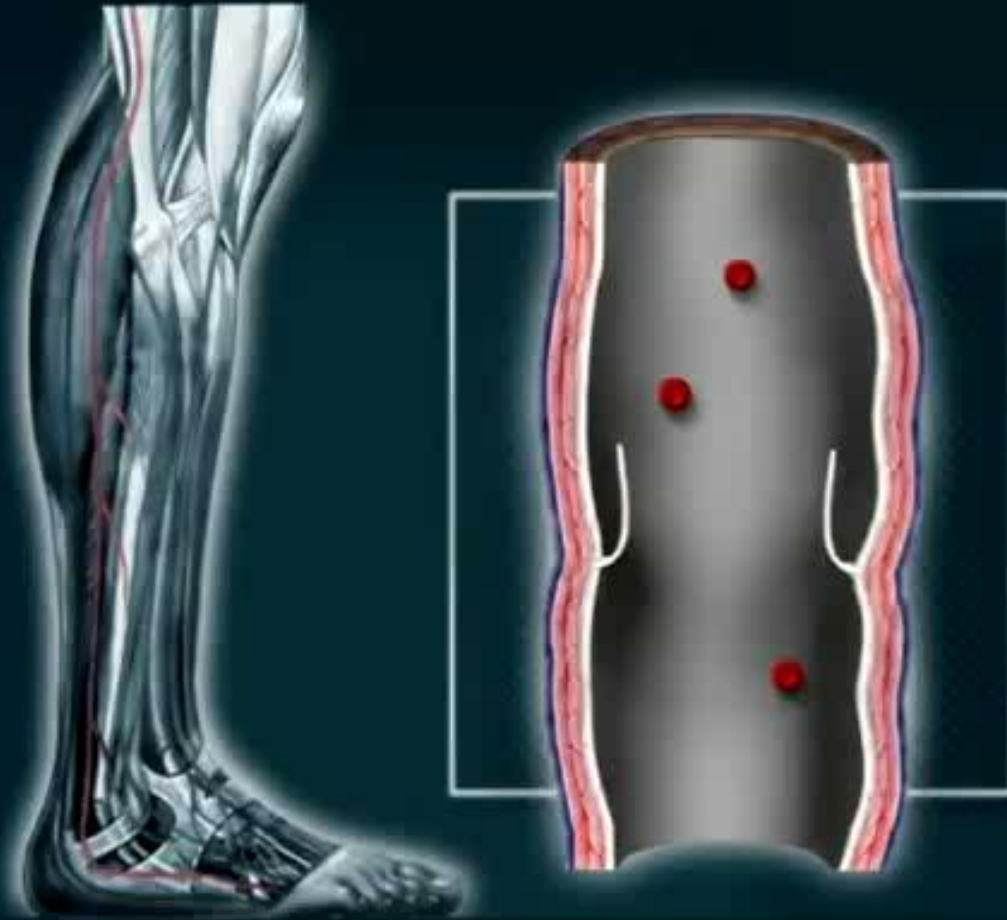
ELVT/Surgery

# Compression Stockings

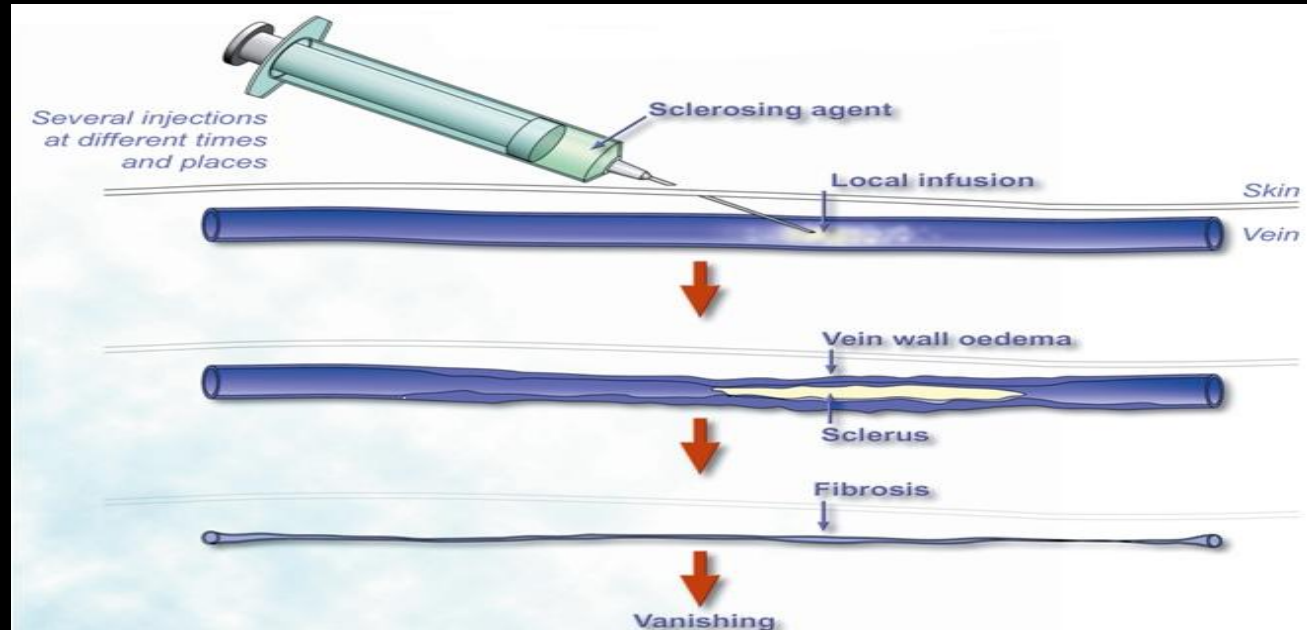




# Compression Stockings



# Sclerotherapy



There are 2 types of veins superficial and deep. If the superficial is not working we remove them and we depend on the deep veins.

Sclerotherapy is the injection of a sclerosing agent into a vein, causing an inflammatory reaction in the endothelium of the vein wall. The vein walls adhere together under compression and form a scar (fibrotic tissue) that is absorbed by the body.

Remember this works only to the small veins not big ones.

# Endovenous Ablation Techniques

Denaturation of vein wall collagen



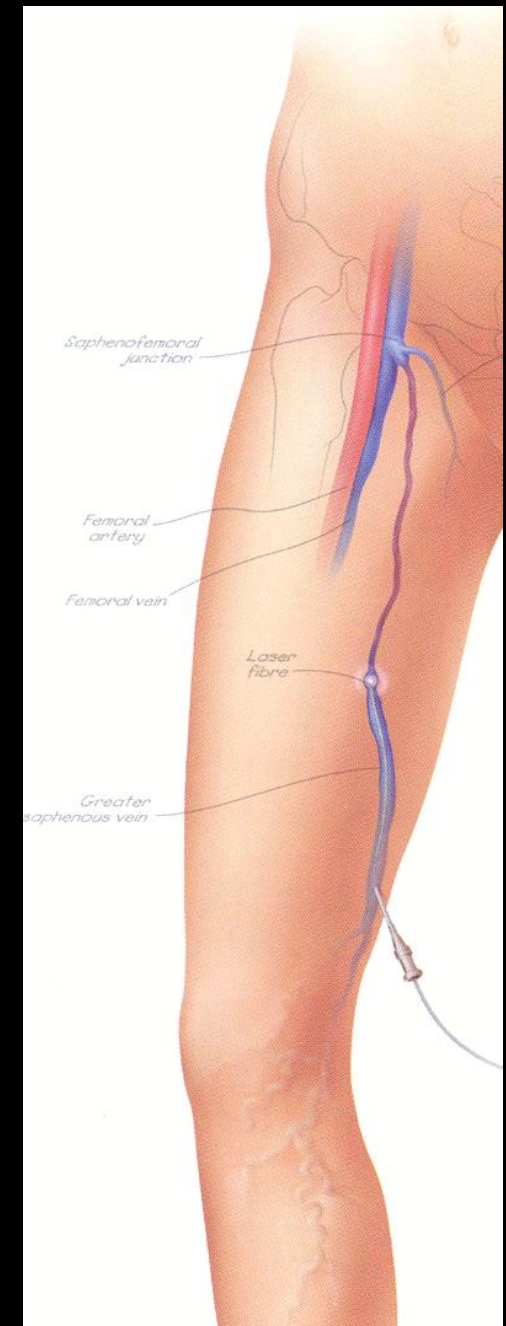
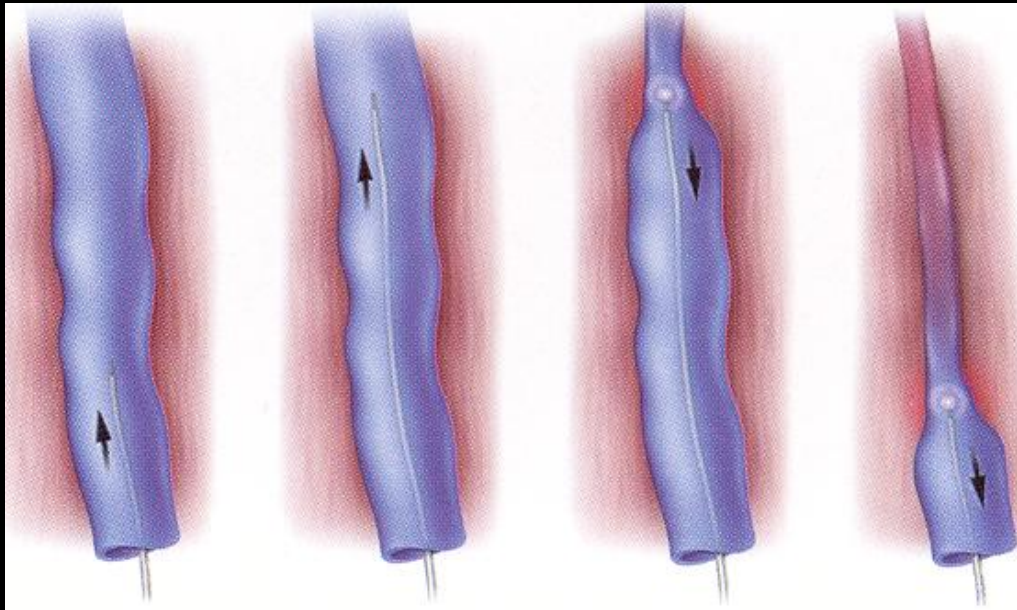
Contraction



Fibrous obliteration

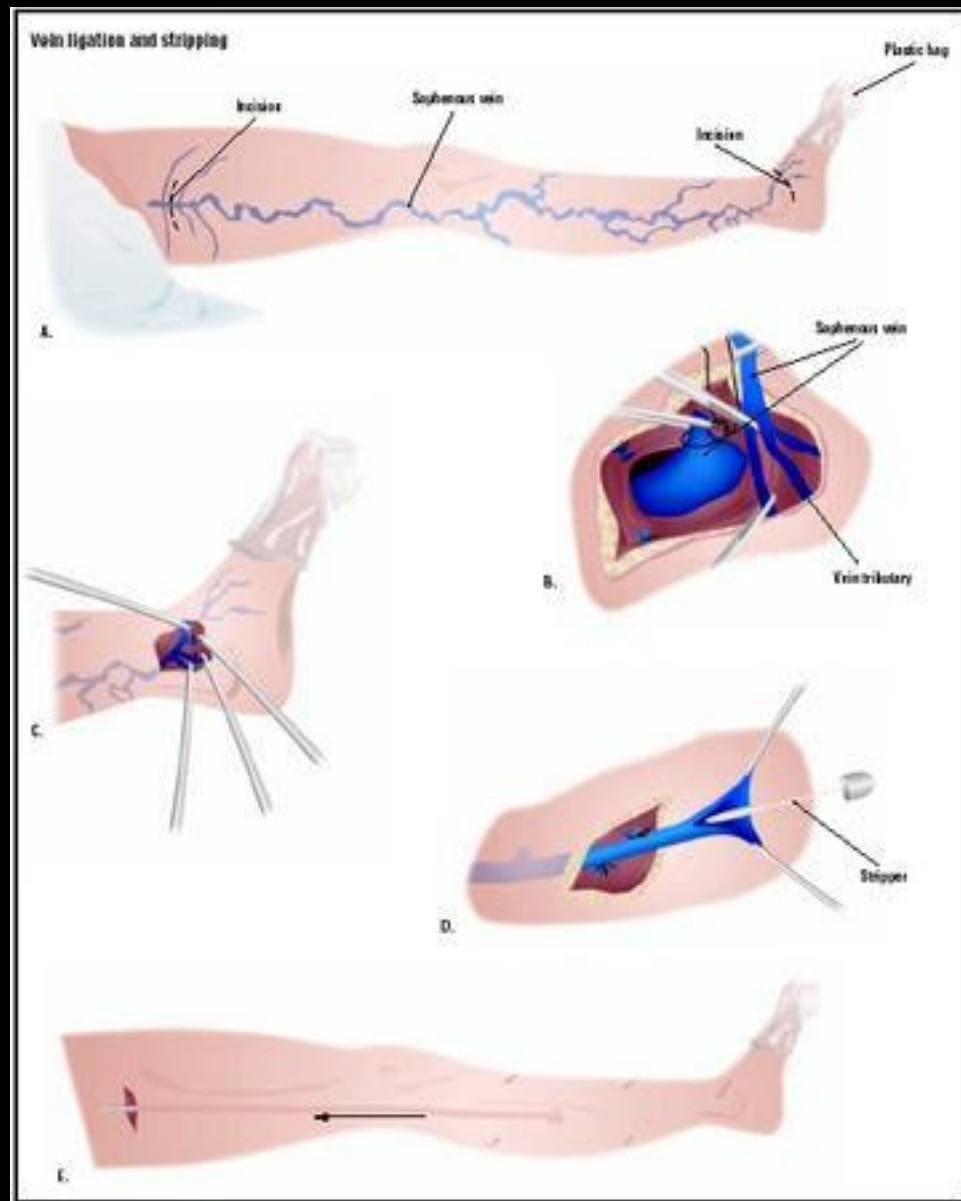


# EndoVenous Laser Therapy (EVLT)





# Surgery





*Thank You*