

PREP XI RR

STUDY NOTES

ANAESTHESIA

3

VIDEOS

37

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PREMIUM STUDY MATERIAL

PREP XI RR

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1. ANESTHESIA PART -1

BIG QUESTION 1: Define anesthesia and trace its historical milestones, highlighting key figures. Describe the different techniques of anesthesia, explaining the purpose and application of each, and how they differ from one another.

Broad Answer:

- Anesthesia means "no sensation."
- The history of modern anesthesia dates back to **October 16, 1846**, when **WTG Morton**, considered the "Father of Modern Anesthesia," gave the first public demonstration of **Ether anesthesia**.
- Other key figures include **August Bier**, the "Father of spinal anesthesia," and **Horace Wells**, who gave the first clinical demonstration of **N2O anesthesia**.
- The main techniques of anesthesia include **local, spinal, epidural, nerve block, and general anesthesia**.

DETAILED QUESTIONS

Q1.1: Describe the purpose and application of a nerve block.

Answer:

- Nerve block anesthesia involves the injection of a local anesthetic near a specific nerve or nerve plexus to block sensation from a particular region of the body.
- It provides targeted pain relief and is commonly used for surgical, diagnostic, and therapeutic procedures.

Q1.2: Describe the purpose and application of epidural anesthesia.

Answer: Epidural anesthesia is used for long-duration surgeries below umbilical, for pain relief or for surgeries above the umbilicus.

Q1.3: Describe the purpose and application of spinal anesthesia.

Answer: Spinal anesthesia is used for short-duration surgeries below the umbilicus

Q1.4: Describe the purpose and application of local anesthesia.

Answer: o numbs a small, specific area, such as in a root canal procedure.

Q1.5: How does general anesthesia differ from the other types of anesthesia?

Answer: General anesthesia is a state where the patient is completely unconscious, which is different from the other types, where the patient remains conscious and only a specific area of the body is affected.

BIG QUESTION 2: Discuss the pre-anaesthetic check-up (PAC), including its essential components and their clinical significance.

Broad Answer:

- **The Pre-anesthetic check-up (PAC)** is a crucial step before any anesthetic procedure, focusing on four key areas:
 - o Airway assessment

- o Fasting status
- o Hemoglobin levels
- o History of comorbidities.
- After PAC, patients are assigned an **ASA physical status class**.

DETAILED QUESTIONS

Q2.1: What are the four important things to look at during a pre-anaesthetic check-up (PAC)?

Answer: The four important things are airway assessment, hemoglobin (Hb) levels, fasting status, and a history of comorbidities.

Q2.2: What is the most important step in PAC, and why?

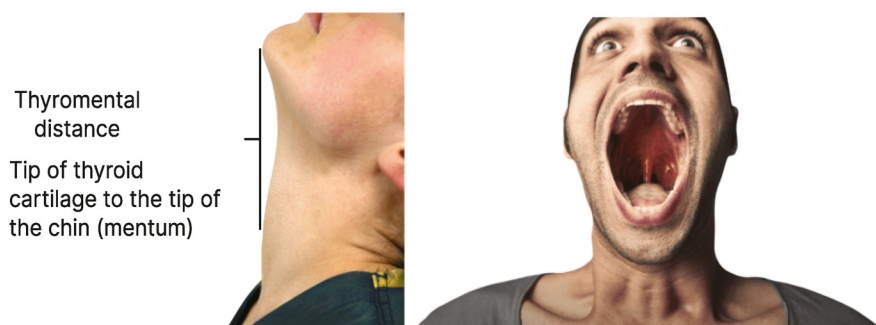
Answer:

- **Airway assessment** is the most important step.
- A thorough assessment prevents many anesthesia-related deaths, as a common cause of death during anesthesia is the failure to intubate or secure the airway.
- Tell the patient to open the mouth. As he opens the mouth (look for 2 parameters). As he lifts the chin (look for 2 parameters)

Q2.3: What are the parameters assessed during an airway examination?

Answer:

- The four parameters are:
 - o Mallampati classification, interincisor distance, thyromental distance, and sternomental distance.



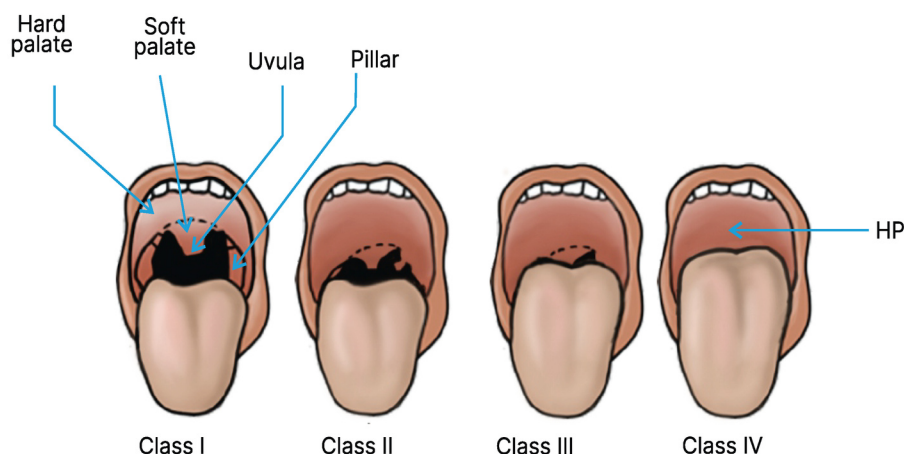
Q2.4: Describe the Mallampati classification system.

Answer:

- Ask the Patient to Open the Mouth
- Observe the oral cavity with the patient sitting upright, head in neutral position, mouth wide open, and tongue protruded (without phonation).
- If all anatomical structures are visible (soft palate, uvula, tonsillar pillars), this indicates:
 - o Adequate oral space for instrumentation.
 - o Ease in inserting and maneuvering a laryngoscope.
 - o Likely easy visualization of the glottis for intubation.

• Visual classification of the structures - Mallampati classification

PYQ: FMGE 2021



Class	Visible Structures	Clinical Significance
Class 0	Hard palate, soft palate, epiglottis	easiest intubation
Class I	Hard palate, soft palate, entire uvula, tonsillar pillars	Adequate visibility; easy intubation
Class II	Hard palate, soft palate, part of uvula; tonsillar pillars partially visible. Tip of Uvula not visible.	Slightly reduced visibility; usually easy intubation
Class III	Hard palate, soft palate only (base of uvula may be seen)	Difficulty in intubation
Class IV	Only hard palate visible	Difficult intubation; minimal airway space

Q2.5: What is the normal interincisor distance, and what does a low distance signify?

Answer:

- The normal interincisor distance is **4-5 cm**.
- A distance of **less than 3 cm** suggests difficult intubation, and the best way to secure the airway may be a tracheostomy.



Q2.6: What are the normal values for thyromental and sternomental distances?

Answer:

- The normal **thyromental distance** is **>6.5 cm**.
- The normal **sternomental distance** is **>12.5 cm**, which is roughly double the thyromental distance.

Q2.7: What are the fasting guidelines for adults and children?

Answer:

- **Adults:** Solid food: 8 hours; semi-solid food: **6 hours**; liquid: **2 hours**.
- **Children:** Liquid water: **2 hours**; mother's milk: **4 hours**; formula feed: **6 hours**.

Q2.8: Which medications can generally be continued before surgery, and which should be stopped?**Answer:**

- Most "A" medications like anti-anginal drugs, anti-epileptic medications, anti-thyroid, and anti-lipidemic drugs can be continued.
 - Aspirin 75mg can also be continued unless the patient is undergoing neurosurgery or retinal surgery.
- Stopped (Mnemonic: HOT MLC Women):
 - Heparin (6 hrs)
 - Herbal medications (6 weeks)
 - Oral hypoglycemic drugs (day of surgery)
 - OC pills (3-4 weeks)
 - TCA (3 weeks)
 - Ticlopidine (14 days)
 - MAOI (3-4 weeks)
 - Lithium (24-48 hrs)
 - Clopidogrel (8 days)
 - Warfarin (3-5 days).

Q2.9: What is the American Society of Anesthesiology (ASA) physical status classification system?**Answer:**

- The ASA classification is a system to certify a patient's health status before anesthesia:

 PYQ: INICET 2021

ASA Class	Definition	Example
ASA I	A normal healthy patient with no systemic disease	No comorbidities, non-smoker, fit individual
ASA II	A patient with mild systemic disease, well-controlled	Controlled diabetes (FBS 90, PPBS 120), controlled hypertension
ASA III	A patient with severe systemic disease, not well controlled	Uncontrolled diabetes (FBS 200, PPBS 380), unstable angina
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent MI, stroke, decompensated heart failure
ASA V	A moribund patient not expected to survive without the operation	Ruptured abdominal aortic aneurysm, massive trauma
ASA VI	A brain-dead patient, for organ donation	Brain-dead patient undergoing organ harvest

Q2.10: What does the suffix E signify?

Answer: The suffix 'E' in the ASA Physical Status Classification System signifies an emergency procedure.

- E stands for Emergency.
- An emergency is a situation where a delay in treatment would significantly increase the threat to the patient's life or a body part.
- For example, an otherwise healthy patient (ASA 1) needing immediate surgery for a ruptured ectopic pregnancy would be classified as 1E.



2. ANAESTHESIA PART -2

BIG QUESTION 1: What are the types, mechanisms, and clinical considerations of Local Anesthetics?

Broad Answer: Local anaesthetics are drugs that reversibly block pain by inhibiting sodium channels, primarily used in regional procedures like spinal, epidural, and nerve block anesthesia. They are classified as aminoesters and aminoamides, each with distinct metabolism and side effect profiles. Lignocaine and bupivacaine are the most commonly used agents, with specific dose limits and toxicity risks that require careful management.

DETAILED QUESTIONS

Q1.1: What are the common clinical uses and mechanism of action of Local Anesthetics?

PYQ: INICET 2021

Answer:

- Used in:
 - Local anaesthesia
 - Spinal anaesthesia (short-duration, below umbilicus)
 - Epidural anaesthesia (long-duration, below umbilicus)
 - Nerve blocks (e.g., brachial plexus)
- Not used for: **General anaesthesia**
- Mechanism:
 - Block Na⁺ channels
 - Non-ionized form enters nerve terminals
 - Ionized form blocks Na⁺ channels
- Cause reversible loss of pain sensation

Q1.2: How are Local Anesthetics classified and what are key examples of Aminoesters?

PYQ: FMGE 2020

PYQ: INICET 2021

Answer:

Classified as

- Aminoesters
- Aminoamides

Aminoesters (contain one 'I')

- Cocaine - first used, eye/spinal anaesthesia, never IV (severe vasoconstriction)
- Procaine - safest LA in malignant hyperthermia
- Tetracaine
- Benzocaine
- Chlorprocaine - shortest-acting LA
- Metabolized by plasma pseudocholinesterase
- Some metabolize into PABA (Procaine, Benzocaine), Cause allergic reactions commonly

Q1.3: What are the characteristics and examples of Aminoamides?

Answer:

- **Aminoamides** (contain two 'I's')
 - o **Lignocaine (Lidocaine/Xylocaine)**
 - Most widely used
 - Max dose: 4.5 mg/kg plain, 7 mg/kg with adrenaline
 - High doses → CNS toxicity
 - o **Bupivacaine**
 - Common in spinal anaesthesia
 - Longer-acting than lignocaine
 - **Most cardiotoxic** - can cause cardiac arrest
 - o **Ropivacaine**
 - Enantiomer of bupivacaine, less potent
 - o **Dibucaine**
 - Longest acting LA
 - Used in **Dibucaine number test** (not for anaesthesia)
 - o **Prilocaine**
 - Surface anaesthesia (e.g., **EMLA cream**)
 - Used in **IVRA** with lignocaine
 - **Contraindicated in neonates** (risk of methemoglobinemia)

Q1.4: What are the signs, risks, and management of Lignocaine systemic toxicity?

Answer:

- High dose > 9 mg/kg leads to:
 - o **Neurotoxicity**
 - o **Perioral numbness** (first sign)
 - o Tremors, seizures
 - o Respiratory arrest
 - o Cardiac arrest
- **Management:**
 - o Seizures → **Antiepileptics**
 - o Respiratory arrest → **Intubate & ventilate**
 - o Antidote: **20% Intralipid solution**
 - Also used for **Bupivacaine toxicity**

BIG QUESTION 2: What are the types, procedures, and complications of regional anaesthesia?

Broad Answer: Regional anaesthesia includes central neuraxial blocks (spinal, epidural, caudal, saddle anaesthesia) and peripheral nerve blocks (brachial plexus, stellate ganglion, femoral/ankle). It provides localized pain control and is widely used in surgeries below the umbilicus, upper limb procedures, and pediatric cases.

DETAILED QUESTIONS

Q2.1: What are the two types of regional anaesthesia?

Answer:

YOURWISH

- Central neuraxial block
- Peripheral nerve block

Q2.2: What are the types of central neuraxial blocks and peripheral nerve blocks ?

Answer:

Central neuraxial blocks

- Spinal anaesthesia
- Epidural anaesthesia
- Caudal anaesthesia
- Saddle anaesthesia

Peripheral nerve blocks

- Brachial plexus block
- Stellate ganglion block
- Femoral/Ankle plexus block

Q2.3: What are the Key features and indications for spinal anaesthesia?

 PYQ: FMGE 2019

Answer:

- **Indications :** Below umbilicus short-duration surgeries:
 - o Appendectomy
 - o LSCS
 - o Hernia
 - o Hydrocele
- **Duration:** 2-3 hours

Q2.4: What is the site and position for spinal anaesthesia?

Answer:

- Site: L3-L5 (Tuffier's line at L4)
- Position: Sitting or lateral
- Needle pierces dura into subarachnoid space (Use Thin bore Dura separating needle)

Q2.5: What layers are pierced in spinal anaesthesia?

 PYQ: NEET PG 2021  PYQ: FMGE 2019

Answer:

- Skin → Subcutaneous → Supraspinous → Inter/Intra/Infra spinous ligament → Ligamentum flavum → feel snap/sudden loss of resistance → Dura → Arachnoid → Subarachnoid (CSF) → Barbotage: Aspirate CSF back into syringe, 0.5-1 ml CSF → Inject local anaesthetic (Bupivacaine or Lignocaine) into CSF

Q2.6: What are common additives in spinal anaesthesia?

Answer:

- Opioids: Fentanyl, Morphine, Sufentanil, Alfentanil
- Avoid: Remifentanyl (neurotoxic preservatives)
- Additives used in local anaesthesia is Adrenaline

Q2.7: What are the intra-operative complications of spinal anaesthesia and how to manage it?

Answer:

- Hypotension (most common) → Block adrenal gland
- Bradycardia
- Shivering
- High spinal anaesthesia
 - o Drug to act on T6, but ascends to T4
 - o Hypotension and Bradycardia is seen
- Total spinal anaesthesia
 - o Drugs ascended to the intracranial segment
 - o Features of High spinal Anaesthesia, Respiratory depression, also cardiac arrest can occur
- Respiratory depression
- Cardiac arrest (least common)
- Management
 - Prepare for complications of spinal Anaesthesia after injection
 - Emergency drug tray
 - o Phenylephrine
 - o Atropine
 - o Pethidine
 - o Laryngoscopy/ET tube/Adrenaline

Q2.8: What are the post-operative complications of spinal anaesthesia?

Answer:

- Acute urinary retention (most common) → Due to Blockage of sacral segments
- Headache
 - o Due to a thick-bore needle causing loss of CSF
 - o Compress 6th cranial nerve
- Cranial nerve damage (6th nerve palsy)

Q2.9: What is the management of spinal anaesthesia intra OP complications?

Answer:

- Hypotension: Phenylephrine or Ephedrine (Contraindicated in Pregnancy as Cause fetal acidosis)
- Bradycardia: Atropine
- Shivering: Pethidine (Contra-Indicated in MOA inhibitors users as causes Severe Sympathomimetic reaction)
- High spinal anaesthesia
 - o Hypotension: Phenylephrine
 - o Bradycardia: Atropine
- Total spinal anaesthesia
 - o Hypotension: Phenylephrine
 - o Bradycardia: Atropine
 - o Respiratory depression
 - Laryngoscopy/ET tube - Airway secured and if the airway not secured, cardiac arrest develops - Adrenaline is given

Q2.10: What is the Management of Post OP Complications of Spinal anaesthesia?

 PYQ: AIIMS 2019

Answer:

Management of headaches in spinal anaesthesia:

- Conservative line
 - o Coffee
 - o NSAIDs
 - o IV fluids
- Definitive - Epidural blood patch

Q2.11: What are the contraindications of spinal anaesthesia?**Answer:**

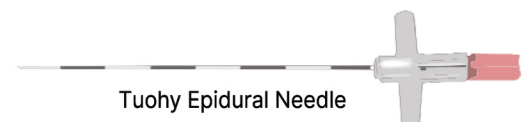
- Shock
 - o Hypotension (80/50 mmHg)
 - o Reduces to 40/20 mmHg

Absolute contraindications

- Raised ICP
 - o CSF jet out or Herniation of meninges
- Local site infection
- Refusal by patient
- Fixed cardiac output lesion
- Low platelets/coagulopathy

Q2.12: What is epidural anaesthesia and when is it used?**Answer:**

- Indication: **Long-duration below-umbilical surgeries** (e.g., hip/knee replacement)
- Catheter placed in epidural space
- Top-up doses allowed
- Drugs: Bupivacaine, Lignocaine
- Used for painless labor: Causes sensory block but Motor activity is intact

**Q2.13: What layers are pierced in epidural anaesthesia?****Answer:**

- Skin → Subcutaneous → Supraspinous → Inter/Intra/Infra spinous ligament → Ligamentum flavum → → feel snap/sudden loss of resistance (last layer) → Dura → Epidural space

Q2.14: What is caudal anaesthesia?**Answer:**

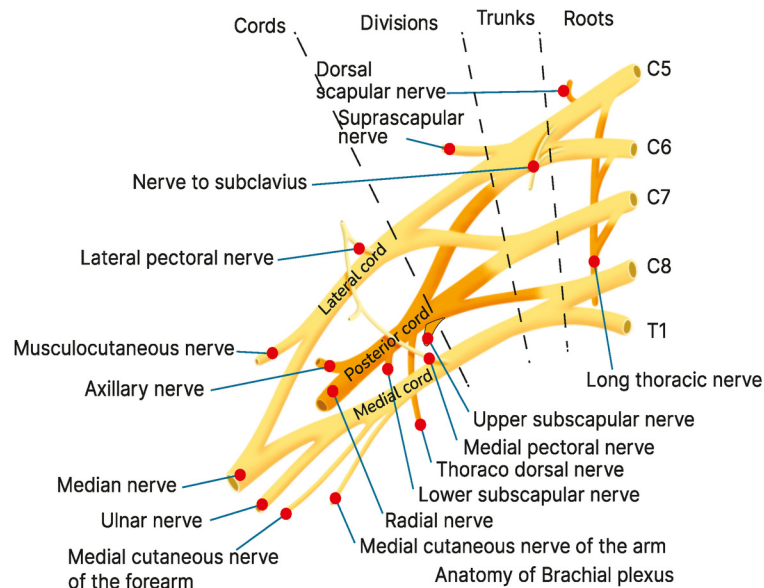
- Given in pediatric cases
- At sacral hiatus (caudal epidural space)

Q2.15: What is saddle anaesthesia and when is it used?**Answer:**

- Type of spinal anaesthesia
- Patient sits for 8 minutes post-injection\
- Used for perineal surgeries (fistula, fissure, hemorrhoids)

Q2.16: What are the key features and types of brachial plexus blocks?

Answer:



The brachial plexus is formed by C5-C8, T1 and is responsible for sensations and motor activities of upper limbs

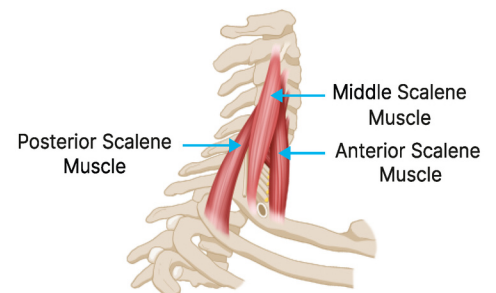
- Interscalene: C5-C7 (Proximal arm surgeries, spares ulnar nerve)
- Supraclavicular: All roots, used for upper limb surgeries, risk of pneumothorax
- Axillary: Distal arm/hand surgeries, spares musculocutaneous nerve

Q2.17: What are the key features of the Interscalene route?

Answer:

Interscalene route

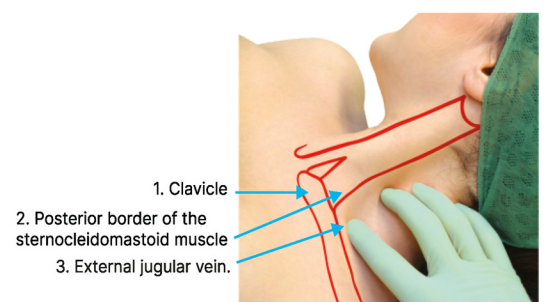
- A needle is introduced between the anterior and middle scalene muscles
- Only proximal routes are blocked - C5-C7
- Commonly used for proximal arm surgeries
- C8, T1 are not blocked - **The ulnar nerve is spared**
- The phrenic nerve may be damaged in this route - **Diaphragmatic palsy**



Q2.18: What are the key features of the Supraclavicular route?

Answer:

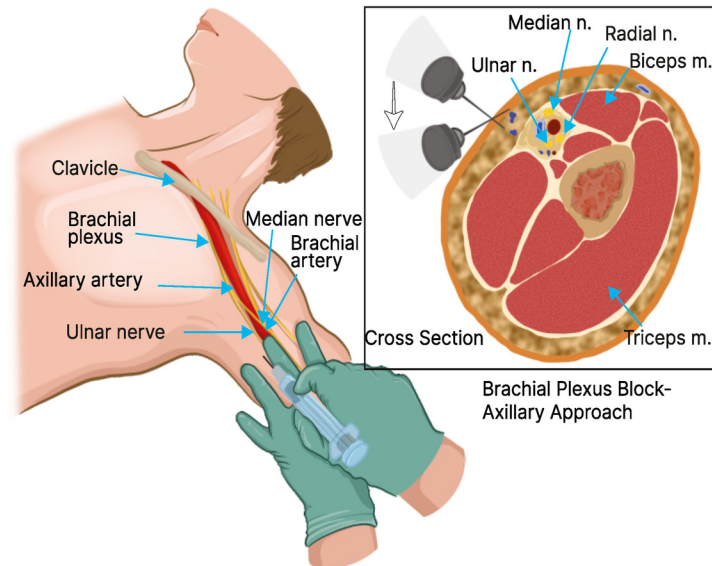
- All the routes are blocked
- Used for all surgeries of upper limbs and is the Best approach
- Complications
 - o The needle might hit pleura → **Pneumothorax (Most severe)**



Q2.19: What are the key features of the Axillary route?

Answer:

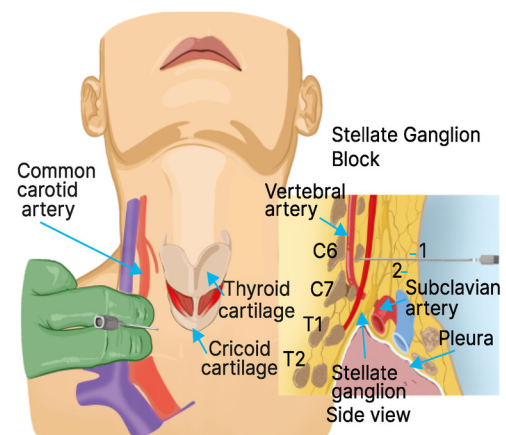
- Needle introduced through axillary to find brachial plexus
- Most distal approach for hand and forearm surgeries
- Nerve spared: Musculocutaneous nerve



Q2.20: What is stellate ganglion block and its indications?

Answer:

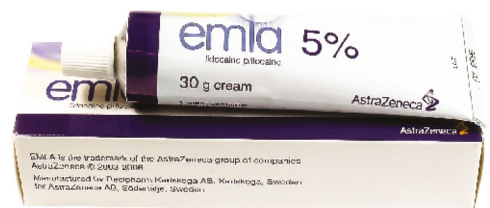
- Used for:
 - o Raynaud's disease
 - o Drug-induced vasospasm
- Responsible for the sympathetic activity of the face, neck, and upper limb
- Stellate ganglion anterior to the border of the C6 vertebrae (Chassagnac tubercle)
- Signs of success:
 - o Horner's syndrome (Ptosis, miosis, anhidrosis)
 - o Guttman sign (nasal mucosa vasodilation)
 - o Muller's sign (tympanic membrane vasodilation)



Q2.21: What are the key features of Surface Anesthetic Cream?

Answer:

- Commonly used as Emla cream
 - o Equal/Eutectic Mixture of Local Anaesthesia
 - o 5% EMLA= Eutectic : 2.5% Lignocaine + 2.5% Prilocaine
- EMLA is usually used in pediatrics on IV cannula refusal
- Contraindicated in Neonates as Prilocaine absorbed into the skin causes Methemoglobinemia



BIG QUESTION 3: What are the key components, stages, agents, and clinical considerations in General Anaesthesia?

Broad Answer: General Anaesthesia (GA) is a medically induced, reversible state of unconsciousness with loss of protective reflexes. It is primarily used for surgeries above the level of the umbilicus (e.g., heart, brain, thoracic, laparoscopic surgeries). The process involves four stages—Preoxygenation, Induction, Maintenance, and Reversal—using a combination of IV agents, inhalational agents, and muscle relaxants. Balanced anaesthesia is the standard approach, utilizing multiple agents titrated for desired effects: amnesia, analgesia, hypnosis, and paralysis. Specific drugs are chosen based on patient comorbidities, surgical needs, and potential side effects.

DETAILED QUESTIONS

Q3.1: What are the four stages of General Anaesthesia and what happens in each stage?

Answer:

- **Preoxygenation** - 3-5 minutes of 100% O₂ via bag-mask to denitrogenate lungs.
- **Induction** - IV/inhalational agents are given to induce unconsciousness; muscle relaxants administered for intubation.
- **Maintenance** - Unconsciousness is sustained using inhalational agents and long-acting muscle relaxants; ventilation is maintained.
- **Reversal** - Inhalational agents are stopped; reversal agents like **Neostigmine** or Sugammadex are used to restore muscle tone; extubation is done when recovery signs are adequate.

Q3.2: What are the main components of General Anaesthesia and how are they achieved?

Answer:

- **Amnesia, Analgesia, Hypnosis, Paralysis**
- Achieved using:
 - o **IV Agents:** Propofol, Thiopentone, Ketamine, Etomidate
 - o **Inhalational Agents:** Isoflurane, Sevoflurane, Desflurane, Halothane
 - o **Muscle Relaxants:** Depolarizing (Scholine), Non-depolarizing (Vecuronium, Atracurium)

Q3.3: What are the key features when you extubate?

Answer:

- Remove ET tube
- Signs of adequate reversal should occur
 - o Bedside: Sustained head lift for >5 seconds & Best method
 - o **Clinical test: Look at TOF ratio: >0.9**
- Induction is achieved by Opioids
 - o Opioids: Fentanyl, Remifentanyl (Ultra short-acting - Metabolized by RBC)
 - o Sufentanyl - Most potent
 - o Non-opioids, commonly used:
 - Barbiturates - Sodium Thiopentone - Methohexital
 - Non barbiturates - Propofol - Etomidate - Ketamine
- Opioids used in patients having severe reduction in ejection fraction, severe cardiorespiratory compromised

Q3.4: What are the key features of Sodium thiopentone?

Answer:

- Yellow amorphous powder
- Ultrashort acting and Rapid redistribution
- **Never mixed with Ringer's lactate** (form crystals)
- Effects on various system
 - o CNS:
 - Protective, Decrease ICP
 - IV induction agent of choice for head injury and neurosurgery
 - Decrease risk of epilepsy, Antiepileptic properties

- Narcoanalysis Truth test -
- o “Enemy of all other systems”
- o CVS: contraindicated in shock, ICD
 - Cause hypotension, tachycardia
- o Respiratory: contraindicated in bronchial asthma
- o Muscular, Pain & Analgesic: no effect
- Antithyroid properties

Q3.5: What are the key features of Propofol?

 PYQ: FMGE 2020

Answer:

- Milky white solution made of - Egg, Lecithin (emulsifying agent) and Soy
- Short elimination half-life: <2 hours
- Similar effects of Thiopentone
- CNS: Reduce ICP and Second best agent
- Other organs same effect as **Sodium thiopentone**
- Propofol causes **Hypotension** and Bradycardia
- Used as IV induction agent choice for
 - o Day care surgery
 - o Porphyrias (Acute intermittent)
 - o Laryngeal Mask Airway insertion
 - o Total Intravenous Anaesthesia → No inhalational agents are used
 - o Only IV induction agent with **Antiemetic property**
 - o Liver surgeries/disorders
 - o Malignant hyperthermia
- Side effects of propofol
 - o Long-term usage: **Propofol infusion syndrome** (>48 hours) in children (Triad: - Skeletal and cardiomyopathy - Metabolic acidosis - Green color urine)

Q3.6: What are the key characteristics of Ketamine?

 PYQ: NEET PG 2019

 PYQ: FMGE 2020

Answer:

- Acts on NMDA receptor blocker
- Effects opposite to Sodium thiopentone
 - o CNS: worst enemy
 - Contraindicated in CNS surgery as damages and increase ICP
 - Increases IOP - Contraindicated in Glaucoma
 - o Increased risk of epilepsy: Contraindicated in epilepsy
 - o Hallucinations and delusions are seen thus contraindicated in Schizophrenic patients
 - o Friend of all other systems
 - CVS: IV induction agent of choice in shock, cyanotic heart diseases
 - Contraindicated in IHD as cannot tolerate extreme changes in BP, HR
 - Cause hypertension, tachycardia
 - Respiratory: induction agent choice in bronchial asthma as causes bronchodilation
 - Muscular: increases muscle tone
 - Pain & Analgesic: only drug having analgesic effect: Painless IV induction agent

Q3.7: What are key features of muscle relaxants ?

Answer:

- Muscle relaxants acts in the Neuromuscular junction
 - o Nm receptors are blocked
- 2 categories
 - o DMR (Depolarising (SCH) muscle relaxants): Drug: Scholine and Decamethonium not used
 - Cannot be reversed by neostigmine
 - o NMDR (Non-Depolarising muscle relaxants)
 - This can be reversed by neostigmin

Q3.8: What are the key features of NMDR (Non-depolarising muscle relaxants)?

Answer:

- To check the adequacy of muscle paralysis we use **Train of Four (TOF)**
- Electrodes are kept on adductor pollicis, stimulate ulnar nerve
- 4 twitches of 0.2 Hz are given with 2 seconds gap
- If DMR (Depolarising Muscle relaxant) is given, all the twitch height remains the same - $T_4/T_1 = 1$
- In the next 10 seconds, the height decreases, but all twitch height remains the same
- If an NDMR (Non-Depolarising Muscle Relaxant) is given after 1 minute, the TOF ratio is taken and The fading effect is seen - $T_4/T_1 = <0.4$
- NMDR is divided into

Q3.9: What are the types of Non-Depolarising Muscle Relaxant)?

Answer:

NMDR is divided into

Steroidal and Benzyl iso quinolinium

- Benzyl iso quinolinium (Ends with curium)
 - o Atracurium
 - o Cis-Atracurium
 - o Mivacurium
 - o Doxacurium
- Steroidal (Ends with Curonium)
 - o Pancuronium
 - o Vecuronium
 - o Rocuronium

Q3.10: What are key features of Atracurium?

Answer:

- Neither metabolised in the liver nor excreted through the kidney
- Magical Metabolism- Hoffman's Elimination/Degradation
- Used in liver /renal failure patients
- Side effects: Histamine release and Laudanosine causes seizures

Q3.11: What are the key features of Pancuronium?

Answer:

YOURWISH

- It is the 2nd-longest acting muscle relaxant - 90-120 mins
- Mnemonic: RRR - Rate, Recovery & Renal excretion
- BP and PR Increases
- MR of choice in shock
- Recovery is delayed
- Renal excretion is high so contraindicated in Renal failure

Q3.12: What are the Muscle relaxants that release Histamine?

Answer:

- D-tubocurarine: maximum
- Mivacurium
- Scholene
- Atracurium

Q3.13: What is Malignant Hyperthermia?

Answer:

- Abnormally high temperature with sustained muscle contraction
- Seen in autosomal dominant patient
- Due to abnormal triggering of Ryanodine receptors
 - o Calcium released
 - o Muscle contracts/ spasm starts in the Masseter muscle

Q3.14: What are the triggers and management of malignant hyperthermia?

Answer:

Triggers of malignant hyperthermia

- Muscle relaxants: Scholine
- Inhalational agents: almost all agents - Maximum seen with Halothane

Treatment - IV Dantrolene sodium

Q3.15: What are key features of Scholine?

 PYQ: NEET PG 2021

Answer:

- Also known as: Succinylcholine/Suxamethonium
- The shortest and fastest-acting muscle relaxant
- Onset: 30-45 seconds and Duration: 3-8 mins
- Metabolized by Plasma pseudocholinesterase in plasma, Deficiency of which cause Scoline apnea
- Depolarising Muscle Relaxant
- Side effects
 - o Due to Fasciculation - Muscle soreness and Hyperkalemia (Contraindicated in hyperkalemia, Renal disease, Tetanus, Burns)
 - o Bradycardia
 - o Increase intracranial tension
 - o Malignant hyperthermia - Dreadful complications

Q3.16: What are key features of Inhalational Agents ?

Answer:

- Used for
 - o Induction purpose only in children → IV induction agent is difficult
 - o Main role: Maintenance of Anaesthesia
- Principles of INH agents

Q3.17: What are key features of Minimal Alveolar Concentration?

Answer:

- Minimal Alveolar Concentration of inhalational agent required to produce no response to any painful stimuli in at least 50% of patients
- Indicate the of INH agents potency
- Always inversely proportional to potency
 - o High MAC value, low potent
 - o Low MAC value, high potent
- Most to least potent inhalational agents
- Mnemonic: MHISD

Methoxyflurane (low MAC)	0.16
Halothane	0.75
Isoflurane	
Sevoflurane	2
Desflurane	6

Q3.18: What are key features of the Blood gas partition coefficient?

Answer:

- Indicate speed of onset and recovery
- Inversely proportional to the speed of onset and recovery
 - o High B/G, slow onset and recovery - The amount of drug in the blood is high
 - o Low B/G, fast onset and recovery - The amount of drug in the blood is low
 - o High amount reaches the CNS
- Amount of drug in blood to drug entering brain
- Mnemonic: for Blood gas partition coefficient: xDSIHM

Xenon, an inert gas not used now	0.14
Desflurane, fast onset and recovery • Day care surgery	0.42
Sevoflurane	
Isoflurane	
Halothane	
Methoxyflurane, high B/G • Slow onset	16%

Q3.19: What is the Effect of Inhalational Agents on Various Systems?

Answer:

- CNS: Most commonly used Isoflurane
- CVS: Most commonly used Isoflurane
- Respiratory system: is commonly used Halothane
 - o Bronchodilation is seen
 - o Respiratory disorder patients: Sevoflurane

- Muscular system: is commonly used Halothane
- Analgesia system: Nitrous and Trilene (maximum analgesia)

Q3.20: What are the key features of Halothane?

 PYQ: FMGE 2021

Answer:

- **4 H's of Halothane**
- Malignant Hyperthermia
- Contraindicated in Heart disease
 - o Produces arrhythmias
 - o Hypotension and Bradycardia
- Halothane-induced Hepatitis
 - o Avoided in continuous infusion or long-term use
- Has 3 maximums
 - o Maximum bronchodilation
 - o Maximum muscle relaxation
 - o Maximum metabolism in the liver - Not used repeatedly

Q3.21: What are the key features of Isoflurane?

Answer:

- The most commonly used inhalational agent in cardiac diseases and CNS diseases
- Side effects
 - o Coronary steal phenomenon - Proven only in animal studies

Q3.22: What are the key features of Sevoflurane?

 PYQ: INICET 2021

Answer:

- Inhalational agent used for induction purpose in **children** → **Sweet odor**
- Side effects
 - o In a closed circuit reacts with soda lime
 - A low flow of gasses is used
 - Forms Compound 'A' Olefin - **Nephrotoxic**
- Best inhalational agent of choice for bronchial asthma
 - o Reduces airway resistance
 - o Second best: Halothane

Q3.23: What are the key features of Desflurane?

 PYQ: NEET PG 2019

 PYQ: INICET 2021

 PYQ: FMGE 2021

Answer:

- Day care surgery
 - o Least metabolized
 - o Airway irritation → Not used
 - o Sevoflurane is used
- Best for cardiac surgery
 - o Vaporiser is Expensive
 - o Isoflurane is used
- Hepatic surgery - Least metabolized in the liver
- Long duration surgeries - Doesn't stay in the body

Q3.24: What are the key features of Nitrous oxide?

🔍 PYQ: NEET PG 2021

🔍 PYQ: INICET 2020

🔍 PYQ: FMGE 2019

Answer:

- Stored in Blue color cylinders
- Good analgesic agents
- Contraindicated in
 - o In Pregnancy, it can cause **teratogenic** effects in the fetus → Bone marrow deformity
 - o Avoid closed-loop surgeries → Intestinal obstruction surgery - One part is obstructed - Another part is filled with air - Nitrous oxide expands air-filled cavities - **Lead to perforation**
- The **second gas effect** is seen
 - o Used as carrier gas - Least potent
 - o Add another inhalational agent
 - o Increases concentration of other agents
- **Diffusion hypoxia** is seen
 - o Does not cause hypoxia during surgery
 - o Stop inhalational agents in the reversal phase - Oxygen saturation falls and Nitrous oxide has better diffusion than oxygen into alveoli
 - o 100% oxygen is given to prevent diffusion hypoxia

Q3.25: Summary of General Anaesthetics?

🔍 PYQ: NEET PG 2019

Answer:

Condition	IV induction agent	Muscle relaxant	Inhalational agent
Heart disease	Etomidate Most cardio-stable Maintain BP, PR	Vecuronium Cardiostable	Desflurane (best) Isoflurane (most common)
Asthma Severe wheeze	Ketamine	Any muscle relaxant	Sevoflurane • Decrease airway resistance Halothane (2nd best)
Shock	Ketamine only	Pancuronium Increase BP, PR	Desflurane Isoflurane (Most common)
Day care surgery (PraMoD)	Propofol <2 hours	Mivacurium Shortest acting	Desflurane (best) • Airway irritation Sevoflurane (most common)
Neurosurgery	Sodium Thiopentone	Any muscle relaxant	Isoflurane, most common



3. ANAESTHESIA PART -3

BIG QUESTION 1: What are supraglottic and infraglottic airway devices, and how are they used in airway management?

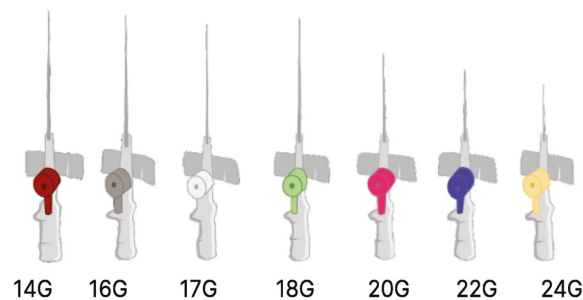
Broad Answer:

- Supraglottic devices like Laryngeal Mask Airways (LMA) are inserted above the vocal cords and are useful for minor surgeries or difficult intubation.
- They do not require laryngoscopy and allow ventilation, but don't prevent aspiration. Infraglottic devices, such as endotracheal tubes, are inserted into the trachea and provide a definitive airway by sealing off the esophagus, allowing direct lung ventilation, and preventing aspiration.
- LMA is easier and quicker, while ETT is preferred in emergencies or surgeries.

DETAILED QUESTIONS

Q1.1: How is IV cannula size selected, and what is the significance of each color in clinical practice?

Answer:



Colors of IV cannula	Gauze	Uses
Orange	14	Shock 🔍 PYQ: FMGE 2020
Grey	16	
Green	18	General Anaesthesia
Pink	20	
Blue	22	Pediatric cases
Yellow	24	
Purple	26	

(Mnemonic: Oh Great God, Please Bless Your People)

Q1.2: Describe the Supraglottic airway device and the Infraglottic airway device.

🔍 PYQ: AIIMS 2020

Answer:

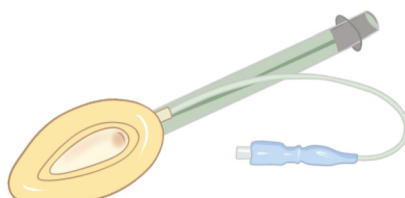
Supraglottic airway device	• Laryngeal mask airway - o Gases enter the trachea, esophagus
Infraglottic airway device	• Inserted directly into the trachea • Ventilation of lungs - o Gas will not move into the esophagus • Definitive airway: Endotracheal tube

Q1.3: What is another name for Laryngeal Mask Airway (LMA)?

PYQ: FMGE 2020

Answer:

- Supraglottic airway device



Q1.4: How is a Laryngeal Mask Airway (LMA) inserted, and where is it positioned?

Answer:

- Inserted through the mouth, and the mask is fitted onto the supraglottic area

Q1.5: What are the indications of LMA?

Answer:

- Indications
 - o Failed intubation/ Difficult intubation
 - o Minor surgeries: Squint surgery

Q1.6: What is the basis for selecting the size of a Laryngeal Mask Airway (LMA)?

Answer:

- Sizes of LMA: Depend on the weight
- Adults
 - o Size 4: 50 to 70 kgs
 - o Size 5: 70 to 100 kgs

Q1.7: What are the features of 1st generation LMA?

Answer:

- 1st generation LMA: LMA classic
- Has only one port for ventilation.

Q1.8: What are the features of the 2nd Generation LMA?

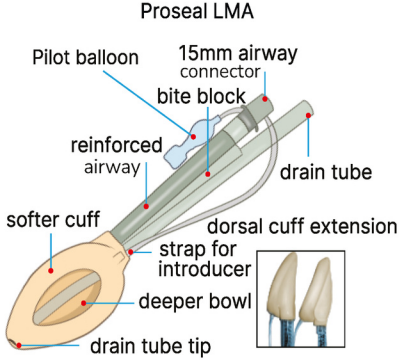
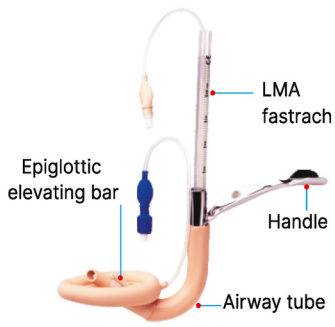
Answer:

- They have two ports:
 - o Tracheal port
 - o Esophageal port
- Have an additional gastric port
 - o Deflate the stomach

Q1.9: What are the types of 2nd generation LMA?

Answer:

- Types of second generation LMA: Proseal, Supreme, i-gel
- Other special type of LMA - Fastrack/ intubating LMA

o Proseal LMA 	o Supreme LMA → Made of polyvinyl chloride 	o IGEL LMA → No cuff, pilot → Less chance of injury 
o Fastrack or intubating LMA 		

Q1.10: In which situation is a Combitube used?

Answer:

- Emergency situations when intubation fails or is not possible.

Q1.11: Is laryngoscopy required to insert a Combitube?

Answer:

- No, it is inserted blindly.

Q1.12: Describe the mechanism of the Combitube airway device.

Answer:

Inserted either into the esophagus or trachea
 ↓
 Inflate the cuff
 ↓
 Inflate the other cuff if the tube is inserted into the esophagus
 ↓
 Prevention by blocking the esophageal aspiration



↓
Ventilation is done through the pores

Q1.13: Which is the best way to secure the airway?

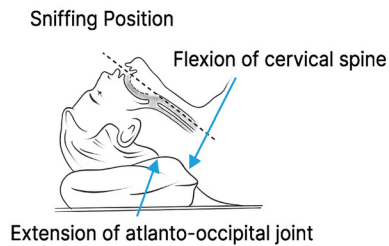
Answer:

- Endotracheal tube

Q1.14: Describe the posture for endotracheal intubation.

Answer:

- Position: Sniffing morning air posture
 - o Extension at Atlanto-occipital joint
 - o Flexion at Neck or cervical spine
 - o Used for normal patients



Q1.15: Which position is preferred for intubation in obese patients?

Answer:

- Ramped position

Q1.16: What are the differences between Macintosh and Miller laryngoscope blades and their respective uses?

Answer:

- Curved laryngoscope: Macintosh
 - o Used in adults
- Straight blade laryngoscope: Miller's
 - o Used in children
 - Children have a larger epiglottis.



Q1.17: How does the MacCoy laryngoscope aid in visualizing the laryngeal aperture?

Answer:

A laryngoscope is inserted into the mouth
↓
An extra handle will help to lift the tongue
↓
Observe the laryngeal aperture



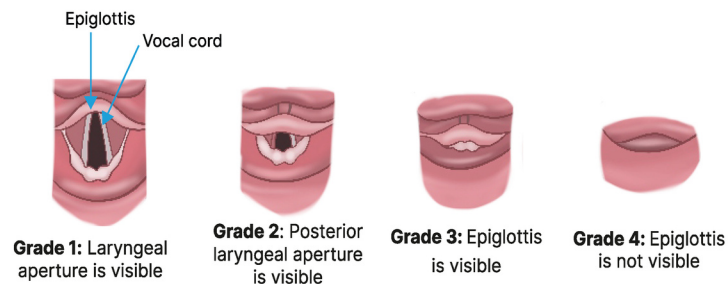
Q1.18: Describe Cormack-Lehane Grading or Classification

Answer:

- Done after laryngoscopy
- Based on the visualization of the vocal cord

YOURWISH

Grade 1	The laryngeal aperture is visible
Grade 2	The posterior laryngeal aperture is visible
Grade 3	Epiglottis is visible
Grade 4	Epiglottis is not visible (Video laryngoscope is preferred)



Q1.19: Which is the narrowest part of the airway in adults?

Answer:

- Glottis

Q1.20: Which is the narrowest part of the airway in children?

Answer:

- Subglottis

Q1.21: What is a stylet used for in airway management?

Answer:

- During difficult intubation.

BIG QUESTION 2: Describe the various airway management devices and methods used during anesthesia, including their indications, parts, and confirmation techniques.

Broad Answer:

- Airway management includes devices like Laryngeal Mask Airway (LMA), laryngoscopes, and endotracheal tubes (ETT).
- LMA is a supraglottic device inserted blindly and used when intubation is not feasible; it doesn't require laryngoscopy.
- ETT provides the most secure airway, placed with a laryngoscope (Macintosh for adults, Miller for children).
- Confirmation of ETT placement is best done using capnography (ETCO₂ 35-45 mmHg). Anesthesia machines (Boyle's machine) deliver gases through high, intermediate, and low-pressure systems.
- Specialized tubes include RAE, Double lumen, and Armored (flexometallic) tubes, each with specific indications like head-neck surgery, one-lung ventilation, or prone position surgeries.

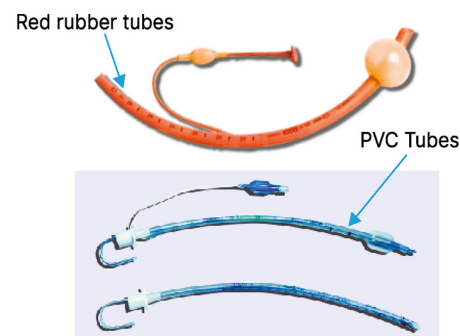
DETAILED QUESTIONS

Q2.1: What are the types of Endotracheal Tube?

Answer:

- It is of two types
 - o Red rubber tubes: Have a high-pressure, low-volume cuff

- Causes: Tracheal mucosal injury
- o PVC tubes: Low-pressure, high-volume cuff
 - It is of two types
 - Cuff PVC tubes
 - Uncuff PVC tubes
 - Microcuffed tubes: Used in children



Q2.2: What are the functions of various parts of the endotracheal tube?

Answer:

PARTS	FUNCTIONS
Proximal Bevelled end	Ventilation
Murphy's eye: Opening	Provides an alternative pore for ventilation
Cuff	Prevents aspiration and displacement of the tube • Pressure: 25-30 cms of H₂O - o 15-22 mmHg - o Should not be >30
Marking of the tube	Tells about the placement of the tube
Position	3-4 cms above the carina.

Q2.3: Which is the best test to confirm endotracheal intubation?

Answer:

- Capnograph

Q2.4: What is measured by a capnograph?

Answer:

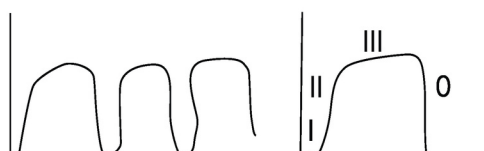
- Measures exhaled CO₂ (ETCO₂)

Q2.5: What are the phases of a normal capnograph?

PYQ: INICET 2020, 2021

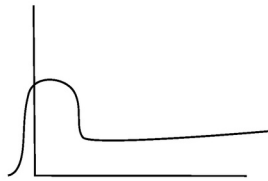
Answer:

Phase 1	Dead space ventilation
Phase 2	Expiratory upstroke • Angle: Alpha
Phase 3	Alveolar plateau
Phase 0	Inspiratory downstream • Angle: Beta - o Measures exhaled CO₂

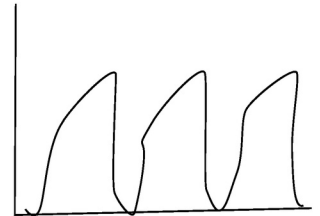


Q2.6: What is the normal range of end-tidal CO₂ (ETCO₂)?**Answer:**

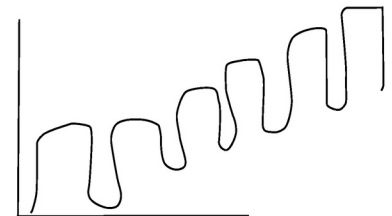
- 35-45 mmHg

**Q2.7: What does a flat ETCO₂ line (0 mmHg) indicate?****Answer:**

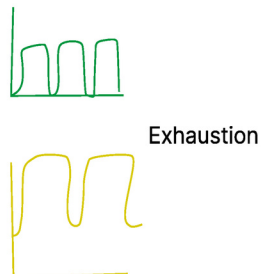
- Seen in
 - o Esophagus intubation
 - o Cardiac arrest
 - o The tube is blocked or disconnected from the breathing circuit

**Q2.8: What does the Sharp fin pattern capnograph indicate?****Answer:**

- Seen in bronchospasm or COPD

**Q2.9: What does a Stepladder capnograph indicate?****Answer:**

- Seen in malignant hyperthermia
- After intubation

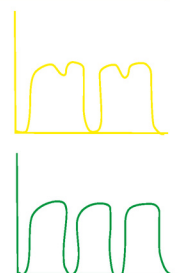
**Q2.10: What does an ETCO₂ capnograph rise above the baseline indicate?****Answer:**

- Base value is high
 - o Usage: Exhausted soda lime

**Q2.11: How does a venous air embolism present during anesthesia, and how is it diagnosed and monitored?****Answer:**

PYQ: NEET PG 2020

- Seen in venous air embolism
 - o Best investigation: Transesophageal echocardiography
 - o Murmur: Windmill murmur
 - o Sudden decline in ETCO values

**Q2.12: What does the Curare notch indicate?****Answer:**

- Curare notch indicates return of spontaneous breathing
 - o Smooth capnography in the alveolar phase
 - o Next step: Muscle relaxation (Top-up dose)

Q2.13: Describe the Flexometallic Endotracheal tube

Answer:

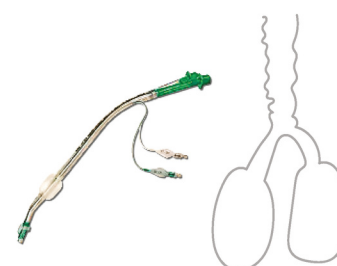
- Other Name: Armored endotracheal tube
- Intubation with a normal PVC tube
 - o Blockage of the tube
- Used for surgeries done in the prone position



Q2.14: Elaborate on the features of the double-lumen Endotracheal tube

Answer:

- Left lung cancer: General anesthesia
- Long endotracheal tube
 - o Pass it through the vocal cord until you feel resistance
 - Change the direction of the tube
 - Inflate the bronchial and tracheal cuff
- Used the surgeries that require one-lung ventilation
- Have bronchial and tracheal openings
- Ventilation of the tracheal pore: Gas moves into both lungs
- The most common cause of hypoxia during one-lung ventilation: Displacement of the tube
- It is confirmed by a fiber optic bronchoscope

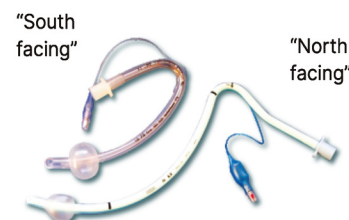


PYQ: FMGE 2020

Q2.15: Describe RAE's tube

Answer:

- Full form: Ring Adair Elwyn
- Nasotracheal tubes are used for oral cavity pathologies



BIG QUESTION 3: What are the key components of the anesthesia machine, and how do they work together to ensure safe and effective delivery of anesthesia?

Broad Answer:

- The anesthesia machine (Boyle's machine) ensures continuous delivery of gases for anesthesia and is divided into high-, intermediate-, and low-pressure systems.
- Cylinders and pipelines supply gases with safety features like pin index and diameter index systems.
- Vaporizers convert liquid anesthetics (e.g., halothane, sevoflurane) into vapors, with color-coded systems for safety.
- Breathing circuits (e.g., Mapleson A for spontaneous, Mapleson D/Bain for controlled ventilation) deliver these gases, while CO₂ absorbents (soda lime) remove expired CO₂ in closed systems.
- Ventilator modes (like CMV, SIMV, APRV) are selected based on patient needs, especially during surgeries or conditions like ARDS.

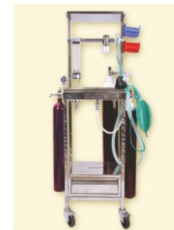
DETAILED QUESTIONS

YOURWISH

Q3.1: Who introduced Boyle's anesthesia machine and in which year?

Answer:

- Edmund Gaskin Boyle, in 1917.



Q3.2: What type of flow system is used in Boyle's anesthesia machine?

Answer:

- Continuous flow system.

Q3.3: What are the three pressure systems in Boyle's anesthesia machine?

Answer:

High-pressure system	• It includes - o Cylinders - o Pressure gauge - o Youk valve assembly - o Pressure relieving valve
Intermediate pressure system	• It includes - o Flow control valve - o O₂/N₂O proportionate devices - o O₂ flush - o Central supply
Low pressure	• It includes - o Rotameter - o Vapourizer - o Common gas outlet

Q3.4: Explain the first part of the anesthesia machine related to gas cylinders, their color coding.

Answer:

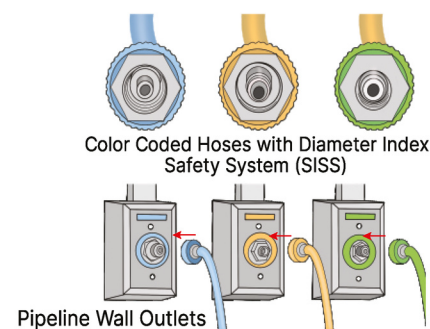
- First part of the anesthesia machine
- Material: Non-MRI compatible Mb
- MRI compatible: and Aluminum titanium
- Have different color codings
 - o Oxygen: Black body + White shoulders
 - o N₂O: Blue color 2
 - o Entonox: Blue body + White shoulders
 - 50% O₂ , 50% N₂O
 - Used for analgesia: No anesthesia
 - o Helium: Brown color
 - o Cyclopropane: Orange color
 - o Halothane: Red color
 - o Air: White body + Black shoulder
 - o N₂ : Black color
 - o CO₂ : Grey color

Q3.5: How does the anesthesia machine prevent incorrect gas connections from cylinders and central pipelines?

Answer:

- Prevent wrong attachment: Pin index system (Holes in cylinder, pins in machine)
 - o Air: 1,5
 - o O₂: 2,5
 - o NO₂: 3,5
 - o Entonox: 7
 - o Co₂:
 - 1,6
 - 2,6

 PYQ: FMGE 2019



Q3.6: Describe the Diameter index safety system

Answer:

- Non-interchangeable connection
- Pressure: 60 PSI

Q3.7: What is the role of vaporizers in anesthesia machines?

Answer:

- Stores liquid volatile inhalational agents
- Material: Copper
- Desflurane: Low boiling point
 - o Special vaporizer: TEC 6

Q3.8: What are the standard color codes for vaporizers of volatile anesthetics?

Answer:

- Halothane: Red
- Isoflurane: Purple
- Sevoflurane: Yellow
- Desflurane: Blue

Q3.9: What is an open circuit in anesthesia?

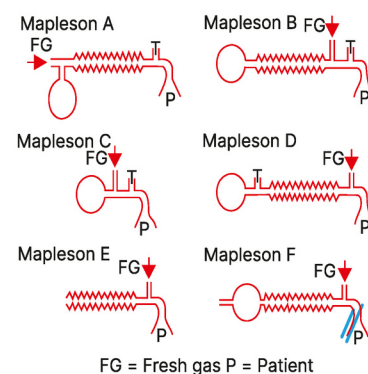
Answer:

- Open circuit: Gases are given without pipes
 - o Mask: Schimmelbusch mask
 - o The exact concentration of the gases cannot be measured

Q3.10: Describe the classification of Mapleson breathing circuits (A to F)

Answer:

- Mapleson A, B, C: The expiratory valve is close to the patient
- Mapleson B, C: Expiratory valve + fresh gas fluids are close to the patient
- Mapleson D: Expiratory valve away from the patient
- Mapleson E, F: Valveless circuit
- Mapleson E: Valveless + Bagless



Q3.11: Describe the Mapleson A circuit.

Answer:

- Other Name: Magill's circuit
- Choice for spontaneous ventilation
- Fresh gas flow = Minute volume (Tidal volume $\times$ respiratory rate)
- Rare case: Controlled ventilation
 - o Fresh gas flow = 1.8- 2 times of the mean volume
- Coaxial circuits
 - o Inlet tube: Expiratory gases
 - o Outlet tube: Inspiratory gases

Q3.12: Which Mapleson circuits are not used?

Answer:

- Not used: Mapleson B, C:

Q3.13: Describe Mapleson D circuit

Answer:

- Other Name: Bains circuit
- Coaxial circuits
 - o Inlet tube: Inspiratory gases
 - o Outlet tube: Expiratory gases
- Choice for controlled ventilation
 - o Fresh gas flow = $1.6 \times MV$
- Spontaneous ventilation
 - o Fresh gas flow = $2-3 \times MV$

Q3.14: What are the salient features of the Mapleson E and F circuit?

? PYQ: INICET 2020

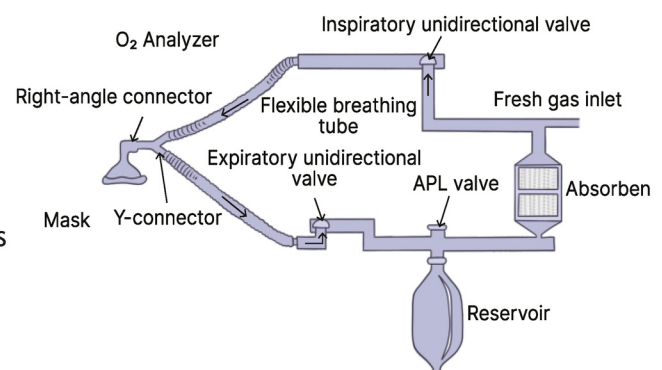
Answer:

- Mapleson E: Ayre's T piece
- Mapleson F: Choice for controlled and spontaneous ventilation for pediatrics

Q3.15: What is a closed circuit in anesthesia?

Answer:

- No expiratory valve
- CO gets absorbed 2
 - o Carbon dioxide absorbing chamber: Have two materials
 - Soda lime
 - Baralyme



Q3.16: What is the composition of soda lime in closed circuit anesthesia systems, and what agents are the Agents avoided with soda lime?

Answer:

- Composition of the soda lime absorbing chamber
 - o 80%: CaOH - Major component

- o 16%: H₂O₂
- o 3%: NaOH - Main component
- o 1-2%: KOH and silica (Increase the hardness)
- Agents avoided with soda lime:
 - (Mnemonic: CT Scan)
 - o Chloroform
 - o Trilene
 - o Sevoflurane

Q3.17: What is the Composition of Baralyme?

Answer:

- 80%: CaOH
- 20%: BaOH

Q3.18: What are the Agents avoided with Baralyme?

Answer:

- Mnemonic: DIE
 - o Desflurane
 - o Isoflurane
 - o Enflurane
- Leads to the formation of carbon monoxide

Q3.19: Write a short note on Ventilation.

Answer:

- Invasive
- Non-invasive mode of ventilation: Used in patients who are not able to maintain saturation
 - o Conscious
- Unconscious patients: Aspiration

BIG QUESTION 4: What are the key modes of mechanical ventilation, their applications, and the role of Positive End Expiratory Pressure (PEEP) in critical care?

Broad Answer:

- Mechanical ventilators function by delivering breaths through either volume-controlled or pressure-controlled modes, tailored to patient needs.
- Common ventilation strategies include Controlled Mandatory Ventilation (CMV) for full ventilatory support, Assist-Controlled Ventilation allowing triggered breaths, Pressure Support Ventilation (PSV) as a supportive mode, and SIMV for gradual weaning.
- Specialized modes are used in specific conditions, such as Inverse Ratio Ventilation, APRV, and prone position ventilation in ARDS, and high-frequency ventilation in emergencies.
- Positive End Expiratory Pressure (PEEP) is a critical adjunct that prevents alveolar collapse and improves oxygenation, particularly in ARDS and pulmonary edema, though it carries risks such as reduced venous return, hypotension, and raised intracranial pressure.
- Together, these modes and adjuncts provide a spectrum of options for supporting patients with respiratory failure.

YOURWISH

Q4.1: What are the two main parameters that can be set in a ventilator?

Answer:

- Volume
- Pressure

Q4.2: What is Controlled Mandatory Ventilation (CMV) and its key feature?

Answer:

- CMV is a mode where the ventilator delivers preset breaths.
- No spontaneous respiratory efforts are allowed.

Q4.3: What is Assist-Controlled Mode of Ventilation, and how does it differ from CMV?

Answer:

- In this mode, moderate sedation is allowed.
- Triggered breaths are permitted (patient can initiate), but the ventilator ensures each breath delivers preset parameters.
- It can be set in volume control or pressure control.

Q4.4: What is Pressure Support Ventilation (PSV) used for?

Answer:

- Asupportive mode of ventilation.
- The patient initiates each breath, and the ventilator provides pressure support to overcome airway resistance.

Q4.5: What is SIMV (Synchronized Intermittent Mandatory Ventilation), and when is it used?

Answer:

- SIMV delivers mandatory breaths but allows spontaneous breathing between them.
- It is primarily used as a weaning mode or as a spontaneous mode of ventilator support.

Q4.6: Which special ventilatory strategies are used in ARDS?

Answer:

- Inverse Ratio Ventilation (IRV)
- APRV (Airway Pressure Release Ventilation)
- Prone position ventilation

Q4.7: What emergency ventilation modes are available?

Answer:

- High-frequency ventilation, subdivided into:
 - o High-frequency oscillatory ventilation (HFOV): 300-900 breaths per minute
 - o High-frequency jet ventilation (HFJV): 120-180 breaths per minute

Q4.8: What is Positive End Expiratory Pressure (PEEP)?

Answer:

- PEEP is the pressure applied to keep alveoli open at the end of expiration.

 PYQ: FMGE 2021

Q4.9: What are the uses of PEEP?**Answer:**

- ARDS patients
- Pulmonary edema

Q4.10: What are the disadvantages of PEEP?**Answer:**

- Decreases venous return
- Reduces cardiac output
- Causes hypotension
- Increases intracranial pressure

Q4.11: What are the two main types of ventilation?**Answer:**

- Invasive ventilation
- Non-invasive ventilation

Q4.12: When is non-invasive ventilation used?**Answer:**

- For patients who are conscious but unable to maintain oxygen saturation adequately.

Q4.13: Why is non-invasive ventilation not suitable for unconscious patients?**Answer:**

- Unconscious patients are at risk of aspiration, hence they require invasive ventilation.

BIG QUESTION 5: Classify oxygen delivery devices and compare low-flow and high-flow systems with examples.**Broad Answer:**

- Oxygen delivery devices are classified as:
 - o Low-flow, variable performance devices: Provide oxygen mixed with room air. FiO_2 varies.
 - Examples: Nasal cannula, simple face mask, non-rebreather mask
 - o High-flow, fixed performance devices: Deliver constant FiO_2 irrespective of patient effort.
 - Examples: Venturi mask, High-flow nasal cannula (HFNC)
 - The Venturi mask works on the Bernoulli principle and is color-coded to indicate FiO_2 .

DETAILED QUESTIONS**Q5.1: What are the two types of oxygen delivery devices?****Answer:**

- Low-flow variable performance oxygen delivery devices
 - o Nasal cannula
 - o Face mask
 - o Non-rebreather mask
- High-flow fixed-performance oxygen delivery devices

- o High-flow nasal cannula
- o Venturi mask

Q5.2: Specify the flow rates and FiO₂ of various Oxygen Delivery Devices

? PYQ: INICET 2021

? PYQ: AIIMS 2020

Answer:

Device	Flow Rate	FiO ₂
Nasal cannula	1-6 lit	25-45% ? PYQ: AIIMS 2019
Simple face mask	6-10 lit	35-60%
Non-rebreather mask	10-15 lit	65-95%
Venturi mask	2-15 lit	24-60%
HFNC	40-60 lit	100%

Q5.3: Explain the salient features of the Venturi Mask

? PYQ: FMGE 2021

Answer:

- Works on the Bernoulli principle
- Color coding: Mnemonic-Boy Was Often Yelling Run Girl

Color	Oxygen (Lit)	FiO ₂
Blue	2 lit	24%
White	4 lit	28%
Orange	6 lit	31%
Yellow	8 lit	35%
Red	10 lit	40%
Green	15 lit	60%

BIG QUESTION 6: What are the essential principles, team roles, assessment steps, and rhythm-specific interventions in Advanced Cardiac Life Support (ACLS) and Pediatric Cardiac Arrest management?

Broad Answer:

- ACLS emphasizes a structured and team-based approach to resuscitation, integrating rapid assessment, high-quality CPR, early defibrillation, airway and ventilation support, and timely drug administration.
- The resuscitation team consists of defined roles (team leader, compressor, ventilator, drug administrator, defibrillator operator, and timer) supported by essential equipment such as defibrillators, airway adjuncts, and emergency drugs.
- Initial management of an unresponsive patient follows a systematic sequence: ensuring scene safety, assessing responsiveness, activating emergency services, checking pulse and breathing, and starting CPR if absent.
- Rhythm recognition is central—shockable rhythms (VF, pulseless VT) require defibrillation, while non-shockable rhythms (asystole, PEA) are managed with CPR and medications.
- In pediatrics, algorithms parallel adult ACLS but emphasize immediate CPR, early epinephrine, and tailored energy doses.
- High-quality CPR requires correct compression rate (100-120/min), depth, minimal interruptions, appropriate ventilation ratios, and rescuer rotation every 2 minutes.

- Drugs like epinephrine (first-line) and amiodarone (for refractory VF/pulseless VT) complement defibrillation.
- ECG recognition of asystole (flatline) and PEA (organized rhythm without pulse) guides interventions and prognosis.

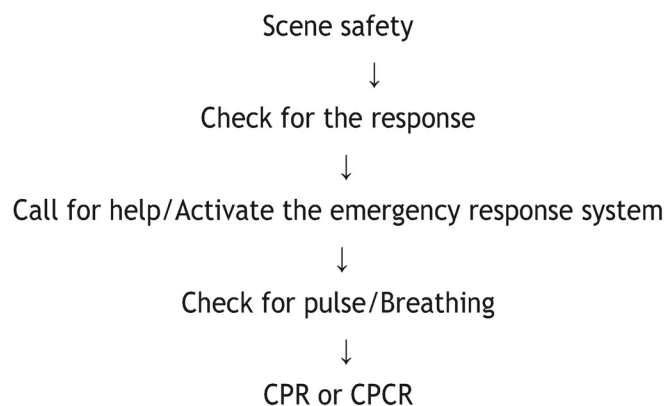
Q6.1: Describe the ACLS resuscitation team role and the essential equipment used?

Answer:

- With medical equipment and drugs
- Teamwork
 - o Team leader
 - o Chest compression
 - o Rescue breaths
 - o Drugs
 - o Defibrillator
 - o Timer

Q6.2: Outline the stepwise approach to the initial assessment and management of an unresponsive patient as per the ACLS algorithm.

Answer:



Q6.3: What are the pulse check sites used during cardiopulmonary resuscitation (CPR) in adults, children, and infants, and their significance?

Answer:

- Children: Brachial pulse
- Adults: Carotid pulse

Q6.4: Describe the Pediatric Cardiac Arrest Algorithm

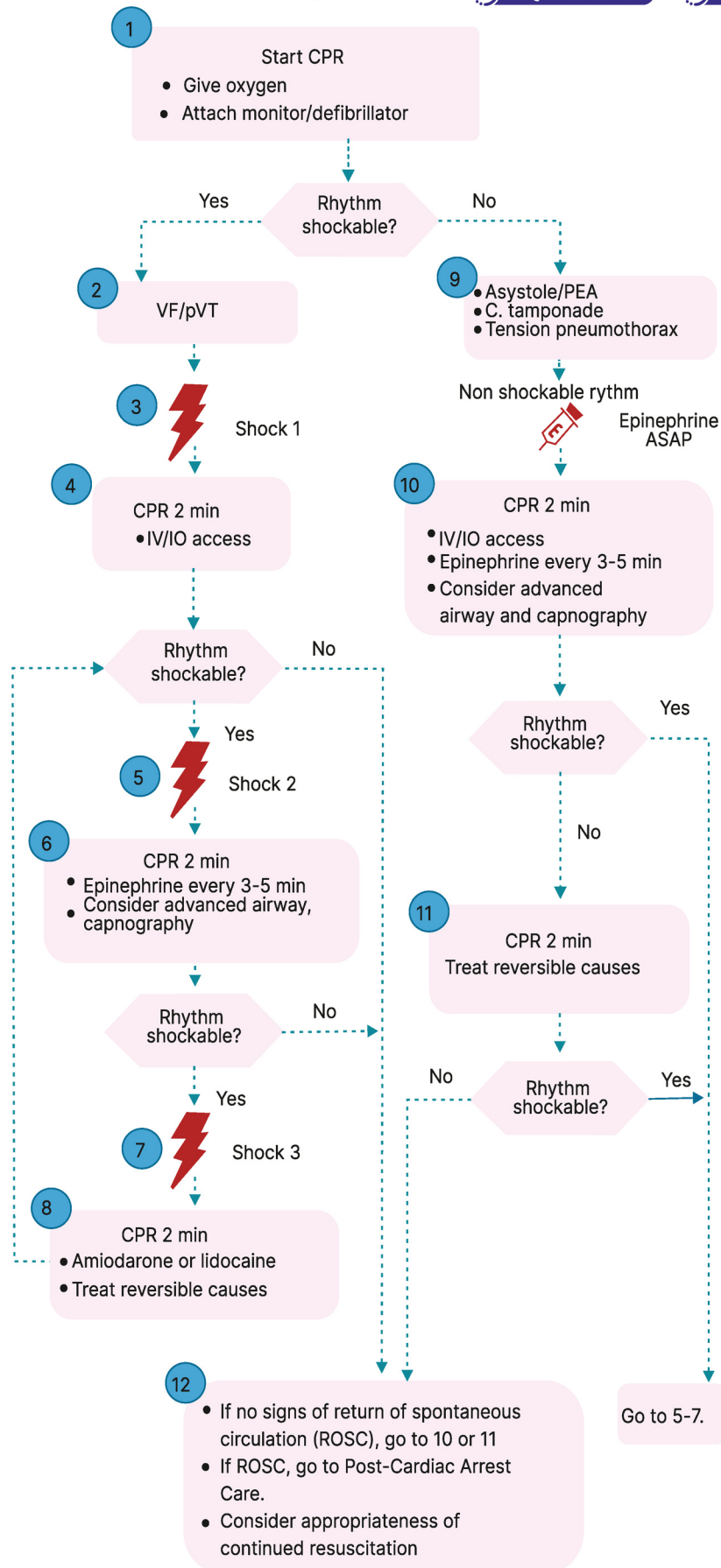
Answer:

Pediatric Cardiac Arrest Algorithm

PYQ: AIIMS 2020

PYQ: INICET 2020

PYQ: FMGE 2021



CPR Quality

- Push hard (at least 2 inches) [5cm] and fast (100-120/min) and allow complete chest recoil.

PYQ: FMGE 2019

- Minimize interruption in compressions,
- Avoid excessive ventilation.
- Rotation compressor every 2 minutes, or sooner if fatigued.
- If no advanced airways, 30:2 compression-ventilation ratio.
- Quantitative wave from capnography If PetCO₂ > 10 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- Biphasic: Manufacturer recommendation (eg, initial dose of 120-200 j); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- Monophasic: 360 J

Drug Therapy

- Epinephrine IV/IO dose: 1 mg every 3-5 minutes
- Amiodarone IV/IO dose: First dose: 300mg bolus. Second dose: 150mg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement Once advanced airways in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of spontaneous circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ³40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Cardiac Tamponade
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

Q6.5: What is the first step in pediatric cardiac arrest management?

Answer:

- Start CPR, give oxygen, and attach a monitor/defibrillator.

Q6.6: Name the two shockable rhythms in the pediatric cardiac arrest algorithm.

Answer:

- Ventricular fibrillation (VF) and Pulseless ventricular tachycardia (VT).

Q6.7: What is the drug of choice (DOC) in pediatric cardiac arrest and its route and dosage?

Answer:

- Drug: Epinephrine
- Routes: IV / IO / ET (Endotracheal, 2.5 mg)
- Dose: 1 mg every 3-5 min

Q6.8: What is the dose of amiodarone in pediatric cardiac arrest?

Answer:

- Dose of amiodarone: 300 mg bolus

Q6.9: What is the recommended compression rate during CPR?

Answer:

- 100-120 compressions per minute.

Q6.10: What is the ideal compression-to-ventilation ratio for a single rescuer in adults?

Answer:

- 30:2 (30 compressions, 2 breaths).

Q6.11: How often should rescuers rotate compressors during CPR?

Answer:

- Every 2 minutes to prevent fatigue and maintain compression quality.

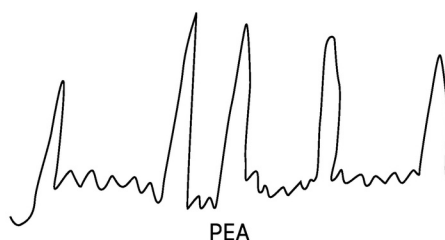
Q6.12: What is the ECG hallmark of Asystole?

Answer:

- Flatline: Asystole

Q6.13: Depiction of Pulseless electrical activity (PEA) on ECG.

Answer:



BIG QUESTION 7: What are the essential monitoring modalities used during anesthesia to assess oxygenation, ventilation, circulation, temperature, and awareness?

Broad Answer:

- Monitoring in anesthesia is fundamental to patient safety and is guided by international standards.
- Oxygenation is continuously assessed using a pulse oximeter, while ventilation is monitored by capnography, ensuring adequacy of CO₂ elimination and airway integrity.
- Circulation is evaluated through blood pressure monitoring (non-invasive and invasive arterial lines), ECG for arrhythmias and ischemia (Lead II for rhythm, Lead V for ischemia), and advanced methods like transesophageal echocardiography in major surgeries.
- Temperature monitoring is critical in long or major operations, with peripheral and core measurements, the pulmonary artery being the most accurate site for core temperature.
- Depth of anesthesia and awareness are monitored with tools such as the Bispectral Index (BIS), which processes EEG activity to reduce intraoperative awareness risk.

Q7.1: How is oxygenation monitored in anesthesia?

Answer:

- Pulse oximeter

Q7.2: How is ventilation monitored in anesthesia?

Answer:

- Capnography

Q7.3: Describe circulation monitoring in anesthesia.

Answer:

- BP: IBP (Radial artery), NIBP
- ECG
 - o Lead II: Detect arrhythmia
 - o Lead IV: Detect ischemia
- Transesophageal echocardiography: Venous air embolism
 - o Major surgery

Q7.4: Discuss temperature monitoring in anesthesia.

 PYQ: NEET PG 2019

Answer:

- Peripheral temperature:
- Core temperature: Major surgery
 - o Best site: Pulmonary artery

Q7.5: How is awareness monitored in anesthesia?

Answer:

- Bi-spectral index monitoring
- Calculate the sum of the EEG