PHYSIOTHERAPY IN PERIPHERAL VASCULAR DISEASE

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PVD (Peripheral Vascular Disease)

- PVD is used to designate a group of disease effecting the blood vessels(artery and vein) and lymphatics.

- Characterised by a reduction in blood flow and hence oxygen through the peripheral vessels.
- When the need of oxygen for the tissue exceeds the supply , areas of ischemia and necrosis will develop in the extremities.
- Consists of :
- PAD (Peripheral arterial disease)
- PVD (Peripheral venous disease)

RISK FACTORS

- Smoking- CO and nicotene effect on intima of vessels.
- Diabetes- Anoxia to endothelium.
- Hypertension- Shear forces.
- Hypercholesterolemia- >LDL cause abnormal cell metabolism.
- Hypercoaguable syndrome.
- Homocysteniemias.

NICOTENE

- Thickens blood and thus makes it harder for blood to carry oxygen
- Increases BP and heart rate
- Lowers HDL,raises LDL and triglyceride
- Damage blood vessels wall(intima) making it stiff and inelastic,narrow.
- Contribute to inflamation which may trigger plaque build up.
- Second hand smoke also has the above mentioned ill effects on human body.

BP and PVD

- High blood pressure causes the arteries to become scarred, hardened and less elastic.
- High bp creates shear forces in the arteries and promotes atherosclerosis process
- High BP subjects the endothelium to oxidative stress and accelerates atherosclerosis

PAD

- A type of arteriosclerosis, involving deposits of fatty substances, calcium, and fibrin in the inner lining of the artery more usually, the legs.

- ARTERIAL INSUFFICIENCY:

  - there is a deceased blood flow toward the tissues, producing ischemia
  - pulses are usually diminished or absent

- Sharp, stabbing pain occurs because of ischemia particularly with activity.
- There is interference with nutrients and 0_2 arriving to the tissues, leading to ischemic ulcers and changes in the skin.

PAD

- **Arteriosclerosis** obliterans.
- Arterial **embolism**
- Raynauds phenomenon.
- Aneurysm.
- Thromboangitis **obliterans**

Peripheral Artery Disease

Fontaine Stages:

I: mild pain on walking ("claudication")

II: severe pain on walking relatively shorter distances (intermittent claudication)

III: pain while resting

IV: loss of sensation to the lower part of the extremity

V: tissue loss (gangrene)

Schwartz,text book of surgery.

PVD

- Alteration in the transport of blood from the capillary back to the heart.
- changes in smooth muscle and connective tissue make the veins less distensible with limited recoil capacity.
- valves may malfunction, causing backflow of blood.
- Virchow's triad: blood stasis, vessel wall injury, and altered blood coagulation

Venous Insufficiency

- There is deceased return of blood from the tissues to the heart.
- Leads to venous congestion and stasis of blood.
- Pulses are present.
- Results in edema, skin changes and stasis ulcers

PVD

- Thrombophlebitis.
- Deep Vein Thrombosis(DVT).
- Varicose vein..

Stages of chronic venous insufficiency

- 0 - no symptoms;
- 1 – heavy feet syndrome;
- 2 - intermittent edema;
- 3 - persistent edema, hyper- or hypopigmentation, lipodermatosclerosis, eczema;
- 4 - venous ulcer.

Schwartz,textbook of surgery

Clinical Manifestations

- Primary varicosities – gradual onset and affect superficial veins, appearance of dark tortuous veins
- dull aches, muscle cramps, pressure, heaviness or fatigue arising from reduced blood flow to the tissues
- Secondary Varicosities – affect the deep veins

  occur due to chronic venous insufficiency or venous thrombosis

  edema, pain, changes in skin color, ulcerations may occur from venous stasis

PHYSIOTHERAPY ASSESSMENT

Screening for PAD

- History taking: **h/o severe pain in legs,increases on walking,decreases with rest.**

- Review of previous medical records: **drug history,surgical history.**

- Physical examination:
  - Inspection.
  - Palpation.
  - Auscultation.
  - Special Tests.

- **Inspection For The Following**
- Any trauma,
- previous surgery scars,
- muscle wasting/muscle asymmetry,
- oedema ,
- erythema,
- ulcers- arterial ulcers tend to be on the borders, sides of the foot,
- neuropathic ulcers on the plantar surface of the foot,
- venous ulcers tend on be on the medial aspect of the leg superior to the medial malleolus.

- hair is absent,
- shiny skin,
- Haemosiderin deposits,
- Lipodermatosclerosis.

INSPECTION OF SKIN

- Skin appears to be glossy and hairless with dedema

Discolouration,haemosedirin deposits pre

sis and

Gangrene

- **Palpation**
- Temperature - cool suggest poor circulation, sides should be compared.
- Pitting edema- should be tested for in dependent locations - dorsum of foot, if present then on the shins. If the patient has been in bed for a longer period of time one should check the sacrum.
- Capillary refill- should be less than 3 seconds.

- Dorsalis pedis artery pulse- on dorsal surface of the foot, running lateral to the tendon of the first toe.
- Posterior tibial artery pulse - posterior and inferior to the medial malleolus.
- Popliteal artery pulse - behind the knee, typically done with both hands.
- Femoral artery pulse - in the femoral triangle / halfway between the ASIS and pubic symphysis

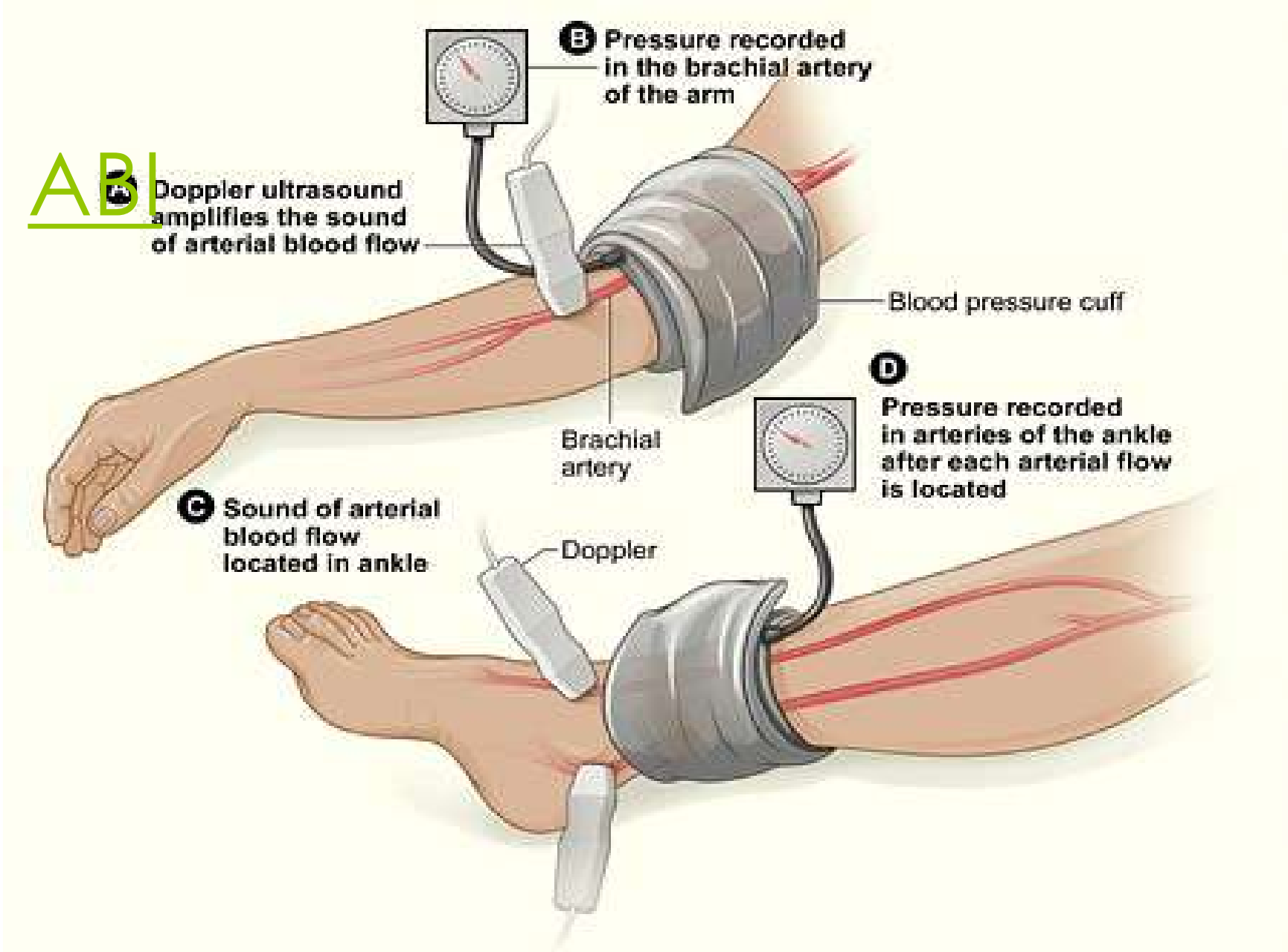
- AUSCULTATION:
- Chest ,
- Femoral arteries for bruits.

- Special tests:
  - Claudication Test.
  - Ankle brachial index(ABI)

ABI RANGES	INDICATIONS
≥1.2	Falsely elevated,arterial disease,diabetes
1.19-0.95	Normal
0.94-0.75	Mild arterial disease+ intermittent claudication
0.74-0.50	Moderate arterial disease + rest pain
≤0.50	Severe arterial disease

Sullivan,text book of rehabilitation

ABI


B Pressure recorded in the brachial artery of the arm
A Doppler ultrasound amplifies the sound of arterial blood flow
Blood pressure cuff
Brachial artery
D Pressure recorded in arteries of the ankle after each arterial flow is located
C Sound of arterial blood flow located in ankle
Doppler

- Buerger's Test :(assessment of arterial sufficiency):
  With the patient supine, note the colour of the feet soles. They should be pink. Then elevate both legs to 45 degrees for more than 1 minute. Observe the soles. If there is marked pallor

Special tests textbook,Maggie

- Rubor of dependency

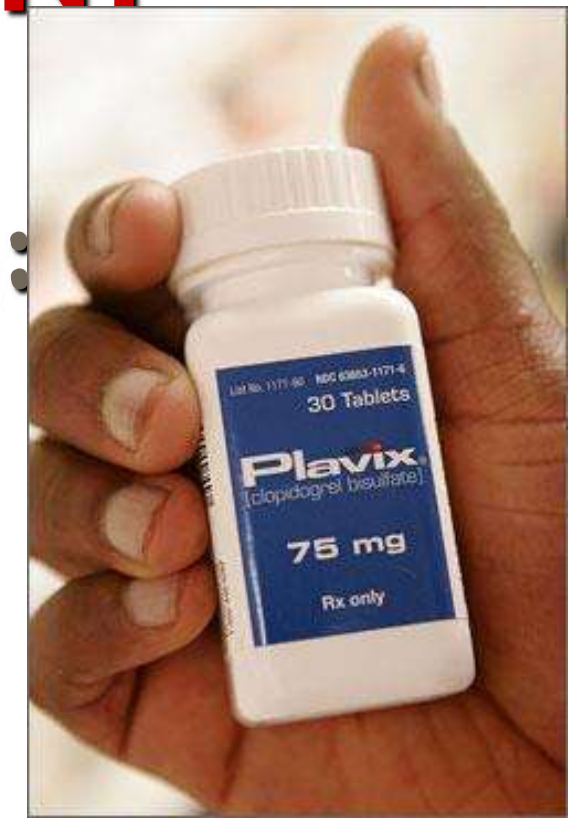
  Sit the patient upright and observe the feet. In normal patients, the feet quickly turn pink. If, more slowly, they turn red like a cooked lobster, suspect ischemia

PAD MANAGEMENT

MEDICAL

Medication Regimen:

- Aspirin
- Plavix (clopidogrel)
- Statins



PAD MANAGEMENT

PHYSIOTHERAPY(AIMS)

- Smoking cessation.
- Regular exercise.
- Diet modification.
- Considerations for Amputed patients.
- Considerations for post surgical patients.
- Improve quality of life.

PT MANAGEMENT(*EXERCISE TESTING)*

- Pharmacological stress testing for patients with claudication.
- Bicycle testing instead of treadmill test.

PT MANAGEMENT(EXERCISE PRESCRIPTION)

- SMOKING CESSATION
- Counselling
- Nicotene patches or gum

- DIET MODIFICATION
- MUFA and PUFA instead of SAFA
- Whole grains,fruits,vegetables and nuts
- Omega-3 fatty acids from fish oil
- Dietary supplements of folic acid,B6,B12

EXERCISE PRESCRIPTION

- Supervised exercise program which is individually tailored for each patient.
- Type-Aerobic.
- Mode-Interval training.
- Duration-30 minutes with rest period in between,can be progressed to 50min
- Frequency-3 times per week.
- Intensity-Intermittent claudication rating scale.
- Calf muscle to be spared,so that claudication does not limit activity.

EXERCISE PROGRAM

- Warm up- 5-10 mins of treadmill walking and stretching.
- Two graded protocol are used in claudication patients:

a) Gardener-Skinner Protocol-Speed 2mph,grade increased by 2% every 2 min

b) Hiatt Protocol-Speed 2mph,grade increased by 3.5% every 3 min.

- Exercise training
- Upper limb strength training-weight cuffs
- Lower limb strength training-isometrics,thera band exercise.
- Balance and proprioception training.
- Gait training.
- Cool down

- Consideration for post revascularisation
- Angioplasty patients are ready for rehabilitation program within a week or two
- For abdominal aortic surgery it takes 6-8 weeks
- Any bypass graft surgical case of lower limb should be taken care of,such as sharp knee flexion to be avcoided in grafts crossing the knee to avoid kinking.
- Cycle are permissible with proper seat height adjustment.

- Consideration for amputee
- PSYCHOSOCIAL EVALUATION
  - To rule out anxiety,depression,stress by evalution tools
  - MOS SF-36(Med outcome of studies)
  - BDI(Beck depression index)
  - BAI(Beck anxiety index)

- PSYCHOSOVIAL INTERVENTION
- Cardiac rehab professional can assist in 3 ways
- By addresing staff concerns about general and specific psychological concerns or presentation by patients.
- By providing individualised treatment
- By providing group psycho educational presentation

- Stump management
- Trainng for balance and proprioception
- Gait training

PT ASSESSMENT

Screening for PVD

- History taking: **Chief complaints of fatigue,heavy feeling and enlargement of feet,paraesthesia,spasm of gastronemius muscle .**

- Review of previous medical records: **drug history,surgical history.**

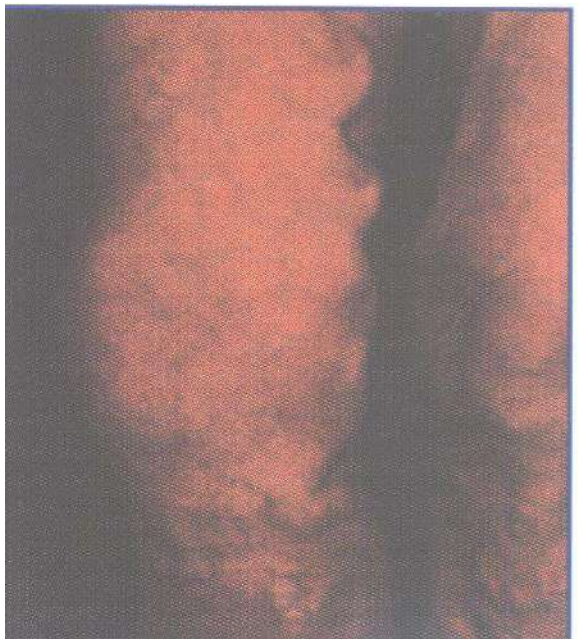
- Physical examination:
  - Inspection.
  - Palpation.
  - Auscultation.
  - Special Tests.

- Inspection of the following:
  - Interskin swollen plexus
  - Varicose vein
  - Oedema
  - Hemosiderosis skin
  - Trophic ulcer

Patient presents with

INTERSKIN SWOLLEN PLEXUS

VARICOSE VEIN



OEDEMA

HEMOSIDERIN DEPOSITS

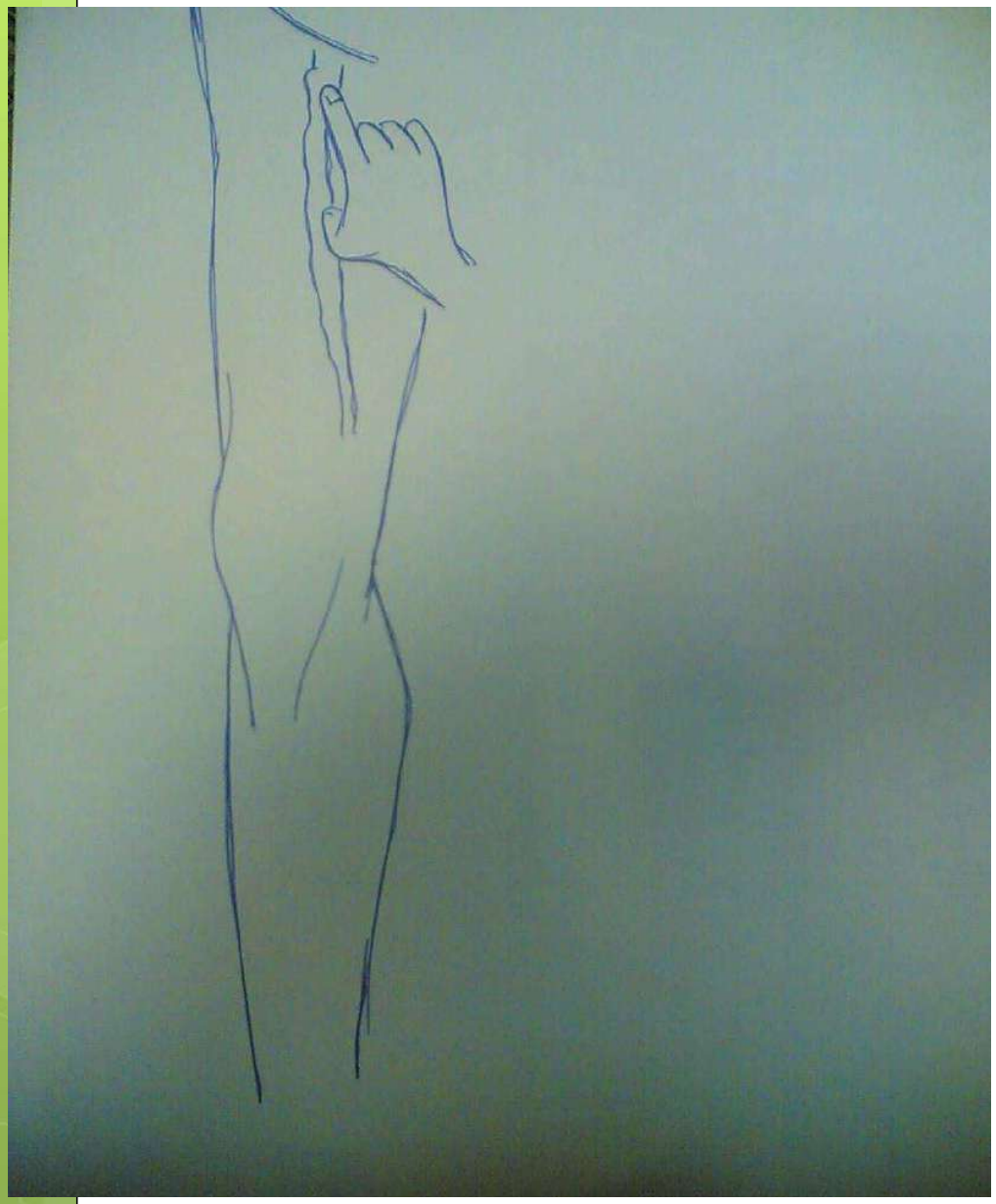
TROPHIC ULCERS

- PALPATION for the following
  - Tenderness
  - Temperature changes
  - Oedema
  - Paraesthesia
- Auscultation
  - chest

Special Tests

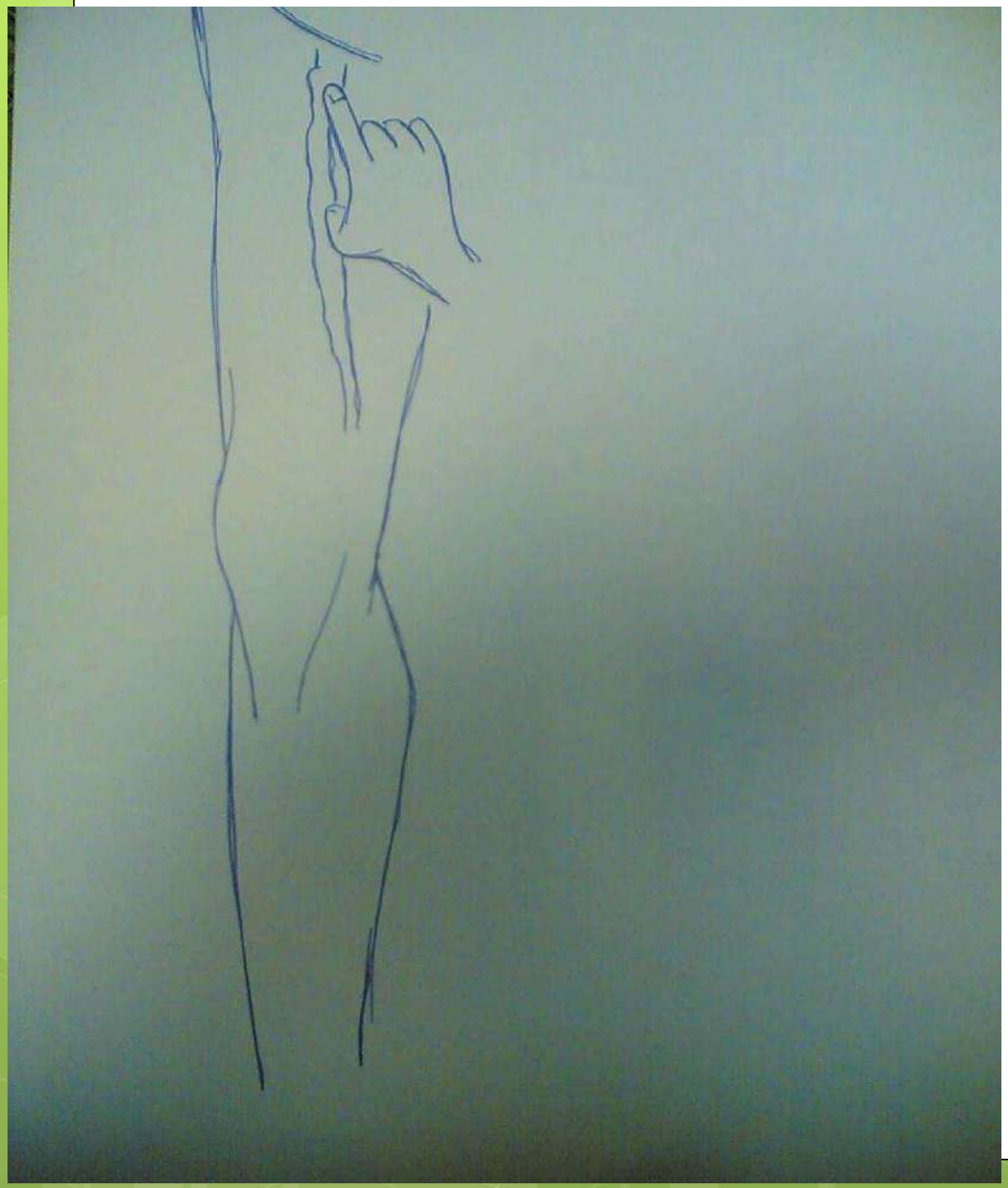
1. Test enable one to judge the condition of valvular apparatus
   - Trendelenburg-Trojanov's tests
   - Hackenbruch's
2. Test enable of insufficient perforating veins
   - *Pratt's test II*
   - *Scheins' test*
   - *Thalmann's test*
3. Test enable the patency of profound veins
   - *Delbe-Pertez test (marching test)*
   - *Pratt-I test*

Trendelenburg-Trojanov's test.



- The patient lying on his back raises one leg. When blood has drained from superficial veins, the greater subcutaneous vein is compressed in the place where it joins the femoral vein and keeping the finger there the patient is asked to rise. If venous trunks swell quickly when the finger is removed, we can conclude that the ostial valve is incompetent.

Hackenbruch's test.



- Place your hand on the thigh where the greater subcutaneous vein joins the femoral vein and ask the patient to cough. You can feel throbs over the vein which points to incompetence of ostial valve.

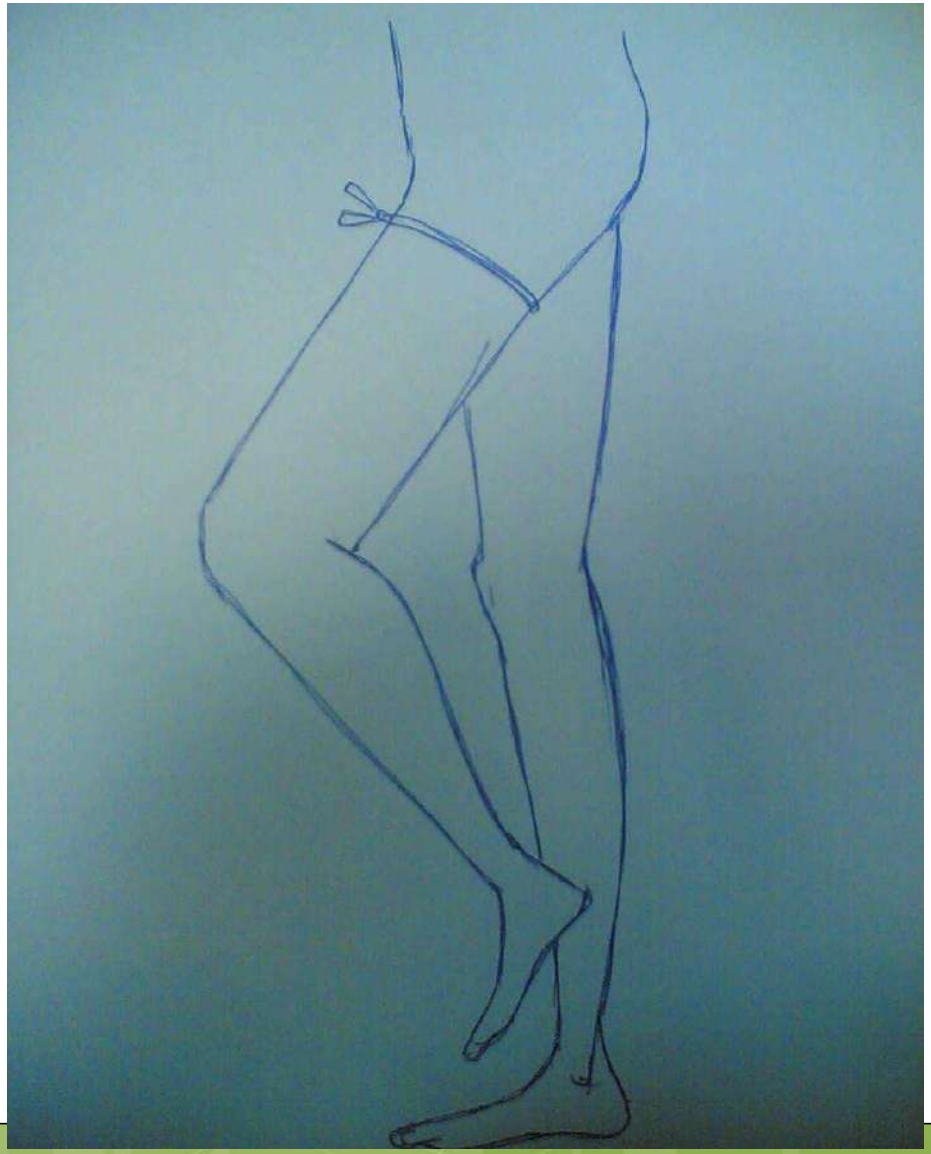
Pratt's test II.

- After draining of subcutaneous veins the lying patient's leg is bandaged with elastic bandage which compresses superficial veins. A tourniquet is applied on the thigh under the poupart fold. When the patient rises, another elastic bandage is applied under the thigh. Then the first bandage is removed loop after loop circling the leg with the utmost loop. The distance between the bandages should 5-6 cm. Quick filling of veins between the bandages points to an incompetent communicant vein in this place.

Scheins' test.

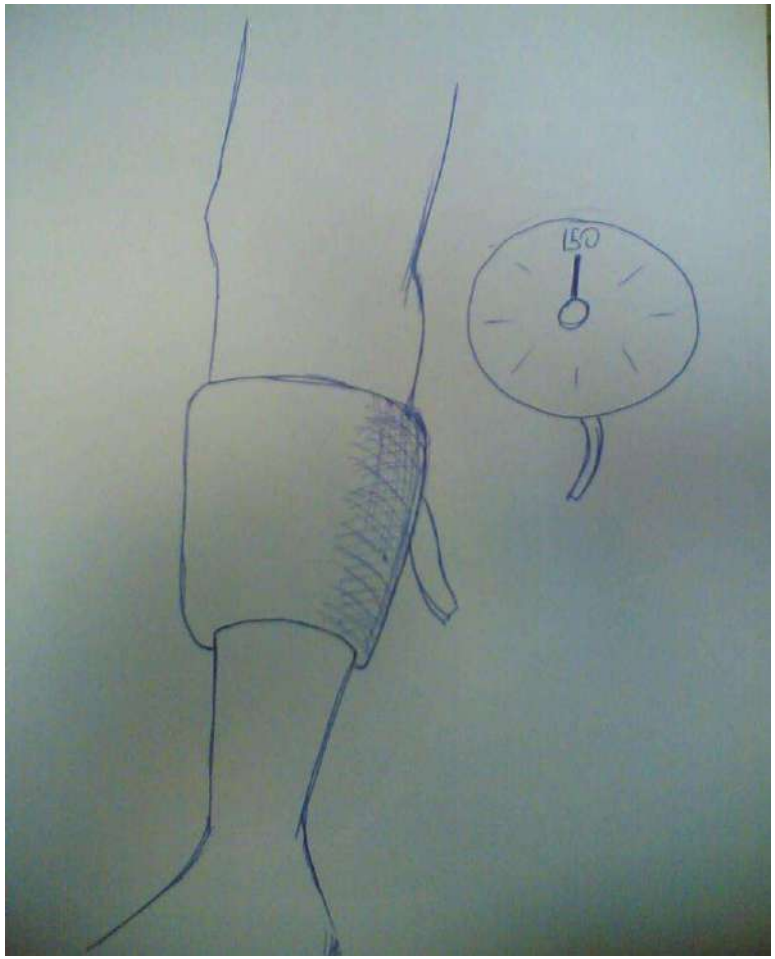
- The patient is placed on the back, his legs are raised. After draining of superficial veins three tourniquets are applied. The patient is asked to rise. A quick swelling of the veins between the tourniquets points to an incompetent perforating vein in this place.

Delbe-Pertez test (marching test)



- A tourniquet compressing only superficial veins is applied to the standing patient's thigh whose subcutaneous veins are maximally full. Then the patient is asked to walk in one spot for 3-5 min. If the veins deflate it means that profound veins are patent; if the veins do not deflate or swell, it means that profound veins are obliterated.

Loevenberg's test



- The cuff of Rivarocci machine is applied to the lower third of shin and air is slowly pumped into it. If sharp pains develop when the pressure in the cuff rises to 150 mm Hg, it is characteristic of thrombophlebitis of profound veins.

Instrumental methods of examination

- ultrasound diagnostics
- contrast-dye radiophlebography

PT MANAGEMENT

- Prevention of DVT:
- It reqiures the prophylactic use of stockings for persons involved in jobs that require continuous standing for long hours.
- **Ergonomic** advice
- ✓ Do not keep your legs in dependent position for long
- ✓ Elevate the legs upto 30degrees with a pillow at ankle, during sleeping at night time.

- Oedema reduction
  - Faradism under pressure
  - Pneumatic compression device
  - High elevation.
  - Pressure bandaging.(in varicose ulcer padding should be given above the ulcer and ulcer area should be kept dry.

- Venous ulcer management
- Proper wound debribemnt and care
- Keep the ulcer area dry and clean with hydrogen peroxide
- LASER-1J/cm²
- US -3MHz ,0.25-.5 for 5-10min
- Ozone therapy

Low level laser therapy for treating venous ulcer.Flemming K.2008.Cochraine summery,online publication

- Care of paraesthetic limb
- Inspect the foot daily for
  - Bruises
  - Cracks
  - Blisters
  - Swelling
  - Dry skin
  - Discolouration
  - Thick socks with well cushioned shoes are advised.

Buerger-Allen exercises

- Elevate feet/legs till feet blanch(whitish), then lowering them till turn red, then resting legs/feet in a horizontal position.
- Client performs exercises lying in bed or on sofa.
- The client is instructed to watch the changes in color blanching indicates inadequate blood. Supply-maintaining this position could harm tissues (death)

Therapeutic effect

- decrease of pathologic venous "capacity" of lower extremities;
- **functional** improvement of the insufficient valvular apparatus;
- increased resorbtion of tissue fluid in the venous part of capillary; its decreased filtration in the arterial part;
- increased fibrinolytic activity of blood.

	Arterial Disease	Venous Disease
Skin	cool or cold, hairless, dry, shiny, pallor on elevation, rubor on dangling	warm, though, thickened, mottled, pigmented areas
Pain	sharp, stabbing, worsens w/ activity and walking, lowering feet may relieve pain	aching, cramping, activity and walking sometimes help, elevating the feet relieves pain
Ulcers	severely painful, pale, gray base, found on heel, toes, dorsum of foot	moderately painful, pink base, found on medial aspect of the ankle
Pulse	often absent or diminished	usually present
Edema	infrequent	frequent, esp. at the end of the day and in areas of ulceration

RESEARCHES

- Improving maximum walking distance in early peripheral arterial disease: Randomised controlled trial

Bess Fowler1, Konrad Jamrozik2, Paul Norman1,Yvonne Allen1 and Eve Wilkinson1

- 1*University of Western Australia 2Imperial College of Science, UK*.

- **Treatment of Intermittent Claudication**
- **With Physical Training, Smoking Cessation,**
- **Pentoxifylline, or Nafronyl**

- ***A Meta-analysis***
- *Bruno Girolami, MD; Enrico Bernardi, MD; Martin H. Prins, MD, PhD; Jan Wouter ten Cate, MD, PhD;*
- *Rohan Hettiarachchi, MD; Paolo Prandoni, MD, PhD; Antonio Girolami, MD; Harry R. Bu¨ ller, MD, PhD*