

Deep vein thrombosis

DVT – Epidemiology and Etiology

- Annual incidence of venous thromboembolism (VTE) is 1/1000
- DVT accounts for one half of VTE
- Carefully evaluated, up to 80% of patients with VTE have one or more risk factors
- Majority of lower extremity DVT arise from calf veins but ~20% begin in proximal veins
- About 20% of calf-limited DVTs will propagate proximally

DVT – VTE Risk Factors

- Malignancy
- Surgery
- Trauma
- Pregnancy
- Oral contraceptives or hormonal therapy
- Immobilization
- Inherited thrombophilia
- Presence of venous catheter
- Congestive failure
- Antiphospholipid antibody syndrome
- Hyperviscosity
- Nephrotic syndrome
- Inflammatory bowel disease

Deep vein thrombosis

- predisposing factors
 - immobility/bed rest
 - post-operative
 - pregnancy and post-partum
 - oral contraceptives
 - severe burns
 - cardiac failure
 - disseminated cancer

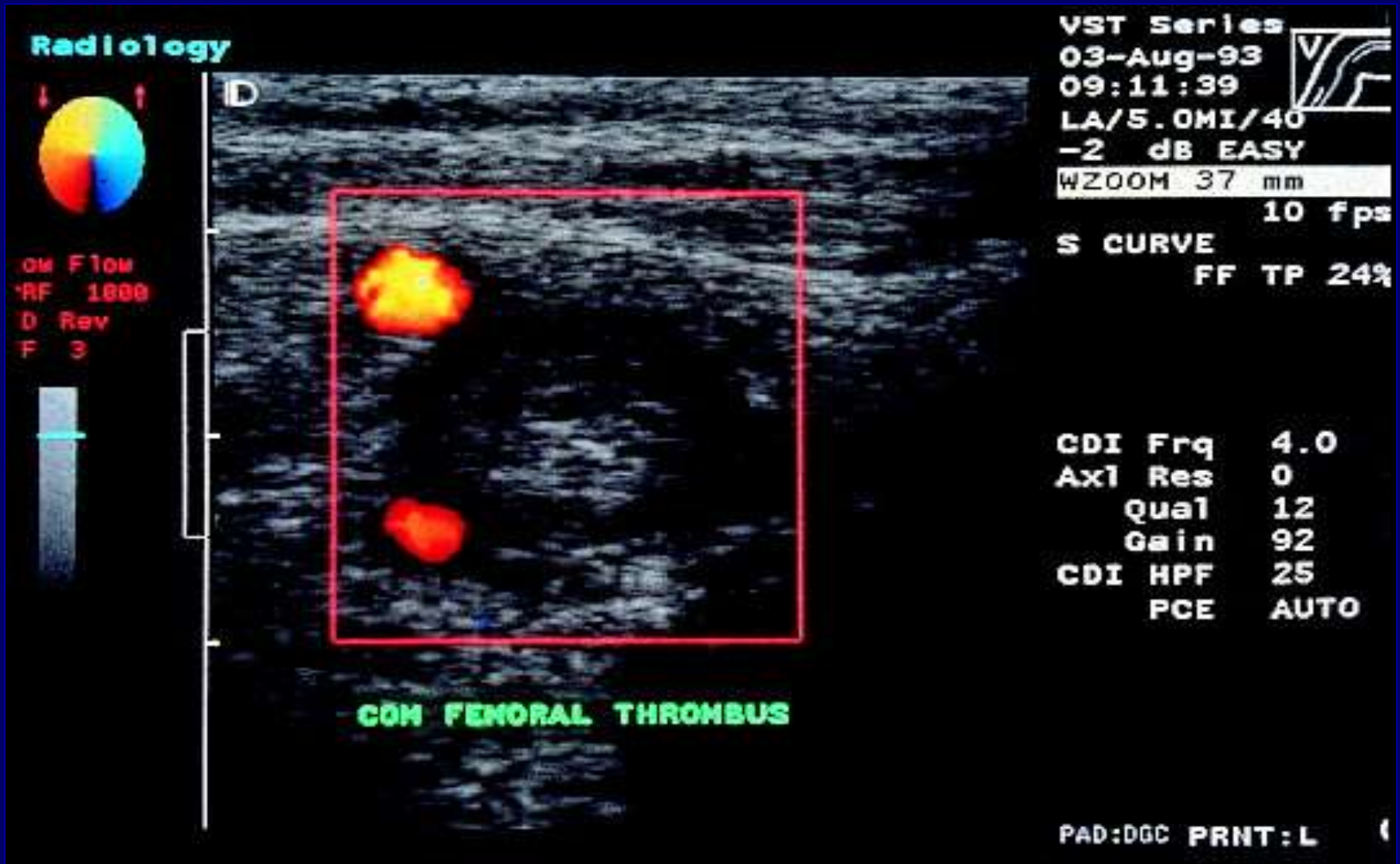


DVT – Clinical Presentation

- Classically = calf pain, tenderness, swelling, redness and Homan's sign
 - Overall sens/spec = 3-91%
 - Unreliable for diagnostic decisions
- Wells developed and tested a clinical prediction model for DVT

Wells PS, Anderson DR, Bormanis J, et al. Value of assessment of pretest probability of deep-vein thrombosis in clinical management. *Lancet* 1997;350(9094):1795-8.

Color duplex scan of DVT



Phlegmasia cerulea dolens

→ Venous gangrene



DVT – Wells Score

The following were assigned a point value of 1 if present:

- Cancer
- Paralysis or plaster immobilization
- Bedrest > 3d or surgery in past 4 wks
- Localized tenderness
- Entire leg swollen
- Calf > 3cm larger than unaffected leg
- Pitting edema greater than unaffected leg
- Collateral superficial veins
- Alternative diagnosis more likely than DVT = - 2 points
- Probability High (≥ 3), Moderate (1-2) or Low (0 or less)
- DVT risk: High – 75%, Moderate – 17%, Low – 3%

HOMAN'S SIGN



DVT – D-Dimer

- **Fibrin degradation product elevated in active thrombosis**
- **Negative test can help exclude VTE**
- **Preferred test**
 - **Quantitative Rapid ELISA – sensitivity 96/95% for DVT/PE**
 - **Other methods include latex agglutination and RBC agglutination (SimpliRED)**

Stein PD, Hull RD, Patel KC, et al. D-dimer for the exclusion of acute venous thrombosis and pulmonary embolism: a systematic review. *Ann Int Med.* 2004;140(8):589-602

DVT – Imaging

- Available imaging and ancillary tests:
 - Compression US – first line test, high sens/spec
 - Venography – gold standard
 - MRI – Lower quality evidence only at present
 - Impedance plesmythography – not in US





* Imaging done from proximal veins. Reproduced with permission from the American College of Chest Physicians.

Table 1 : Criteria proposed by Wells et al for calculating the risk of DVT

Clinical feature	Score
1. Active cancer within 6 months	1
2. Paralysis, paresis, or cast of lower extremity	1
3. Recently bedridden > 3 d or major surgery within 4 wk	1
4. Localized tenderness along deep vein system	1
5. Calf diameter > 3 cm larger than opposite leg at 10 cm below the tibial tuberosity	1
6. Pitting edema	1
7. Collateral superficial veins (non-varicose)	1
8. Alternative diagnosis as \geq likely than that of DVT	-2

Pretest Probability For DVT based upon Wells Score And Frequency of DVT

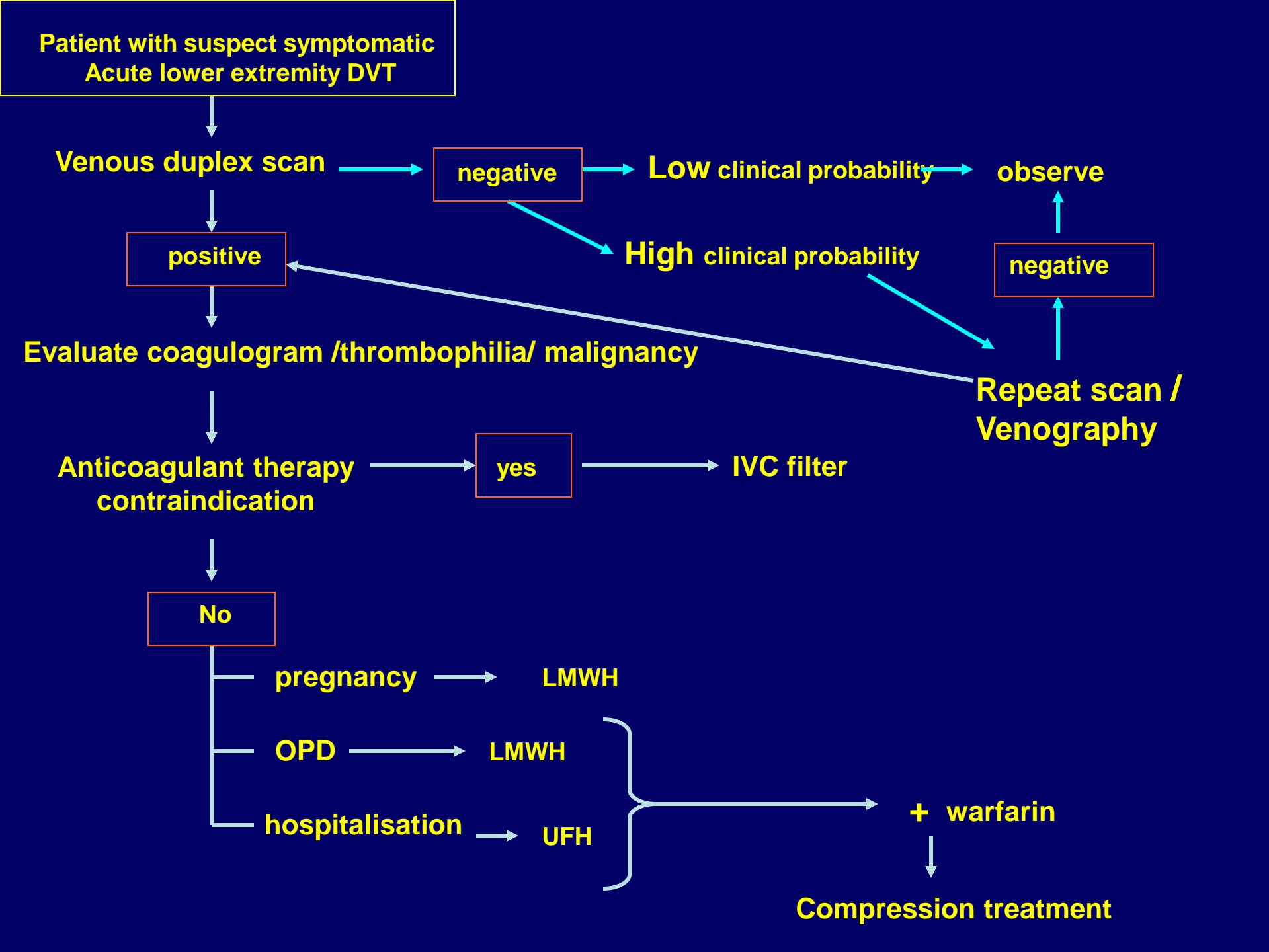
Score	Probability	Frequency of DVT(%)
0	low	03
1-2	medium	17
≥ 3	high	75

Can DVT be prevented?

- **high risk patients must be identified and offered prophylaxis**
 - **heparin sub-cutaneously**
 - **leg compression during surgery**

Can DVT be treated?

- intravenous heparin
- oral warfarin



PE – Epidemiology and Etiology

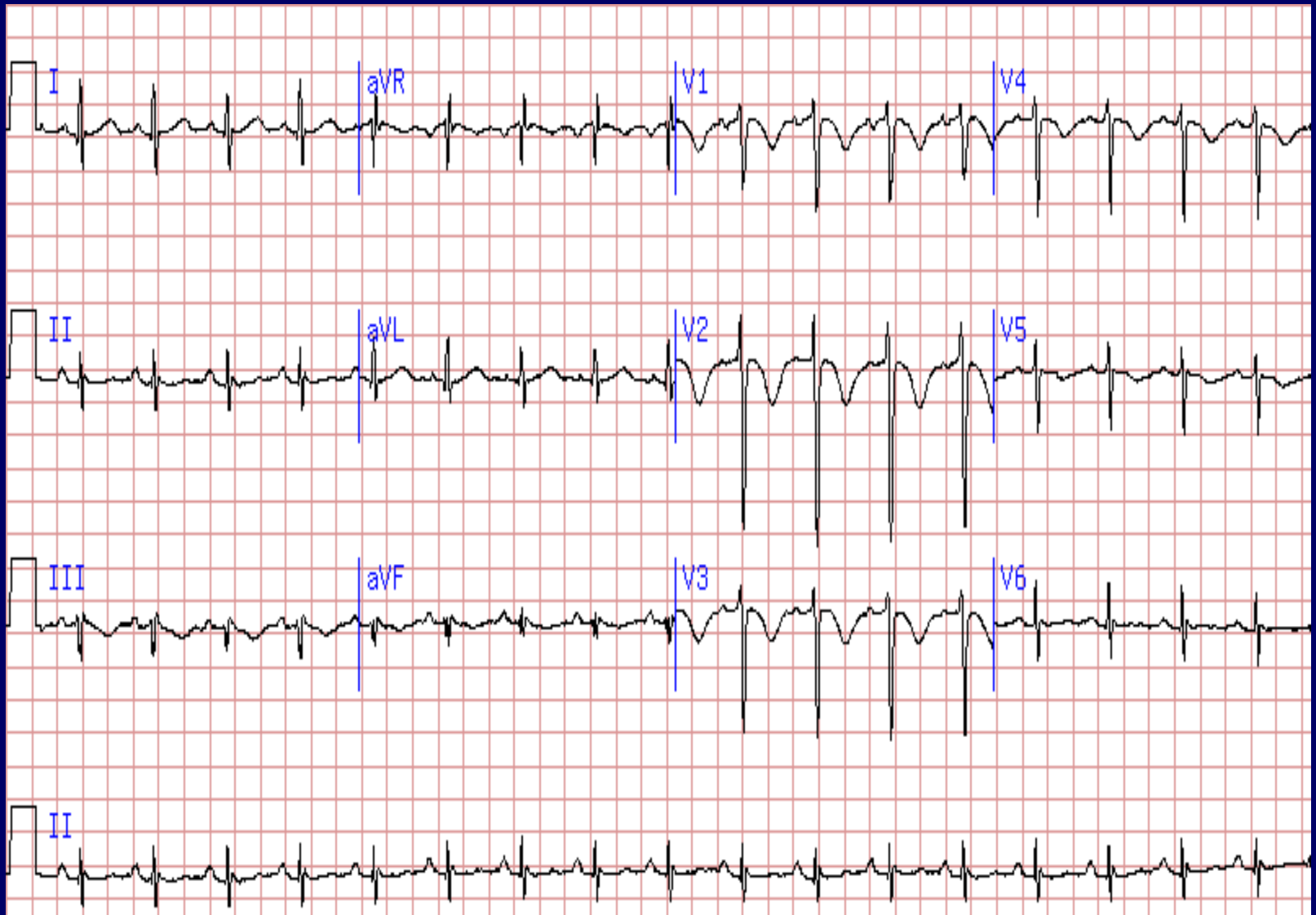
- 100-200,000 deaths per year due to PE
- Most PE arise from lower extremity DVT
- In patients with DVT, 40-60% will have a PE on V/Q scanning

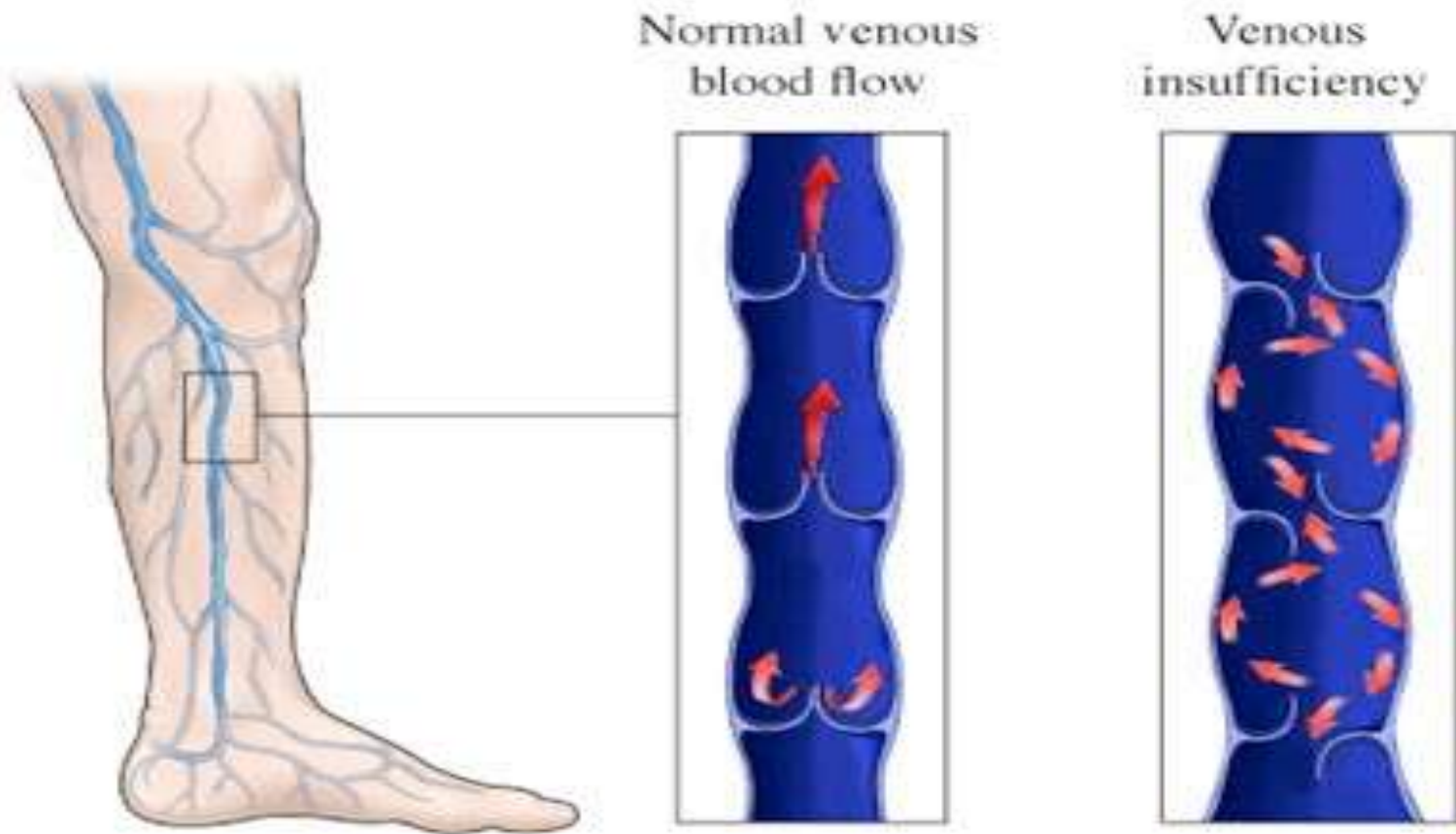
“Pulmonary embolus is not a disease. It is a complication of DVT.” Ken Moser MD

PE – Clinical Presentation

- **Dyspnea, pleuritic pain and cough most common symptoms**
- **Tachypnea, rales and tachycardia most common signs**
- **ABG limited value for diagnosis**
- **EKG and CXR often abnormal, but usually lacking specificity to aid diagnosis**

PIOPED Study. JAMA. 1990;263(20):2753-59. Stein PD, Goldhaber SZ, Henry JW. Chest 1995;107:139-43





CHRONIC VENOUS INSUFFICIENCY

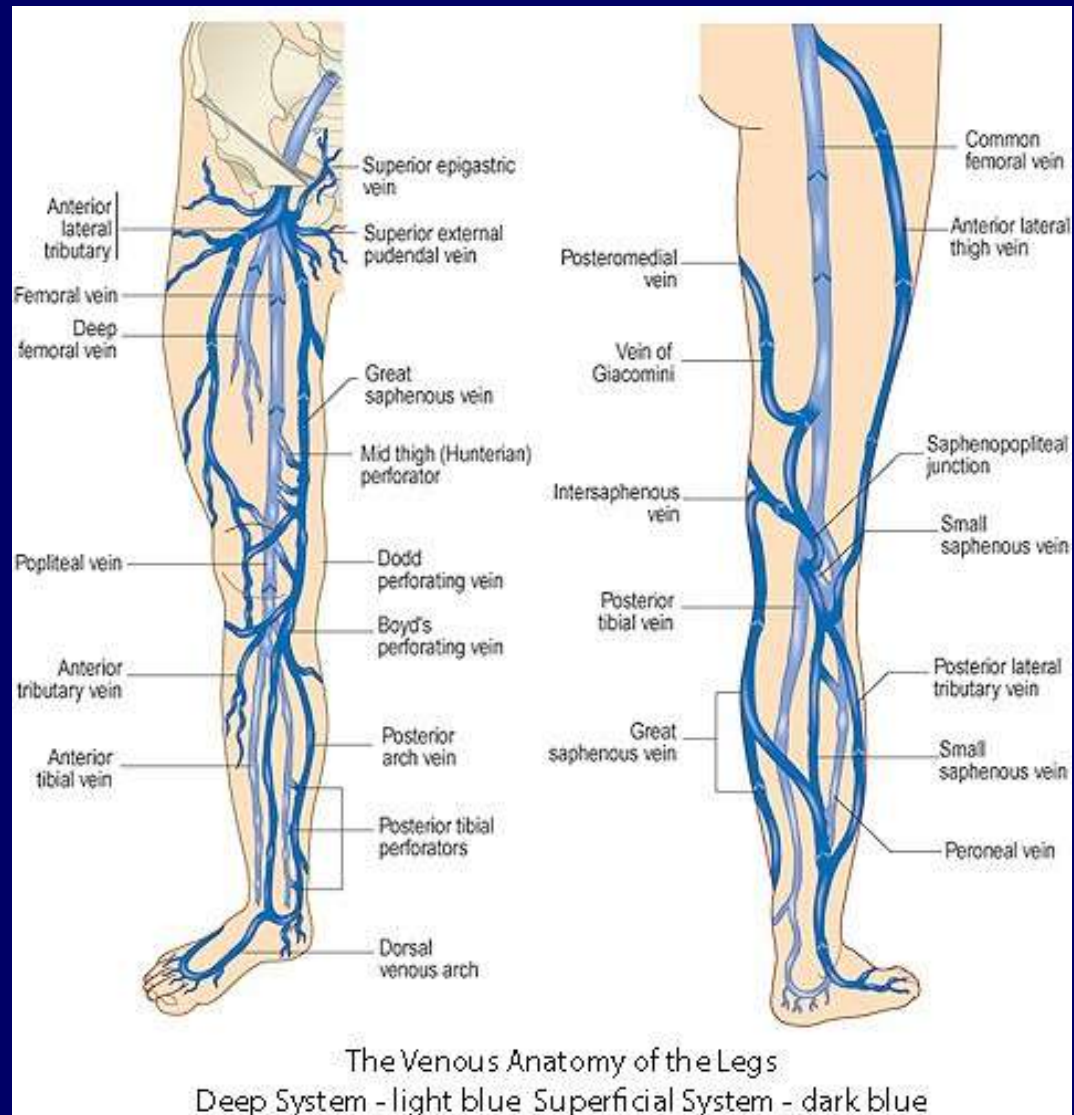
Definition

- Chronic venous insufficiency (CVI) is a common cause of leg pain and swelling, and is commonly associated with varicose veins. It occurs when the valves of the veins do not function properly, and the circulation of blood in the leg veins is impaired.



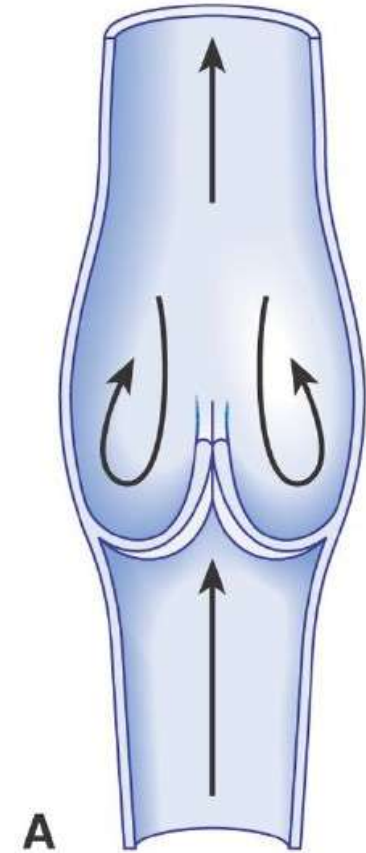
CVI occurs because a vein is *partly blocked*, or *blood is leaking around the valves (reflux) of the veins which results venous hypertension.*

Anatomy



Competent or “normal” valve

Venous valves are bicuspid (two) flap like structures made of elastic tissue. The valves function to keep blood moving in one direction.



What makes up the venous system

- **Deep venous system:** the channel through which 90% of venous blood is pumped out of the legs
- **Superficial venous system:** the collecting system of veins
- **Perforating veins:** the conduits for blood to travel from the superficial to the deep veins
- **Musculovenous pump:** Contraction of foot and leg muscles pumps the blood through one-way valves up and out of the legs

+ Prevalence of Chronic Venous Disease

- n CVD (C1 to C6) affects **75 % of adults** in the USA¹ and around 64% worldwide.²
- n CVI (C3 to C6) affects **16% of adults in the USA**¹ and **24% worldwide**.²
- n Venous ulcers (C6) affect 2.5 million patients/year in the USA.³
- n 70% of venous ulcers recur within 5 years of healing.⁴

1- Passman MA. *J Vasc Surg* 2011;54:2S-9S 2- Rabe E. *Int Angiol* 2012;31:105-115.

3- Eklof B. *J Vasc Surg* 2004;40:1248-1252. 4- Callam MJ. *BMJ*. 1987;294:1389-1391.

+ Causes

Venous pathology develops when venous pressure is increased

Outflow obstruction

Valvular incompetence à deep or superficial veins,
perforator veins

Muscle pump failure

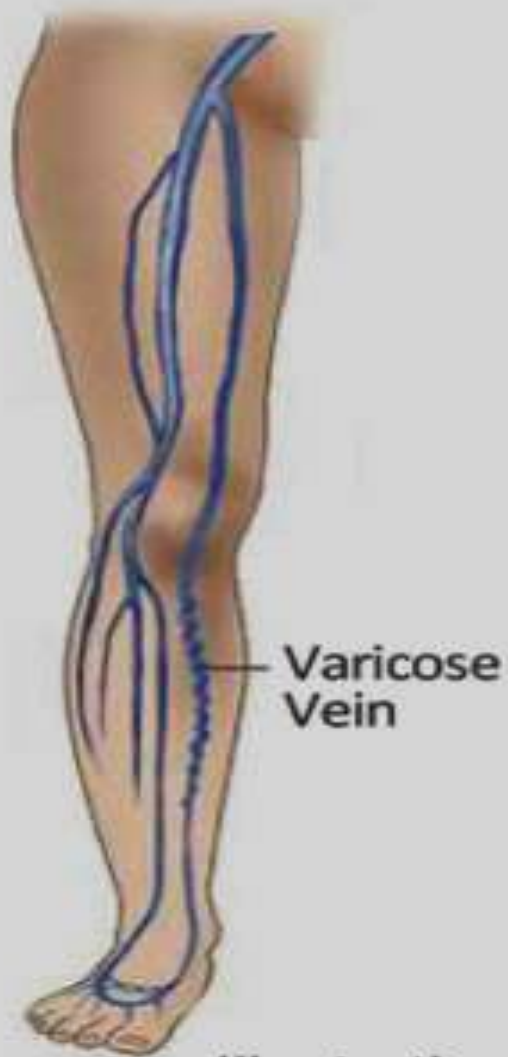
Risk Factors

The most important factors leading to the development of chronic venous insufficiency and varicose veins include:

Family history

- ◆ Increasing age over 30
- ◆ One or more blood clots in superficial or deep veins
- ◆ Female gender, although varicose veins occur nearly as commonly in men
- ◆ Multiple pregnancies
- ◆ Prolonged standing
- ◆ Heavy lifting

Limited physical activity, high blood pressure and obesity have also been linked with the presence of varicose veins in women.



Normal Vein



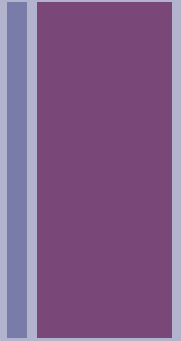
Varicose Vein



Illustration used with permission from the
Society of Interventional Radiology



PROGRESS OF CVI



Venous hypertension causing:

1. Leukocyte trapping

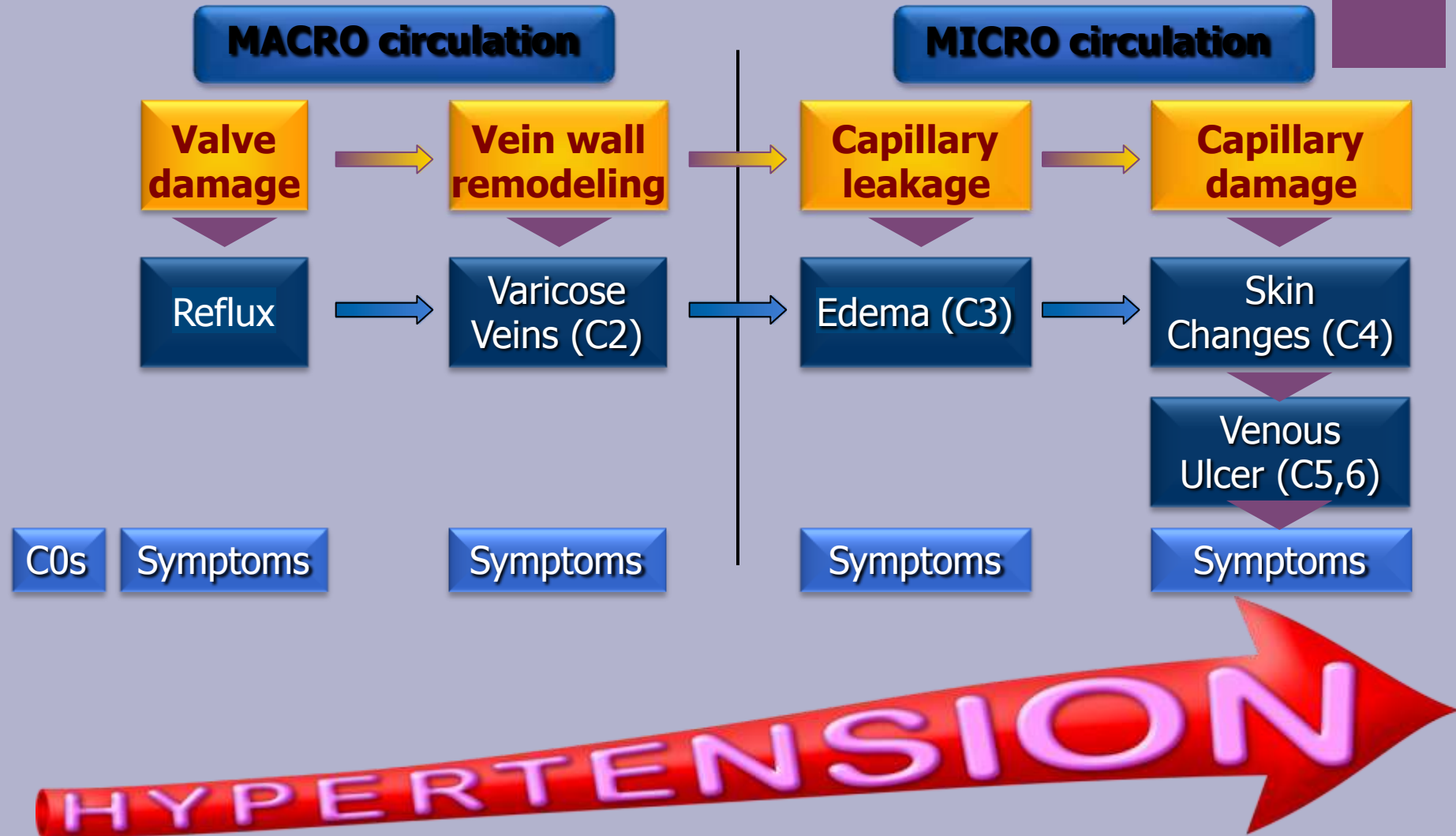
Leukocyte extravasations from hyperpermeability microcirculation to the surrounding tissue. This condition results tissue inflammation, dermatitis eczematoid then ended by venous ulcer.

2. Chronic blood congestion in the lower part of extremity causing edema and hyperpigmentation

n **Risk factors : older age, obesity, pregnancy**

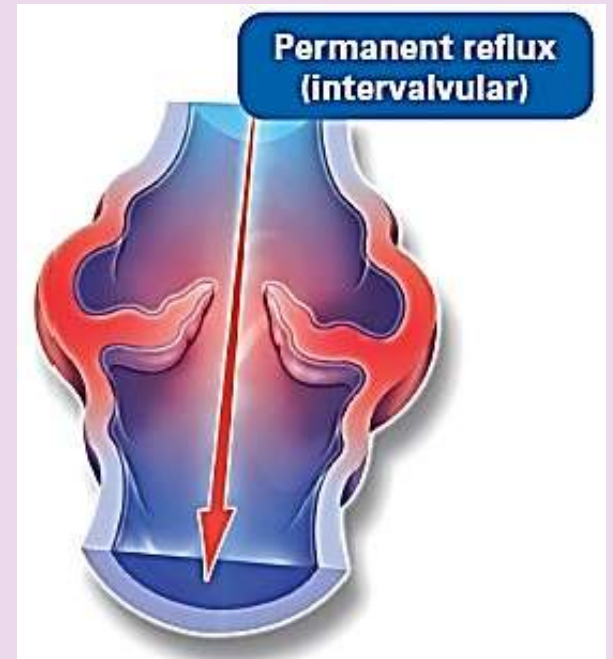
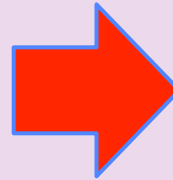
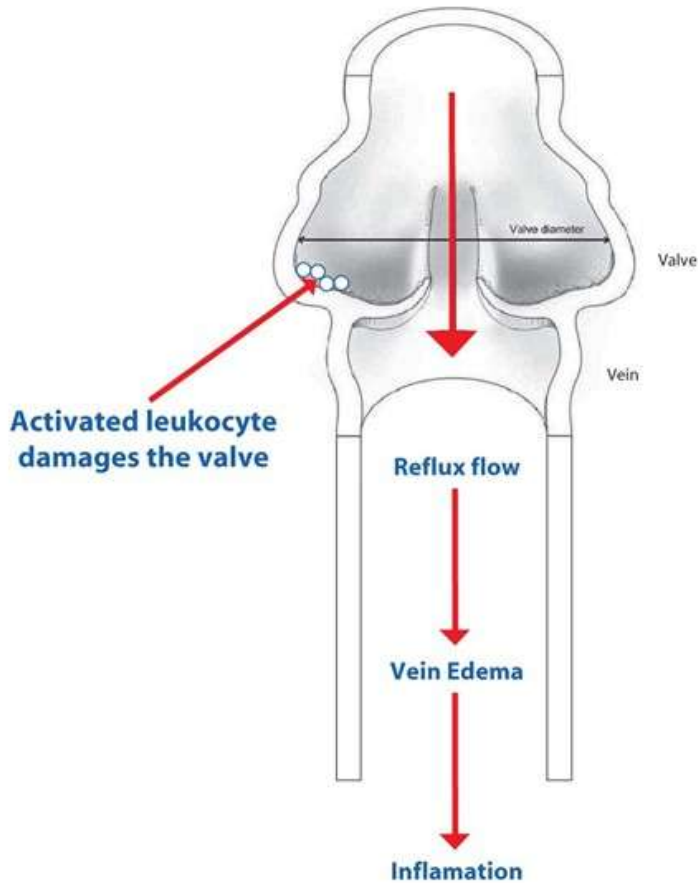
n **Precipitating factors : prolonged standing and**

+ Progression of chronic venous disease: **venous hypertension is the key**



+ Pathogenesis of Chronic Venous Disease

▶ Pathogenesis of Chronic Venous Disease



Venous hypertension is linked to venous inflammation

Genetic predisposition, obesity, pregnancy, ..
Environmental factors repeated over time

Altered patterns of blood flow,
Change in shear stress

Shear stress dependent leukocyte-endothelial interaction

Chronic inflammation in vein wall and valve

Remodeling in venous wall and valves

Valve failure, reflux

Chronic hypertension

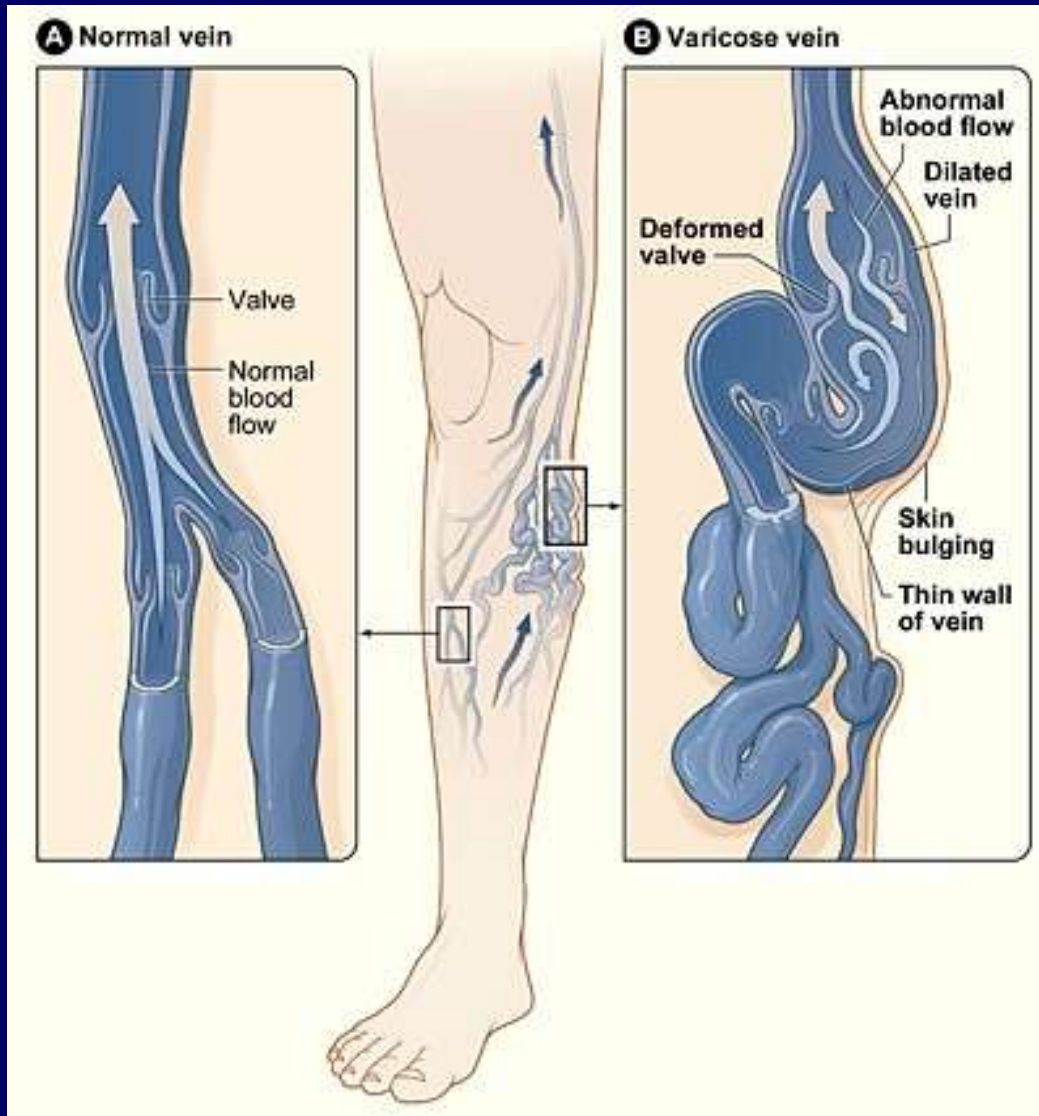
Activation of C receptors



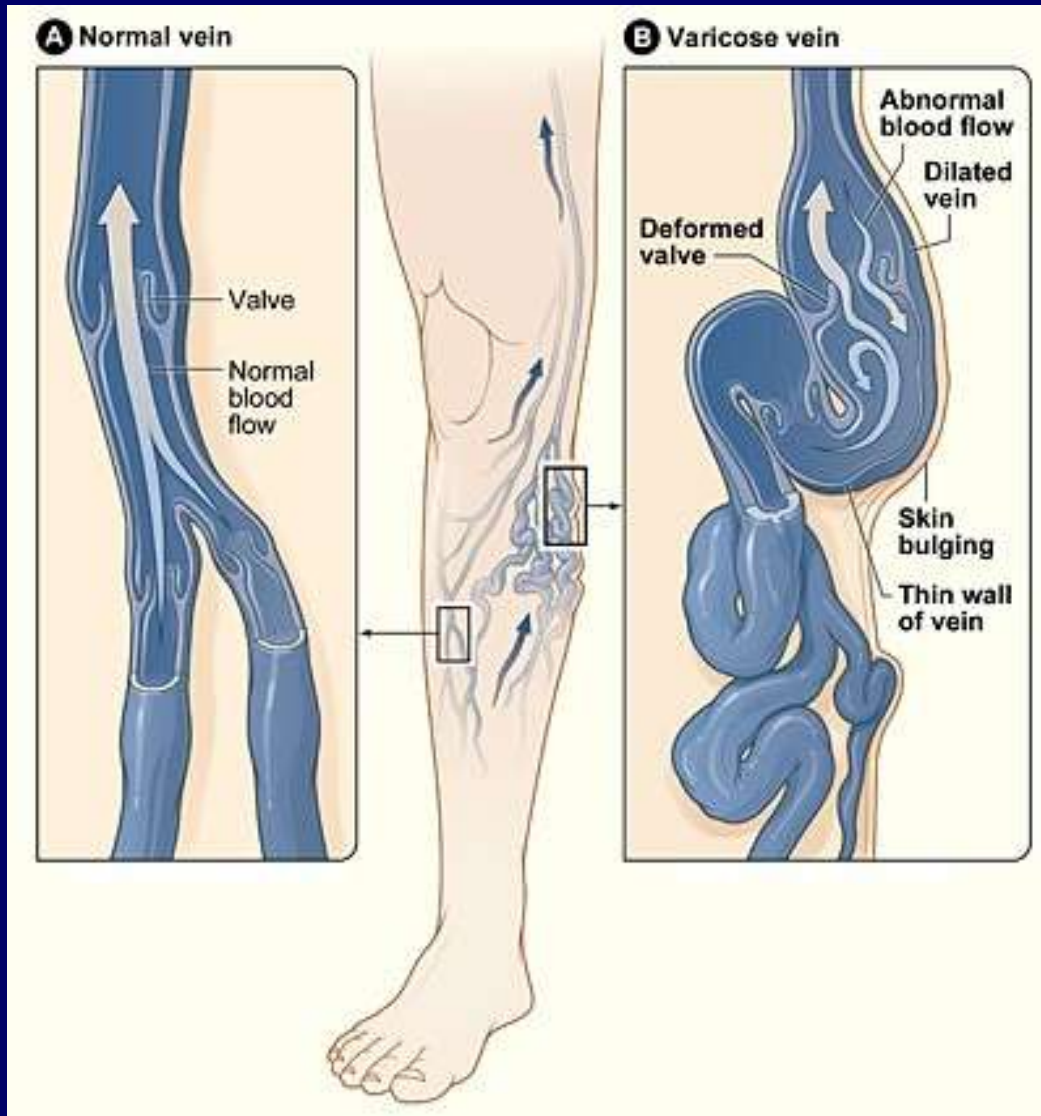
Pain



+ Varicose Vein



+ Varicose Vein



Clinical Symptoms of CVI :

- 1) Night Cramp**
- 2) More and more Heaviness in the evening**
- 3) Itching**
- 4) Pain**



Clinical Signs of CVI



A : Edema

B : Hyper pigmentation



C : Dermatitis
D : Venous Ulcer
E : Venous Ulcer

Symptoms

- Symptom free
- when varicose veins are associated with CVI :
- ankle and foot swelling
- Other skin changes in the lower leg that commonly occur include discoloration, eczema, scarring or hard, thickened skin and ulceration.

Diagnosis

- **Physical examination.**
- **Venous duplex ultrasound exam.**
- **A CAT scan or MRI may be used to exclude other causes of leg swelling. These diagnostic tests are painless.**

Treatment

The treatment of CVI involves both medical and surgical treatments:

- ❑ Diet and lifestyle**
- ❑ Avoid prolonged standing or sitting**
- ❑ Elevate the feet above the thighs when sitting and above their heart when lying down three to four times a day if possible to reduce swelling**
- ❑ Structured exercise such as walking to strengthen calf muscles may improve calf muscle function**



Treatment of CVI alone

1. Micronized Purified Flavonoid Fraction
2. Stocking Gradient



Purified Micronized Flavonoid Fraction (MPFF)

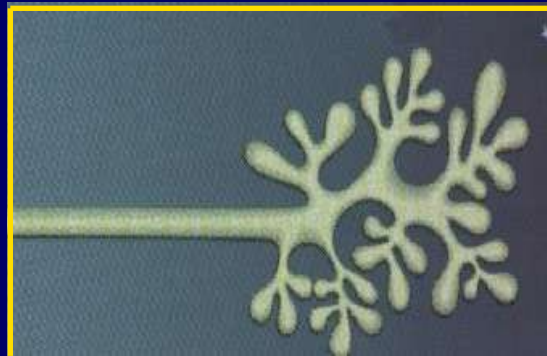
Benefits:

Improve venous tone à increase microcirculation flow à reducing leucocyte adhesion

Improve lymphatic drainage à decrease edema

Reduce capillary hyperpermeability à à

Protection of inflammatory process in microcirculation !!!!!!!





Compression Stockings / Gradient Stocking

Benefits :

1. Reduce reflux
2. Reduce edema
3. Increase venous return by enhancing muscle contraction



Treatment CVI

n **1.MPFF**

- CVI

n **2.Stocking Gradient**

- CVI

n **3. Endovenous Ablasion**

- VARICOSE

n **4.Phlebectomy**

- VARICOSE

n **5. Perforator vein
ligation**

- VENOUS ULCER

