

NEET SS 2024 DrNB Vascular Surgery Paper2 Question Paper with Solution

Time Allowed :3 Hours	Maximum Marks :100	Total Questions :10
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 10 questions. The maximum marks are 100.
3. Each Question is of 10 marks.

1. A 48-year-old male was started on anticoagulation for unprovoked deep vein thrombosis (common femoral vein and popliteal vein) with pulmonary embolism. He has following doubts after reading about DVT on internet and needs a counselling session with the treating vascular surgeon:

(a) How long should he continue on anticoagulation?

Solution:

Step 1: Understanding the case.

The patient has been diagnosed with unprovoked deep vein thrombosis (DVT) and pulmonary embolism. Unprovoked DVT means that the patient developed blood clots without a clear external cause, such as surgery, immobility, or trauma. These conditions require anticoagulation therapy to prevent the formation of additional clots and to manage the current thrombotic events.

Step 2: Duration of anticoagulation therapy.

In cases of unprovoked DVT, anticoagulation therapy is typically prescribed for 3 to 6 months. This period allows the blood clot to resolve while minimizing the risk of further clot formation. For some high-risk patients, long-term anticoagulation may be recommended. Factors influencing the duration include the patient's risk of recurrence and bleeding, as well as any underlying conditions (e.g., cancer).

Step 3: Clinical guidelines.

The clinical guidelines generally recommend a minimum of 3 months of anticoagulation for unprovoked DVT. After this period, the decision to continue anticoagulation should be individualized, considering the risk of clot recurrence versus the risk of bleeding complications. In high-risk cases, indefinite anticoagulation may be necessary.

Step 4: Conclusion.

In this case, the patient should continue anticoagulation therapy for at least 3 to 6 months,

with further evaluation to decide if longer therapy is needed based on risk factors.

Quick Tip

For unprovoked DVT, 3 to 6 months of anticoagulation therapy is typically recommended. Long-term therapy may be needed for high-risk patients.

(1) (b) What are the precautions while taking anticoagulation?

Solution:

Step 1: Understanding anticoagulation therapy.

Anticoagulation therapy is used to reduce the risk of blood clots forming, but it also increases the risk of bleeding. As such, patients need to take certain precautions to manage their treatment safely.

Step 2: Monitoring and management.

- Regular blood tests: For patients on warfarin, regular monitoring of INR (International Normalized Ratio) is required to ensure that the blood's clotting ability is in the therapeutic range (usually between 2.0 and 3.0). For other anticoagulants like dabigatran or rivaroxaban, monitoring may not be necessary but must still be used with caution.
- Avoiding activities that increase bleeding risk: Patients should avoid activities that could result in falls or injury (e.g., contact sports, heavy lifting) as this could lead to serious bleeding complications.
- Drug and food interactions: Certain foods (especially those high in vitamin K like leafy greens) and drugs (like NSAIDs) can interfere with anticoagulation therapy. It's important to maintain a consistent diet and consult with the healthcare provider before taking new medications.

Step 3: Educating the patient.

Patients should be educated on the signs of bleeding (e.g., unusual bruising, prolonged bleeding from cuts, or blood in urine or stool) and instructed to seek immediate medical attention if these occur. It's also important to notify all healthcare providers about their anticoagulation therapy to avoid dangerous drug interactions.

Step 4: Conclusion.

Precautions for anticoagulation therapy include regular monitoring of INR (for warfarin), avoiding high-risk activities, managing diet and medications carefully, and being alert to signs of bleeding. Regular communication with healthcare providers is essential for safe anticoagulation management.

Quick Tip

For anticoagulation patients, regular blood monitoring, avoiding trauma, and being mindful of drug/food interactions are crucial.

(1) (c) What are the chances of developing a malignancy and why?

Solution:

Step 1: Connection between DVT and malignancy.

Unprovoked DVT is often associated with an increased risk of underlying malignancy. This is because certain cancers can cause hypercoagulability, a condition in which the blood is more prone to clotting. The most common cancers associated with DVT are those of the pancreas, lungs, and gastrointestinal tract.

Step 2: Risk factors for malignancy.

The risk of malignancy is higher in individuals with unprovoked DVT, particularly those who are older or have a family history of cancer. Additional risk factors include unexplained weight loss, fatigue, or a personal history of cancer.

Step 3: Clinical approach.

For patients with unprovoked DVT, it is recommended to rule out malignancy with further testing. This may involve imaging studies (e.g., CT scans, ultrasounds) and blood tests (e.g., tumor markers). The decision to perform extensive cancer screening is based on the patient's age, family history, and the presence of additional symptoms.

Step 4: Conclusion.

The risk of developing a malignancy in the presence of unprovoked DVT is significant. This association necessitates further workup to rule out any underlying cancers, particularly in high-risk individuals.

Quick Tip

For patients with unprovoked DVT, screening for malignancy is essential, especially if there are additional risk factors or unexplained symptoms.

(1) (d) Why was he not given the benefit of thrombolysis?

Solution:

Step 1: Understanding thrombolysis.

Thrombolysis is a treatment that involves dissolving blood clots using medications (thrombolytics) like alteplase or streptokinase. It is typically reserved for severe or life-threatening cases, such as massive pulmonary embolism or when there is a large clot burden in the body.

Step 2: Indications for thrombolysis.

Thrombolysis is generally indicated for patients who are hemodynamically unstable, meaning their blood pressure is low or they are in shock due to a massive clot obstructing blood flow. It can also be used in patients with severe symptoms and significant respiratory compromise due to pulmonary embolism.

Step 3: Why was thrombolysis not used in this case?

In this case, the patient may not have been experiencing severe enough symptoms or life-threatening complications to warrant thrombolysis. If the patient's hemodynamic status was stable and the clot was not causing immediate respiratory failure, thrombolysis would not be indicated. Instead, anticoagulation therapy is generally sufficient for managing the condition.

Step 4: Conclusion.

Thrombolysis is a treatment for severe cases of clotting, especially when the patient is unstable. In this case, the patient's condition may not have required thrombolysis, and anticoagulation therapy alone is typically appropriate.

Quick Tip

Thrombolysis is reserved for severe cases, especially when the patient is unstable. In most cases of DVT or PE, anticoagulation alone is effective.

2. A 58-year-old male chronic smoker diabetic and having normal coronaries presents with bilateral calf claudication. Femoral pulses are palpable but distal pulses are absent with bilateral ABI of 0.5 and no rest pain or tissue loss. He has following doubts after reading about peripheral vascular disease on internet and needs a counselling session with the treating vascular surgeon.

(a) Whether he should get operated / intervened or not?

Solution:**Step 1: Understanding the case.**

The patient has a history of smoking, diabetes, and peripheral vascular disease, presenting with bilateral calf claudication. The absence of distal pulses and a low ABI (Ankle-Brachial Index) of 0.5 indicates significant peripheral arterial disease (PAD). While femoral pulses are palpable, the reduced distal pulses suggest compromised blood flow to the lower extremities.

Step 2: Surgical Intervention Consideration.

The decision to intervene surgically depends on the severity of symptoms and the patient's quality of life. In this case, with claudication (pain during walking), the patient may benefit from surgical revascularization if the symptoms are severe or worsening. However, if the symptoms are manageable with medical therapy, surgical intervention may not be necessary. A comprehensive assessment of the patient's functional status and progression of the disease is required.

Step 3: Conclusion.

The patient may be considered for surgical intervention if claudication significantly limits his daily activities. Otherwise, medical management should be considered first.

Quick Tip

For patients with PAD, surgical intervention is considered when symptoms are severe or affect daily life. Medical management should be attempted first for mild cases.

(2) (b) What are the chances of losing the limb over the next few years what are the chances of mortality?

Solution:**Step 1: Understanding the patient's condition.**

The patient's bilateral calf claudication, combined with a low ABI, suggests moderate to severe peripheral arterial disease. The risk of limb loss in PAD patients depends on the severity of the disease, progression of atherosclerosis, and the development of critical limb ischemia (CLI), which is characterized by rest pain, ulcers, or tissue necrosis.

Step 2: Risk of limb loss.

The risk of losing the limb increases if the disease progresses to critical limb ischemia (CLI). In patients with ABI of 0.5, the risk of developing CLI is higher. However, with proper medical management (including smoking cessation, glycemic control, and appropriate use of antiplatelet agents), the risk of limb loss can be reduced. Surgical intervention like revascularization can further decrease the risk.

Step 3: Mortality risk.

The risk of mortality in patients with PAD is also elevated, particularly if they have multiple risk factors like smoking and diabetes. Studies show that the 5-year mortality rate in patients with PAD can range from 20-40%, especially if there is significant cardiovascular involvement. The risk of mortality is higher in patients who develop critical limb ischemia or are unable to manage the disease effectively.

Step 4: Conclusion.

If left untreated, the patient has a moderate to high risk of both limb loss and mortality, depending on disease progression. Early intervention and management can significantly improve prognosis.

Quick Tip

In patients with PAD, managing risk factors like smoking, diabetes, and hypertension is crucial in reducing the risk of limb loss and mortality.

(2) (c) What are the components of best medical management you would advise to him?

Solution:**Step 1: Understanding the treatment goals.**

The main goal of medical management in peripheral arterial disease is to alleviate symptoms, prevent disease progression, and reduce the risk of complications, including limb loss and cardiovascular events. Treatment should address the patient's risk factors and include lifestyle modifications.

Step 2: Components of best medical management.

- Smoking cessation: Smoking is a major risk factor for PAD and exacerbates disease progression. The patient should be encouraged to stop smoking.
- Glycemic control: As the patient is diabetic, controlling blood sugar levels is crucial in preventing further vascular damage.
- Antiplatelet therapy: Medications like aspirin or clopidogrel should be prescribed to reduce the risk of thrombotic events.
- Statins: Statins should be prescribed to control cholesterol levels and reduce the risk of cardiovascular events.
- Exercise therapy: Supervised walking programs can improve symptoms of claudication and increase walking distance.
- Blood pressure control: Hypertension should be managed effectively to reduce the strain on blood vessels.

Step 3: Conclusion.

The best medical management for this patient includes smoking cessation, blood sugar control, antiplatelet therapy, statin therapy, regular exercise, and blood pressure management. These measures can significantly reduce the progression of PAD and improve quality of life.

Quick Tip

For patients with PAD, managing underlying risk factors (like diabetes, smoking, and hypertension) and using antiplatelet therapy are essential for effective management.

3. A 65-year-old male presented with history of TIA, transient right upper limb weakness, diagnosed to have bilateral carotid artery stenosis on colour doppler.

(a) How would you evaluate this patient?

Solution:

Step 1: Understanding the clinical context.

The patient has a history of transient ischemic attack (TIA), which suggests that there is a temporary disruption in blood flow to the brain. The right upper limb weakness indicates a possible neurological deficit, often linked to carotid artery stenosis. Bilateral carotid artery stenosis seen on color Doppler further supports the diagnosis of potential cerebrovascular disease.

Step 2: Evaluation approach.

The patient should undergo a thorough evaluation to assess the severity of carotid artery stenosis and its impact on brain perfusion. Key steps in evaluation include:

1. Detailed clinical history: Including the onset, duration, and progression of symptoms (TIA, limb weakness) and risk factors (hypertension, smoking, diabetes, hyperlipidemia).
2. Neurological examination: Assessing the severity of neurological deficits and identifying any residual weakness or signs of cerebrovascular disease.
3. Imaging studies: A repeat carotid ultrasound or CT angiography/MRI angiography may be needed to confirm the degree of stenosis and visualize the plaque morphology and location.
4. Assessment of cerebral perfusion: Using transcranial Doppler or cerebral angiography to assess blood flow to the brain and identify areas at risk.

Step 3: Conclusion.

A combination of clinical evaluation, neurological examination, and imaging studies will help assess the severity of the stenosis and guide further management.

Quick Tip

In patients with TIA and carotid artery stenosis, it's essential to assess both the degree of stenosis and the presence of collateral circulation to determine the treatment approach.

(3) (b)How would you assess the plaque morphology?

Solution:

Step 1: Understanding plaque morphology.

Plaque morphology refers to the composition and structure of the plaques in the carotid arteries. The nature of the plaque (whether it is stable or unstable) can provide information on the risk of stroke or other complications. Stable plaques are more fibrous, while unstable plaques are more lipid-rich and prone to rupture.

Step 2: Assessment methods.

Plaque morphology can be evaluated through various imaging techniques, including:

1. Color Doppler ultrasound: Non-invasive and widely used to evaluate the degree of stenosis, as well as the characteristics of the plaque. Plaques that are echolucent (less reflective) may be lipid-rich, while echogenic plaques are often more fibrous and stable.
2. CT angiography: Provides a detailed view of the arterial walls and plaques, allowing for the assessment of plaque composition and the identification of any thrombus or ulceration.
3. MRI/MR angiography: High-resolution imaging that can assess plaque composition, distinguishing between fibrous and lipid-rich plaques. It is also useful for detecting intraplaque hemorrhage or ulceration.
4. Intravascular ultrasound (IVUS): Invasive but provides detailed imaging of the plaque structure, including the presence of calcifications, lipid core, and fibrous cap.

Step 3: Conclusion.

A combination of non-invasive imaging (such as Doppler ultrasound or MRI) and advanced methods (such as CT angiography or IVUS) can provide a comprehensive evaluation of the plaque morphology, which helps guide treatment decisions.

Quick Tip

In assessing plaque morphology, the key is to determine whether the plaque is stable or unstable, as unstable plaques are more prone to rupture and cause embolic events.

(3) (c)How would you manage him?

Solution:

Step 1: Goals of management.

The primary goal of managing this patient is to reduce the risk of stroke and manage the carotid artery stenosis. Management strategies can be medical or surgical, depending on the severity of the disease and the patient's symptoms.

Step 2: Medical management.

- Antiplatelet therapy: Aspirin or clopidogrel should be prescribed to prevent platelet aggregation and reduce the risk of thrombosis. In some cases, dual antiplatelet therapy (aspirin + clopidogrel) may be considered for higher-risk patients.
- Statins: Statin therapy should be initiated to reduce cholesterol levels and stabilize the plaque. Statins also have an anti-inflammatory effect on the arterial wall, which may prevent further progression of atherosclerosis.
- Blood pressure control: Aggressive management of hypertension is crucial to reduce the risk of stroke and further damage to the carotid arteries.
- Glycemic control: If the patient is diabetic, optimizing blood glucose levels is essential to prevent progression of atherosclerosis.

Step 3: Surgical management.

- Carotid endarterectomy (CEA): This procedure may be considered if the stenosis is severe (typically greater than 70%).
- Carotid artery stenting (CAS): This may be an option for patients who are not candidates for endarterectomy, particularly those with high surgical risk or those with anatomically unfavorable carotid arteries.

Step 4: Conclusion.

Management should focus on medical therapy (antiplatelet, statins, blood pressure control) as first-line treatment. If the patient remains symptomatic or has severe stenosis, surgical options like carotid endarterectomy or stenting should be considered.

Quick Tip

In patients with symptomatic carotid stenosis, the goal is to reduce the risk of stroke through a combination of medical management and, if necessary, surgical intervention.

4. A 65-year-old patient presented with chest pain with ECG changes. However, his transthoracic ECHO was normal and coronary arteries were normal on coronary angiography done through right radial artery. There was suspicion of aortic dissection while carrying out coronary angiography.

(a) What is the likely diagnosis?

Solution:**Step 1: Understanding the clinical picture.**

The patient presents with chest pain and ECG changes, which are commonly associated with conditions like acute coronary syndrome (ACS). However, the transthoracic echocardiogram (ECHO) and coronary angiography were normal, ruling out a myocardial infarction or significant coronary artery disease. The suspicion of aortic dissection arises, given the location of the

chest pain and the potential for involvement of the aorta.

Step 2: Likely diagnosis.

Aortic dissection is the most likely diagnosis. This condition occurs when there is a tear in the inner layer of the aorta, allowing blood to flow between the layers of the aortic wall, which can lead to aortic rupture or compromise of blood flow to vital organs. The patient's chest pain, often described as tearing or sharp, and ECG changes are suggestive of this condition.

Step 3: Conclusion.

Given the clinical presentation and suspicion of aortic dissection, this is the most likely diagnosis. Further imaging is required for confirmation.

Quick Tip

In patients with chest pain and suspected aortic dissection, it is critical to consider the risk factors (e.g., hypertension, connective tissue disorders) and confirm the diagnosis with imaging like CT angiography or MRI.

(4) (b) How will you evaluate him further?

Solution:

Step 1: Initial clinical evaluation.

In the setting of suspected aortic dissection, it is important to obtain a detailed clinical history, including risk factors such as hypertension, connective tissue diseases (like Marfan syndrome), or a history of aortic disease. A thorough physical examination should be conducted to check for signs of shock, a difference in blood pressure between limbs, or a new heart murmur.

Step 2: Imaging studies.

The gold standard for diagnosing aortic dissection is CT angiography (CTA) of the chest, which provides detailed imaging of the aorta and helps to confirm the presence of a dissection and the extent of involvement. If CTA is unavailable, MRI of the aorta is also highly effective. An aortogram during coronary angiography can also help visualize the aorta and any potential dissection, especially if there is suspicion during the procedure.

Step 3: Laboratory tests.

Blood tests, including D-dimer, may be helpful in assessing the likelihood of aortic dissection, though it is not diagnostic. Elevated D-dimer levels may indicate acute pathology such as dissection, although other conditions can also elevate this marker.

Step 4: Conclusion.

To evaluate further, the patient should undergo CT or MRI angiography to confirm the diag-

nosis of aortic dissection. Invasive aortography can be performed if necessary.

Quick Tip

In patients with suspected aortic dissection, CT or MRI angiography is crucial for confirming the diagnosis and assessing the extent of the dissection.

(4) (c) How will you manage him?

Solution:

Step 1: Initial management.

The patient with suspected aortic dissection should be treated as a medical emergency. The primary goals are to stabilize the patient, control pain, and prevent the progression of the dissection. The initial management involves:

1. Blood pressure control: The most critical step in management is to control blood pressure and reduce shear stress on the aortic wall. Medications like beta-blockers (e.g., labetalol) are used to control the heart rate and blood pressure. Vasodilators such as nitroprusside may also be used in addition to beta-blockers if necessary.
2. Pain management: Adequate analgesia should be provided to control the chest pain. Opioids may be required in severe cases.
3. Monitoring: Continuous monitoring in an intensive care setting is necessary for hemodynamic stability.

Step 2: Surgical management.

Surgical intervention is required for type A aortic dissections, which involve the ascending aorta. Surgery should be performed as soon as possible, often in an emergency setting. For type B dissections (descending aorta), surgery may be considered if there is evidence of rupture, compromised organ perfusion, or failure of medical management. In some cases, endovascular repair may be an option.

Step 3: Long-term management.

Post-operatively, patients should be closely monitored for complications, such as re-dissection, and long-term blood pressure control is crucial. Lifelong surveillance with imaging is often recommended, especially for those with type B dissection.

Step 4: Conclusion.

Management includes controlling blood pressure and heart rate, pain relief, and surgery for type A dissections. For type B, conservative management or endovascular repair may be appropriate. Close follow-up is necessary for long-term monitoring.

Quick Tip

In aortic dissection, blood pressure control and timely surgical intervention (especially for type A dissections) are critical to preventing mortality.

5. A 55-year-old male underwent a common femoral artery to below knee popliteal artery bypass using reversed great saphenous vein graft one month ago.

(a) How will you follow him up?

Solution:

Step 1: Understanding the case.

The patient has undergone bypass surgery using a reversed great saphenous vein graft, which is a common approach for revascularizing the lower extremity in cases of peripheral arterial disease. Follow-up is essential to monitor for complications such as graft occlusion or stenosis.

Step 2: Follow-up plan.

Follow-up should include both clinical and imaging assessments:

1. Clinical examination: Monitor for symptoms such as claudication, rest pain, or signs of graft infection. Check for any signs of limb ischemia, such as changes in skin color, temperature, or pulses.
2. Ankle-brachial index (ABI): ABI should be measured to assess the graft's patency and the overall vascular status of the lower limb.
3. Color Doppler ultrasound: This non-invasive imaging technique can assess the patency of the graft, measure the peak systolic velocity (PSV) and evaluate for any stenosis or graft failure. Regular Doppler assessments are crucial in detecting early graft issues.

Step 3: Conclusion.

Follow-up should include clinical evaluation, ABI measurement, and regular imaging (e.g., Color Doppler ultrasound) to monitor graft patency and detect any complications.

Quick Tip

Regular follow-up after bypass surgery is crucial for early detection of graft issues. Non-invasive imaging techniques like Color Doppler are essential for monitoring graft patency.

(5) (b) After 6 months, PSV were found to be increased on distal anastomotic site on colour doppler. What is the likely etiology at this juncture? How will you proceed further?

Solution:

Step 1: Understanding the findings.

An increase in PSV (Peak Systolic Velocity) at the distal anastomotic site on color Doppler suggests that there may be a narrowing or stenosis at this site. This could indicate the development of graft stenosis, which is a common complication following bypass surgeries.

Step 2: Likely etiology.

The likely etiology of increased PSV at the distal anastomosis is graft stenosis or intimal hyperplasia at the anastomotic site. These issues can occur due to turbulent flow, endothelial injury, or a mismatch in the diameter between the graft and the vessel. The stenosis could be caused by the formation of a neointimal layer that narrows the lumen of the graft.

Step 3: Further management.

1. Repeat imaging: Confirm the diagnosis with angiography or a more detailed CT angiogram to assess the extent of stenosis and the possibility of graft occlusion.
2. Graft revision: If significant stenosis is detected (usually if the PSV is greater than 200 cm/s), surgical revision or angioplasty of the graft may be needed to restore patency.

Step 4: Conclusion.

Increased PSV at the distal anastomotic site likely indicates graft stenosis or intimal hyperplasia. Further imaging and potential revision or angioplasty are needed to restore normal blood flow.

Quick Tip

Increased PSV at the anastomotic site suggests graft stenosis. Timely intervention with imaging and potential revision is critical to prevent graft failure.

(5) (c)How are the lesions in the venous grafts categorised based on PSV and velocity ratios (Vr)?

Solution:

Step 1: Understanding the classification of lesions.

Lesions in venous grafts are typically assessed based on Peak Systolic Velocity (PSV) and Velocity Ratio (Vr). These parameters are used to determine the degree of stenosis and help in classifying graft lesions.

Step 2: PSV and Vr classification.

- Normal graft: PSV less than 100 cm/s and a Vr of less than 2.0. This indicates that the graft is patent with no significant stenosis.
- Mild stenosis: PSV between 100 and 200 cm/s with a Vr between 2.0 and 3.0. This suggests

a minor narrowing that is likely not causing significant blood flow reduction.

- Moderate stenosis: PSV between 200 and 300 cm/s with a Vr of 3.0 to 4.0. This indicates moderate narrowing, which may be associated with some symptoms of claudication.
- Severe stenosis: PSV greater than 300 cm/s with a Vr greater than 4.0. This is indicative of significant stenosis or impending graft failure, and intervention is likely needed.
- Graft occlusion: If the PSV is absent or significantly reduced and there is no flow detected, the graft is considered occluded.

Step 3: Conclusion.

Lesions in venous grafts are classified into normal, mild, moderate, or severe stenosis based on PSV and Vr values. Timely intervention is needed for moderate or severe stenosis to prevent graft failure.

Quick Tip

PSV and Vr are key indicators of graft health. A higher PSV and Vr typically suggest more severe stenosis, which requires prompt attention.

6. Type 3 Crawford aneurysm:

- (a) Advantages and disadvantages of open surgical repair vs total endovascular repair.

Solution:

Step 1: Understanding Type 3 Crawford aneurysm.

A Type 3 Crawford aneurysm involves a rupture or expansion of the aorta, typically affecting the distal descending aorta and the abdominal aorta. It is often associated with aortic dissection or trauma and requires prompt surgical intervention to prevent catastrophic outcomes.

Step 2: Open surgical repair.

Advantages:

- Direct visualization: Allows for a clear view of the aneurysm, which is essential for precise repair.
- Long-term durability: Open repair is associated with a long-term, durable repair, especially for larger aneurysms.
- Better control of bleeding: Surgeons have direct control over any bleeding, which can be more easily managed in an open procedure.

Disadvantages:

- Higher morbidity: Open repair is more invasive, often requiring larger incisions, which increases the risk of complications such as infection and longer recovery times.
- Longer hospital stay: Patients usually require longer hospitalization post-operatively, especially if there are complications.

- Higher risk of spinal cord ischemia: Because of the involvement of the descending aorta, there is a higher risk of damaging the spinal arteries, which could lead to spinal cord ischemia.

Step 3: Endovascular repair.

Advantages:

- Minimally invasive: Endovascular repair uses smaller incisions and is associated with a shorter recovery time and reduced hospital stay.
- Lower immediate risk: Being a minimally invasive procedure, it carries a lower immediate risk of complications like infection and bleeding.
- Faster recovery: Endovascular repair typically allows patients to recover faster and return to normal activity more quickly.

Disadvantages:

- Durability concerns: Endovascular repairs may not be as durable over the long term as open surgical repairs, especially in larger aneurysms or more complex cases.
- Limited to certain patients: Not all aneurysms are suitable for endovascular repair, particularly if there are significant anatomical challenges.
- Potential for endoleak: One of the major risks is the occurrence of an endoleak, where blood continues to flow into the aneurysm sac, requiring further intervention.

Step 4: Conclusion.

The choice between open surgical repair and endovascular repair depends on the patient's anatomical features, the complexity of the aneurysm, and overall health. Both options have their advantages and disadvantages, which should be carefully considered in each individual case.

Quick Tip

Endovascular repair is often preferred for its minimally invasive nature, but it may not be suitable for all patients. Open surgical repair remains the gold standard for complex cases.

(6) (b) Mechanisms to prevent spinal cord ischemia.

Solution:

Step 1: Understanding spinal cord ischemia.

Spinal cord ischemia occurs when there is a reduction in blood flow to the spinal cord, which can lead to irreversible neurological deficits. In the context of aortic aneurysm repair, particularly in open surgeries involving the thoracoabdominal aorta, there is a significant risk of spinal cord ischemia due to the disruption of blood flow through the intercostal and lumbar arteries.

Step 2: Mechanisms to prevent spinal cord ischemia.

1. Cerebrospinal fluid (CSF) drainage: CSF drainage is commonly used to prevent spinal cord ischemia. By draining CSF, there is a reduction in spinal cord pressure, which helps improve blood flow to the cord and reduces the risk of ischemia.
2. Maintaining collateral circulation: During the surgery, efforts should be made to preserve the intercostal arteries or create collateral pathways to maintain blood flow to the spinal cord.
3. Perfusion strategies: Enhanced perfusion of the aorta using temporary bypass techniques or maintaining a high systemic blood pressure during surgery can help ensure adequate blood flow to the spinal cord.
4. Pre-operative planning: In some cases, pre-operative embolization of branches of the aorta may be considered to avoid injury to critical vessels during surgery.

Step 3: Conclusion.

Preventing spinal cord ischemia involves maintaining optimal perfusion, using CSF drainage, and preserving collateral blood flow to the spinal cord. Adequate pre-operative planning and intraoperative monitoring are essential for reducing the risk.

Quick Tip

Spinal cord ischemia is a major concern in thoracoabdominal aortic surgeries. Prevention strategies, including CSF drainage and careful management of perfusion, are essential to reduce the risk of neurological complications.

7. A 65-year-old male, presented with acute onset pain in right lower limb, with absent popliteal and below pulses. On admission, patient had ongoing pain and was having venous signals in foot with mild to moderate sensorimotor deficit.

(a) What is your diagnosis? Classify the different types of presentation.

Solution:**Step 1: Understanding the clinical signs.**

The patient presents with acute onset pain, absent pulses in the right lower limb, and a sensorimotor deficit. The absence of pulses suggests arterial insufficiency, and the venous signals in the foot may indicate venous congestion or inadequate perfusion. These findings are suggestive of acute limb ischemia (ALI), a condition where there is a sudden decrease in limb blood flow, typically due to a blockage in an artery.

Step 2: Diagnosis - Acute Limb Ischemia (ALI).

ALI is characterized by the sudden onset of pain, absent pulses, and motor/sensory deficits. It is a vascular emergency, often caused by embolism, thrombosis, or trauma leading to ischemia. The diagnosis is supported by the absence of arterial pulses and neurological deficits, but the

presence of venous signals suggests some residual venous return.

Step 3: Classification of presentation.

The presentation of ALI can be classified into the following types:

1. Embolic: Occurs when a clot (often from the heart) travels to a distal artery, blocking blood flow. It typically affects a previously healthy vessel.
2. Thrombotic: Caused by the gradual accumulation of a blood clot (thrombus) due to underlying atherosclerosis. Symptoms develop more slowly but can still lead to acute ischemia.
3. Traumatic: Resulting from external injury causing arterial rupture or blockage. This is often seen in cases of trauma or surgery.
4. Hypercoagulable states: Conditions that increase clotting risk, such as cancer or clotting disorders, may lead to ALI.

Step 4: Conclusion.

The most likely diagnosis in this patient is acute limb ischemia, potentially embolic or thrombotic in origin. Further evaluation is necessary to determine the cause of ischemia.

Quick Tip

Acute limb ischemia is a medical emergency. Immediate intervention is required to restore blood flow and prevent irreversible tissue damage.

(7) (b)He developed a painful calf after one hour of the procedure. What is the condition and how will you manage it?

Solution:

Step 1: Understanding the new symptoms.

After the procedure, the patient develops a painful calf, which could suggest a complication. The likely condition is compartment syndrome, which occurs when increased pressure within a muscle compartment compromises blood flow, leading to ischemia and pain. This condition often arises after surgical interventions, trauma, or prolonged pressure.

Step 2: Diagnosis of compartment syndrome.

Compartment syndrome is typically diagnosed based on clinical signs such as:

1. Severe pain that is disproportionate to the injury, especially pain that increases with passive stretch of the affected muscles.
2. Tightness or swelling in the calf.
3. Sensory changes or paresthesia due to nerve compression.
4. Weakness in the affected muscles.

Diagnostic confirmation can be done by measuring intracompartmental pressure using a pressure monitoring device. If the pressure exceeds 30 mmHg, compartment syndrome is likely.

Step 3: Management of compartment syndrome.

The management of compartment syndrome is a surgical emergency, and the steps include:

1. Urgent fasciotomy: The main treatment is a fasciotomy, where the fascial compartments are surgically opened to relieve pressure and restore blood flow.
2. Monitoring: Close monitoring of the calf and limb after the fasciotomy to ensure adequate perfusion and healing.
3. Supportive care: Pain management and fluid resuscitation to support circulation.

Step 4: Conclusion.

The patient most likely has compartment syndrome, which requires immediate intervention via fasciotomy. Delaying treatment could lead to irreversible muscle and nerve damage.

Quick Tip

Compartment syndrome is a surgical emergency. Prompt recognition and fasciotomy are essential to prevent irreversible tissue damage.

8. A 68-year-old male with chronic kidney disease underwent left brachiocephalic arteriovenous fistula 8 months back and is well functional. He complains of a feeling of coldness in left hand while undergoing dialysis for the past two months:

(a) What is the condition he is suffering from?

Solution:

Step 1: Understanding the symptoms.

The patient has a functional arteriovenous (AV) fistula in his left arm for dialysis, and his complaint of coldness in the left hand is likely due to a vascular issue related to the AV fistula. The condition he is most likely suffering from is steal syndrome. Steal syndrome occurs when there is an excessive diversion of blood from the distal vascular bed (in this case, the hand) due to the increased flow through the AV fistula, leading to ischemia or a sensation of coldness and discomfort in the affected limb.

Step 2: Conclusion.

The patient is most likely suffering from dialysis access-related steal syndrome due to the arteriovenous fistula.

Quick Tip

Steal syndrome is a common complication in patients with dialysis access. It can cause symptoms like coldness and pain in the distal limb, and management is necessary to restore proper circulation.

(8) (b) What are the various grades of this condition?

Solution:

Step 1: Understanding the grading system.

Steal syndrome in dialysis patients can be classified into different grades based on the severity of symptoms and the degree of ischemia in the affected limb. The grading is often done according to the clinical presentation and the findings on imaging studies, such as Doppler ultrasound. The grades are as follows:

Grade 1 (Mild):

- Coldness or mild discomfort in the hand or fingers, often without significant functional impairment.
- No significant changes in the arterial or venous waveform on Doppler studies.

Grade 2 (Moderate):

- Persistent coldness or pain, often associated with some loss of function in the affected hand (e.g., weak grip or difficulty performing tasks).
- Doppler studies may show some reduction in the distal arterial flow.

Grade 3 (Severe):

- Severe ischemia with resting pain, ulcers, or gangrene in the affected limb.
- Doppler studies show significant reduction or absence of arterial flow to the hand. This is a medical emergency requiring intervention.

Step 2: Conclusion.

The grades of steal syndrome are classified based on clinical symptoms and Doppler findings, ranging from mild discomfort to severe ischemia with potential tissue loss.

Quick Tip

Steal syndrome is graded based on the severity of symptoms and findings on Doppler ultrasound. Grade 3 represents severe ischemia, which requires urgent intervention.

(8) (c)How will you manage him now and if this condition progresses?

Solution:

Step 1: Management of mild to moderate steal syndrome.

If the patient has mild or moderate symptoms (Grade 1 or 2), management involves conservative measures aimed at improving blood flow and reducing the symptoms. This includes:

1. Adjustment of dialysis flow rates: Reducing the flow rate of dialysis through the AV fistula may help in alleviating the symptoms of steal syndrome.
2. Compression: Use of compression garments or gloves can help improve distal circulation in the hand.
3. Medical therapy: Medications such as vasodilators (e.g., nitrates) may be used to improve blood flow to the distal hand.
4. Positioning: Elevating the arm may help relieve symptoms by improving venous return.

Step 2: Management of severe steal syndrome.

In cases of severe steal syndrome (Grade 3), where ischemia is severe and associated with tissue loss or resting pain, more invasive measures are necessary:

1. Surgical intervention: A fistula revision or arterial revascularization may be required to restore adequate blood flow to the hand. This may involve ligating the fistula or creating a new access site.
2. Endovascular treatment: If surgical intervention is not possible, endovascular techniques such as stenting or angioplasty of the feeding artery may be considered.
3. Fistula abandonment: In extreme cases, it may be necessary to abandon the existing fistula in favor of another access site, such as a catheter or graft.

Step 3: Long-term management and prevention.

- Monitoring: Regular follow-up with Doppler ultrasound to assess for recurrence or progression of steal syndrome.
- Dialysis access optimization: Ensuring that the dialysis access site is optimized to avoid further complications, including steal syndrome.

Step 4: Conclusion.

Management depends on the severity of steal syndrome, ranging from conservative measures in mild cases to surgical or endovascular interventions in severe cases. Early intervention is critical to prevent progression and tissue damage.

Quick Tip

In severe cases of steal syndrome, early surgical or endovascular intervention is key to preventing irreversible tissue damage.

9. A patient underwent thrombectomy of femoro popliteal segment with poor out-flow and was on heparin infusion. His platelet count dropped from 2 lakhs to 1 lakh/mm³ on 6th day of infusion. Other blood parameters were normal and there was no feature of sepsis/infection.

(a) What is the likely cause of this condition?

Solution:

Step 1: Understanding the patient's presentation.

The patient presents with a significant drop in platelet count (thrombocytopenia) after being on heparin infusion. This drop, occurring on the 6th day of treatment, with no signs of infection or sepsis, strongly suggests Heparin-induced thrombocytopenia (HIT). HIT is a known complication of heparin therapy, where the body forms antibodies against heparin-bound platelet factor 4 (PF4), leading to platelet activation and consumption. This results in thrombocytopenia, and in some cases, an increased risk of thromboembolic events.

Step 2: Conclusion.

The most likely cause of this patient's thrombocytopenia is Heparin-induced thrombocytopenia (HIT).

Quick Tip

HIT typically occurs after 5-10 days of heparin therapy. A significant drop in platelet count after this period should raise suspicion of HIT.

(9) (b)How will you confirm your diagnosis?

Solution:

Step 1: Clinical suspicion.

The diagnosis of HIT is primarily based on clinical suspicion. In this case, the patient's platelet count dropped significantly after 6 days of heparin therapy, and there is no sign of infection or other causes of thrombocytopenia, which strongly suggests HIT.

Step 2: Confirmatory tests.

1. Heparin-induced platelet aggregation test (HIPA): This test detects antibodies that cause platelet activation in the presence of heparin. It is a specific test but not always readily available.
2. Serotonin release assay (SRA): This is the gold standard test for confirming HIT, as it measures the ability of antibodies to activate platelets in the presence of heparin.
3. PF4-heparin ELISA: This enzyme-linked immunosorbent assay detects antibodies to the

PF4-heparin complex and is commonly used in clinical practice. A positive result is highly suggestive of HIT, though it may not confirm the condition in all cases.

Step 3: Conclusion.

To confirm HIT, a serotonin release assay (SRA) or PF4-heparin ELISA should be performed. If these tests are positive, it confirms the diagnosis of HIT.

Quick Tip

When diagnosing HIT, a positive PF4-heparin ELISA or serotonin release assay confirms the diagnosis, especially when clinical suspicion is high.

(9) (c) What is the pathology behind the process?

Solution:

Step 1: Pathophysiology of HIT.

Heparin-induced thrombocytopenia (HIT) is an immune-mediated reaction caused by antibodies against the heparin-platelet factor 4 (PF4) complex. When heparin binds to PF4 on platelet surfaces, it forms a complex that triggers the production of antibodies in some individuals. These antibodies bind to the heparin-PF4 complex, leading to the activation of platelets. This activation promotes clot formation and platelet consumption, causing a drop in platelet count (thrombocytopenia).

Step 2: Mechanisms leading to thromboembolic complications.

In addition to thrombocytopenia, the activated platelets can form aggregates, which may lead to thromboembolic events, including deep vein thrombosis (DVT), pulmonary embolism (PE), or arterial thrombosis. This paradoxical pro-thrombotic state despite low platelet counts is a hallmark of HIT.

Step 3: Conclusion.

The pathophysiology of HIT involves the formation of antibodies against the heparin-PF4 complex, leading to platelet activation, consumption, and increased thromboembolic risk.

Quick Tip

In HIT, antibodies against the heparin-PF4 complex activate platelets, leading to both thrombocytopenia and a pro-thrombotic state.

(9) (d)How will you manage this condition?

Solution:

Step 1: Discontinuation of heparin.

The first step in managing HIT is to immediately discontinue all heparin products, including heparin flushes or low molecular weight heparin (LMWH), as they will continue to trigger the immune response.

Step 2: Anticoagulation alternatives.

1. Direct thrombin inhibitors (DTIs): Medications such as argatroban or bivalirudin are preferred as alternatives to heparin. These drugs directly inhibit thrombin and are not cross-reactive with HIT antibodies.
2. Fondaparinux: This is another alternative that can be used, as it has minimal cross-reactivity with HIT antibodies. However, caution is advised in patients with renal impairment.

Step 3: Monitoring and supportive care.

- Monitoring platelet count: Regular monitoring of the platelet count is important to ensure the resolution of thrombocytopenia.
- Managing thromboembolic events: If a thromboembolic event has occurred, the patient may need additional therapies such as thrombolytics or mechanical thrombectomy, depending on the severity and location of the clot.

Step 4: Conclusion.

Management involves stopping heparin, using alternative anticoagulation, and carefully monitoring for thromboembolic events. It is crucial to treat both the thrombocytopenia and the pro-thrombotic state.

Quick Tip

In HIT, discontinue heparin immediately and use alternatives like direct thrombin inhibitors (e.g., argatroban) for anticoagulation. Monitor for thromboembolic events.

10. Describe mechanism of action, indications, dosage, and side effects of the following drugs:

(a) Cilostazol.

Solution:

Step 1: Mechanism of Action.

Cilostazol is a phosphodiesterase III inhibitor that works by inhibiting the enzyme phosphodiesterase III. This inhibition increases cyclic AMP (cAMP) levels within the platelets and

smooth muscle cells, leading to vasodilation and inhibition of platelet aggregation. Cilostazol thus improves blood flow by preventing platelet clumping and dilating blood vessels, particularly in the lower extremities.

Step 2: Indications.

Cilostazol is primarily indicated for the treatment of intermittent claudication (IC) in patients with peripheral arterial disease (PAD). It is used to improve walking distance and relieve symptoms of pain and discomfort caused by reduced blood flow in the legs.

Step 3: Dosage.

The typical dosage of cilostazol is 100 mg twice daily, taken orally. Dosage adjustments may be necessary in patients with renal or hepatic impairment. Cilostazol should be taken on an empty stomach, 30 minutes before or 2 hours after meals, to optimize absorption.

Step 4: Side Effects.

The common side effects of cilostazol include:

1. Headache: A frequent side effect, especially during the initiation of treatment.
2. Diarrhea: This is another common side effect of cilostazol.
3. Palpitations or Tachycardia: Some patients may experience an increase in heart rate.
4. Peripheral edema: Swelling in the legs or feet can occur.
5. Dizziness: Light-headedness or dizziness may occur, particularly in older patients.

It is contraindicated in patients with congestive heart failure (CHF) due to the risk of exacerbating the condition.

Quick Tip

Cilostazol is effective for intermittent claudication but should be avoided in patients with heart failure due to its potential to worsen symptoms.

(10) (b) Rivaroxaban.

Solution:

Step 1: Mechanism of Action.

Rivaroxaban is an oral direct Factor Xa inhibitor. It works by binding to Factor Xa, a key enzyme in the coagulation cascade, and preventing its activation. This inhibition blocks the conversion of prothrombin to thrombin, which reduces thrombus (clot) formation. By inhibiting Factor Xa, rivaroxaban prevents both the intrinsic and extrinsic coagulation pathways, providing effective anticoagulation.

Step 2: Indications.

Rivaroxaban is used for various indications, including:

1. Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation

(AF).

2. Treatment and prevention of deep vein thrombosis (DVT) and pulmonary embolism (PE).
3. Prevention of venous thromboembolism (VTE) following hip or knee replacement surgery.
4. Secondary prevention of stroke in patients with a history of stroke or transient ischemic attack (TIA).

Step 3: Dosage.

The usual dosage of rivaroxaban varies based on the indication:

1. For non-valvular atrial fibrillation, the dose is typically 20 mg once daily, with food.
2. For DVT and PE treatment, the initial dose is usually 15 mg twice daily for the first 21 days, followed by 20 mg once daily.
3. For VTE prevention after surgery, the dose is typically 10 mg once daily.

Dosage adjustments are necessary for patients with renal impairment or hepatic dysfunction.

Step 4: Side Effects.

The common side effects of rivaroxaban include:

1. Bleeding: As with any anticoagulant, bleeding is the most significant risk, including major bleeding events like gastrointestinal or intracranial bleeding.
2. Anemia: Reduced red blood cell count due to bleeding or other causes.
3. Liver enzyme abnormalities: Elevated liver enzymes have been observed in some patients.
4. Gastrointestinal issues: Nausea, vomiting, or abdominal pain may occur.
5. Rash: A mild rash can occur in some patients.

Step 5: Conclusion.

Rivaroxaban is a highly effective anticoagulant with multiple indications, particularly in the prevention and treatment of thromboembolic events. Careful monitoring for bleeding and dose adjustments in patients with renal impairment are essential for safe use.

Quick Tip

Rivaroxaban is a convenient oral anticoagulant, but monitoring for bleeding risk is crucial, especially in patients with renal impairment.