NEET SS 2024 Diploma Anaesthesiology Paper2 Question Paper with Solutions

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

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 What is Total Intravenous Anaesthesia (TIVA)? Describe target-controlled infusion.

Correct Answer: Total Intravenous Anaesthesia (TIVA) involves the use of intravenous agents for both induction and maintenance of anaesthesia. Target-controlled infusion (TCI) is a method used to control the infusion of anaesthetics based on a predefined target concentration.

Solution:

Step 1: Understanding Total Intravenous Anaesthesia (TIVA).
TIVA is a technique of anaesthesia in which intravenous anaesthetic agents are used exclusively to induce and maintain anaesthesia, avoiding the need for inhaled volatile anaesthetics. This method provides an alternative for patients who may be sensitive to inhalation agents or in cases where maintaining a precise, controlled level of anaesthesia is essential. TIVA is commonly used in surgeries where the use of inhalation agents is contraindicated or where a more controlled and predictable anaesthetic profile is desired.

Step 2: Describing Target-Controlled Infusion (TCI).
Target-Controlled Infusion (TCI) is a method used to administer intravenous anaesthetics where the drug concentration in the blood is controlled by a computer system. The anaesthetist sets a target concentration for the drug, and a computer-controlled infusion pump adjusts the infusion rate to maintain this level in the bloodstream. TCI allows for precise control over the pharmacokinetics of the anaesthetic, providing a more consistent and stable anaesthetic depth, and minimizing the risk of overdose or underdose. The TCI system automatically adjusts the infusion rates based on real-time feedback from the patient's response.

Step 3: Conclusion.
The correct understanding of TIVA is that it uses only intravenous agents for anaesthesia, and the method of target-controlled infusion ensures that the drug concentration is controlled in a

precise and accurate manner to maintain a consistent depth of anaesthesia. TIVA, combined with TCI, allows for a safer, more controlled anaesthetic experience.

Quick Tip

Target-controlled infusion is an advanced method that allows for precise, real-time control over anaesthetic drug levels, optimizing patient safety and anaesthetic depth.

---

1. b) Enumerate the indications, advantages, and disadvantages of TIVA.

Correct Answer: Indications for TIVA include patients with a history of inhalation agent intolerance, those requiring a more controlled anaesthetic profile, and patients with contraindications for inhalation anaesthesia. The advantages of TIVA include reduced environmental pollution and the avoidance of inhaled agents. Disadvantages may include the need for continuous monitoring and potential issues with drug accumulation.

Solution:

Step 1: Understanding the Indications of TIVA.
Total Intravenous Anaesthesia (TIVA) is indicated for a variety of reasons: - Patients with inhalation agent intolerance: Some patients are allergic or have adverse reactions to inhaled anaesthetic agents, making TIVA a safer alternative. - Controlled anaesthesia profile: TIVA is ideal for situations where precise control over anaesthetic depth is required, as it allows for better titration of the anaesthetics. - Contraindications for inhalation anaesthesia: For example, patients with certain respiratory conditions may not tolerate inhaled agents, and TIVA provides an alternative.
Step 2: Advantages of TIVA.
The advantages of TIVA include: - Reduced environmental pollution: Since TIVA eliminates the need for volatile agents, it is more environmentally friendly. - Avoidance of inhaled agents: TIVA allows for complete intravenous administration, which is beneficial for patients who may have adverse reactions to volatile anaesthetics. - Fewer side effects: For some patients, TIVA may result in fewer side effects, such as nausea and vomiting, compared to traditional anaesthesia.
Step 3: Disadvantages of TIVA.
The disadvantages of TIVA include: - Need for continuous monitoring: Since TIVA uses intravenous agents, it is crucial to monitor the drug levels closely to avoid complications such as overdose or underdose. - Drug accumulation: Certain drugs used in TIVA may accumulate in the body, leading to prolonged effects after surgery, especially in patients with poor liver or kidney function. - Technical complexity: The use of TIVA requires precise calculations and monitoring, which can be more technically challenging compared to inhalation anaesthesia.
Step 4: Conclusion.
TIVA is a valuable anaesthesia technique with many advantages, such as reducing environmental pollution and offering a controlled anaesthesia profile. However, it also has some drawbacks,

including the need for continuous monitoring and the potential for drug accumulation. Understanding when to use TIVA and the associated risks is essential for safe anaesthesia practice.

Quick Tip

Always ensure continuous monitoring of intravenous drug concentrations during TIVA to avoid complications like overdose or prolonged anaesthesia.

---

2. a) Enumerate the objectives and measures for pre-operative optimization of a pheochromocytoma patient.

Correct Answer: The objectives for pre-operative optimization of a pheochromocytoma patient include controlling hypertension, managing volume status, and ensuring adequate alpha and beta blockade. The measures include the use of alpha-blockers, beta-blockers, and hydration therapy.

Solution:

Step 1: Controlling Hypertension.
Patients with pheochromocytoma typically present with hypertension due to excess catecholamine secretion. The first step in pre-operative management is controlling hypertension to reduce the risk of cardiovascular complications during surgery. Alpha-blockers such as phenoxybenzamine are used to control the vasoconstriction caused by excess catecholamines.

Step 2: Managing Volume Status.
Pheochromocytoma can lead to fluid and electrolyte imbalances, particularly hypovolemia. Pre-operative measures include ensuring the patient is adequately hydrated to counteract this. Fluid resuscitation helps in improving blood volume and preventing hypotension post-surgery.

Step 3: Alpha and Beta Blockade.
Alpha-blockers (e.g., phenoxybenzamine) should be started first to prevent a hypertensive crisis. Once adequate alpha blockade is achieved, beta-blockers (e.g., propranolol) are introduced to control tachycardia and arrhythmias. This combined blockade helps in stabilizing the patient before surgery.

Step 4: Conclusion.
The goal of pre-operative optimization for a pheochromocytoma patient is to reduce the risk of cardiovascular events during surgery. Effective hypertension management, hydration, and alpha-beta blockade are crucial to achieving this.

Quick Tip

Start alpha-blockers before beta-blockers to avoid unopposed alpha stimulation, which can worsen hypertension.

---

2. b) Describe anaesthetic technique for intra-operative management of pheochromocytoma.

Correct Answer: The anaesthetic technique for intra-operative management of pheochromocytoma includes general anaesthesia with careful monitoring of haemodynamics, ensuring alpha and beta blockade is maintained, and avoiding sudden catecholamine release during tumour manipulation.

Solution:

Step 1: General Anaesthesia.
General anaesthesia is typically used for pheochromocytoma surgery, with a focus on maintaining stable haemodynamics. The anaesthetist should be prepared for sudden fluctuations in blood pressure, particularly during tumour manipulation.

Step 2: Monitoring Haemodynamics.
Continuous monitoring of blood pressure, heart rate, and ECG is essential. The anaesthetist should be prepared to respond quickly to hypertensive episodes. This includes the use of short-acting antihypertensive medications such as nitroprusside to control sudden surges in blood pressure.

Step 3: Maintaining Alpha and Beta Blockade.
It is important to ensure that the patient remains on adequate alpha and beta blockade throughout the procedure. This prevents the release of catecholamines from the tumour during surgery, which could lead to a hypertensive crisis or arrhythmias.

Step 4: Tumour Manipulation.
During the tumour excision, care must be taken to avoid tumour manipulation before achieving adequate blockade. Sudden release of catecholamines can trigger a hypertensive crisis. The anaesthetist should also be ready to manage potential arrhythmias and sudden drops in blood pressure once the tumour is removed.

Step 5: Conclusion.
Intra-operative management of pheochromocytoma requires careful anaesthesia management to ensure stable haemodynamics, effective blockade, and minimization of catecholamine release. Close monitoring and appropriate pharmacological support are critical during the surgery.

Quick Tip

Maintain alpha and beta blockade throughout the surgery to prevent sudden catecholamine release during tumour manipulation.

---

3. a) Discuss the post-operative pain management modalities in a 58-year-old female with carcinoma right breast planned for modified radical mastectomy.

Correct Answer: Post-operative pain management for a patient undergoing modified radical mastectomy involves a combination of pharmacological and non-pharmacological modalities. These include opioid and non-opioid analgesics, regional anaesthesia techniques such as nerve blocks, and adjunctive therapies like NSAIDs and local anaesthetics.

Solution:

Step 1: Pain Assessment.
The first step in post-operative pain management is assessing the patient's pain level using a standardized pain scale. This helps determine the appropriate analgesia approach. A 58-year-old female undergoing modified radical mastectomy is likely to experience both somatic and visceral pain, necessitating a multi-modal pain management approach.

Step 2: Opioid and Non-Opioid Analgesia.
- Opioids: Drugs like morphine or fentanyl are commonly used for moderate to severe pain. These can be administered via patient-controlled analgesia (PCA) or IV infusion for consistent pain relief. - Non-opioid analgesics: NSAIDs like ibuprofen or paracetamol can be used for mild pain and as adjuncts to reduce opioid consumption and minimize side effects such as nausea and sedation.

Step 3: Regional Anaesthesia.
Regional anaesthesia, particularly a thoracic paravertebral block or epidural analgesia, can be very effective in managing pain following a modified radical mastectomy. These blocks provide excellent pain relief, especially in the first 24-48 hours post-surgery, and help reduce opioid use.

Step 4: Adjunctive Therapies.
- Local anaesthetics: Injecting local anaesthetics at the surgical site can help manage pain during the early post-operative period. - Gabapentinoids: Medications like gabapentin can be used for neuropathic pain management, especially if nerve injury occurs during surgery. - Cryotherapy: Applying cold packs to the surgical site can help reduce pain and swelling.

Step 5: Conclusion.
Post-operative pain management in breast cancer surgery involves a combination of opioids, non-opioids, regional anaesthesia, and adjunctive therapies. The goal is to provide adequate

pain relief while minimizing side effects, allowing the patient to recover as comfortably as possible.

Quick Tip

Use a multi-modal approach to pain management, combining opioids, non-opioids, regional blocks, and adjuncts to improve patient comfort and reduce opioid-related side effects.

---

3. b) Post-spinal shivering.

Correct Answer: Post-spinal shivering is a common occurrence following spinal anaesthesia, typically due to thermoregulatory dysfunction and hypothermia. Management includes warming measures, administration of shivering suppressants, and fluid administration to restore normal thermoregulation.

Solution:

Step 1: Understanding Post-Spinal Shivering.
Shivering after spinal anaesthesia is commonly caused by a temperature drop, particularly as the sympathetic blockade induces vasodilation, leading to heat loss. This results in a mismatch between the body's temperature and the hypothalamic set point, triggering shivering as the body's attempt to generate heat.

Step 2: Causes of Post-Spinal Shivering.
- Hypothermia: Often induced by the cool operating room environment, the low ambient temperature exacerbates the thermoregulatory response. - Sympathetic Blockade: Spinal anaesthesia can block sympathetic nervous system activity, reducing the body's ability to conserve heat by causing vasodilation in the peripheral vasculature.

Step 3: Management of Post-Spinal Shivering.
- Warming Measures: These include covering the patient with warm blankets, using forced air warming systems, or heating intravenous fluids to prevent further heat loss. - Shivering Suppressants: Medications such as clonidine, dextromethorphan, or meperidine (a pethidine) can be used to suppress shivering. - Fluid Administration: IV fluids at body temperature can help re-establish normal thermoregulation and prevent further heat loss.

Step 4: Conclusion.
Post-spinal shivering is typically self-limiting but can cause patient discomfort. Appropriate management involves warming the patient, suppressing shivering pharmacologically, and preventing further heat loss. Monitoring and addressing these factors can help ensure a comfortable post-operative recovery.

Quick Tip

Warming measures and pharmacological suppression of shivering are essential to manage post-spinal shivering effectively.

---

4. a) What are the techniques for controlled hypotensive anaesthesia?

Correct Answer: The techniques for controlled hypotensive anaesthesia include the use of vasodilators, manipulation of anaesthetic agents, and controlled blood loss techniques. Medications like nitroglycerin, sodium nitroprusside, and beta-blockers are commonly used.

Solution:

Step 1: Vasodilator Use.
Controlled hypotension can be achieved through the administration of vasodilators that cause systemic vasodilation. Commonly used agents include: - Nitroglycerin: A potent vasodilator that reduces both preload and afterload. - Sodium nitroprusside: An intravenous vasodilator that directly affects both arterial and venous smooth muscle to reduce blood pressure. These agents are titrated to achieve the desired blood pressure reduction while maintaining perfusion to critical organs.
Step 2: Manipulation of Anaesthetic Agents.
General anaesthetic agents such as volatile anaesthetics (e.g., sevoflurane, desflurane) can cause vasodilation. The depth of anaesthesia is adjusted to increase the effect of the vasodilators and maintain the target hypotensive state.
Step 3: Controlled Blood Loss.
In some surgeries, controlled blood loss techniques are employed to minimize the risk of bleeding and maintain a low blood pressure. This can be particularly useful in surgeries requiring minimal bleeding, such as in neurosurgery or ophthalmic surgeries.
Step 4: Conclusion.
Controlled hypotensive anaesthesia is a technique used to reduce intraoperative bleeding and improve surgical visibility. The use of vasodilators, manipulation of anaesthetic depth, and controlled blood loss are all effective strategies to achieve this goal.

Quick Tip

Always monitor organ perfusion during controlled hypotension to prevent ischemic damage to vital organs.

---

4. b) Indications, contraindications, and complications of controlled hypotensive anaesthesia.

Correct Answer: Indications for controlled hypotensive anaesthesia include surgeries with a high risk of blood loss, such as neurosurgery or orthopedic surgery. Contraindications include patients with coronary artery disease or severe hypovolemia. Complications include inadequate organ perfusion, arrhythmias, and post-operative hypotension.

Solution:

Step 1: Indications.
Controlled hypotensive anaesthesia is indicated in surgeries where minimizing blood loss is crucial. These include: - Neurosurgery: To reduce bleeding in the brain and improve visibility. - Orthopedic surgeries: Particularly those involving large joints, where reducing bleeding is vital for a clean operative field. - Ophthalmic surgeries: Reducing bleeding in delicate eye surgeries improves surgical precision. - Spinal surgeries: Helps control bleeding in the spinal cord area.
Step 2: Contraindications.
Controlled hypotensive anaesthesia is contraindicated in certain patients, including: - Coronary artery disease (CAD): Lowering blood pressure in these patients can compromise coronary perfusion, increasing the risk of myocardial infarction. - Hypovolemia: Patients with low circulating blood volume are at risk of inadequate organ perfusion, leading to shock or multi-organ failure. - Severe hypertension: In these cases, further lowering of blood pressure can lead to ischemic damage to vital organs.
Step 3: Complications.
The main complications associated with controlled hypotensive anaesthesia include: - Inadequate organ perfusion: Reducing blood pressure too much can impair the blood flow to critical organs, including the kidneys, liver, and brain. - Arrhythmias: Sudden drops in blood pressure can lead to electrolyte imbalances, increasing the risk of arrhythmias. - Post-operative hypotension: Some patients may experience prolonged hypotension after the procedure, leading to delayed recovery or other complications such as dizziness or fainting.
Step 4: Conclusion.
Controlled hypotensive anaesthesia is a valuable technique to reduce intraoperative bleeding, but it must be used carefully with consideration of the patient's cardiovascular status and the risks of complications such as inadequate perfusion or arrhythmias.

Quick Tip

Ensure close monitoring of blood pressure and organ perfusion to prevent complications during controlled hypotensive anaesthesia.

---

5. A 3-year-old child presents with respiratory distress and the child is planned for emergency bronchoscopic removal of foreign body in the right main bronchus. Discuss the anaesthetic concerns, technique of anaesthetizing this patient and possible complications.

Correct Answer: The anaesthetic concerns in a 3-year-old child for foreign body removal include airway management, maintaining ventilation, and managing possible aspiration or hypoxia. The technique should involve careful monitoring and the use of inhalation anaesthesia, with possible use of muscle relaxants. Complications include hypoxia, aspiration, and trauma to the airway.

Solution:

Step 1: Anaesthetic Concerns.
In a 3-year-old child undergoing emergency bronchoscopic removal of a foreign body, the primary concerns include: - Airway management: The child may have partial or complete airway obstruction due to the foreign body. Intubation with a suitable-sized endotracheal tube should be planned. In some cases, a rigid bronchoscope may be used to directly visualize and remove the foreign body. - Maintaining ventilation: Due to the compromised airway, maintaining adequate ventilation is crucial. The child may need to be managed with positive pressure ventilation or assisted ventilation if they cannot maintain spontaneous breathing. - Aspiration and hypoxia: Aspiration of secretions or the foreign body itself may occur during the procedure. Additionally, hypoxia may develop if ventilation is not adequately maintained or if there is obstruction. The use of supplemental oxygen is essential throughout the procedure.
Step 2: Technique of Anaesthetizing the Patient.
The technique for anaesthetizing a child for bronchoscopy involves: - Premedication: Sedation should be provided pre-operatively using agents like midazolam or oral sedatives to calm the child. This will help alleviate anxiety and ease the process of securing the airway. - Induction of anaesthesia: Anaesthesia can be induced using inhalational agents such as sevoflurane or isoflurane via face mask, which is often preferable in children for ease of administration. Alternatively, intravenous induction with propofol may be used if the intravenous access is established. - Airway management: Following induction, a size-appropriate endotracheal tube should be inserted to secure the airway. A rigid bronchoscope can be introduced if needed to remove the foreign body. Monitoring should include continuous pulse oximetry and capnography to ensure adequate oxygenation and ventilation. - Muscle relaxation: Muscle relaxants such as succinylcholine may be required to facilitate intubation and the bronchoscopy procedure.
Step 3: Complications.
The potential complications include: - Hypoxia: Prolonged ventilation difficulties, or an obstructed airway, may lead to hypoxia. This is a major concern in paediatric patients. Adequate monitoring and rapid intervention are critical. - Aspiration: The child may aspirate secretions or food particles during the procedure, potentially leading to aspiration pneumonia. Prevention can be done through suctioning and ensuring airway protection during the bronchoscopy. - Trauma to the airway: Inserting the bronchoscope or endotracheal tube can cause trauma to the airway, including laryngospasm or bronchospasm. Close monitoring and proper technique are crucial to minimize this risk. - Airway obstruction: During removal of the foreign body, accidental displacement or movement of the foreign object can cause sudden complete obstruction, requiring immediate action.
Step 4: Conclusion.
Anesthesia for foreign body removal in a 3-year-old requires careful planning, especially in managing the airway and ventilation. Adequate preoperative sedation, secure intubation, and constant monitoring for complications like hypoxia and aspiration are essential for a safe pro-

cedure.

Quick Tip

Always ensure that the child is adequately premedicated to reduce anxiety, and secure the airway before proceeding with bronchoscopic foreign body removal.

---

6. a) Methods to prevent haemodynamic response to laryngoscopy and intubation.

Correct Answer: Methods to prevent haemodynamic responses to laryngoscopy and intubation include the use of lidocaine, adequate anaesthetic depth, vasodilators, and beta-blockers. Additionally, the use of smooth intubation techniques, as well as appropriate pre-oxygenation, can help minimize these responses.

Solution:

Step 1: Anaesthetic Depth.
Ensuring adequate anaesthetic depth during laryngoscopy and intubation is crucial to preventing a haemodynamic response. If the patient is too lightly anaesthetized, intubation and laryngoscopy can cause a significant increase in sympathetic tone, leading to increased heart rate and blood pressure. A deeper plane of anaesthesia with agents like propofol or sevoflurane can help reduce this response.

Step 2: Use of Lidocaine.
Lidocaine is a local anaesthetic that can be used topically or intravenously to reduce the haemodynamic response. It works by stabilizing the cell membrane and preventing the propagation of action potentials in nerve fibers, which can reduce the reflexive increase in heart rate and blood pressure during intubation. Lidocaine can be sprayed onto the vocal cords or given intravenously prior to intubation.

Step 3: Vasodilators and Beta-Blockers.
- Vasodilators: Medications like nitroglycerin or sodium nitroprusside can be used to reduce blood pressure and prevent a hypertensive response. These should be used carefully, as they can also affect perfusion. - Beta-blockers: Beta-blockers such as esmolol or metoprolol can be used to block the sympathetic response, reducing heart rate and blood pressure. These are particularly useful for patients with known cardiovascular risk factors.

Step 4: Smooth Intubation Technique.
Using a smooth and gentle technique during intubation can minimize the stress response. Rapid or forceful intubation increases the likelihood of a haemodynamic response. Using the correct size endotracheal tube, as well as an appropriate technique for intubation, can reduce the stimulation of the larynx and minimize the haemodynamic response.

Step 5: Conclusion.
The goal is to minimize the sympathetic response that occurs during laryngoscopy and intubation by ensuring adequate anaesthetic depth, using appropriate pharmacological agents like lidocaine, vasodilators, and beta-blockers, and employing smooth intubation techniques. This helps ensure stable haemodynamics during the procedure.

Quick Tip

Ensure deep anaesthesia and pre-treatment with lidocaine to minimize the haemodynamic response to laryngoscopy and intubation.

---

6. b) Atrial fibrillation - types and management.

Correct Answer: Atrial fibrillation can be classified into paroxysmal, persistent, and permanent types. Management includes rate control with beta-blockers or calcium channel blockers, rhythm control with antiarrhythmic drugs, and anticoagulation to prevent thromboembolism. In some cases, electrical cardioversion may be required.

Solution:

Step 1: Types of Atrial Fibrillation.
Atrial fibrillation (AF) is classified into three types based on the duration and frequency of episodes: - Paroxysmal AF: Episodes of AF that last less than 7 days and resolve spontaneously. This is the most common type and often occurs in patients with underlying heart disease. - Persistent AF: AF that lasts longer than 7 days and does not resolve spontaneously. It requires medical intervention to restore sinus rhythm. - Permanent AF: Long-term, continuous AF that is not reversible and where rate control becomes the main treatment focus.

Step 2: Management of Atrial Fibrillation.
The management of AF involves three main goals: rate control, rhythm control, and prevention of thromboembolism. - Rate control: Medications like beta-blockers (e.g., metoprolol) or calcium channel blockers (e.g., diltiazem) are used to slow the ventricular response and maintain a normal heart rate. - Rhythm control: This involves attempts to restore normal sinus rhythm. Antiarrhythmic drugs such as amiodarone or flecainide are used for pharmacological cardioversion. Electrical cardioversion may be performed in cases of persistent AF where pharmacological methods fail. - Anticoagulation: To prevent stroke and thromboembolism, anticoagulation is critical. Warfarin or newer agents like dabigatran, rivaroxaban, or apixaban are commonly used to prevent clot formation in the atria. The decision for anticoagulation therapy depends on the CHA2DS2-VASc score, which assesses the patient's stroke risk.

Step 3: Conclusion.
Atrial fibrillation is a common arrhythmia that requires a tailored treatment plan depending on the type of AF. Effective management involves controlling the heart rate, attempting to

restore normal sinus rhythm, and preventing complications like stroke through anticoagulation therapy.

Quick Tip

Rate control is often the initial management strategy, but rhythm control or anticoagulation may be needed depending on the patient's condition.

---

7. a) What is blood component therapy? Describe via a flow chart how different blood components are obtained from whole blood.

Correct Answer: Blood component therapy involves separating whole blood into its components, allowing for targeted therapy. Blood components obtained from whole blood include red blood cells, plasma, platelets, and cryoprecipitate. The separation process involves blood collection, centrifugation, and isolation of components.

Solution:

Step 1: Blood Component Therapy Definition.
Blood component therapy refers to the practice of separating whole blood into its components for targeted treatment. This allows healthcare providers to administer only the necessary components for specific medical conditions, thereby improving patient outcomes and reducing the risk of transfusion-related complications.
Step 2: Flow Chart for Obtaining Blood Components.

$$\text{Whole Blood Collection} \longrightarrow \text{Centrifugation} \longrightarrow \text{Separation into Components}$$

- Red Blood Cells (RBCs): These are separated by removing the plasma and platelets. RBCs are transfused for patients with anemia or blood loss. - Platelets: After centrifugation, platelets are isolated from the plasma and used for patients with thrombocytopenia or bleeding disorders. - Plasma: The supernatant after centrifugation contains plasma, which is rich in clotting factors and can be transfused for conditions such as bleeding or clotting disorders. - Cryoprecipitate: The remaining component after plasma is frozen and thawed contains fibrinogen, factor VIII, and von Willebrand factor. It is used for patients with bleeding disorders.

Quick Tip

Centrifugation is key to separating blood into its components for targeted therapy, allowing for more efficient and specific treatment.

---

7. b) How are platelets stored? Enumerate indications and complications of platelet transfusion.

Correct Answer: Platelets are stored at room temperature with gentle agitation. Indications for platelet transfusion include thrombocytopenia, bleeding disorders, or platelet dysfunction. Complications include allergic reactions, fever, transfusion-related lung injury (TRALI), and bacterial contamination.

Solution:

Step 1: Storage of Platelets.
Platelets are stored at room temperature (20–24°C) with gentle agitation to prevent clumping. Unlike red blood cells, which are stored in refrigerators, platelets are stored at room temperature due to their sensitivity to cold. They should be used within 5 days of collection to ensure their effectiveness in transfusion.
Step 2: Indications for Platelet Transfusion.
Platelet transfusion is indicated in the following cases: - Thrombocytopenia: Platelet counts less than 50,000/L in patients at risk of bleeding or less than 10,000/L in non-bleeding patients. - Bleeding Disorders: In conditions like leukemia, myelodysplastic syndromes, or after chemotherapy. - Platelet Dysfunction: Conditions like Bernard-Soulier syndrome, where platelets do not function properly despite a normal platelet count.
Step 3: Complications of Platelet Transfusion.
The complications associated with platelet transfusion include: - Allergic Reactions: Mild reactions like rashes or severe reactions like anaphylaxis can occur. - Febrile Reactions: The transfusion may cause fever, particularly in patients with prior platelet transfusions. - Transfusion-Related Acute Lung Injury (TRALI): A rare but serious complication characterized by acute respiratory distress. - Bacterial Contamination: Platelets, stored at room temperature, are susceptible to bacterial growth, leading to potential infection.
Step 4: Conclusion.
Platelets are stored at room temperature with gentle agitation and must be used within 5 days of collection. Platelet transfusion is used for thrombocytopenia, bleeding disorders, or dysfunctional platelets, but complications such as allergic reactions, TRALI, and bacterial contamination must be closely monitored.

Quick Tip

Monitor platelet transfusion patients closely for allergic reactions, fever, and signs of TRALI, especially in those with previous transfusions.

---

8. a) Compare and contrast Ropivacaine and Bupivacaine.

Correct Answer: Ropivacaine and Bupivacaine are both amide local anaesthetics used for regional anaesthesia. While they share similar mechanisms of action, Ropivacaine has a lower

cardiotoxicity and is less potent than Bupivacaine. Ropivacaine is also less lipophilic and has a lower tendency to cause motor block.

Solution:

Step 1: Mechanism of Action.
Both Ropivacaine and Bupivacaine are amide local anaesthetics that work by inhibiting sodium ion influx through voltage-gated sodium channels, thereby preventing nerve depolarization and conduction. This results in reversible anaesthesia in the area of administration.
Step 2: Potency and Duration of Action.
- Bupivacaine: It is more potent than Ropivacaine, providing longer-lasting anaesthesia. Its duration of action makes it ideal for longer surgical procedures. - Ropivacaine: Less potent than Bupivacaine, leading to shorter duration of anaesthesia. It is often used when a shorter anaesthetic effect is needed, such as in labour analgesia.
Step 3: Cardiovascular and Toxicity Profile.
- Bupivacaine: Known for its higher cardiotoxicity, especially at higher doses. It can cause arrhythmias, hypotension, and cardiac arrest in the event of accidental intravascular injection. - Ropivacaine: Has a safer cardiovascular profile compared to Bupivacaine, with lower cardiotoxicity. It is preferred in high-risk patients due to its reduced risk of causing life-threatening cardiac arrhythmias.
Step 4: Motor Block and Sensory Block.
- Bupivacaine: More likely to cause motor block, which is desirable for certain surgical procedures where motor relaxation is needed. - Ropivacaine: Less likely to cause motor block and is often preferred when sensory block with minimal motor impairment is required, such as during epidural anaesthesia in labour.
Step 5: Conclusion.
Ropivacaine and Bupivacaine both have their specific indications based on their pharmacological properties. Bupivacaine is more potent and longer-lasting but carries a higher risk of cardiotoxicity, while Ropivacaine offers a safer alternative, especially in high-risk patients or when less motor blockade is desired.

Quick Tip

Choose Ropivacaine over Bupivacaine in patients with a higher risk of cardiovascular issues, as Ropivacaine has a lower cardiotoxicity.

---

8. b) Discuss the anaesthetic implications of autonomic neuropathy.

Correct Answer: Autonomic neuropathy affects the autonomic nervous system, leading to impaired responses to haemodynamic changes. Anaesthetic implications include difficulty in maintaining blood pressure, altered heart rate control, impaired thermoregulation, and increased risk of aspiration. Management requires careful monitoring and the use of drugs that

minimize fluctuations in blood pressure.

Solution:

Step 1: Pathophysiology of Autonomic Neuropathy.
Autonomic neuropathy results in damage to the autonomic nerves, which regulate involuntary functions such as heart rate, blood pressure, digestion, and thermoregulation. The condition can result from chronic diseases such as diabetes mellitus, autoimmune disorders, or other systemic conditions that affect the peripheral nervous system.
Step 2: Anaesthetic Implications.
- Haemodynamic Instability: Patients with autonomic neuropathy may have difficulty compensating for changes in blood pressure, particularly in response to anaesthesia or surgical stress. This can lead to hypotension or difficulty maintaining an adequate blood pressure during surgery. - Altered Heart Rate Control: The inability to regulate heart rate properly may result in tachycardia or bradycardia, especially during anaesthesia induction or surgical stimulation. Drugs that influence autonomic tone, such as atropine or beta-blockers, may be required. - Impaired Thermoregulation: These patients may have difficulty regulating body temperature, leading to either hypothermia or hyperthermia during surgery. Careful temperature monitoring and warming/cooling measures are essential. - Risk of Aspiration: Autonomic neuropathy can lead to impaired gastric motility and reduced sphincter tone, increasing the risk of gastroesophageal reflux and aspiration during anaesthesia. Careful airway management and the use of prokinetic agents may be necessary.
Step 3: Anaesthetic Management.
- Preoperative Optimization: Ensure optimal glucose control (in diabetic patients), fluid balance, and preoperative evaluation of cardiovascular status. - Intraoperative Monitoring: Monitor heart rate, blood pressure, and temperature closely. The use of invasive monitoring, such as an arterial line, may be beneficial for real-time blood pressure management. - Anaesthetic Drugs: Select anaesthetic agents that are less likely to cause dramatic haemodynamic fluctuations. The use of regional anaesthesia may be advantageous in some cases to avoid general anaesthesia-induced cardiovascular instability. - Postoperative Care: Monitor for signs of hypotension, arrhythmias, or temperature instability postoperatively. Provide appropriate fluids, temperature control, and blood pressure support as needed.
Step 4: Conclusion.
Anaesthetizing a patient with autonomic neuropathy requires careful monitoring and management of haemodynamic parameters, heart rate, and body temperature. The anaesthetist should anticipate complications such as hypotension, arrhythmias, and impaired thermoregulation and adjust anaesthetic techniques accordingly.

Quick Tip

Preoperative optimization and careful monitoring of cardiovascular and thermoregulatory status are crucial in patients with autonomic neuropathy.

9. A 48-year-old patient known case of chronic kidney disease on hemodialysis, is posted for percutaneous nephrolithotomy (PCNL). Discuss the anaesthetic concerns and technique for conduct of anaesthesia for this patient, with rationale.

Correct Answer: Anaesthetic concerns in patients with chronic kidney disease on hemodialysis include fluid and electrolyte imbalances, altered drug pharmacokinetics, and the risk of bleeding. The technique involves careful monitoring of renal function, adjusting the use of anaesthetic agents, and coordinating with the nephrology team for dialysis timing.

Solution:

Step 1: Anaesthetic Concerns.
In a patient with chronic kidney disease (CKD) undergoing PCNL, the following concerns should be addressed: - Fluid and Electrolyte Imbalance: Hemodialysis patients often have altered fluid and electrolyte status. Preoperative assessment should include checking serum electrolytes, particularly potassium, as hyperkalemia is a life-threatening risk. Fluid resuscitation should be performed carefully, and intraoperative fluid management should be monitored closely to avoid overload. - Renal Function: Anesthesia drugs are metabolized differently in CKD patients, so drugs should be carefully selected, considering their renal clearance. Drugs like propofol, fentanyl, and remifentanil are preferred because they are less reliant on renal excretion. - Anemia: Chronic kidney disease often leads to anemia due to reduced erythropoietin production. Preoperative hemoglobin levels should be monitored, and blood transfusions may be necessary in cases of significant anemia. - Bleeding Risk: CKD patients on hemodialysis may have an increased risk of bleeding due to platelet dysfunction. Preoperative evaluation of coagulation status is essential, and adjustments may be needed in anticoagulant management.
Step 2: Anaesthesia Technique.
The anaesthesia technique should be tailored to the patient's condition. The following steps outline an appropriate approach: - Preoperative Preparation: - Dialysis Timing: If possible, dialysis should be performed the day before surgery to correct fluid and electrolyte imbalances and remove excess uremic toxins. - Premedication: Premedication with benzodiazepines (e.g., midazolam) may help reduce anxiety and ease induction. - Induction of Anaesthesia: - Inhalation Agents: Sevoflurane or isoflurane are typically used for induction and maintenance, as they are less dependent on renal clearance. - Intravenous Agents: Propofol or etomidate can be used for induction. However, caution should be taken in patients with severe renal impairment as the metabolism of propofol can be affected in the setting of liver dysfunction, though it has minimal renal clearance. - Airway Management: General anaesthesia is preferred, and an endotracheal tube should be used to secure the airway. - Intraoperative Monitoring: Careful monitoring of blood pressure, heart rate, oxygen saturation, and ECG is essential. If there are concerns about fluid status, central venous pressure (CVP) monitoring may be useful. - Pain Management: Opioids like fentanyl or remifentanil should be used cautiously due to their renal clearance. Regional anaesthesia (e.g., epidural or spinal) may be beneficial for pain control, though the use of local anaesthetics should be adjusted for renal function. - Postoperative Care: Close monitoring in the recovery room is necessary, especially for respiratory function and fluid balance. If there is significant blood loss or fluid retention, additional dialysis may be needed.
Step 3: Conclusion.
The anaesthetic management of a patient with chronic kidney disease on hemodialysis for PCNL

requires careful consideration of fluid and electrolyte balance, renal function, and bleeding risk. Tailoring the anaesthesia technique to the patient's condition, involving the nephrology team for coordination of dialysis timing, and careful intraoperative monitoring will help ensure a successful outcome.

Quick Tip

Coordinate with the nephrology team to ensure proper dialysis timing and avoid intraoperative fluid overload in hemodialysis patients.

---

10. a) Possible causes of airway obstruction following thyroid surgery and management.

Correct Answer: Airway obstruction following thyroid surgery can be caused by bleeding, edema, hematoma formation, or laryngeal nerve injury. Management involves securing the airway, controlling bleeding, providing analgesia, and monitoring for complications. In some cases, reintubation or surgical intervention may be necessary.

Solution:

Step 1: Causes of Airway Obstruction.
- Bleeding: Postoperative bleeding can lead to hematoma formation around the trachea, which can compress the airway and lead to obstruction. - Edema: Swelling of the tissues in the neck and surrounding areas after surgery can compress the airway, particularly in the first few hours after the procedure. - Hematoma Formation: A blood clot that forms around the surgical site can compress the trachea or larynx, leading to obstruction. - Laryngeal Nerve Injury: Injury to the recurrent laryngeal nerve during thyroid surgery can lead to hoarseness, stridor, and airway obstruction due to vocal cord paralysis.
Step 2: Management.
- Securing the Airway: If obstruction is noted, the airway should be immediately secured using endotracheal intubation or a tracheostomy if necessary. - Control of Bleeding: Hemostasis should be achieved by either surgical revision or draining the hematoma. - Steroids and Antihistamines: If edema is the cause of obstruction, steroids or antihistamines may be administered to reduce the swelling. - Observation: Close monitoring in a recovery room with continuous pulse oximetry and airway assessment is essential. - Reintubation: If the patient develops respiratory distress or is unable to maintain their airway, reintubation may be required.
Step 3: Conclusion.
Post-thyroidectomy airway obstruction is a serious complication and must be managed quickly. Immediate intervention may be required to ensure airway patency and patient safety.

Quick Tip

Always be vigilant for signs of airway obstruction, especially in the first 24 hours after thyroid surgery. Early detection and intervention can prevent life-threatening complications.

---

10. b) Discuss the anaesthesia technique for modified electro-convulsive therapy (ECT).

Correct Answer: The anaesthesia technique for ECT includes the use of general anaesthesia with a short-acting intravenous agent, such as propofol, and muscle relaxation with succinylcholine to minimize patient movement and prevent injury during the procedure. Monitoring includes continuous oxygen saturation and blood pressure measurement.

Solution:

Step 1: Induction of Anaesthesia.
The patient should be placed on a comfortable position with proper oxygenation. Anaesthesia is induced with a short-acting intravenous agent like propofol, which provides a rapid onset and short duration of action. The goal is to induce unconsciousness without significant cardiovascular depression.
Step 2: Muscle Relaxation.
To minimize the risk of fractures and musculoskeletal injury during the seizure induced by ECT, muscle relaxation is essential. Succinylcholine is the drug of choice, as it provides rapid muscle relaxation and short duration. It helps to prevent muscle contractions during the procedure, reducing the risk of injury.
Step 3: Airway Management.
Adequate airway management is critical to ensure oxygenation throughout the procedure. This can be achieved through intubation or the use of a laryngeal mask airway (LMA). During the seizure, it is important to maintain an open airway to prevent aspiration or respiratory complications.
Step 4: Monitoring.
- Oxygenation and Ventilation: Continuous monitoring of oxygen saturation (SpO2) using pulse oximetry is essential. - Blood Pressure and ECG: Blood pressure and ECG should be continuously monitored throughout the procedure to detect any significant changes in cardiovascular status.
Step 5: Recovery and Postoperative Care.
After the procedure, the patient should be allowed to recover from anaesthesia in a monitored environment. Post-operative monitoring should include assessing airway patency, oxygenation, and recovery from muscle relaxation. Patients often experience post-ictal confusion or disorientation.
Step 6: Conclusion.
The anaesthesia technique for ECT involves the use of short-acting intravenous agents like

propofol for induction, succinylcholine for muscle relaxation, and careful monitoring of airway and cardiovascular status throughout the procedure. This ensures patient safety and minimizes the risk of complications during ECT.

Quick Tip

Always ensure muscle relaxation during ECT to prevent injury from the induced seizure and to protect the patient from aspiration.
