1. **Introduction:**

1.1. **Definition**
A varicose vein is a subcutaneous vein with abnormal dilatation, elongation, tortuosity, incompetent valves and reflux.

1.2. Varicose veins can be present in various parts of the body including the oesophagus (oesophageal varices), anal canal (haemorrhoids) and scrotum (varicocele), but it is most common on the lower extremities.

1.3. Distinguish between true varicosities found subcutaneously and intracutaneous venous telangiectasis and reticular veins.

2. **Anatomy of the venous system of the lower limbs**
   - **Superficial system:**
     A network in the subcutaneous tissue and skin: vena saphena magna, vena saphena parva and branches.
   - **Deep system:**
     Accompany the arteries deep to the fascia in the muscle compartments.
   - **Communicators / Perforators:**
     Connect the superficial and deep systems, occur in specific anatomical positions.
   - **Valves:**
     Bicuspid valves regulate uni-directional flow. Most common in the lower leg and less in the upper leg. Single valve in the vena iliaca externa or common femoral vein and no valves in the inferior vena cava.

3. **Physiology**
Flow and flow direction are determined by:
   - Muscle pump in calves and feet
   - Respiratory movement of the diaphragm
   - Pump action of the heart (vis a tergo)
   - Valves regulate flow from:
     - Distal to proximal
     - Superficial to deep (through the perforators)

THE KEY TO EFFECTIVE VENOUS FUNCTION IS COMPETENT VALVES
4. **Pathophysiology**

The pathophysiology of venous disease consist of two mechanisms e.g.:

1. Valve incompetence
2. Venous obstruction

4.1. Valves are damaged and become incompetent through:

- Excessive stretching of the veins - the valve cusps cannot oppose
- Thrombosis with recanalization
- Congenital absence or hypoplasia of valves

INCOMPETENT VALVES → REFLUX → ABN PRESSURE AND FLOW PATTERNS →

- Dilatation
- Extension
- Tortuous course
- Stasis
- Chronic venous insufficiency

4.2. Venous obstruction follows after venous thrombosis and leads to chronic venous insufficiency. (See chapter on PTS)

**Venous pressure changes in the dorsal foot veins during standing and with exercise**

1. Normal
2. Varicose veins
3. Deep venous incompetence
4. Venous outflow obstruction

$3 + 4 = \text{Ambulatory venous hypertension}$
1. **Normal:**
   - Pressure drops quickly at the start of exercise and gradually returns to the original level after cessation of exercise

2. **Varicose veins:**
   - Pressure drops slower during exercise and does not reach the same low levels as in the normal condition. After cessation of exercise the pressure rises quickly

3. **Deep venous incompetence:**
   - Pressure drops only slightly or may even rise during exercise.
     = ambulatory venous hypertension

5. **Primary varicose veins**
5.1. Common condition, which occurs in 20% of the general population. More common in females than in males (2 : 1)
   Occurrence more common with advanced age

5.2. **Etiology:**
   - Two theories
     - Primary valve incompetence
     - Primary wall incompetence → dilatation → valve becomes incompetent
   - Absent valves at the sapheno femoral or saphena popliteal junction
   - Genetic predisposition: usually a positive family history

5.3. **Contributing factors to the development of varicose veins:**
   - Obesity
   - Pregnancy:
     - Hormonal influence
     - ↑ Blood volume
     - ↑ Pelvic circulation
     - ↑ Pressure of the uterus on the pelvic veins and inferior vena cava
   - Lifestyle:
     - Long periods of standing or sitting
     - Insufficient exercise
     - Low fibre diet / chronic constipation
     - Tight fitting underwear
     - Smoking
     - Previous DVT
   - Female hormones

6. **Secondary varicose veins**
   - Post thrombotic:
     - DVT → recanalization with damage to the valves in the deep system → reflux occurs → leads to higher pressure in the deep system → incompetence of the valves of the perforators → ↑ flow in the superficial system → varicose veins in the superficial system.
   - Chronic obstruction of the inferior vena cava or iliaca Vv → secondary varicose veins in the leg
• Rare causes:
  o AV Fistula
    ▪ Congenital (Klippel – Trenaunay syndrome)
    ▪ Post trauma

7. **Complications of untreated varicose veins**
   • Thrombophlebitis
   • Spontaneous bleeding
   • Skin discoloration
   • Eczema
   • Lipodermatosclerosis
   • Ulceration

8. **Clinical presentation**
   • Asymptomatic
   • Cosmetically unacceptable
   • Tired, heavy, painful legs
   • Cramps during night time
   • Swelling of ankles
   • Irritation of the skin (eczema/pruritis)
   • Spontaneous bleeding
   • Thrombophlebitis
   • Venous ulcer

   Symptoms of primary varicose veins are seldom severe, but varicose veins are often a cosmetic problem. Secondary varicose veins have more severe symptoms due to the concomitant symptoms of the post-phlebitic limb (post thrombotic syndrome). Be careful to ascribe severe pain to varicose veins, unless there is thrombophlebitis.

9. **Clinical examination**
   • History:
     o Family history of varicose veins
     o History of previous DVT
     o Hypercoagulability
     o Previous varicose vein operation (20% of varicose operations are for recurrent varicose veins)
     o Pregnancy history
     o Current and previous medication
     o Oral contraception
     o Female hormone replacement therapy
     o Complications, thrombophlebitis, ulceration, etc

10. **Physical examination**
    • Examine the patient in the erect and supine position
    • Local examination of the limb:
      o Type of veins: telangiectases, reticular veins, truncal veins.
      o Anatomical distribution of the varicose veins: Vena saphena magna, vena saphena parva or both
      o Signs of previous complications: thrombophlebitis, bleeding, ulcer
Scars
Signs of chronic venous insufficiency – typical skin changes, hyperpigmentation, lipodermatosclerosis, ulceration
Asymmetry
Ankle oedema
Scars of previous operations
- Arterial examination: signs of arterial insufficiency, confirm pulse status
- Systemic examination:
  - Presence of abdominal or pelvic masses
- Clinical tests:
  - To determine sapheno-femoral incompetence, deep system patency and perforator incompetence
    - Schwartz test – (percussion test)
    - Brodie – Trendelenburg test
    - Perthe test

11. Special investigations
- Hand held Doppler – test for sapheno-femoral and vena saphena magna incompetence and reflux
- Venous Duplex Doppler study – very sensitive and specific but operator dependant

11.1. Indications for Duplex Doppler investigation:
- History of previous DVT
- Signs of chronic venous insufficiency
- Recurrent varicose veins
- Vena saphena parva varicosities, mark saphena parva – popliteal junction
- Abnormal syndromes or anomalies

12. Management
12.1. Conservative:
- Assuance, explain that this is not a life- or limb threatening condition
- Weight loss if required
- Avoid sitting or standing for long periods
- Promote venous return through regular exercise, elevating legs
- Supportive elastic stockings:
  - Relieve symptoms
  - Prevent deterioration
  - Camouflage unsightly veins

Principle of graded supportive pressure stockings:
- Maintains continuous pressure, reduces congestion
- Gradient between ankle > knee > thigh

Different types:
- Class 1 : Pressure at ankle 18 - 21mmHg
- Class 2 : 23 – 32mmHg
- Class 3 : 34 – 46mmHg
- Class 4 : 49 mmHg
Pressure stockings are used for:
- Mild varicose veins
- During pregnancy
- Where surgery is not indicated
- Post surgery or sclerotherapy
- DVT
- Post phlebitic limb
- Chronic venous insufficiency
- Lymph oedema

Uncomplicated varicose veins usually require Class 2 stockings whereas Class 3+4 stockings are used for chronic venous insufficiency and lymph oedema respectively. Compression bandages are indicated for venous eczema and venous ulceration (see chapter).

12.2. Sclerotherapy:
- **Aim:** Obliteration of the lumen through permanent fibrosis
- **Method:** Sclerosing agent injected into empty vein followed by continuous compression and supportive stockings
- **Indicated for:**
  - Short isolated and dilated segments
  - Recurrent varicose veins
  - Incompetent perforators
  - Venous telangiectases and reticular veins (spider veins, vanity veins)
- **Complications:**
  - Skin discolouration
  - Skin necrosis and ulceration
  - Hypersensitivity reactions, etc

12.3. Surgery:
- **Indicated for :**
  - Proximal incompetence: Sapheno-femoral, sapheno-popliteal
  - Perforator incompetence
- **Vena saphena magna varicosities:**
  - Trendelenburg procedure with stripping = ligation of the sapheno-femoral junction and side branches followed by stripping of the saphena magna
  - Varicose veins in the lower leg are often in the posterior arch vein and side branches with an intact saphenous vein below the knee; routine stripping of the infra popliteal saphenous vein is not indicated
- **Vena saphena parva varicose veins:**
  - Ligation of the sapheno-popliteal junction with stripping of saphena parva
12.4. **Medication:**
There are various drugs that are supposed to increase venous tone, but will at best only give symptomatic relief.
Pentoxifylline enhances red blood cell conformability and decreases platelet aggregation; therefore improves the micro-circulation and is of value in chronic venous insufficiency with stasis ulceration.

13. **Complications of surgery for varicose veins**
- Injury to the major veins – femoral or popliteal
- Arterial injury
- Nerve injury (nervus saphenus, suralis, peronealis)
- DVT
- Haematoma
- Lymphocele
- Recurrence – 10-20% of varicose veins will recur

14. **Thrombophlebitis**
- Is superficial thrombosis in varicose veins
- Clinical appearance:
  - Pain, tenderness, red discolouration, palpable, cord of the varicose vein – low grade temperature
- Treatment:
  - Mild analgesic
  - NSAID
  - Supportive stocking / bandage
  - Mobilise
- NOTE:
  - Anti-coagulation not indicated
  - Antibiotics not indicated (inflammatory condition, no infection) with the exception of septic phlebitis
  - Seldom surgery
- REMEMBER:
  - Recurrent thrombophlebitis (thrombophlebitis migrans) may be indicative of underlying mucinous adenocarcinoma: Trousseau syndrome (Originally described for pancreatic carcinoma).