

## **WEEK 7: Nursing care for patients with Peripheral disorders including: Aneurysm, Arterial embolism, Arterial thrombosis, Chronic venous insufficiency, Leg ulcer, Varicose vein**

### **Arterial Embolism**

Arterial embolism is a sudden interruption of blood flow to an organ or body part caused by an embolus adhering to the arterial wall. The primary type of embolus is a blood clot (thromboembolism), but other materials can also cause emboli. This condition is a major cause of infarction, leading to tissue death due to the lack of blood supply.



An embolized fragment of an atrial myxoma (a tumour embolus) at the iliac bifurcation

### **Signs and Symptoms**

Symptoms of arterial embolism can vary depending on the location and size of the embolus. Generally, the symptoms include pain in the affected body part and temporarily decreased organ function. Later symptoms may involve signs of infarction, leading to permanently decreased organ function.

For instance, myocardial infarction symptoms include chest pain, dyspnea, diaphoresis, weakness, light-headedness, nausea, vomiting, and palpitations. Limb infarction symptoms encompass coldness, decreased or absent pulse beyond the blockage, pain, muscle spasm, numbness, tingling, pallor, and muscle weakness, potentially leading to paralysis.

### **Commonly Occluded Sites**

Arterial emboli commonly occur in the legs and feet, but they can also affect the brain, causing strokes, or the heart, causing heart attacks. Less frequent sites include the kidneys, intestines, and eyes.

### **Risk Factors**

Risk factors for arterial embolism include disturbed blood flow, arterial wall injury, and hypercoagulability. Specific conditions like atrial fibrillation, mitral stenosis, and endocarditis increase the risk. Atherosclerosis is a significant risk factor, with associated risks such as advanced age, cigarette smoking, hypertension, obesity, hyperlipidaemia, diabetes mellitus, sedentary lifestyle, and stress.

Other risk factors include recent surgery, previous stroke or cardiovascular disease, long-term intravenous therapy, and bone fractures. Paradoxical embolisation can occur in individuals with a septal defect of the heart, where a clot passes from veins into arteries through the heart.

### **Pathophysiology**

Arterial embolism results from emboli blocking blood flow in an artery, causing ischaemia and possibly infarction with tissue necrosis. Collateral circulation may compensate for the loss of arterial flow but develops slowly, making sudden embolisation more very important than gradual occlusion.

## **Materials**

Arterial embolisms can consist of various materials:

- Thromboembolism (blood clot)
- Cholesterol embolism (from atherosclerotic plaque)
- Fat embolism (from bone fractures or fat droplets)
- Air embolism (air bubbles)
- Septic embolism (pus containing bacteria)
- Cancer embolism

## **Diagnosis**

Diagnosis involves evaluating symptoms and may include tests such as Doppler ultrasound, echocardiography, arteriography, MRI, blood tests for elevated enzymes, blood cultures, ECG, and angiography.

## **Prevention**

Preventing atherosclerosis through diet, exercise, and smoking cessation is very important. High-risk individuals may take antithrombotic medications like warfarin or antiplatelet drugs prophylactically.

## **Treatment**

Treatment aims to control symptoms and restore blood flow. Medications include antithrombotic drugs (anticoagulants, antiplatelet medication, thrombolytics), painkillers, and vasodilators. Intra-arterial thrombolysis can be used to deliver antithrombotic agents directly to the clot.

Surgical options include arterial bypass surgery and embolectomy using techniques like thromboaspiration, angioplasty with balloon catheterisation, and open surgery. In severe cases, amputation may be necessary.

## **Prognosis**

The prognosis depends on the clot location and blockage extent. Without treatment, arterial embolism has a high mortality rate, and the affected area can suffer permanent damage. Arterial emboli may recur even after successful treatment.

## **Complications**

Complications vary by blockage site and can include myocardial infarction, transient ischaemic attack, stroke, necrosis, gangrene, and septic shock.

## **Epidemiology**

In the United States, approximately 550,000 people die annually from heart-related arterial embolism and thrombosis. Among these, around 100,000 deaths are considered premature.

### Self-assessment MCQs (select the best answer)

- 1. What is the primary type of embolus causing arterial embolism?**
  - a. Air bubble
  - b. Fat droplet
  - c. Blood clot
  - d. Cholesterol fragment
  - e. Cancer cell
  
- 2. Which of the following is a common symptom of myocardial infarction?**
  - a. Muscle spasm
  - b. Vomiting
  - c. Numbness
  - d. Tingling
  - e. Pallor
  
- 3. What is a significant risk factor for arterial embolism?**
  - a. High calcium levels
  - b. Hyperthyroidism
  - c. Atherosclerosis
  - d. Low blood pressure
  - e. High white blood cell count
  
- 4. Which diagnostic test is used to visualize blood flow and detect blockages in arteries?**
  - a. Blood culture
  - b. MRI
  - c. Doppler ultrasound
  - d. ECG
  - e. Angioscopy
  
- 5. What type of embolism is caused by air bubbles entering the bloodstream?**
  - a. Septic embolism
  - b. Fat embolism
  - c. Air embolism
  - d. Cancer embolism
  - e. Thromboembolism
  
- 6. Which medication is commonly used to prevent clot formation in high-risk individuals?**
  - a. Antibiotics
  - b. Warfarin
  - c. Antihistamines
  - d. Beta-blockers
  - e. Insulin
  
- 7. What is the term for temporary decreased organ function due to arterial embolism?**
  - a. Ischaemia
  - b. Infarction
  - c. Embolisation

- d. Gangrene
- e. Necrosis

**8. Which of the following is NOT a common site for arterial emboli?**

- a. Legs
- b. Brain
- c. Heart
- d. Eyes
- e. Liver

**9. What is a common complication of untreated arterial embolism?**

- a. High blood pressure
- b. Necrosis
- c. Weight gain
- d. Increased appetite
- e. Muscle hypertrophy

**10. Which surgical option might be used to restore blood flow in arterial embolism?**

- a. Appendectomy
- b. Angioplasty with balloon catheterization
- c. Colostomy
- d. Laparoscopy
- e. Endoscopy

## Chronic Venous Insufficiency

Chronic Venous Insufficiency (CVI), also known as chronic venous disease, is a condition where blood pools in the veins, straining their walls. The most common cause is superficial venous reflux, a treatable issue. This condition primarily affects the legs, as efficient blood return requires functional venous valves.

When vein impairment leads to significant symptoms such as swelling and ulcer formation, it is termed chronic venous disease. It should not be confused with post-thrombotic syndrome, which involves deep vein damage from previous deep vein thrombosis. CVI is more prevalent in women and is influenced by factors like genetics, smoking, obesity, pregnancy, and prolonged standing.

### Signs and Symptoms



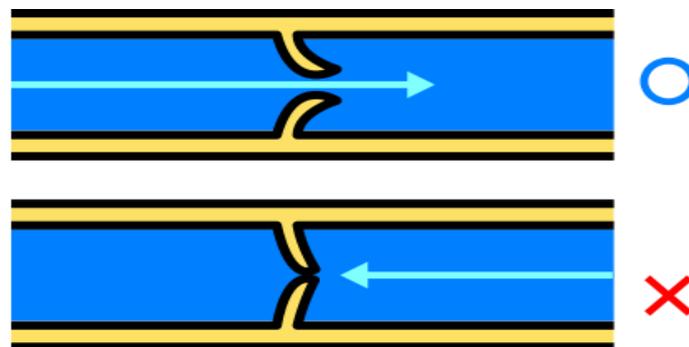
Chronic venous insufficiency

CVI in the legs presents various signs and symptoms:

- Varicose veins
- Itching (pruritus)
- Hyperpigmentation
- Phlebetic lymphedema
- Chronic swelling of the legs and ankles
- Leg ulcers

It may also lead to complications like venous stasis, venous ulcers, stasis dermatitis (varicose eczema), and contact dermatitis. Advanced conditions include atrophie blanche, lipodermatosclerosis, and even malignancy, which is rare but aggressive. Pain, anxiety, depression, inflammation, and cellulitis are also associated with CVI.

## Causes



Venous valves

CVI typically arises from the reflux of venous valves in superficial veins, but several conditions can instigate it:

- Deep vein thrombosis (DVT)
- Superficial vein thrombosis
- Phlebitis
- May–Thurner syndrome, a rare condition where blood clots form in the iliofemoral vein due to vascular compression in the leg.

Deep and superficial vein thrombosis can stem from thrombophilia (increased blood clot formation propensity), and arteriovenous fistulae may cause CVI even if vein valves are functional.

## Diagnosis



B-flow ultrasonograph over a valve of the great saphenous vein, showing a venous reflux (flow toward right in the image).

Diagnosis involves clinical history and examination to rule out systemic causes like hypervolaemia and heart failure. Duplex ultrasound can detect venous obstruction or valvular incompetence and is used for planning venous ablation procedures. Invasive venography is reserved for surgery candidates or suspected venous stenosis. Other diagnostic tools include ankle-brachial index, air or photoplethysmography, intravascular ultrasound, and ambulatory venous pressures.

## Classification



Acute venous ulcer (45 x 30 mm).

The CEAP classification system (Clinical, Etiological, Anatomical, and Pathophysiological) categorises CVI:

- **Clinical:** From no obvious features (C0) to acute ulcers (C6)
- **Aetiology:** Primary, secondary, congenital, or unknown causes
- **Anatomical:** Superficial, deep, perforator, or no obvious location
- **Pathophysiology:** Obstruction, reflux, or both

## Nursing Management

### Conservative

Conservative management aims to alleviate symptoms and prevent worsening:

- Manual compression lymphatic massage therapy
- Red vine leaf extract
- Sequential compression pump
- Ankle pump
- Compression stockings
- Blood pressure medication
- Hydroxyethylrutoside medication
- Frequent leg elevation
- Bed tilting to elevate feet above heart level

### Surgical

Surgical interventions aim to cure by altering veins with incompetent valves:

- Ligation (tying off a vein)
- Vein stripping (removal)
- Surgical repair
- Endovenous Laser Ablation
- Vein transplant
- Subfascial endoscopic perforator surgery (tying off with an endoscope)
- Experimental valve repair and transposition

- Hemodynamic surgeries

The CHIVA method is a minimally invasive, ultrasound-guided surgery for treating varicose veins under local anesthetic.

## **Prognosis**

CVI can lead to significant morbidity, with chronic venous ulcers being particularly challenging to treat. Recurrences are common without resolving venous hypertension. Phlebitis and deep vein thrombosis are frequent complications, and severe haemorrhage is possible. Surgical outcomes remain unsatisfactory despite various procedures.

## **Self-assessment MCQs (select the best answer)**

- 1. What is the most common cause of Chronic Venous Insufficiency (CVI)?**
  - a. Deep vein thrombosis
  - b. Superficial venous reflux
  - c. May–Thurner syndrome
  - d. Arteriovenous fistulae
  - e. Thrombophilia
- 2. Which of the following is NOT a symptom of CVI in the legs?**
  - a. Varicose veins
  - b. Hyperpigmentation
  - c. Leg ulcers
  - d. Heart palpitations
  - e. Chronic swelling of the legs and ankles
- 3. Which diagnostic tool is primarily used to detect venous obstruction or valvular incompetence?**
  - a. Invasive venography
  - b. Duplex ultrasound
  - c. Ankle-brachial index
  - d. Photoplethysmography
  - e. Intravascular ultrasound
- 4. In the CEAP classification system, what does "C6" indicate?**
  - a. No obvious features
  - b. Varicose veins
  - c. Oedema
  - d. Acute ulcers
  - e. Hyperpigmentation
- 5. Which of the following is NOT a conservative management technique for CVI?**
  - a. Manual compression lymphatic massage therapy
  - b. Endovenous Laser Ablation
  - c. Compression stockings
  - d. Red vine leaf extract
  - e. Frequent leg elevation
- 6. Which surgical method for CVI involves the removal of veins?**
  - a. Ligation

- b. Endovenous Laser Ablation
- c. Vein stripping
- d. Subfascial endoscopic perforator surgery
- e. Hemodynamic surgeries

**7. Which of the following is a complication associated with CVI?**

- a. Hypervolaemia
- b. Cellulitis
- c. Pulmonary embolism
- d. Renal failure
- e. Myocardial infarction

**8. What is the purpose of using compression stockings in CVI management?**

- a. To diagnose venous reflux
- b. To prevent deep vein thrombosis
- c. To alleviate symptoms and prevent worsening
- d. To perform surgical intervention
- e. To increase blood clot formation

**9. Which condition involves deep vein damage resulting from previous deep vein thrombosis and should not be confused with CVI?**

- a. Superficial vein thrombosis
- b. May–Thurner syndrome
- c. Post-thrombotic syndrome
- d. Phlebitis
- e. Arteriovenous fistulae

**10. Which of the following is a rare but aggressive complication of CVI?**

- a. Stasis dermatitis
- b. Venous ulcers
- c. Atrophie blanche
- d. Lipodermatosclerosis
- e. Malignancy

## **Venous Ulcers**

Venous ulcers, also known as venous insufficiency ulceration, stasis ulcers, and varicose ulcers, are chronic wounds predominantly found in the ankle region. Defined by the American Venous Forum as full-thickness skin defects that fail to heal spontaneously, these ulcers are sustained by chronic venous disease, typically diagnosed via venous duplex ultrasound. Affecting about 1% of the population, venous ulcers are a significant cause of chronic wounds, often resulting from improper functioning of venous valves in the legs.

### **Signs and Symptoms**

Venous ulcers commonly present with moderate pain that improves upon elevation. The ulcers have irregular, sloping edges and are often accompanied by oedema due to increased hydrostatic pressure. Other symptoms include localised loss of skin pigmentation known as

'atrophie blanche', hardening of the skin termed lipodermatosclerosis, and associated superficial varicose veins or "ankle flare". The ulcers usually develop along the medial distal leg and negatively impact the quality of life.



Venous ulcer before surgery



Healing process of a chronic venous stasis ulcer of the lower leg



Healing venous ulcer after one month

## Pathophysiology

Venous ulcers arise mainly due to venous stasis, often caused by chronic venous insufficiency or congestive heart failure, leading to increased venous pressure. This results in ineffective blood flow, causing the leakage of blood proteins into the extravascular space, which hinders wound healing. Accumulation of white blood cells and inflammatory factors further contributes to the formation of chronic wounds. Venous stasis ulcers typically appear in the lower extremities due to damage to the venous valvular system.

## Diagnosis

Diagnosis involves clinical assessment and may include venous duplex ultrasound to confirm chronic venous disease. The CEAP classification system (clinical, aetiology, anatomy, and pathophysiology) helps assess the severity of the ulcers. Distinguishing venous ulcers from arterial ulcers is very important; venous ulcers are usually found on the medial leg with irregular edges, while arterial ulcers appear on the lateral leg and bony prominences with a punched-out appearance.



Venous ulcer (45 x 30 mm)

## **Treatment**

Treatment aims to create an environment conducive to skin growth. This often involves addressing underlying venous reflux and using compression therapy, which enhances healing by reducing venous pressure. Compression stockings, exercise, and patient education are very important components. The NICE guidelines recommend referral to a vascular specialist for all venous leg ulcers.

Antibiotics are typically reserved for cases of infection, while topical agents like cadexomer iodine have shown benefits. The use of medical-grade honey is supported by some evidence, though not conclusively. There is uncertainty regarding the effectiveness of various dressings and the role of therapeutic ultrasound.

## **Compression Therapy**

Compression therapy is essential for managing venous ulcers, as it decreases vein diameter and pressure, facilitating blood flow and reducing inflammation. Elastic bandages, compression stockings, and intermittent pneumatic compression devices are commonly used. Research indicates that compression dressings can reduce pain and expedite healing.

## **Medications**

Medications like pentoxifylline and sulodexide may aid in healing by reducing platelet aggregation and inflammation. Aspirin and oral zinc supplements are under investigation, though their efficacy is not yet confirmed.

## **Skin Grafts and Artificial Skin**

Skin grafts from animal sources and artificial skin made of collagen and cultured cells can promote healing by providing a scaffold for new tissue growth.

## **Surgery**

Surgical interventions, including endovenous ablation and foam sclerotherapy, have shown success in reducing ulcer recurrence and promoting healing. These techniques, particularly when combined with compression therapy, offer promising outcomes.

## Dressings

The efficacy of various dressings remains uncertain, though silver-containing dressings and ibuprofen dressings for pain relief have shown some promise.



Chronic venous insufficiency & Venous ulcer

## Self-assessment MCQs (select the best answer)

- 1. What is the primary cause of venous ulcers?**
  - a. Diabetes
  - b. Chronic venous insufficiency
  - c. Arterial insufficiency
  - d. Neuropathy
  - e. Hypertension
- 2. Which diagnostic tool is commonly used to confirm chronic venous disease in the context of venous ulcers?**
  - a. MRI
  - b. CT Scan
  - c. Venous duplex ultrasound
  - d. X-ray
  - e. PET Scan
- 3. Venous ulcers are most commonly found in which location on the body?**
  - a. Upper arm
  - b. Medial distal leg
  - c. Lateral thigh
  - d. Abdomen
  - e. Lower back
- 4. What is the role of compression therapy in the treatment of venous ulcers?**
  - a. Increases vein diameter
  - b. Reduces venous pressure
  - c. Increases venous pressure
  - d. Promotes bacterial growth
  - e. Causes further skin breakdown
- 5. Which symptom is NOT typically associated with venous ulcers?**
  - a. Oedema
  - b. Moderate pain that improves upon elevation

- c. Irregular, sloping edges
  - d. Punched-out appearance on bony prominences
  - e. Localised loss of skin pigmentation
- 6. Which classification system is used to assess the severity of venous ulcers?**
- a. ABCD classification
  - b. NYHA classification
  - c. CEAP classification
  - d. Glasgow Coma Scale
  - e. APGAR score
- 7. Which of the following is a commonly used topical agent in the treatment of venous ulcers?**
- a. Silver nitrate
  - b. Salicylic acid
  - c. Cadexomer iodine
  - d. Benzoyl peroxide
  - e. Hydrocortisone
- 8. Which medication has shown potential benefits in healing venous ulcers by reducing platelet aggregation and inflammation?**
- a. Ibuprofen
  - b. Pentoxifylline
  - c. Paracetamol
  - d. Codeine
  - e. Metformin
- 9. What type of surgical interventions are used to treat venous ulcers?**
- a. Arthroscopy and joint replacement
  - b. Endovenous ablation and foam sclerotherapy
  - c. Coronary artery bypass grafting
  - d. Gastric bypass surgery
  - e. Appendectomy
- 10. Which of the following is NOT a recommended component of venous ulcer management?**
- a. Compression stockings
  - b. Exercise
  - c. Antibiotics for all cases
  - d. Patient education
  - e. Referral to a vascular specialist

## Varicose Veins

Varicose veins, or varicoses, are a condition where superficial veins become enlarged and twisted. They typically develop in the legs, just under the skin, and can be merely a cosmetic issue; however, they may also cause discomfort such as fatigue, pain, itching, and nighttime leg cramps.

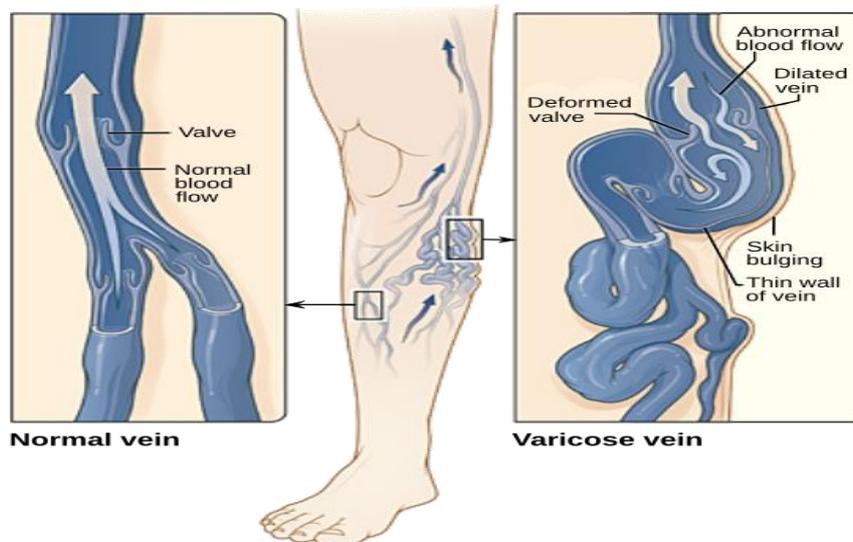
Complications can include bleeding, skin ulcers, and superficial thrombophlebitis. Varices in the scrotum are termed varicocele, and those around the anus are known as haemorrhoids. The physical, social, and psychological effects of varicose veins can lower a patient's quality of life.



Left leg of a male affected by varicose veins

## Causes

Varicose veins often have no specific cause but are linked to risk factors such as obesity, lack of exercise, leg trauma, family history of the condition, and pregnancy. They can result from chronic venous insufficiency due to weak or damaged valves in the veins. They are diagnosed primarily through examination and ultrasound.



How a varicose vein forms in a leg. Figure A shows a normal vein with a working valve and normal blood flow. Figure B shows a varicose vein with a deformed valve, abnormal blood flow, and thin, stretched walls. The middle image shows where varicose veins might appear in a leg.

## Signs and Symptoms

Signs and symptoms associated with varicose veins include:

- Aching, heavy legs
- Appearance of spider veins (telangiectasia) in the affected leg
- Ankle swelling
- A brownish-yellow shiny skin discolouration near the affected veins

- Redness, dryness, and itchiness of areas of skin, termed stasis dermatitis or venous eczema
- Muscle cramps when making sudden movements, such as standing
- Abnormal bleeding or healing time for injuries in the affected area
- Lipodermatosclerosis or shrinking skin near the ankles
- Restless legs syndrome
- Atrophie blanche, or white, scar-like formations
- Burning or throbbing sensation in the legs

People with varicose veins might have a positive D-dimer blood test result due to chronic low-level thrombosis within dilated veins.

## **Complications**

While most varicose veins are benign, severe cases can lead to significant complications such as pain, tenderness, heaviness, skin conditions like dermatitis, skin ulcers, development of carcinoma or sarcoma in longstanding venous ulcers, severe bleeding from minor trauma, blood clotting within affected veins (superficial thrombophlebitis), and acute fat necrosis.

## **Diagnosis**

### **Clinical Test**

Clinical tests may include the Trendelenburg test to determine the site of venous reflux and the nature of the saphenofemoral junction.

### **Investigations**

Traditionally, imaging techniques were used if deep venous insufficiency was suspected. Currently, lower limbs venous ultrasonography is recommended for all patients with varicose veins for better assessment and lower recurrence rates.

## **Stages**

The CEAP Classification, developed in 1994 by the American Venous Forum, outlines stages from C0 (no visible signs) to C6 (active venous ulcer), with sub-stages indicating symptomatic or asymptomatic conditions.

## **Treatment**

### **Active Treatment**

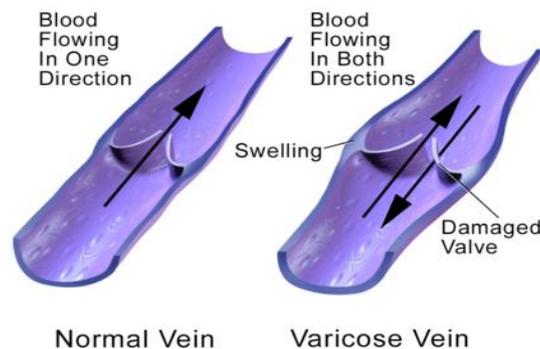
Active treatments include surgery, laser and radiofrequency ablation, ultrasound-guided foam sclerotherapy, cyanoacrylate glue, mechanochemical ablation, and endovenous steam ablation. No significant differences have been found between treatments, though radiofrequency ablation might offer better long-term benefits.

### **Conservative Treatment**

The National Institute for Health and Clinical Excellence (NICE) recommends referral to a vascular service for treatment of symptomatic varicose veins. Conservative treatments like support stockings should be used only if treatment isn't possible. Symptoms can be managed through leg elevation, regular exercise, wearing graduated compression stockings, and using intermittent pneumatic compression devices. Diosmin/hesperidin and other flavonoids, as well as anti-inflammatory medication, can also be helpful.

## **Procedures**

- **Stripping:** Removal of saphenous vein main trunk, with complications like deep vein thrombosis, pulmonary embolism, and wound infections.
- **Sclerotherapy:** Use of sclerosants to shrink veins, effective for both spider veins and larger varicose veins under ultrasound guidance.
- **Endovenous Thermal Ablation:** Includes laser, radiofrequency, and steam treatments, with fewer complications compared to open surgery.
- **Medical Adhesive:** Injection of cyanoacrylate to seal veins, offering a success rate of about 96.8%.
- **Echotherapy Treatment:** High-intensity focused ultrasound therapy, a non-invasive method allowing immediate return to daily activities.



Comparison of healthy and varicose veins

## Epidemiology

Varicose veins are most common after age 50, more prevalent in females, and have a hereditary component. They are also observed in smokers, those with chronic constipation, and individuals with occupations requiring prolonged standing.

## Self-assessment MCQs (select the best answer)

1. **What are varicose veins?**
  - a. Superficial veins that become enlarged and twisted
  - b. Deep veins that become blocked
  - c. Arteries that become hardened
  - d. Capillaries that rupture
  - e. Lymph nodes that swell
2. **Which of the following is NOT a typical symptom of varicose veins?**
  - a. Aching, heavy legs
  - b. Ankle swelling
  - c. Muscle cramps
  - d. White blood cell count increase
  - e. Restless legs syndrome
3. **Which imaging technique is currently recommended for better assessment of varicose veins?**
  - a. MRI
  - b. CT Scan
  - c. X-ray
  - d. Lower limbs venous ultrasonography
  - e. PET Scan

**4. Which of the following conditions is a type of varices found around the anus?**

- a. Haemorrhoids
- b. Varicocele
- c. Lipodermatosclerosis
- d. Telangiectasia
- e. Atrophie blanche

**5. What is the primary cause of varicose veins?**

- a. Bacterial infection
- b. Weak or damaged valves in the veins
- c. High cholesterol
- d. Viral infection
- e. Autoimmune disorder

**6. Which treatment involves using sclerosants to shrink varicose veins?**

- a. Stripping
- b. Sclerotherapy
- c. Radiofrequency ablation
- d. Cyanoacrylate glue
- e. Endovenous steam ablation

**7. Which classification system is used to outline the stages of varicose veins?**

- a. ABCD
- b. CEAP
- c. DAS28
- d. TNM
- e. ROME IV

**8. Which of the following is considered a conservative treatment for varicose veins?**

- a. Ultrasound-guided foam sclerotherapy
- b. Cyanoacrylate glue
- c. Wearing graduated compression stockings
- d. Radiofrequency ablation
- e. Endovenous thermal ablation

**9. Which complication is NOT associated with varicose veins?**

- a. Skin ulcers
- b. Superficial thrombophlebitis
- c. Acute fat necrosis
- d. Dehydration
- e. Severe bleeding from minor trauma

**10. Which of the following is a risk factor for developing varicose veins?**

- a. High protein diet
- b. Regular exercise
- c. Leg trauma
- d. High altitude living
- e. Low sodium intake

