Diseases of the veins

Department of Surgery № 2

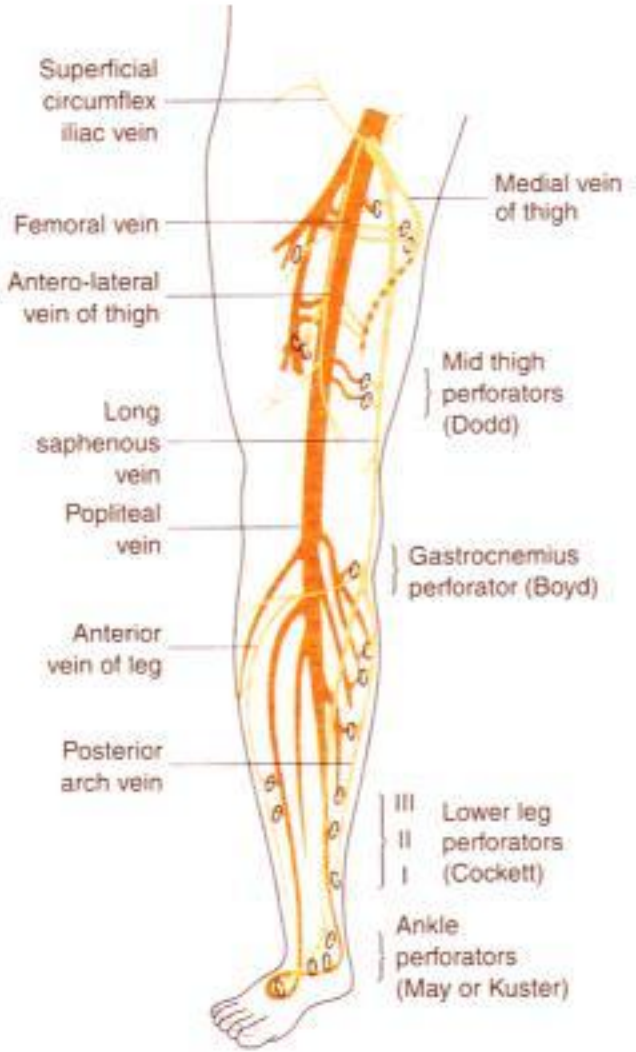


Fig. 16.1 The superficial veins of the lower limb.

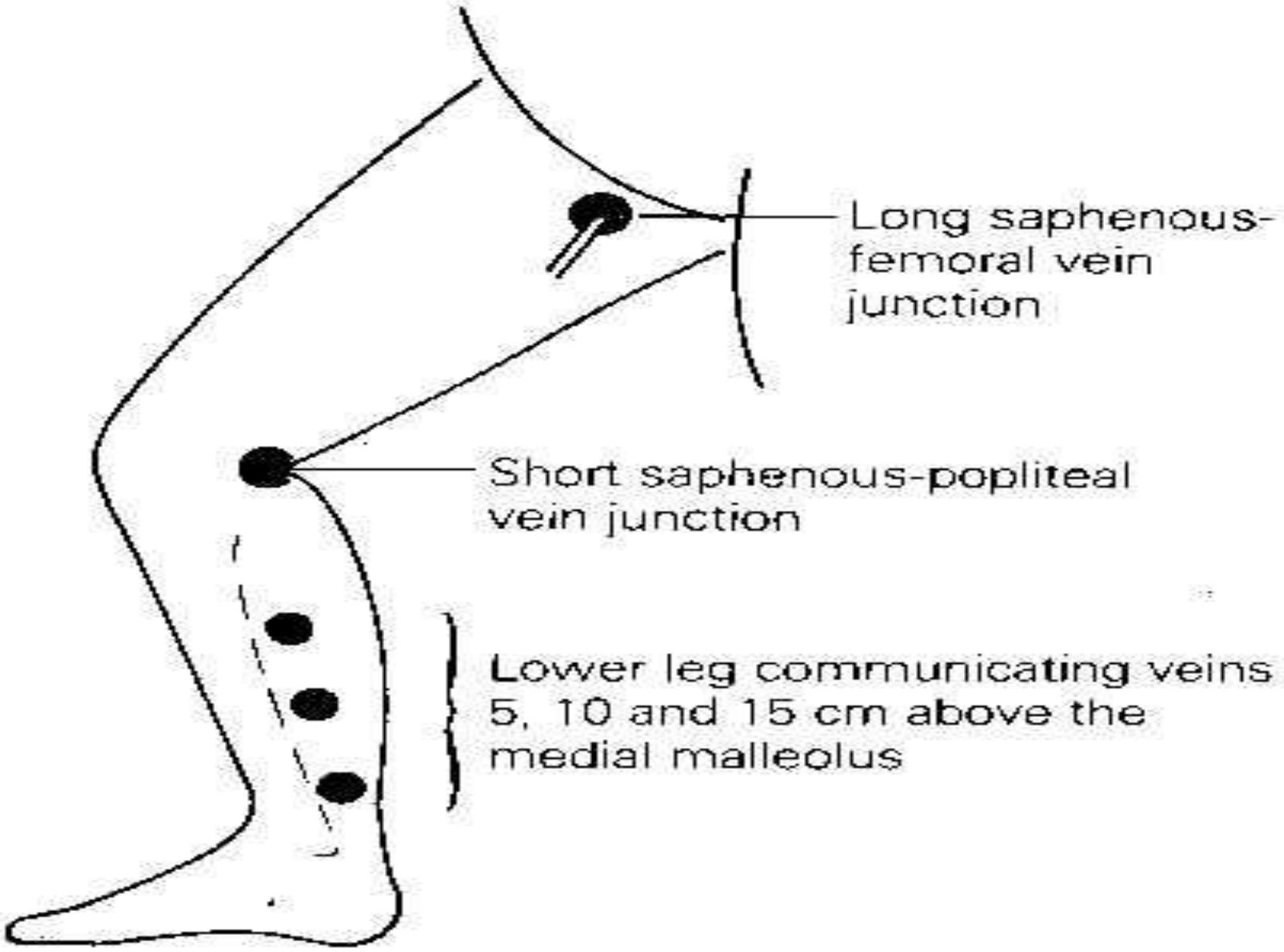
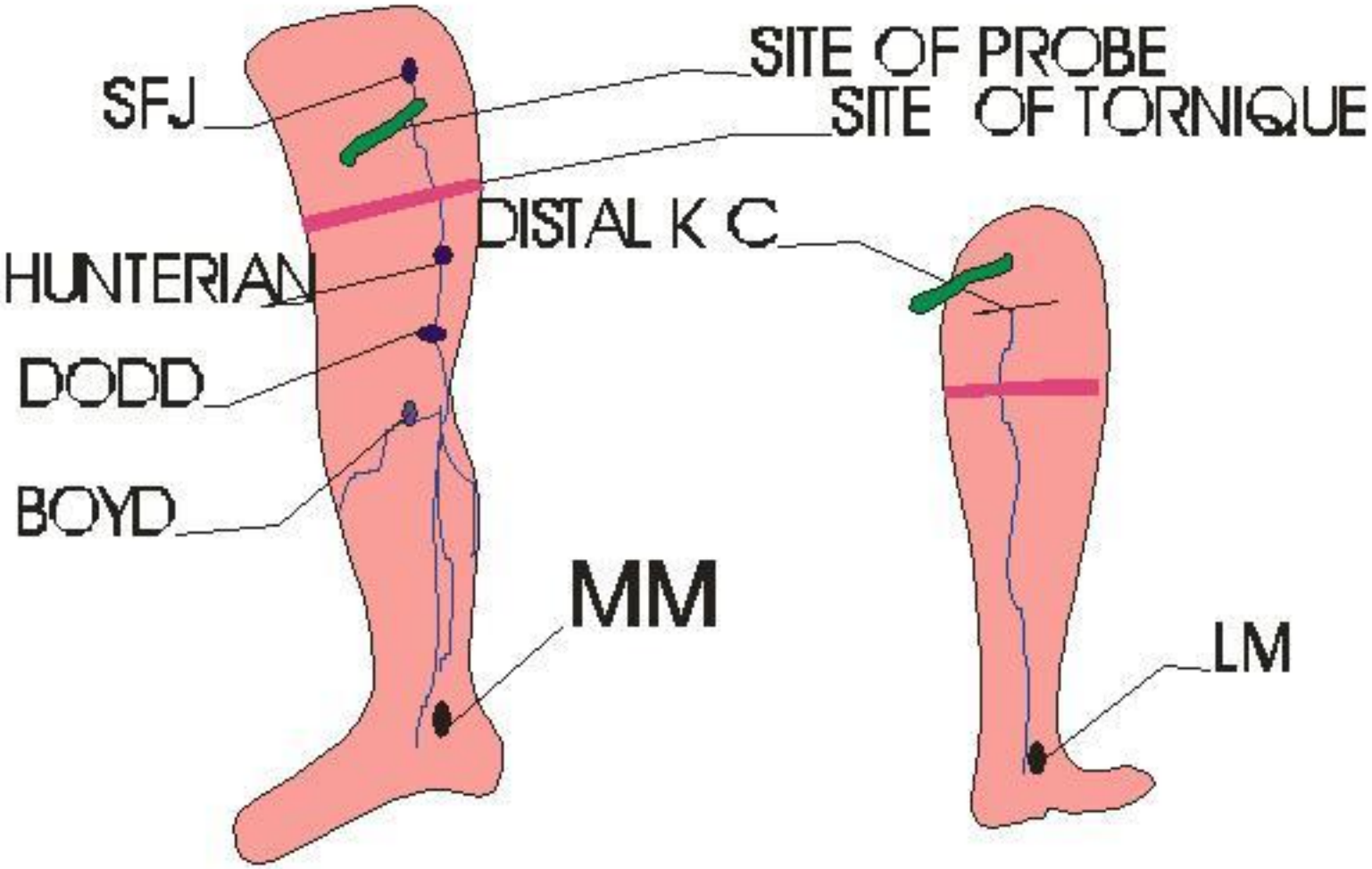


Figure 7.11 The common sites where the superficial veins connect with the deep veins.


SFJ
SITE OF PROBE
SITE OF TORNIQUE
DISTAL K C
HUNTERIAN
DODD
BOYD
MM
LM

Venous return

- Muscle pump (peripheral hearts)
- - ve intra thoracic pressure
- Arterial pulsation
- Vise at ergo

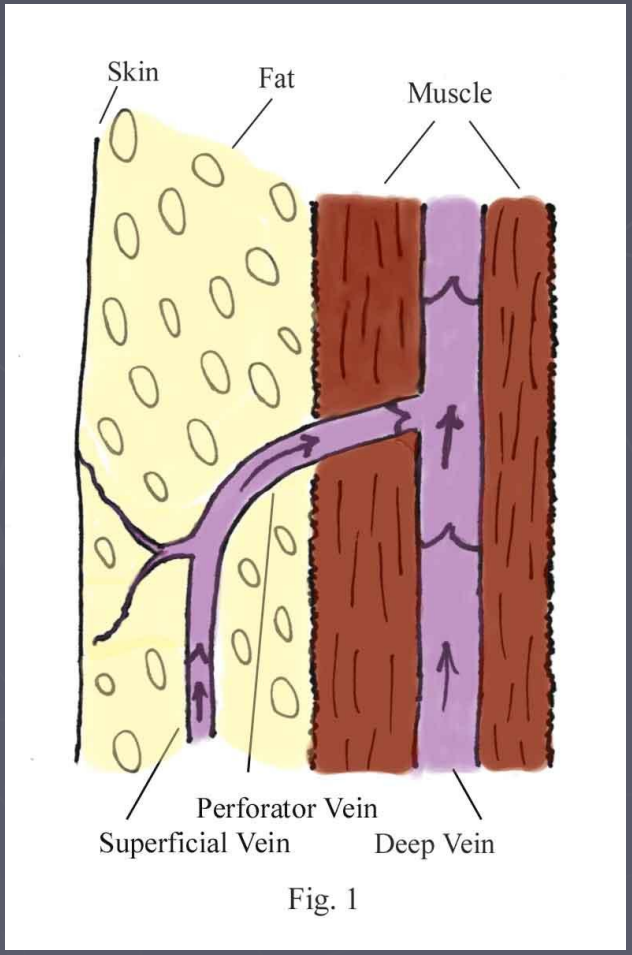

Skin
Fat
Muscle
Perforator Vein
Superficial Vein
Deep Vein

Fig. 1

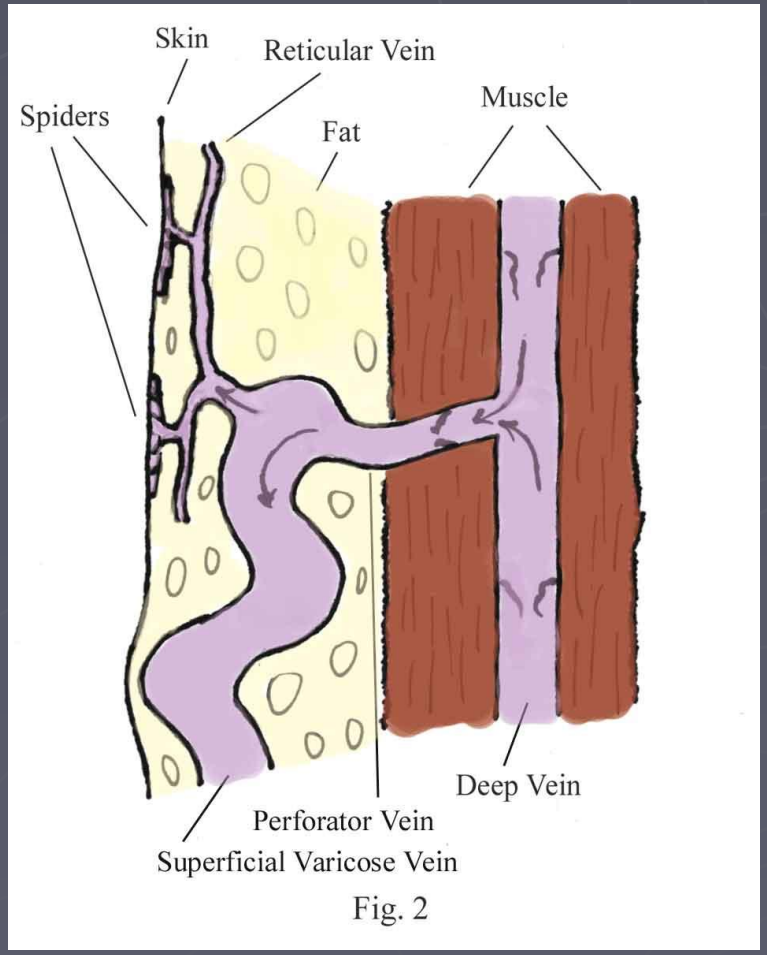

Skin
Reticular Vein
Spiders
Muscle
Fat
Deep Vein
Perforator Vein
Superficial Varicose Vein

Fig. 2

Varicose Veins

- Dilated, elongated & tortuous vein of the LL
- problem comes from incompetent calve.
- 10 -20 % of worlds population have varicose veins.

Causes of varicos veins in lower limbs.

- **Secondary**
  - Obstruction of venous outflow.
    - Pregnancy.
    - Fibroids
    - Ovarian cysts.
    - Abdominal lymphadenopathy
    - Pelvic cancer (cervical, uterus, ovary, rectum)
    - Ascites
    - Illiac vein thrombosis.
    - Retroperitoneal fibrosis
  - Valve destruction.
    - DVT
  - High flow and pressure:
    - Arteriovenous fistula (esp the aquired traumatic variety)eg.Klippel-Trenaunay syndrome (which is one form of congenital AV malformation syndrome)
- **Primary:**
  - Cause not known. Often familial.Probably weakness of vein wall that permits valve ring to dilate.
  - Congenital abscence of valves very rare.

Varicose Veins (Etiology)

- Primary
  - Hereditary
  - Occupational
  - Pregnancy
  - obesity
- Secondary
  - Venous obstruction
  - Venous compression
  - A/V fistula

Varicose Veins (Etiology)

- **Obstruction of venous outflow.**
  - **Pregnancy.**
  - **Fibroids**
  - **Ovarian cysts.**
  - **Abdominal lymphadenopathy**
  - **Pelvic cancer (cervical, uterus, ovary, rectum)**
  - **Ascites**
  - **Illiac vein thrombosis.**
  - **Retroperitoneal fibrosis**
- Valve destruction.
  - **DVT**
- High flow and pressure:
  - **Arteriovenous fistula (esp the aquired traumatic variety)**
  - **Klippel-Trenaunay syndrome (which is one form of congenital AV malformation syndrome**

Varicose Veins

Primary V V

- History:
  - young and middle aged women most commonly affected.1:10 men :women
  - Aggrevating factors associated with increased incidence of varicose veins:
    - female sex,
    - parity,
    - clothing,
    - prolonged standing,
    - marked obesity,

Secondary V V

- History:
  - Any age most commonly affect men
  - Aggrevating factors associated with increased incidence of varicose veins:
    - DVT
    - Trauma
    - Compression
    - fracture

Varicose Veins (symptoms)

- Disfiguring effects of the veins usually principle complaint
- Pain,
  - dull ache, and heaviness
  - felt in calves and lower leg
  - worse during day esp. on standing up,
  - relieved by lying down for 15-30 min.
- Edema (swelling around ankle)
  - Aggregated by standing
  - Relived by recumbency
- night cramps

- Disfiguring effects of the veins usually principle complaint
- Pain,
  - dull ache, and heaviness
  - felt in calves and lower leg
  - worse during day esp. on standing up and walking
  - relieved by lying down for 15-30 min.
- Edema (swelling around ankle)
  - Aggregated by standing
  - Relived by recumbency
- night cramps

- Post phlebitic syndrome
  - dilated veins, venous stars, pigmentation, eczema and ulceration.

Varicose Veins (signs)

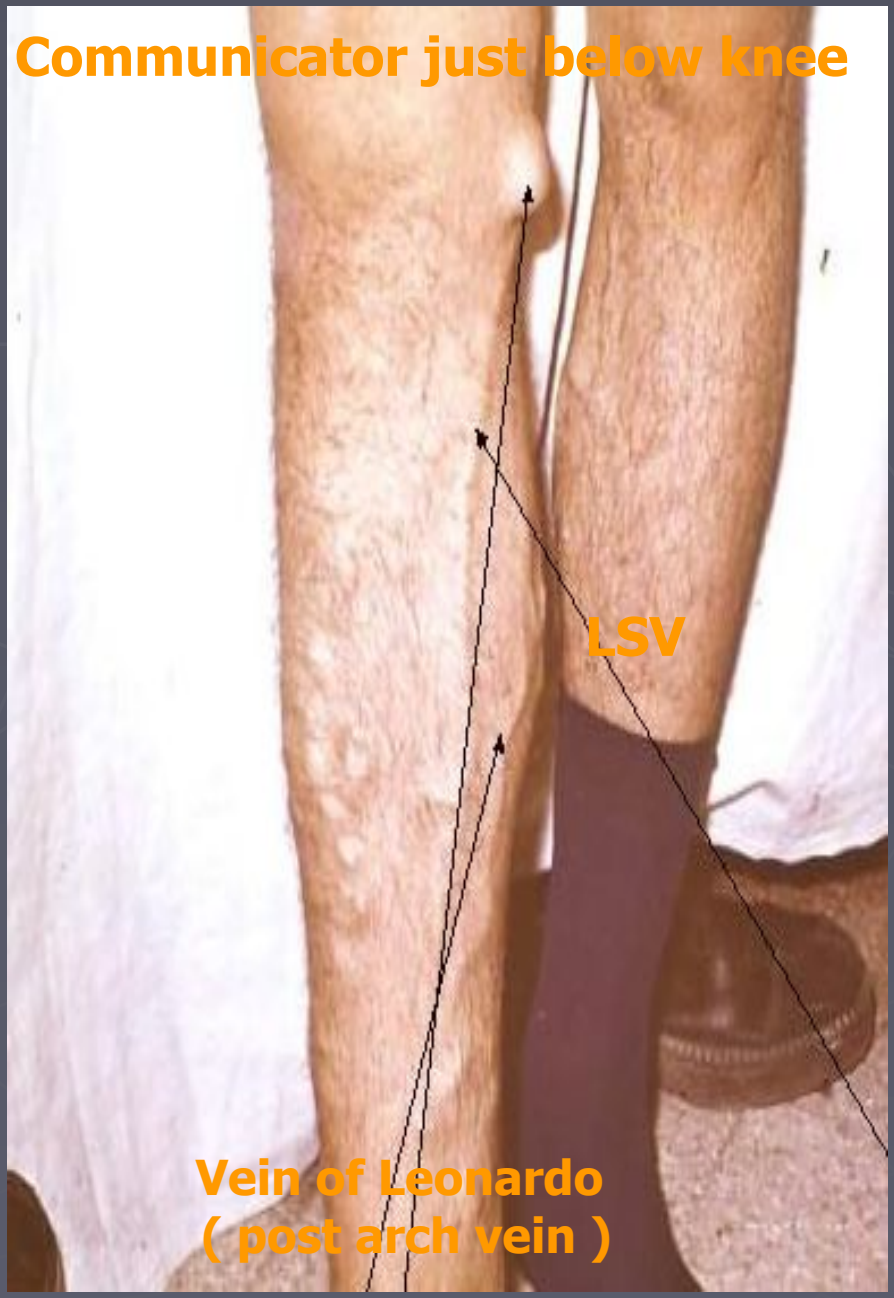
- Dilated elongated tortuous veins
- Types of varices
  - Tubular with dilated LSV or SSV
  - Saccular incompetent perforator (blow out)
- Signs of PPS - ve
- Special testes
  - Modified perthe's
  - Cough impulse
  - Trendelenburg's test
  - Multiple tourniquet test
  - Shwartz test

- Dilated elongated tortuous veins
- Types of varices
  - Serpintine dilated tributeries
  - Spider indicate A/ V fistula
- Signs of PPS + ve
- Special testes
  - Modified perthe's
  - Cough impulse
  - Trendelenburg's test
  - Multiple tourniquet test
  - Shwartz test


LSV behind the knee
Vein of Leonardo
(post arch vein)
LSV in front of medial
malleolus


LSV
LSV behind the knee
Vein of Leonardo
(post arch vein)


LSV behind the knee
Vein of Leonardo
(post arch vein)


Communicator just below knee
LSV
Vein of Leonardo
(post arch vein)

LSV starting at mid thigh
Communicator and pass
behind the knee

Antromedial and calf
Group of tributaries

mid thigh
Communicator

Antromedial and calf
Group of tributaries

Examination:

- Inspection:
  - ask patient to stand up.
  - look for abnormal visible subcutaneous veins. if dilated and tortuous=varicose veins.
  - record size and shape of the veins.
  - venous stars (minute veins radiating from a single feeding vein
  - oedema
  - inspect skin esp. lower medial 1/3 for pigmentation, eczema, ulceration.

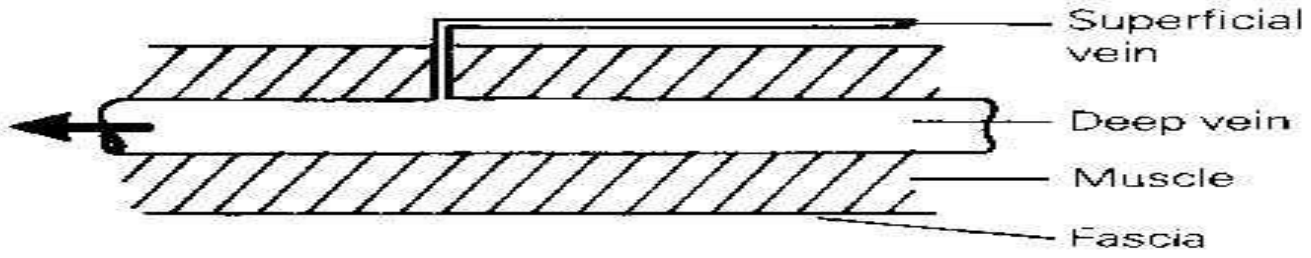
Examination:

- Palpation:
  - feel along the course of the veins and feel the tension in the veins
  - feel saphenofemoral and saphenopopliteal junctions and ask patient to cough, a strong cough impulse indicates incompetent valves.
  - feel along *medial* side of lower leg for tender defects in deep facia with patient standing and lying, these are sites of incompetent valves.
  - look for pitting oedema, thickening, and tenderness.
  - brown pigmentation , eczema and ulceration

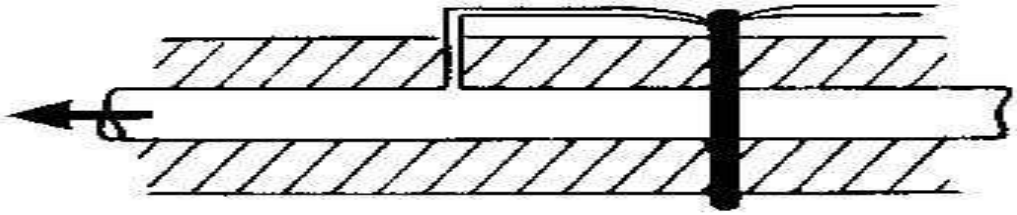
Examination

- Tourniquet tests.
  - to check for the site of the incompetent valves.
  - Lie patient flat and elevate one leg
  - place tourniquet along upper 1/3 of thigh
  - ask patient to stand up
  - if veins fill above tourniquet the incompetence above.
- Trendelenburgs test.
  - direct digital pressure on long saphenous vein valve.
  - patient first lying with leg up
  - stand up patient

Leg horizontal, superficial veins empty

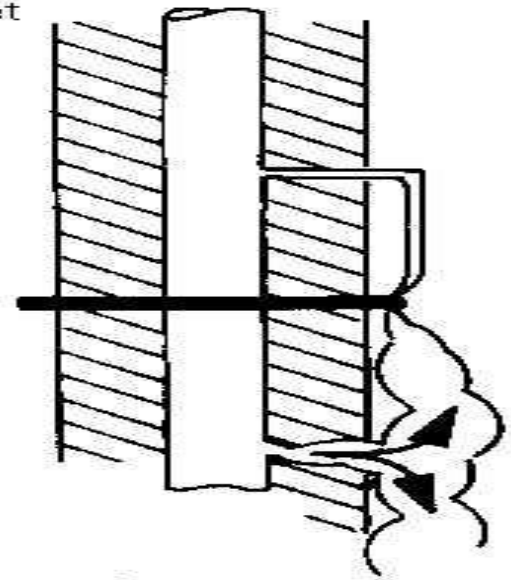


Tourniquet occludes the superficial veins

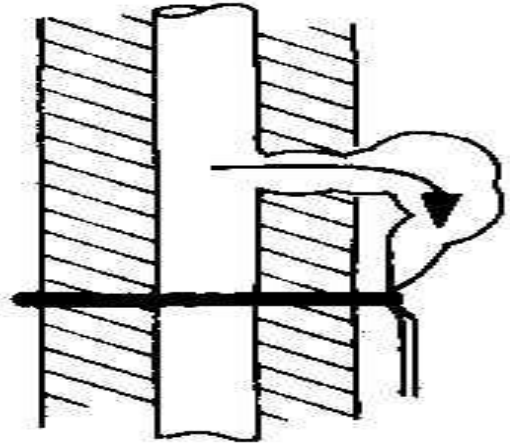


The patient stands up

An incompetent communicating vein below the tourniquet fills the superficial veins below the tourniquet



An incompetent communicating vein above the tourniquet fills the superficial veins above the tourniquet



By moving the tourniquet up and down the leg it is possible to determine the level of the incompetent communicating veins

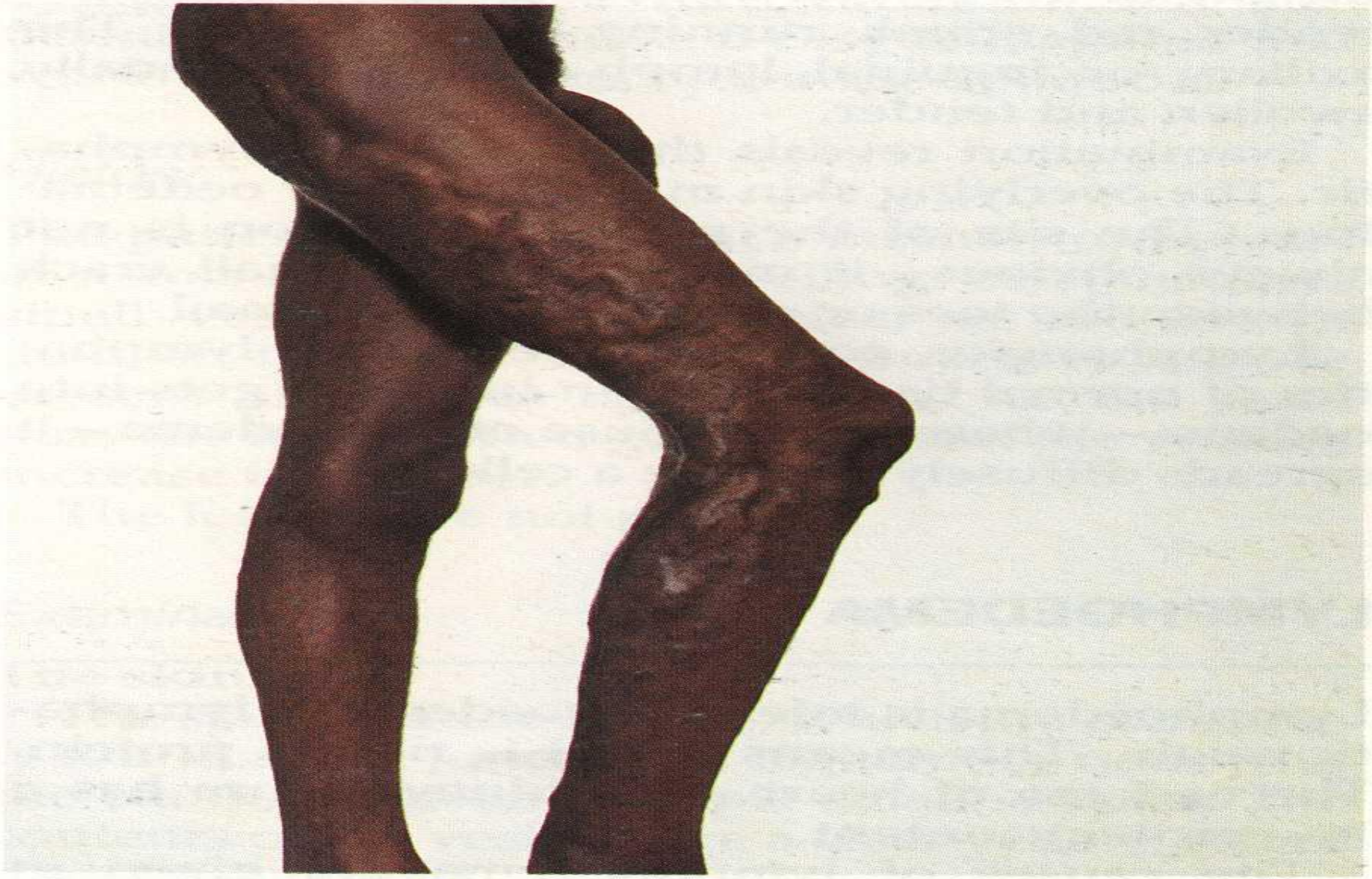
Examination

- Percussion:
  - transmission of percussion waves downward implies incompetent valves (Shwartz test).
  - Place fingers of one hand on lower limit of visible vein and tap top.
- Auscultation:
  - listen over clusters of veins especially if they remain distended when patient lies down may be arteriovenous fistula.

Examination

- *General examination:*
  - examine abdomen, incl rectal and vaginal examination.
  - men: palpate testes, testicular tumours can be small but cause massive enlargement of the abdominal nodes with vena caval obstruction.
  - look for dilated collateral veins on abdomen.
  - direction of flow: Harvey's test (emty veins with 2 fingers and see where it fills from)

Congenital A/V fistula with secondary V V



This patient had the abnormal dilated veins on the lateral side of the leg typical of the Klippel-Trenaunay syndrome with marked overgrowth of the length and circumference of the leg.

Traumatic A/V fistula with secondary V V

Investigation

- Routine Lab mainly BSL
- Hand held Doppler

Continuous wave Doppler (CWD)

(phono-angiography)

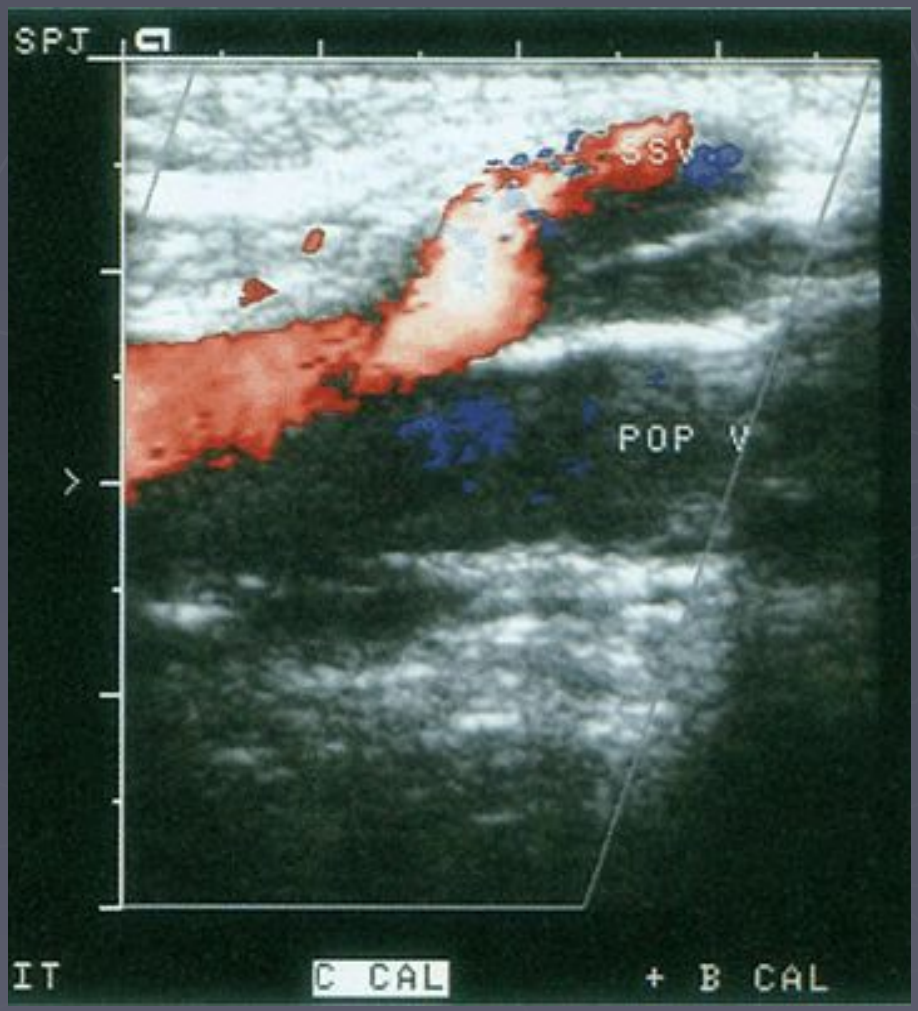
Investigation

- Doppler US

Investigation

Duplex US gold standard

- (B mode ultrasound and a coupled doppler probe)
- allows direct visualiastion of veins, direction of flow can be recorded



Investigation

- Plethysmography and Venography are obsolete
- Venous pressure
- Radio-active isotope scanning
- Arteriograpgy if A/V fistula

Complications:

- Haemorrhage
- Oedema
- Skin pigmentation
- Lipodermatosclerosis
- Varicose eczema
- Venous ulceration
- Thrombophlebitis
- Atrophie blanche
- Marjolin ulcer
- Equinous deformity

Varicose eczema

Thrombophelbitis

Treatment

- A. Non- operative management.
  - walking should be encouraged and prolonged sitting and standing should be forbidden
  - patient should elevate leg as frequently as possible to reduce venous pressure.
  - elastic stockings. extending from distal metatarsals to just below the knee

Treatment

Compression sclerotherapy.

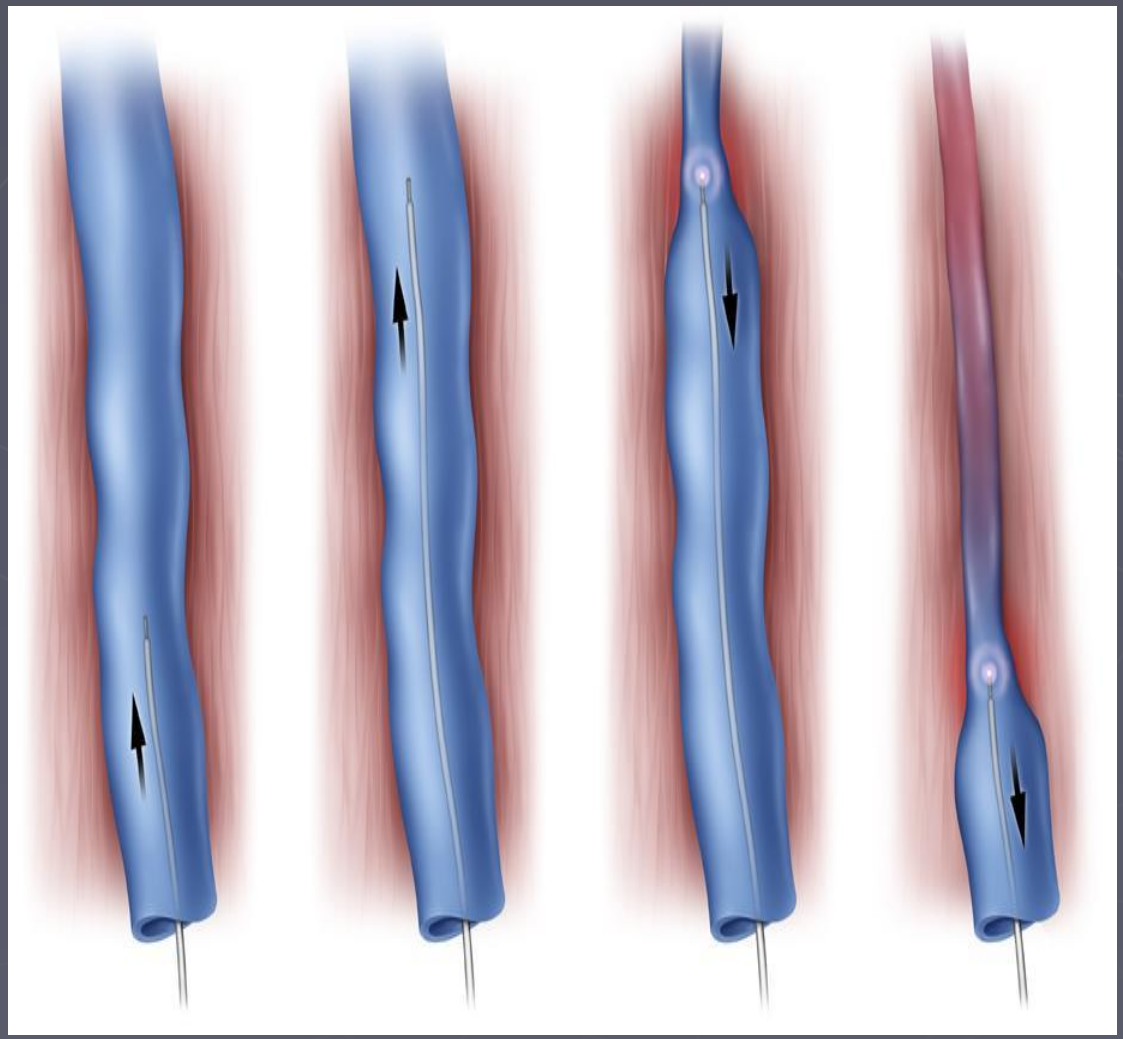
- permanent fibrotic occlusion of collapsed veins.
- patient is recumbent and veins collapsed,
- a small amout of 0.5 ml of sclerosing solution (3% sodium tetradecyl sulfate) is injected into each varix

Compression sclerotherapy.

- continuous pressure is maintained for 1-2 weeks with elastic stockings.
- much less expensive than surgery
- if successful it gives the best cosmetic result.
- long term results are worse than surgery.
- best for small unsightly veins, dilated superficial veins, lower leg perforators, and recurrent or persistant veins after surgery
- unsatisfactory at or above the knee

Endo-venous laser

- Peri-venous LA
- 810 nm diode
- Time consuming
- Less painful



Radiofrequency ablation

- Peri-venous LA/ regional anaesthesia
- Pode expansion in CFV
- Cook at 85°C
- Time consuming

Treatment

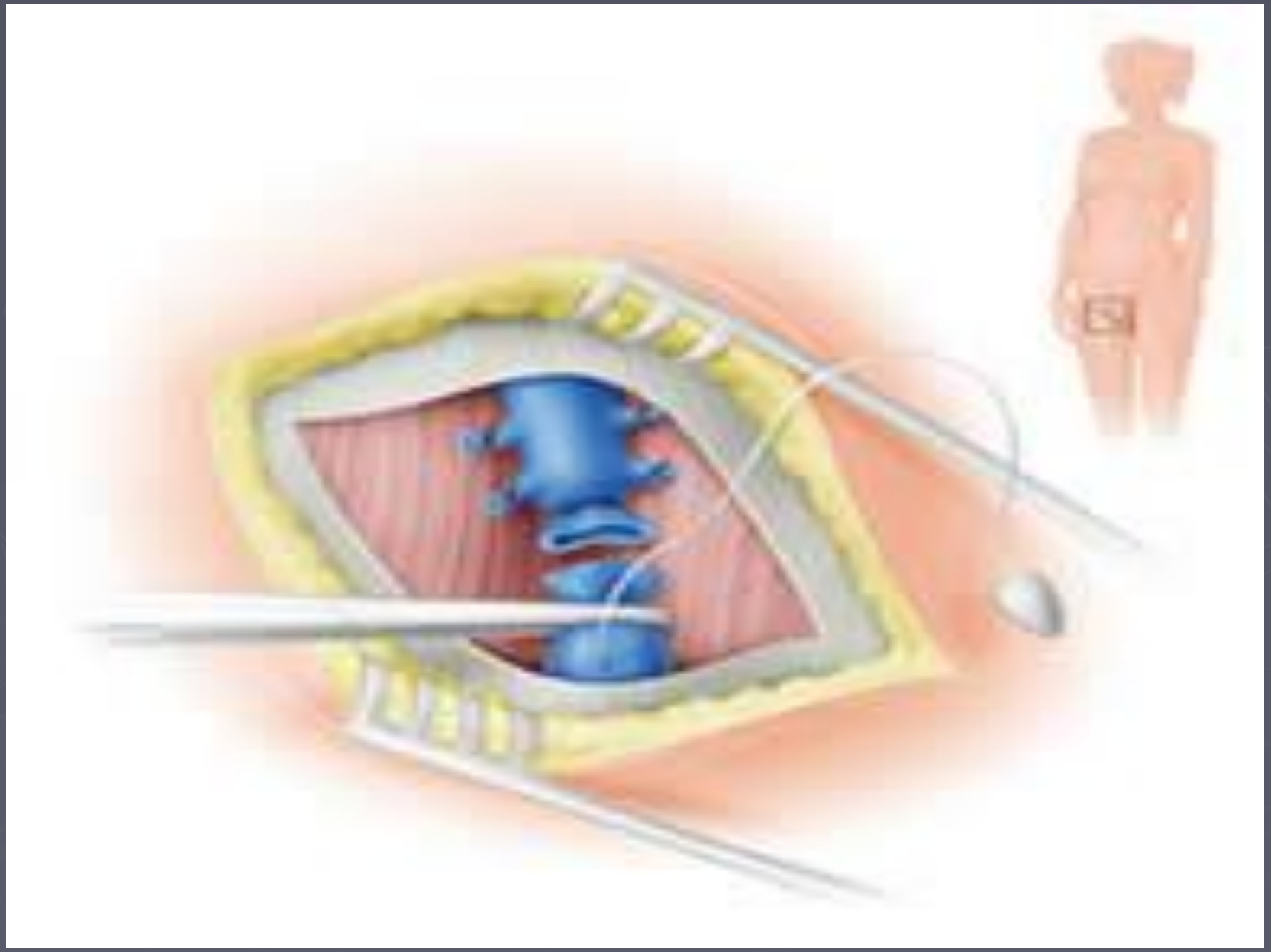
Surgical therapy.

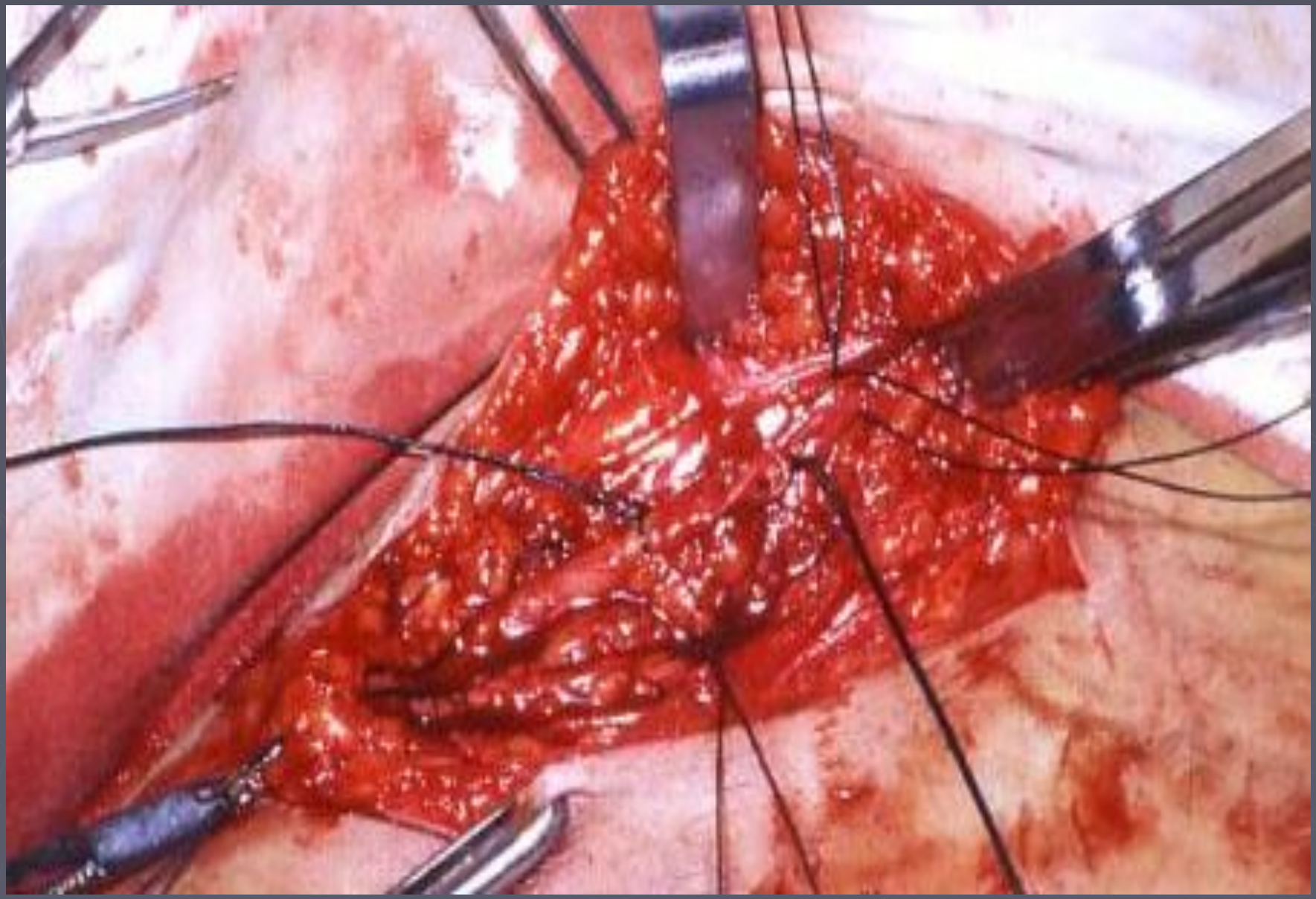
- **Indications:**
  - **severe symptoms**
  - **very large varices**
  - **attacks of superficial phlebitis**
  - **haemorrhage from rupturd varices.**
  - **ulceration from venous stasis.**
  - **cosmetic reasons.**

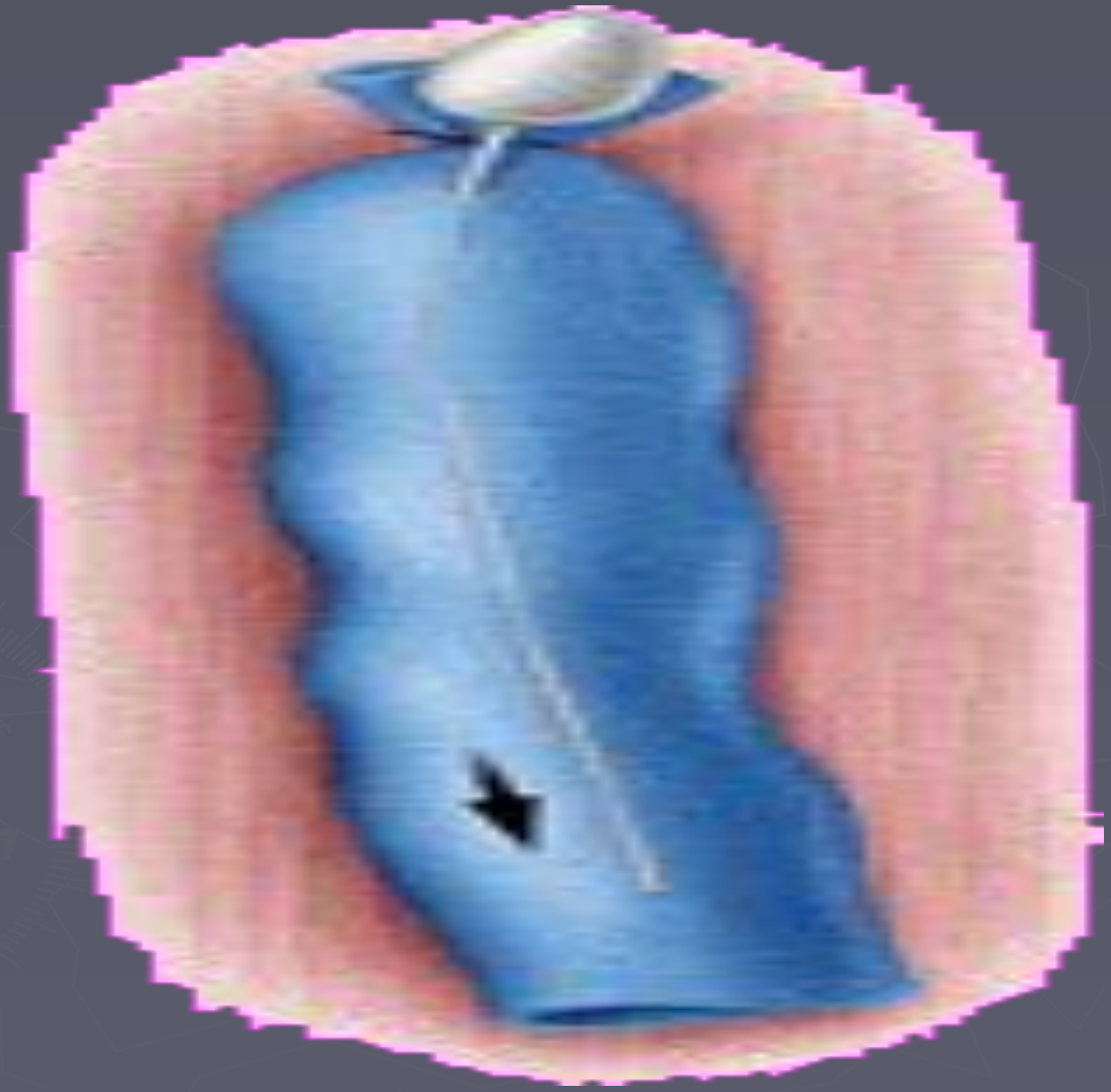
Treatment

Surgical therapy.

- **identify all perforating and superficial veins preoperatively and mark them.**
- **results depend on thoroughness of the procedure.**
- **postoperatively leg is supported with elastic bandages for approximately 6 weeks.**
- **elevation of leg in bed minimizes postop swelling.**
- **recurrens rate of about 10%. most common cause is failure to ligate all the tributaries, and incompetent perforators.**

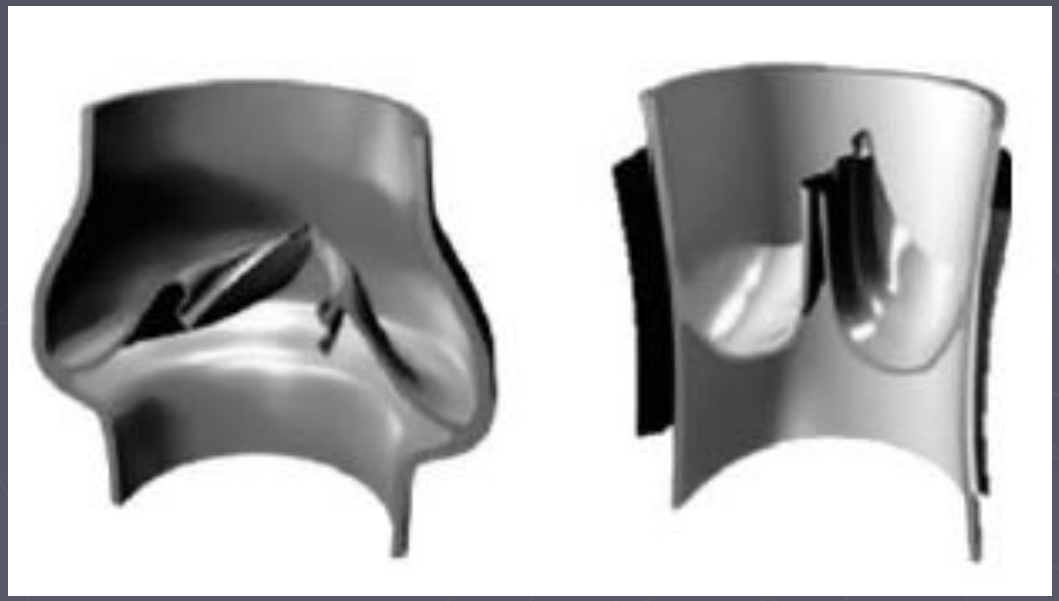


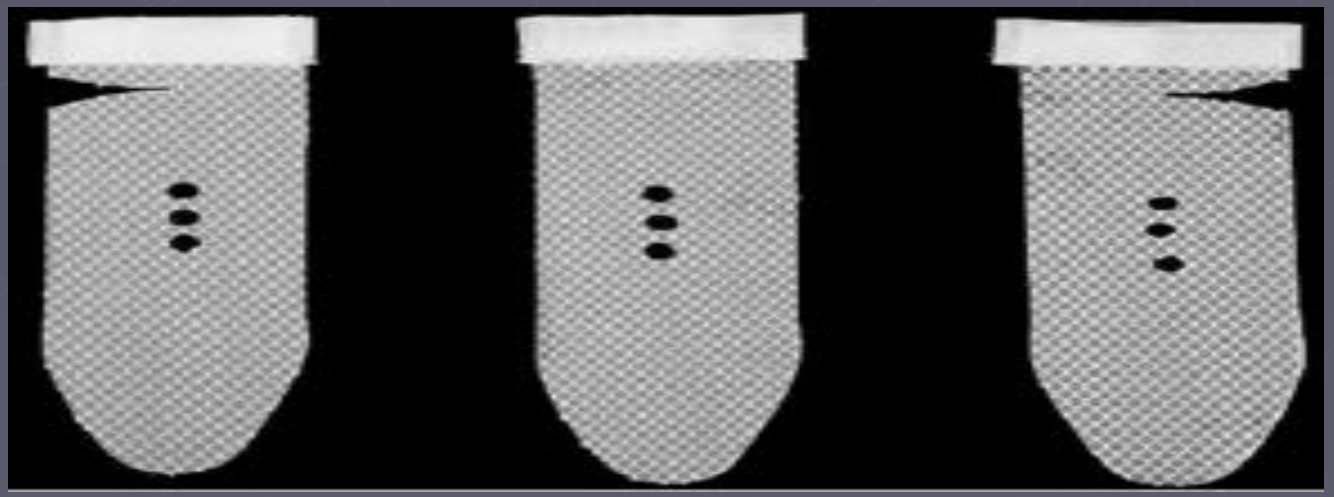




External valvular stent

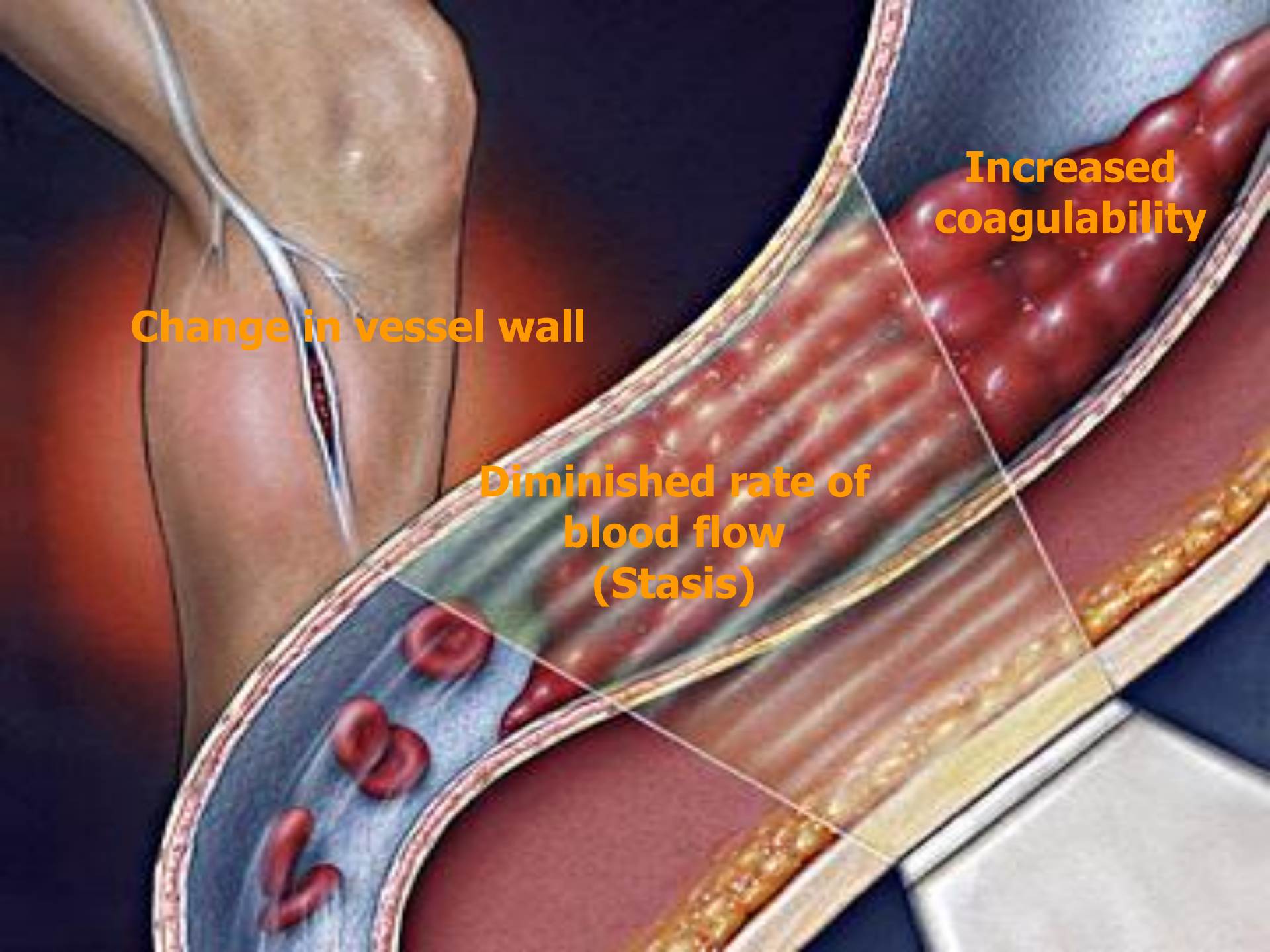
- Adjustable gore-tex/ dacron cuff
- ?physiological





Deep Vein Thrombosis

- Only 1/3 of DVT's cause symptoms and signs.
- predisposition to thrombosis is predicted with *Virchow's triad.*
  - **Change in vessel wall**; distention, injury, inflammation, trauma.
  - **Diminished rate of blood flow**; during and after operations (postop rare before 40years, most common operations;obesity, operations for cancer,prostate and hip), debilitating diseases
  - **Increased coagulability of the blood**; infections, after haemorrhage, visceral cancers,during pregnancy, hypercoagulable states(congenital abnormalities of protein C and S, antithrombin III), deficiencies in the fibrinolytic system


Increased coagulability
Change in vessel wall
Diminished rate of blood flow (Stasis)

Deep Vein Thrombosis

- History:
  - pain and swelling in the calf or whole leg of sudden onset and severe
  - walking may be difficult
  - if PE pleuritic pain, dyspnea, haemoptysis, collapse.
- Examination.
  - Swelling
  - muscles containing the thrombus may be hard and tender.
  - Homan's sign (pain in calf when foot is plantar flexed)
  - If thrombosis obstructes communicating veins then superficial veins may dilate and leg feel hot.
  - phlegmasia alba dolens (white leg or milky leg)
  - Phlegmasia cerulea dolens (venous thrombosis blocks all main veins and leg becomes congested and blue)

Deep Vein Thrombosis

Major criteria

- History of DVT or family history
- Malignancy
- Paralyzed or recent plaster immobilization
- Recent bed ridden > 3 days
- Operated < 4 weeks
- Thigh and calf sweeling
- Calf swelling > 3 cm

Deep Vein Thrombosis

Minor criteria

- Trauma to the leg < 60 day
- Hospitalization in last 6 months
- Unilateral oedema
- Unilateral erythema
- Unilateral dilated veins

Deep Vein Thrombosis

- High possibility 85 %
  - > 3 major
  - > 2 major > + 2 minor
- Moderate possibility 33 %
  - 1 major + > 2 minor
  - > 3 major
- Low possibility 5 %
  - others

DVT

Phlegmasia cerula Dolens

Common Iliac occlusion With phlegmasia Cerula dolens

IVC occlusion

Prevention of DVT

- ***Before operation:*** Stop pill (if possible 6 weeks before), grossly overweight patients should reduce weight, those over 40 should have increased activity 2-3 weeks at home, low dose heparin
- ***During operation:*** prevent pressure on venous system(elevate leg on sand bag), graduated compression stocking or intermittent pneumatic compression, after operation elevate and massage the leg.
- ***After operation:*** Massage, leg movements, graduated stockings (TED stockings), low dose heparin, adequate hydration, early ambulation, Patients should not sit with their legs dependant often better to have in bed then sitting in a chair.

Prevention of DVT

Methods of prevention:

- Mechanical: assisting venous return by; Graduated static compression elastic stockings (Kendall's Thrombo Embolic Deterrent-TED) may reduce incidence of DVT to below 10% (20% in hip surgery), electronic stimulation of calf muscles, Pneumatic compression.
- Low dose heparin 5000 units subcutaneously 2h before operation and continued twice daily until patient is fully ambulating, avoid if operation will leave bleeding areas or if bleeding in cosed space may be disastrous.
- Low molecular weight heparins; reduced risk of bleeding but as effective.
- (Dextran '70'. inhibits platelet adhesion 500ml iv during operation and 500 ml following 24 h)

Treatment of DVT

- **accurate diagnosis using doppler ultrasound (or venography).**
- **Anticoagulation**
  - **(Aim of treatment is to prevent proximal propagation of thrombus)**
  - **before anticoagulation collect blood for APTT, INR and platelet count.**

Treatment of DVT

Heparin

- **5000 units IV as loading dose**
- **followed by initially 1250 units/hour then adjust according to APTT.**
- **Measure APTT every 4hours and adjust dose accordingly 60-85 seconds is the considered therapeutic dose.**
- **When dose is in the therapeutic range check APTT daily.**
- **Check platelets 3/week for heparin induced thrombocytopenia.(rare)**

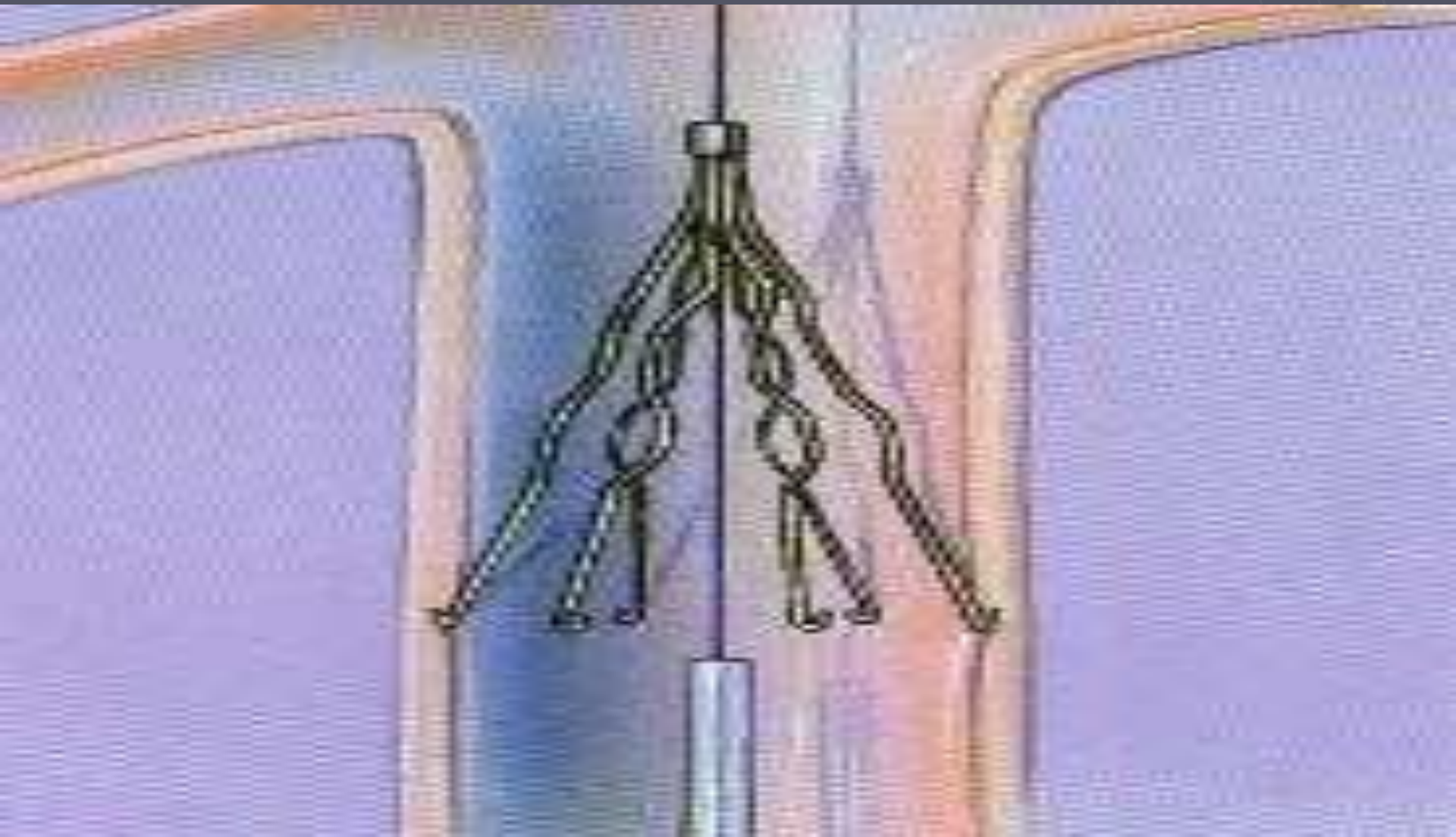
Treatment of DVT

- **cease heparin when warfarin is established with a therapeutic INR 2< for 2days.**
- **initial Warfarin 10mg orally, once daily for 2 days, on 3 day warfarin should be adjusted according to INR.**
- **continue for 3-6 month.**
- **check INR on 3 day, then daily, for first week, then weekly**

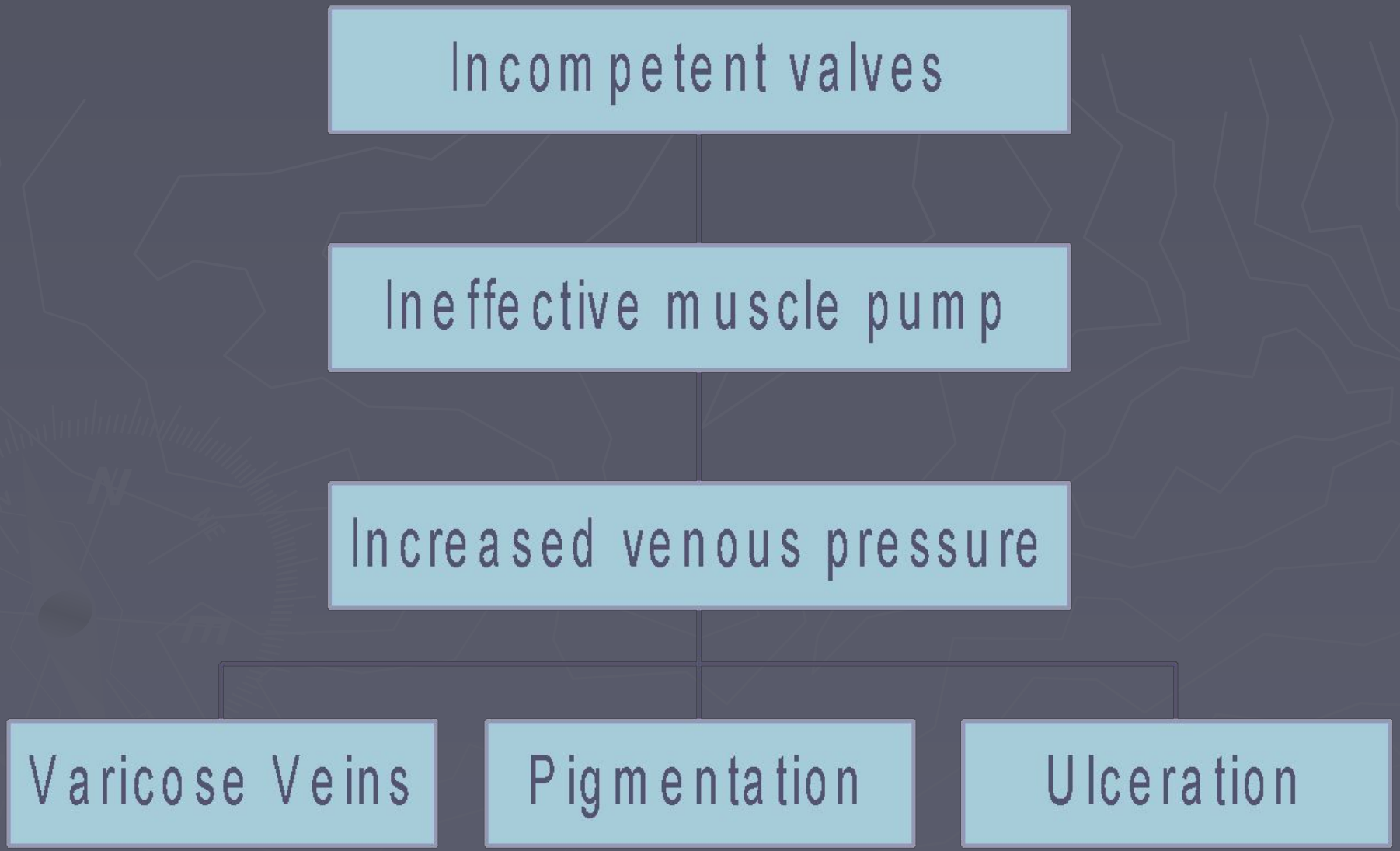
Treatment of DVT

- Thrombectomy; rarely indicated
- Fibrinolytic treatment:
  - streptokinase, urokinase or combination of streptokinase with tissue plasminogen activator (TPA).
  - consider in young people with extensive thrombosis
- Thrombolysis
  - likelihood of substantial thrombolysis is below 50%
  - there is only limited evidence of long term benefit.
  - carries an increased risk of major bleeding.
- Venous interuption
  - extension of life treatening thrombus; consider venous interuption using filter

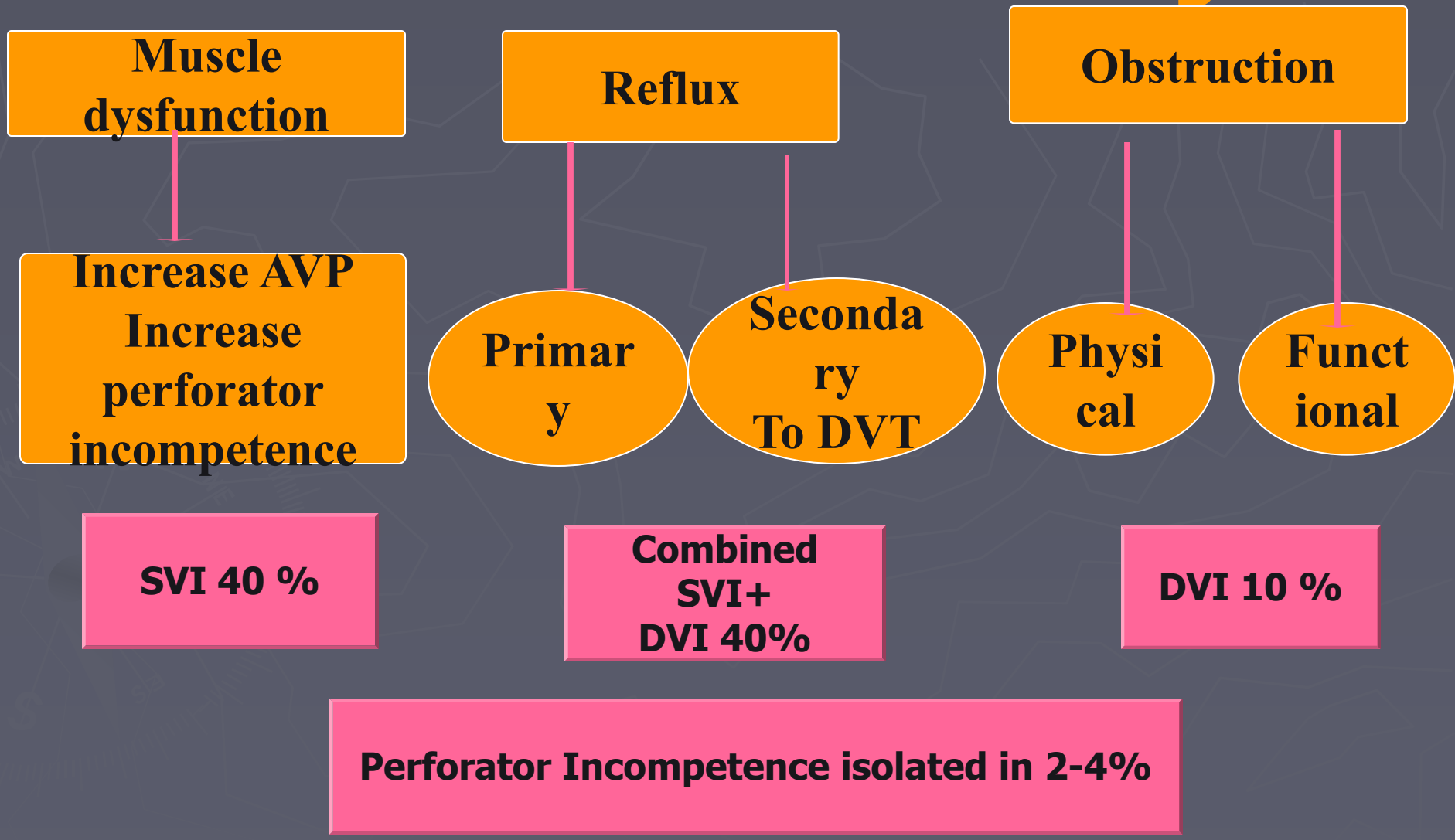
IVC filter



Chronic venous insufficiency



Chronic venous insufficiency Macro- circulation Changes



Chronic venous insufficiency Micro- circulation Changes

The two most popular current explanations for this process are

Fibrin cuff theory

- Increase venous pressure will lead to capillary elongation and widening of the pores
- giving a chance to fibrinogen to escape and polymerize creating a cuff that impedes oxygenation ~>ulceration

White cell trapping theory

- Decreased pressure gradient slow circulation down and trap the WBCs that marginate and block capillaries.
- These will liberate oxygen free radicals and proteolytic enzymes causing endothelial damage.

Chronic venous insufficiency Micro- circulation Changes

Arterio-venous communications

Some suggest the presence arteriovenous shunts further depriving the skin from oxygen

Trap hypothesis

Some suggest that macromolecules exuded can trap growth factors and cells rendering them unavailable for regular tissue repairs

Tissue pressure

The benefit of elevation, elastic stocking and corrective venous surgery reduces the tissue pressures and heal the ulcers

Cutaneous iron overload

The accumulation of ferritin can induce production of oxygen free radilces causing tissue destruction.

Chronic venous insufficiency

- Oedema
- Skin pigmentation
- Lipodermatosclerosis
- Varicose eczema
- Venous ulceration
- Thrombophlebitis
- Atrophie blanche
- Marjolin ulcer
- Equinous deformity

Venous Ulcer

- The ulcer
  - Gaiter area lower leg (medial lower 1/3)
  - edge sloping and pale purple-blue in colour.
  - base ping granulation tissue.
  - tendons and bones may be exposed.
  - seropurulent discharge, heavy infection and pus is not common.
  - shallow and flat.
  - surrounding tissues show signs of venous hypertension (pigmentation, warmth, redness and tenderness)
  - scars from previous ulcers, scar tissue may interfere with movement of foot.
  - lymph nodes should not be enlarged.


LSV
CVI
Ankle flare


LSV
CVI
Ankle flare

An acute venous ulcer. The surrounding lipodermatosclerosis is clearly visible. In the acute stages when tissues are dying and sloughing, venous ulcers can be very painful.

A chronic recurrent infected, enlarging, venous ulcer. The base contains little healthy granulation tissue and many areas of avascular fibrous tissue.

DD of leg ulcer

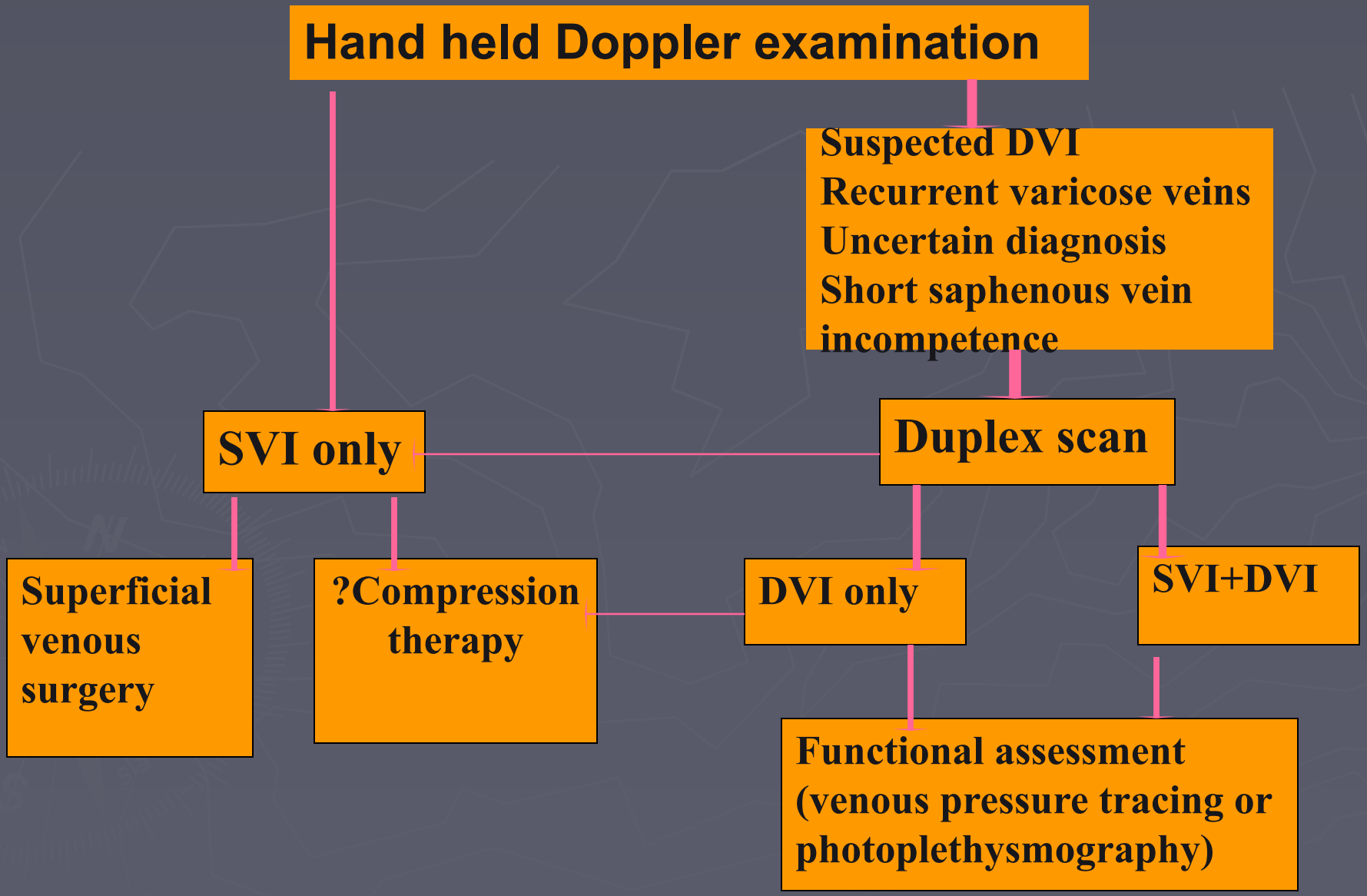
- Infective Ulcer
  - TB
  - $
- Ischemic ulcer
- Traumatic
- Malignant
  - Epithelioma
  - Malignant melanoma
- Trophic ulcer

DD of leg ulcer

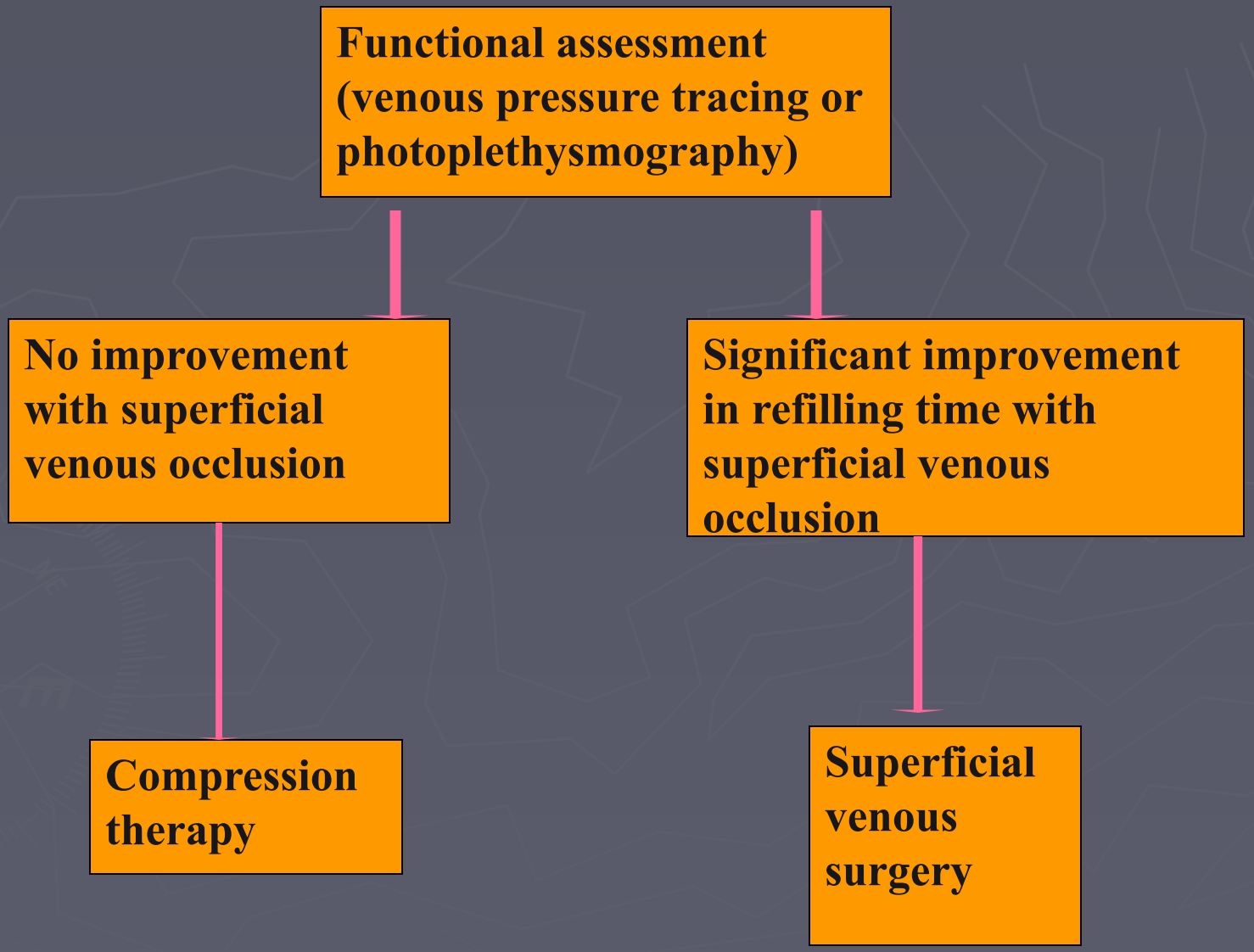
Traumatic ulcer

Ecthyma

Symptomatic chronic venous insufficiency or Impending ulceration



Symptomatic chronic venous insufficiency or Impending ulceration



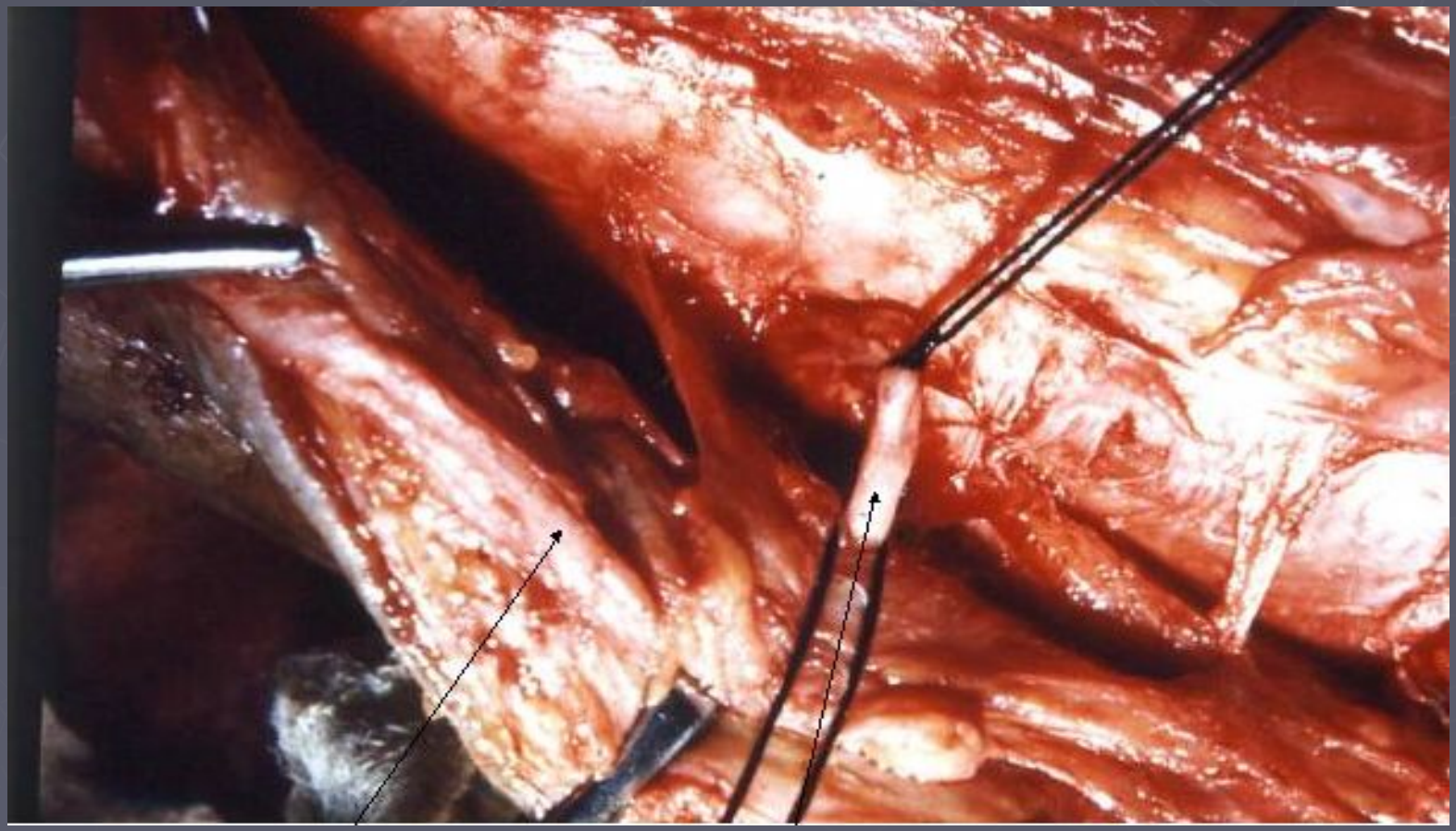
Conservative Treatment

- Bisgaar method: Elevation, bandaging, exercises and massage.
- Compression bandaging:
  - multilayer bandaging for several weeks or
  - strong graduated compression stockings (40mmHg at ankle),
  - compression therapy is very successful but ulcers may re-occure.

Surgical Treatment

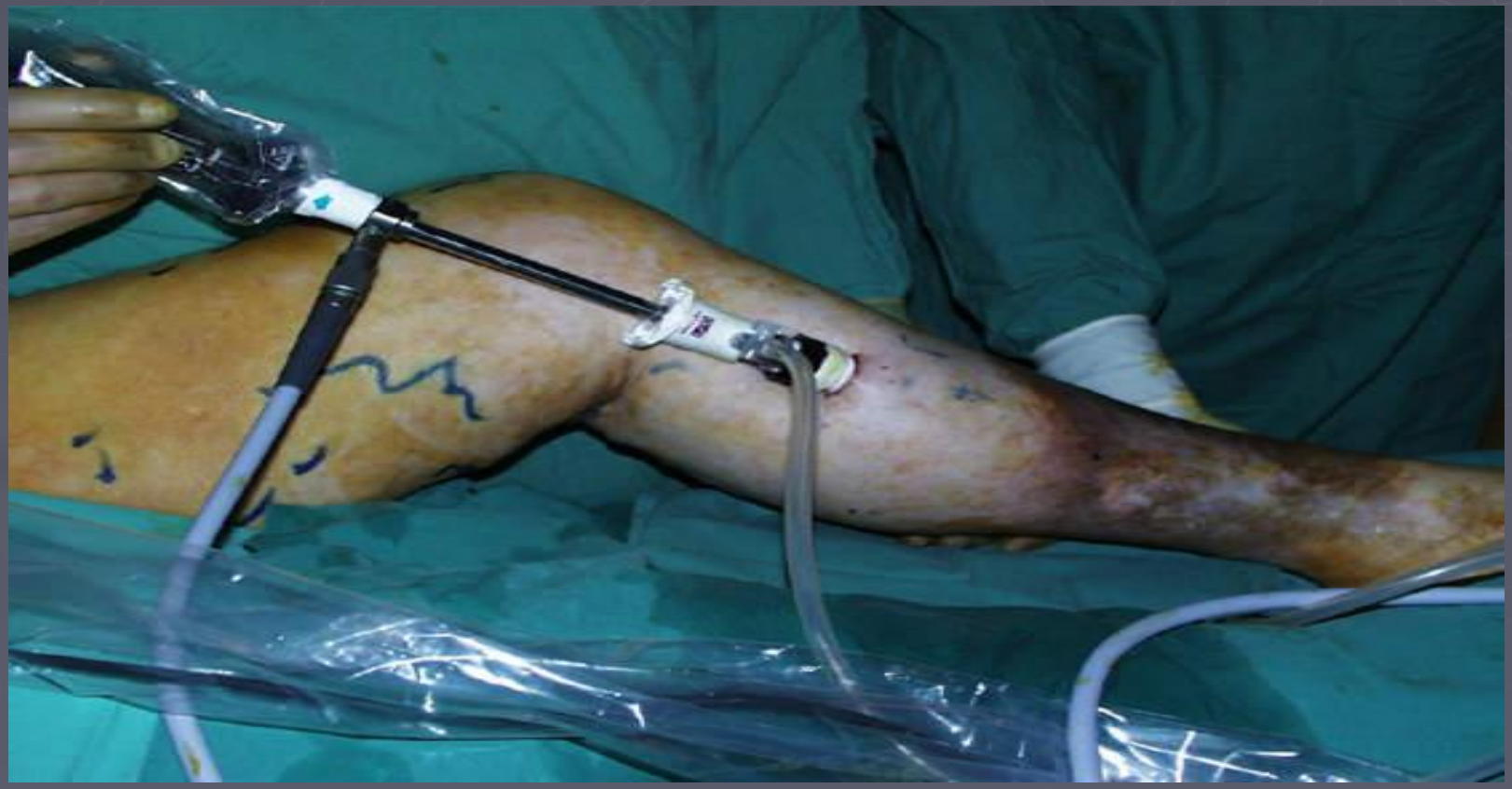
- Ligation and division of incompetent perforating veins
  - to prevent hydrodynamic forces generated in the muscular compartment from reaching the skin
  - (surgical or endoscopic)
- Stripping of incompetent main superficial systems if they are contributing to the high AVP significantly
- Plastic surgery: grafting.

Perforator sub facial ligation



Endoscopic perforator surgery

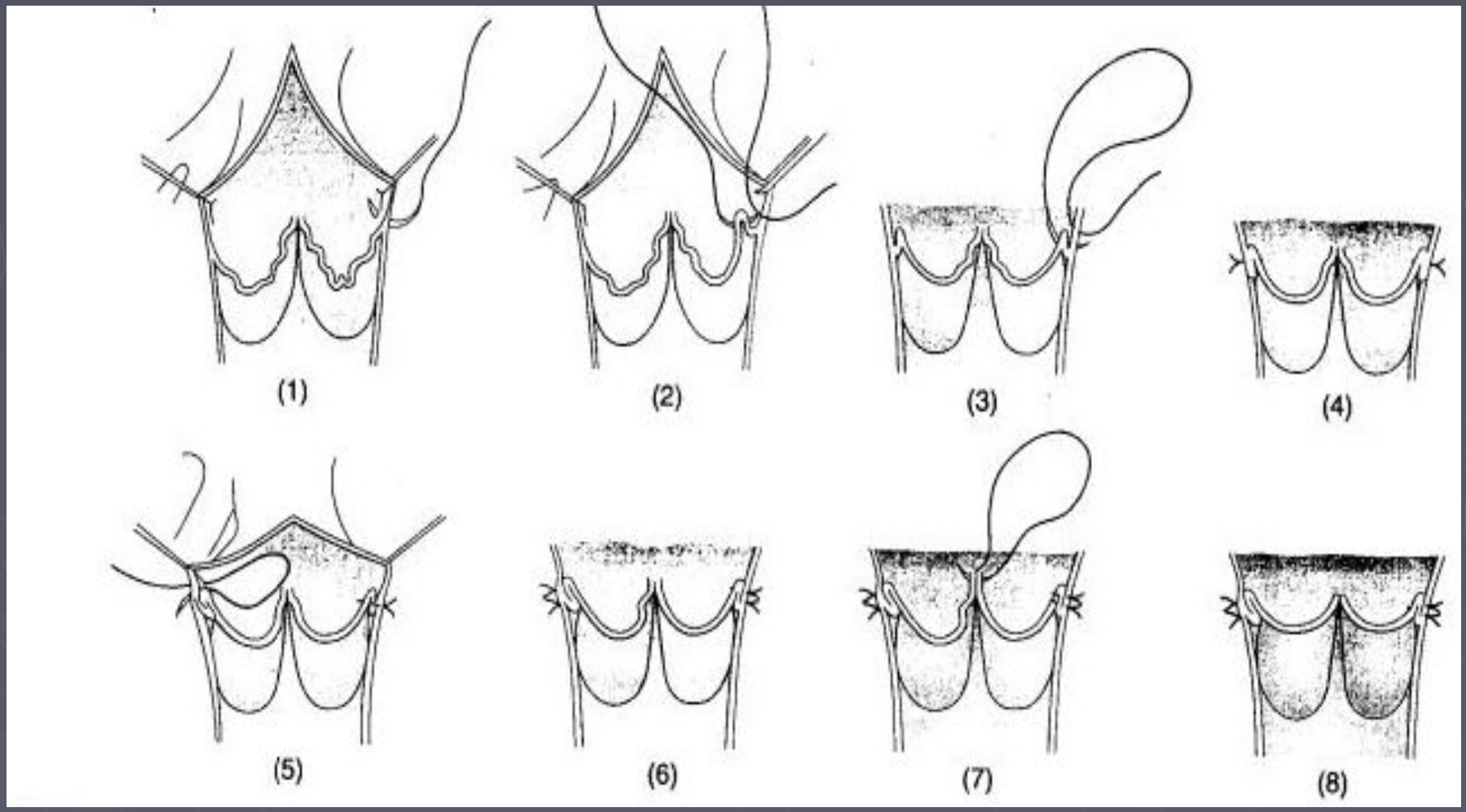
- Active or healed ulcers
- Contra-indicated in
  - Deep venous occlusion
  - Infected ulcer



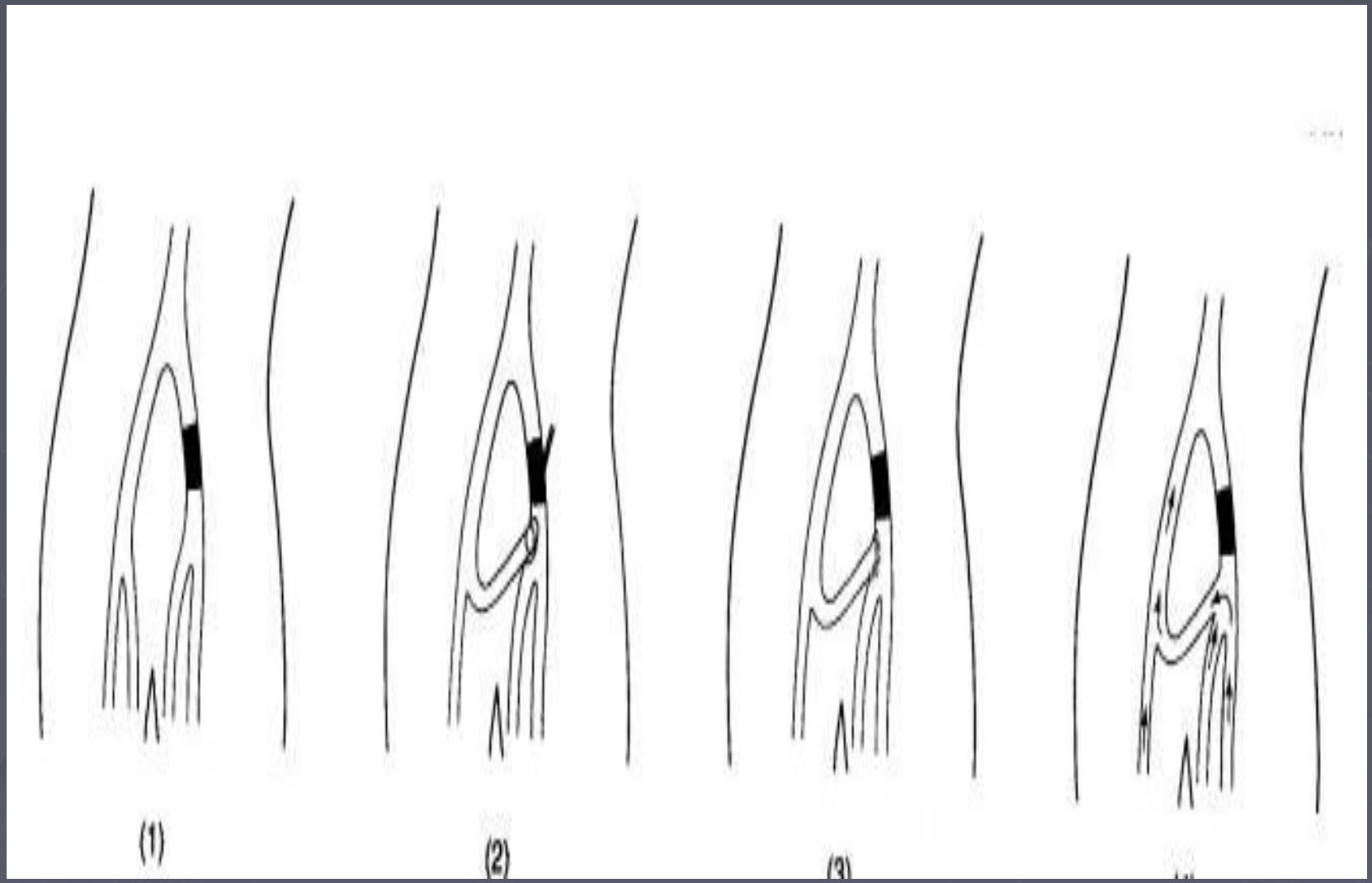
Treatment

Deep venous reconstruction

- Not yet standard treatment
- Can correct primary deep veins reflux but not post-thombotic reflux or obstruction
- Most commonly repaired veins are femoral and popliteal
- Done from within
  - Valvuloplasty
  - Valve transposition or coursing
  - Valve transplantaton



Kistner type valve repair for deep vein incompetence



Palma procedure for deep system obstruction

Lymphoedema.

- interstitial oedema of lymphatic origin.
- rich in protein.
- most common cause is secondary lymph node disease.

Causes

- ***Primary:***
  - Congenital or acquired deficiency of the lymphatics (aplasia or Hypoplasia)
  - Dilation and incompetence of the lymphatic (Hyperplasia).
  - According to age of onset
    - Congenita since birth 10 %
    - Precox adolescent (15- 35) 75 %
    - Tarda > 35 y 15 %

Causes

- ***Secondary:***
  - *Neoplastic infiltration of lymph nodes.*
    - secondary carcinoma
    - Primary reticuloses.
  - *Infection*
    - Filariasis (parasite Wuchereria bancrofti) found in tropical and subtropical climates.This is a cause of severe lymphoedema (elephantiasis)
    - lymphogranuloma inguinale
    - TB
    - Recurrent non-specific infection.
  - *Iatrogenic*
    - surgical excision
  - irradiation of lymph nodes.

Clinical Classification

- Sub clinical with histological abnormalities of LN and lymphatic
- Grade I
  - Oedema pit on pressure
  - Swelling disappear on elevation or bed rest
- Grade II
  - Oedema does not pit on pressure
  - Swelling not disappear on elevation or bed rest
- Grade III
  - Oedema
  - Irreversible skin changes (fibrosis or papillae)

Lymphoedema.

History.

- females>males.
- slowly progressive swelling of the limb or genitelia.
- lower limb most often affected often history of trauma several years ago.
- not painful and no discomfort.
- commonly complicated by athlete's foot (tinea pedis) and episodes of cellulitis.
- Vesicles may appear on the skin that leak clear-coloured fluid.
- symptoms of underlying cause
- very rare complication of lymphangiosarcoma.
- oedema does not respond to leg elevation.

Examination.

- oedema
  - all oedema pits (clasically sayed to be non-pitting).
  - lymphoedema of the lower limb affect the toes much more than other oedemas, if it has been present for long time the toes become squared-off.
  - Examine the whole patient esp. cardia, renal and abdomen, as well as local (venous congestion, venous thrombosis) as diagnosis of lymphoedema is done after everything else has been excluded
- SC fibrosis
  - the skin on the dorsum of the foot can not be pinched Stemmer's sign

Examination.

- In advanced cases
  - Chronic eczema
  - Fungal skin infection (Dermatophtosis)
  - Fungal nail infection (Dermatomycosis)
  - skin gets thick and hyperkeratotic.
  - thick scales grow outward and look like warts.
- Ulceration esp if associated CVI
- Rare
  - Lymphangectasia (megalymphatics)
  - lymphangiosarcoma

Investigation

- Laboratory
- Pathology
- Radiology
  - Contrast lymphangiography
  - Isotope lymphangiography
  - CT scan
  - MRI

Management:

- goals of treatment is to control the oedema and to prevent recurrent infection.
- early treatment gives the best results before fibrosis developes and health of skin and subcutaneous tissues are compromised.

Management:

Non-operative Management:

- Physical methods
  - reduce lymph formation; elevation of the limb.
  - external compression; custom fitted, elastic stockings worn threwout the day.
  - sequential air compression devices.
- Pharmacotherapy
  - restrict dietary sodium
  - diuretics when oedema is being actively treated.
  - instruction about foot care and hygiene to prevent recurrent cellulitis.
  - prophylactic antibiotics may be recuired
  - Antifungal

Management:

- ***Surgical Treatment:***
  - Only needed in a small number of patients.(16%)
  - Indications for surgery.
    - impaired function.
    - pain
    - recurrent cellulitis and lymphangitis
    - lymphangiosarcoma
    - cosmetic although the result will not be a normal looking limb.

Management

Bypass

- Microsurgery: axial pattern and mycocutaneous flaps and lymphatic-lymphatic and lymphatico-venous anastomoses.
- some procedures try to relieve the obstruction by transplanting lymph channels from normal areas

Management

Reduction procedures

- excisional procedures removing skin and lymphoedematous subcutaneous tissues and usually requires extensive skin grafts. complications: scarring, sensory loss, recurrent swelling.
- Thompson procedure:
- Sistrunk
- Homan
- charles