

Vascular Surgery

QUESTIONS

- 2.1 Which of the following statements is true regarding primary varicose veins?
- a Sapheno-femoral incompetence is more common than sapheno-popliteal incompetence.
 - b Surgery should not be offered without a prior trial of graded compression stockings.
 - c Damage to the saphenous nerve during surgery results in foot drop.
 - d Endovenous laser treatment is only useful for treating sapheno-femoral incompetence.
 - e They are commonly caused by deep vein thrombosis.
- 2.2 A 47-year-old man has recently returned to the ward following emergency left common femoral artery embolectomy for an acutely ischaemic left leg. He is on intravenous heparin and has a morphine PCA. You are asked to review him, as he is complaining of severe left-calf pain and swelling. On examination, the calf is swollen and tender. Pedal pulses are palpable. The most appropriate next step is:
- a Stop the IV heparin.
 - b Administer 10mg intravenous morphine stat and call the pain team.
 - c Lower the left leg to improve the blood supply.
 - d Perform left-leg fasciotomy.
 - e Check the APTT is therapeutic.

- 2.3** Features of critical limb ischaemia do NOT include:
- a Rest pain of greater than two weeks' duration
 - b Gangrene
 - c Ulceration
 - d Toe pressures of <30 mmHg
 - e A claudication distance of <50 yards (46 metres)
- 2.4** A 56-year-old unemployed man presents to clinic with a three-month history of right-calf claudication at 8.0 yards (7.2 metres). This is relieved by rest and not associated with rest pain, ulcers or gangrene. He is a heavy smoker and has a medical history of hypertension. Examination reveals a good right femoral, popliteal and dorsalis pedis pulse, with an absent right posterior tibial pulse. Right-leg ABPIs = 0.6. The most appropriate next step is:
- a Lower-limb diagnostic angiography
 - b Right-leg angioplasty
 - c Optimise medical therapy; advise to 'stop smoking and keep walking'
 - d Lower-limb CT angiography
 - e Femoral-distal bypass surgery
- 2.5** A 63-year-old woman presents with a history over the last few months of episodes of left amaurosis fugax. Examination reveals a left-sided carotid bruit. The most appropriate next step is:
- a Carotid endarterectomy
 - b Carotid angiography
 - c CT scan brain
 - d Carotid Doppler ultrasound (duplex)
 - e MR angiography
- 2.6** A 79-year-old man presents to A&E with severe epigastric pain that radiates to the back. His peripheries are cold and pale. He has a blood pressure of 60/44 mmHg and a heart rate of 110 bpm. A tender pulsatile mass is palpable within the epigastrium. The most appropriate next step is:
- a Urgent CT scan of the abdomen
 - b Focused assessment with sonography for trauma (FAST) scan in A&E
 - c Aggressive fluid resuscitation to bring blood pressure to within the normal range
 - d Theatre
 - e Transfer to another hospital for emergency endovascular repair

- 2.7** Which of the following statements is NOT true regarding central venous line insertion?
- a Positioning the patient in the Trendelenburg position reduces the risk of air embolus.
 - b Pneumothorax is more commonly associated with subclavian line insertion.
 - c A post-insertion chest X-ray should be performed to exclude a pneumothorax.
 - d Insertion should ideally be performed under ultrasound guidance.
 - e Cardiac arrhythmia is a recognised complication.
- 2.8** Which of the following does NOT form part of the management of an acutely ischaemic limb?
- a Intramuscular heparin
 - b Thrombophilia screen
 - c ECG
 - d Urinalysis
 - e Embolectomy
- 2.9** The most common aetiology of leg ulcers in the United Kingdom is:
- a Arterial
 - b Neuropathic
 - c Neoplastic
 - d Venous
 - e Vasculitic
- 2.10** The operative mortality associated with ruptured abdominal aortic aneurysm (AAA) repair is:
- a <5%
 - b 10%
 - c Approximately 50%
 - d Nearly always fatal
 - e Dependent on the grade of the surgeon
- 2.11** Which of the following statements is true regarding venous leg ulcers?
- a They commonly lie over the lateral malleolus.
 - b They usually require skin grafting.
 - c Four-layer compression bandaging should only be applied if ABPIs are >0.9.
 - d They rarely heal completely.
 - e Venous duplex should be performed in all cases.

- 2.12** A 57-year-old woman presents to A&E with a three-day history of diffuse headache that is worse at night and has become progressively more severe. In addition, she complains of pain in the jaw on chewing. Examination reveals tenderness over the right temporal artery and an afferent pupillary defect. Fundoscopy is normal. ESR is 67 mm/hour. The most appropriate next step is:
- a High-dose corticosteroids
 - b High-dose immunoglobulins
 - c Urgent temporal artery biopsy
 - d Intravenous fluorescein angiography
 - e Referral to an ophthalmologist for assessment of visual acuity
- 2.13** A 37-year-old woman who is on warfarin and has a known extensive left femoral deep vein thrombosis becomes acutely short of breath, with saturations of 87% on room air. Her blood pressure is 120/76 mmHg and her heart rate is 106 bpm. The most useful first-line investigation would be:
- a Repeat lower-limb venous duplex
 - b CT pulmonary angiogram
 - c Blood test to ensure INR is within the therapeutic range
 - d Echocardiogram
 - e Chest X-ray
- 2.14** Which of the following is NOT a recognised feature of cardiac tamponade?
- a Abolition of the y descent of the jugular venous waveform
 - b Hypotension
 - c Raised jugular venous pressure
 - d Bradycardia
 - e Pulsus paradoxus
- 2.15** A 67-year-old man is seen by his GP and is incidentally noted to have a non-tender, expansile and pulsatile mass within his abdomen. His blood pressure is 130/80 mmHg and his heart rate is 70 bpm. The most appropriate next step is:
- a Urgent referral to the vascular surgeons
 - b Ultrasound scan of the abdominal aorta
 - c Full blood count
 - d CT scan of the abdomen
 - e MRA of the abdomen

- 2.16** Indications for elective AAA repair in men include:
- a Age >60 years
 - b Size >5.5 cm
 - c Growth rate greater than 0.5 cm per year
 - d Coexisting popliteal aneurysm
 - e All of the above
- 2.17** A 40-year-old woman presents to her GP with varicose veins that have been present since her second pregnancy but have been gradually increasing in size. Clinical examination reveals prominent varicose veins and sapheno-femoral incompetence. Which of the following statements is true?
- a Graded compression stockings will provide a permanent cure.
 - b A venous duplex should be performed.
 - c She may have coexisting sapheno-popliteal incompetence.
 - d Venous ulceration is a contraindication for surgery.
 - e They will spontaneously regress with time.
- 2.18** A 67-year-old woman presents to A&E with a four-hour history of a cold and painful left leg. She is a smoker and has no other significant co-morbidity. On examination, popliteal and pedal pulses cannot be palpated, and the leg is pale, mottled and cold to the knee, with reduced sensation. An ECG reveals that she is in atrial fibrillation. The most appropriate next step is:
- a Left below-knee amputation
 - b Commence warfarin
 - c Intravenous amiodarone
 - d Advise 'stop smoking and keep walking' and optimise vascular risk factors
 - e Embolectomy
- 2.19** Four days following her return to England from America, a 29-year-old woman develops a painful, swollen left leg. On examination, the left leg is swollen to the thigh, the calf is tender and all lower-limb pulses are palpable. The most appropriate next step is:
- a CT pulmonary angiogram to exclude a pulmonary embolus
 - b Urgent venous duplex of the left leg
 - c Therapeutic-dose heparin
 - d Pelvic ultrasound
 - e Warfarin

- 2.20** Which of the following statements is true regarding aneurysms?
- a Approximately 50% of popliteal aneurysms are bilateral.
 - b AAAs are more common in Asians.
 - c The greatest risk factor for aneurysm formation is diabetes.
 - d Splenic artery aneurysms are more common in men.
 - e Popliteal aneurysms are more prone to rupture than are AAAs.
- 2.21** A 56-year-old insulin-dependent diabetic man presents with gangrene of his right big toe. On examination of the right foot, there is wet gangrene of the big toe, with surrounding cellulitis. All lower-limb pulses are palpable, and there is 'glove and stocking' sensory loss. The most appropriate next step is:
- a Intravenous heparin
 - b Urgent MRI of the foot
 - c Intravenous broad-spectrum antibiotics
 - d Hyperbaric oxygen therapy
 - e Amputation
- 2.22** The most common cause of lymphoedema is:
- a Filariasis
 - b Milroy's disease
 - c Radiotherapy
 - d Malignancy
 - e Deep vein thrombosis
- 2.23** A 28-year-old woman presents in clinic complaining of pallor of her fingers when she goes out in the cold. They then become worryingly blue, and then they go red and tingle when she goes indoors. On examination, all upper-limb pulses are palpable, and the hands are warm. The following may be advised in the management of her condition, EXCEPT:
- a Nifedipine
 - b Cold avoidance
 - c Gloves
 - d Iloprost (intravenous prostaglandin)
 - e Heparin

- 2.24** A 30-year-old lorry driver presents complaining of ulcers in the nail folds of his fourth and fifth fingers and pallor and tingling of his fingers when they are exposed to the cold. He smokes 35 cigarettes a day and is otherwise well. Examination reveals nicotine staining around his fingers and dry ulcers on the fourth and fifth digits; upper-limb pulses are all palpable. The most likely diagnosis is:
- a Hyperhidrosis
 - b Thoracic outlet syndrome
 - c Buerger's disease
 - d Takayasu's arteritis
 - e Raynaud's disease
- 2.25** Which of the following disorders is more common in women than in men?
- a Takayasu's arteritis
 - b Lymphoedema congenita
 - c Aortic dissection
 - d Hyperhidrosis
 - e Carotid body tumour
- 2.26** A 60-year-old Afro-Caribbean man is admitted to A&E complaining of a severe 'tearing' intrascapular pain, which came on suddenly. He has a medical history of hypertension, for which he takes bendrofluazide 2.5 mg once daily. On examination, his blood pressure is 170/90 mmHg from the right arm and 145/70 mmHg from the left arm, and his heart rate is 100 bpm. His ECG demonstrates no acute changes, and his chest X-ray reveals a widened mediastinum. The most likely diagnosis is:
- a Rupture of the oesophagus
 - b Ruptured thoracic aortic aneurysm
 - c Mediastinitis
 - d Aortic dissection
 - e Cardiac tamponade

- 2.27** Which of the following statements is true regarding carotid artery disease?
- a** A stenosis of 100% of the internal carotid artery warrants surgery.
 - b** Presence of a carotid bruit is a reliable indicator of stenosis.
 - c** Atherosclerotic lesions typically occur at the carotid bifurcation.
 - d** Damage to the hypoglossal nerve during carotid endarterectomy leads to weakness of the tongue on the contralateral side.
 - e** Stroke is not a recognised complication of surgery.
- 2.28** A 45-year-old truck driver is seen in clinic complaining of bilateral buttock and thigh claudication at 50 yards (46 metres). He confides that he has recently become impotent. He is a smoker and has a medical history of hypertension, for which he takes amlodipine 5 mg once daily. On examination, he has weak femoral and absent popliteal and pedal pulses. His feet are pale and cool. Duplex confirms your diagnosis. The most appropriate intervention would be:
- a** Femoral-crural bypass
 - b** Axillo-unifem bypass
 - c** Bilateral femoral angioplasty
 - d** Femoral-popliteal bypass
 - e** Aorto-bifemoral bypass
- 2.29** Which of the following is an early feature of acute lower-limb ischaemia?
- a** Fixed mottling
 - b** Pain on passive movement of the limb
 - c** Paralysis
 - d** Pallor
 - e** Paraesthesia
- 2.30** A 19-year-old is brought in by ambulance following an assault. He is confused, with a blood pressure of 70/40 mmHg and a heart rate of 120 bpm. On further examination, you notice he has a stab wound medial to his left nipple. In addition, his JVP is raised. The most appropriate next step is:
- a** Urgent chest X-ray
 - b** Arterial blood gas
 - c** Insert a central line to more accurately assess JVP
 - d** Needle thoracocentesis
 - e** Pericardiocentesis

ANSWERS

2.1 The correct answer is A.

Varicose veins are dilated, tortuous veins of the superficial venous system. Sapheno-femoral incompetence is more common (seen in approximately 90%) than incompetence at the sapheno-popliteal junction in primary varicose veins. Damage to the saphenous nerve results in an area of sensory loss over the medial aspect of the calf, above the medial malleolus. Although deep vein thrombosis can cause varicose veins, it is not a *common* cause.

2.2 The correct answer is D.

Compartment syndrome due to reperfusion syndrome is a well-recognised complication following revascularisation (i.e. post-embolectomy) and is a surgical emergency. Symptoms are due to a raised intrafascial compartment pressure (>30 mmHg), which can lead to irreversible ischaemic necrosis of muscles and nerves crossing through the affected compartment. Clinical features include severe pain out of proportion to the injury; pain on passive stretch of the muscles within the compartment; and other signs of acute limb ischaemia. Four-compartment fasciotomy is the treatment of choice.

2.3 The correct answer is E.

Critical limb ischaemia is defined by the European Working Group on Critical Leg Ischaemia as the presence of ischaemic rest pain requiring analgesia for more than two weeks, or ulceration, or gangrene of the lower extremity where the absolute ankle systolic blood pressure is <50 mmHg and/or the toe systolic pressure is <30 mmHg (i.e. symptoms are due to objectively proven arterial occlusive disease).

2.4 The correct answer is C.

Intermittent claudication is reproducible ischaemic muscle pain that is classically bought on by walking and relieved by rest. It affects 5% of men over the age of 50 and is a common presentation of peripheral vascular disease. Treatment is medical, with intervention reserved for select cases e.g. patients with debilitating symptoms. Invasive imaging, i.e. angiography, should not be performed unless intervention is being considered.

2.5 The correct answer is D.

Further imaging is required prior to carotid endarterectomy. Carotid duplex is the preferred first-line imaging modality. CT scan of the brain is not useful in cases of transient ischaemic attack (TIA).

2.6 The correct answer is D.

The most likely diagnosis in an elderly, hypotensive male is a ruptured AAA. A profoundly hypotensive patient should not undergo CT scanning (which is often described as the 'doughnut of death') and is not fit for transfer to another hospital. FAST scanning, although able to assess for an aneurysm, cannot accurately detect rupture. Hypotensive resuscitation is often advocated in cases of ruptured AAAs.

2.7 The correct answer is A.

Reverse Trendelenburg is thought to reduce the risk of air embolus.

2.8 The correct answer is A.

Acute limb ischaemia may be caused by a thrombus or an embolus; management includes investigations geared towards establishing a cause. Urinalysis is useful for demonstrating myoglobinuria, since rhabdomyolysis is a well-recognised complication. Heparin should be administered intravenously.

2.9 The correct answer is D.

Approximately 80–5% of all leg ulcers in the UK are venous in aetiology.

2.10 The correct answer is C.

Operative mortality will be affected by the patient's co-morbidity. The operative mortality associated with elective AAA is between 1.2% and 8.4%.

2.11 The correct answer is C.

Ankle brachial pressure index should be assessed to exclude arterial disease. Venous ulcers typically occur in the gaiter region and overlie the medial malleolus. Venous duplex is indicated in patients with recurrent or complicated varicose veins, short saphenous incompetence or suspected deep venous insufficiency. The mainstay of management is leg elevation and compression bandaging. Skin grafting is performed in selected cases.

2.12 The correct answer is A.

This patient has a history suggestive of temporal arteritis (also known as giant cell arteritis) – a systemic vasculitis that primarily affects medium and large arteries. Features include new-onset headache, tenderness overlying the temporal artery, jaw claudication, an elevated ESR and, most devastatingly, visual loss. If temporal arteritis is suspected, treatment with high-dose steroids should be commenced in order to avoid visual loss. Definitive diagnosis is obtained by biopsy of the affected (usually temporal) artery, and this can be performed at a later stage.

2.13 The correct answer is C.

In view of the fact that the patient has an extensive femoral deep vein thrombosis, she is likely to have had a pulmonary embolus. It would be useful to establish whether she is therapeutic in terms of her warfarin, as it is likely that she is suboptimally anticoagulated.

2.14 The correct answer is D.

Physical signs of cardiac tamponade include neck vein distension, tachycardia, tachypnoea, pericardial rub, Beck's triad (i.e. increased jugular venous pressure, hypotension and diminished heart sounds), pulsus paradoxus, occasionally Kussmaul's sign and abolition of the y descent of the jugular venous or right atrial waveform. Note that not all of these will necessarily be present.

2.15 The correct answer is B.

A patient with an asymptomatic AAA does not require emergent referral to the vascular surgeons. An ultrasound scan of the abdominal aorta is the first-line screening investigation of choice and is used to monitor AAA growth.

2.16 The correct answer is B.

Other indications for AAA repair are growth rate >1.0 cm per year and the development of symptoms.

2.17 The correct answer is C.

Graded compression stockings, although not a cure for varicose veins, provide symptomatic relief. They reduce leg swelling and can prevent complications. A venous duplex is indicated in complex or recurrent venous disease. Venous ulceration and other secondary venous tissue changes, e.g. lipodermatosclerosis, are indications for surgical intervention.

2.18 The correct answer is E.

The patient has an acutely ischaemic leg – this is a surgical emergency. The most likely cause is an embolus, as the patient is in atrial fibrillation. Urgent referral to the vascular surgeons, intravenous heparin and embolectomy either with or without on-table angiography are required.

2.19 The correct answer is C.

The patient has symptoms, signs and risk factors supporting the diagnosis of a deep vein thrombosis (DVT). Therapeutic-dose heparin should be commenced on the clinical suspicion of a DVT. DVT should be subsequently confirmed with venous duplex imaging. There is no suggestion that the patient has had a pulmonary embolus, so CT pulmonary angiogram is not indicated. Heparin should be discontinued once therapeutic levels of warfarin are reached, and warfarin should be continued for six months.

2.20 The correct answer is A.

The greatest risk factor for aneurysm formation is thought to be smoking. AAAs are more common amongst Caucasians and are approximately five times more common in men than in women. Popliteal aneurysms are the most common peripheral artery aneurysm, affecting 10% of patients with an AAA. Popliteal aneurysms rarely rupture, and complications arise due to thrombosis or embolisation distally causing lower-limb ischaemia. Splenic artery aneurysms are more common in women.

2.21 The correct answer is C.

After wound swabs for culture, broad-spectrum antibiotics should be commenced in the first instance. Gram-positive cocci such as *Staphylococcus aureus*, group B *Streptococcus pyogenes*, group A *Streptococcus agalactiae* and methicillin-resistant *Staphylococcus aureus* (found in patients previously hospitalised) are the most commonly implicated organisms. If osteomyelitis is suspected, it may be useful to first X-ray the foot then perform an MRI. Amputation is indicated if there is spreading infection, failure of antibiotic therapy or gas gangrene. Dry, not wet, gangrene usually autoamputates.

2.22 The correct answer is A.

The nematode *Wuchereria bancrofti* is responsible for filariasis. Milroy's disease is a cause of primary lymphoedema, which is rare. The others are causes of secondary lymphoedema.

2.23 The correct answer is E.

The patient has Raynaud's disease. This is an idiopathic vasospastic condition that usually affects young women. When secondary to another condition, e.g. systemic lupus erythematosus or rheumatoid arthritis, it is termed Raynaud's syndrome.

2.24 The correct answer is C.

Buerger's disease (thromboangiitis obliterans) is an arterio-occlusive disease that affects the medium and small arteries of the upper and lower limbs. It typically affects young males and is clearly linked with smoking.

2.25 The correct answer is A.

Takayasu's arteritis is a chronic inflammatory disease that affects the aorta and its main branches; it is sometimes called 'pulseless arteritis'. It is more common in women and Asians.

2.26 The correct answer is D.

An aortic dissection is a tear in the intima that results in a connection between the aortic lumen and the media. Propagation of the dissection longitudinally and a re-entry tear result in the formation of a true lumen, lined by intima, and a false lumen, between the intima and media. Aortic dissections are more common in men, and predisposing factors include hypertension, connective-tissue disorders, pregnancy and trauma. They may be categorised according to their location using the DeBakey (types I, II and III) and Stanford (types A and B) classifications.

2.27 The correct answer is C.

The aim of surgery is to reduce the risk of stroke. An occluded carotid artery has no thromboembolic potential. Two-thirds of patients with a critical stenosis will not have a bruit. Damage to the hypoglossal nerve during carotid endarterectomy leads to weakness of the tongue on the same side. Stroke is an important complication of surgical intervention.

2.28 The correct answer is E.

The patient has symptoms suggestive of distal aorta and iliac (aortoiliac) occlusion, otherwise known as Leriche's syndrome. Leriche's syndrome is a classic triad of buttock/thigh claudication, impotence and absent/diminished femoral pulses.

2.29 The correct answer is D.

The others are late signs. Fixed mottling, muscle rigidity and pain on passive movement of the limb suggest irreversibility of the ischaemia. Pallor, pain and an objective temperature level are early signs of acute limb ischaemia.

2.30 The correct answer is E.

The patient has a history and signs suggestive of cardiac tamponade (accumulation of fluid in the pericardial space). The classic presentation of Beck's triad of hypotension, raised jugular venous pressure and muffled heart sounds, is typically seen in acute cardiac tamponade.