The veins
Clinical assessment of the venous circulation of the lower limb

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Anatomy and physiology;
• The veins of the lower limb are divided into: --
  -the superficial.
  -deep systWms. separated by the deep fascia of the leg.
  -communicating veins.
  -The deep veins have many valves.
  -Large venous sinusoids within the soleus muscle
  -The superficial veins all eventually join either the great (long) or the lesser (short) saphenous system.
  -These two major subcutaneous veins end where they communicate with the femoral and popliteal veins, respectively
  -The two superficial systems are also joined to the deep veins by a number of other communicating (perforating) veins, the most important of which are in the calf.
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Anatomy and physiology:
• The deep veins accompany the arteries (venae commitantes) of the lower leg and join to form the popliteal vein, which also receives blood from the calf muscle sinusoids.
Anatomy and physiology:

• In the erect position, the venous return is heavily dependent on the calf muscle pump.

• Contraction of the calf muscles forces blood out of the calf veins into the popliteal veins, and on towards the heart.

• During calf muscle relaxation, the intramuscular veins open, but blood is prevented from refluxing back into them from the proximal deep veins by the valves in the popliteal veins.

• The negative pressure in the deep veins then sucks blood in from the superficial system through the communicating veins to reduce the superficial venous pressure.
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• In the erect position, the venous return is heavily dependent on the calf muscle pump.
Symptoms of lower limb venous disease

- ‘unsightly veins’ in their lower limbs.
- pain or discomfort when standing.
- minor ankle swelling.
- skin changes (lipodermatosclerosis, eczema, pigmentation and ulceration) in the skin of the gaiter region.
- Superficial veins may occasionally bleed or thrombose.
- leg swelling.
- chest pain, haemoptysis and dyspnoea.
Examination of the veins of the lower limb

- Inspection.
- Palpation.
- Percussion.
- Auscultation.
- Tourniquet tests.
- Doppler flow detector studies.
Examination of the veins of the lower limb

**Inspection:**

- The lower limbs need to be fully exposed with the patient standing erect.

- **Varicose veins:** visible, dilated and tortuous subcutaneous veins.
- **Saphena varix:** A blue-tinged bulge in the groin, which disappears on lying down,
- **Spider veins or venous stars:** minute and intradermal veins.
- **Reticular veins:** Slightly larger intermediate veins.
- **Ankle blowouts:** Large, prominent, distended veins on the medial side of the lower calf lie in close proximity to the site of incompetent calf communicating veins.
- **Ankle flare or corona phlebectatica:** network of small dilated venules that develops beneath the lateral and/or medial malleolus of limbs with severe venous hypertension.
- **Collateral veins:**
- **Lipodermatosclerosis,** and eventually **eczema and ulceration:** skin pigmentation, tenderness and subcutaneous induration may be caused Venous hypertension caused by venous outflow obstruction or severe reflux.
Examination of the veins of the lower limb

**Palpation:**

- The examiner’s dominant hand should be gently run over the course of the main veins and their tributaries because dilated veins can sometimes be more easily felt than seen, especially in fat legs.
- Carefully palpate the sapheno-femoral junction (2.5 cm below and lateral to the pubic tubercle).
- The sapheno-popliteal junction, which has a variable position in the popliteal fossa (high or low). May need to bend the knees slightly to relax the deep fascia covering the popliteal fossa.
- The patient should be asked to cough while the dilated veins are palpated to see if there is any impulse or thrill (a cough impulse).
- Palpate the skin of the calf to define any areas of induration and tenderness (**lipodermatosclerosis**).
Examination of the veins of the lower limb

**Percussion:**

- The distended, dilated trunks of the long and short saphenous systems transmit a percussion wave in an orthograde direction whether or not the valves are competent. The more distended the vein, the better the wave is transmitted. The valves must be incompetent if a percussion wave is transmitted retrogradely, i.e. downwards while the patient is standing.

- Percussion can also be used to help to define the terminations of the long and short saphenous veins by placing the fingers of one hand gently over the upper end of the dilated saphenous trunk and percussing the vein below it, using the middle finger of the other hand to ‘flick’ distended varicosities further down the leg.
Examination of the veins of the lower limb

**Auscultation:**

- over any large clusters of veins, especially if they remain distended when the patient lies down and the limb is elevated. A machinery murmur over such veins indicates that they are secondary to an **arteriovenous fistula.**
Examination of the veins of the lower limb

**Tourniquet tests**

- *Many clinicians have abandoned tourniquet tests as a means of assessing varicose veins in favour of more sophisticated investigations such as duplex ultrasound, but these tests are simple to perform and, if correctly carried out, can provide useful information on the major sites of communicating vein incompetence.*
- The patient should lie on a couch that has a small foot stool attached to it, onto which the patient can rapidly stand.
- The limb to be examined is then elevated – often by placing it on the examiner’s shoulder – to empty the veins, a process that can be expedited by stroking the blood within the veins towards the heart.
- A tourniquet made from a long length of 1 cm diameter soft rubber tubing is then pulled tight around the upper thigh and held in place by strong artery forceps.
- The patient is then asked to stand up quickly, and the legs are observed for 10–15 seconds. Superficial to deep valvular incompetence is (are) there above or below?
- This can be confirmed by suddenly releasing the tourniquet and watching the veins below the site of the tourniquet rapidly distend from above, as blood regurgitates down the long saphenous vein. There must be other sites of superficial to deep incompetence below the level of the tourniquet if the veins below the tourniquet fill immediately the patient stands up.
Examination of the veins of the lower limb

**Tourniquet tests:**

- This test can be repeated with the tourniquet moved progressively down the whole length of the leg to try to define all the sites of superficial to deep vein incompetence.
- but it is easier and simpler to apply it once below the knee to exclude short saphenous incompetence.
- A modification of the tourniquet test is to empty the limb as described above and apply direct digital pressure over the upper end of the long saphenous vein while the patient stands up to see if this prevents retrograde filling. This is called the *Trendelenburg (tourniquet) test*.
- Venous hypertension caused by proximal vein obstruction or the presence of an arteriovenous fistula should be suspected if the varicose veins fail to collapse on elevation.
Examination of the veins of the lower limb

Doppler flow detector studies:

• The simple directional Doppler ultrasound flow probe described on page 323 can also be used to assess venous reflux.
• The patient is asked to stand up, and the ultrasound probe is placed over the termination of the long and then the short saphenous veins using coupling jelly. The direction of venous blood flow, augmented by rapid intermittent manual compression of the calf or any prominent varicosities in the lower limb, is then assessed.
• A uniphasic signal on squeezing, with no sound on relaxation, indicates competent valves with forward flow. A biphasic signal, with prolonged retrograde flow on releasing the compression, indicates reflux and valvular incompetence.
• Retrograde flow can also be confirmed by asking the patient to perform the Valsalva manoeuvre.
• Valsalva manoeuvre consists of taking a deep breath, pinching off the nose, closing the mouth and attempting a forced expiration.
Routine for assessing the venous circulation

Ask the patient to stand up.

- **Inspection:**
  - Site, tortuosity and size of visible veins
  - Effect of elevation and dependency
  - Ankle oedema
  - Skin colour, especially above the medial ankle

- **Palpation:**
  - Palpate the trunks of the long and short saphenous veins
  - Palpate the sapheno-popliteal junction
  - Feel the texture of the skin and subcutaneous tissues

- **Percussion:**
  - Percussion wave conduction upwards or downwards

- **Auscultation**
  - Listen for bruits over prominent varices

- **Tourniquet tests**
- **Doppler ultrasound**