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Pediatric Anesthesiology (PA)

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Question: 1260

A 3-year-old child with a known history of Tetralogy of Fallot (unrepaired) is undergoing a minor procedure. During induction, the child becomes deeply cyanotic, and the pulse oximeter reads 60%. The heart rate is 140 bpm. Which of the following interventions will most effectively improve oxygenation?

- A. Administration of a 10 mg/kg bolus of ketamine
- B. Decreasing the systemic vascular resistance (SVR) with isoflurane
- C. Administration of a 10 mcg/kg bolus of esmolol

Answer: A

Explanation: This is a "Tet spell," characterized by an increase in right-to-left shunting across the VSD, often due to a decrease in SVR or an increase in pulmonary vascular resistance (PVR). The goal of treatment is to increase SVR and/or decrease PVR. Ketamine is an excellent choice as it increases SVR. Other treatments include knee-chest positioning (mimicking squatting to increase SVR), fluid boluses, 100% oxygen (to decrease PVR), and phenylephrine (to increase SVR). Esmolol can be used to treat infundibular spasm but is not the first-line for hypotension-induced shunting. Increasing ventilation can actually worsen shunting if it increases intrathoracic pressure.

Question: 1261

A 10-year-old patient with Sickle Cell Disease (HbSS) is undergoing a laparoscopic cholecystectomy. Preoperative hemoglobin is 9.0 g/dL and HbS percentage is 45%. Intraoperatively, the patient becomes hypothermic (34.8°C) and the $EtCO_2$ is maintained at 48 mmHg to stimulate respiration. Which of the following is the most likely complication of these intraoperative conditions?

- A. Acute chest syndrome
- B. Hemolytic crisis
- C. Vaso-occlusive crisis

Answer: C

Explanation: Vaso-occlusive crisis in Sickle Cell Disease is triggered by factors that promote the deoxygenated state of hemoglobin S, which then polymerizes and causes red blood cell sickling. The primary triggers are hypoxia, acidosis (high CO_2), hypothermia, and dehydration. In this scenario, both hypothermia and hypercarbia (acidosis) are present, significantly increasing the risk of sickling and subsequent vaso-occlusion in the microvasculature. While acute chest syndrome is a postoperative concern, the immediate physiological consequence of these triggers is a vaso-occlusive event.

Question: 1262

An 18-month-old child presents with a sudden onset of wheezing and coughing while eating peanuts. On physical exam, there are decreased breath sounds on the right side. The child is scheduled for an emergent rigid bronchoscopy. Which of the following is the most appropriate anesthetic management strategy for foreign body extraction?

- A. Maintenance of spontaneous ventilation to prevent distal migration of the object
- B. Use of a laryngeal mask airway (LMA) to facilitate the surgeon's access
- C. Rapid sequence induction with succinylcholine to secure the airway quickly

Answer: A

Explanation: For rigid bronchoscopy to remove a foreign body, maintaining spontaneous ventilation is traditionally preferred. Positive pressure ventilation can push a partially obstructing foreign body further down the tracheobronchial tree, potentially turning a partial obstruction into a complete one. Spontaneous ventilation also helps maintain the airway patency during the procedure. While TIVA or volatile agents can be used, the goal is to keep the patient breathing on their own until the object is secured. RSI is generally avoided unless the patient has a full stomach and the risk of aspiration outweighs the risk of object migration.

Question: 1263

A 12-year-old patient with Klippel-Feil syndrome is scheduled for spinal fusion. Preoperative imaging reveals a Type II anomaly. During the airway assessment, the anesthesiologist must consider the specific anatomical restrictions of this syndrome. What is the defining anatomical feature of Klippel-Feil syndrome that most impacts airway management?

- A. Subglottic stenosis at the level of the cricoid cartilage
- B. Macroglossia and mandibular hypoplasia
- C. Congenital fusion of at least two cervical vertebrae

Answer: C

Explanation: Klippel-Feil syndrome is defined by the congenital fusion of two or more cervical vertebrae. This leads to a short neck, low posterior hairline, and significantly limited cervical range of motion. Unlike Down syndrome, where atlanto-axial instability is the primary concern, the primary challenge in Klippel-Feil is the lack of neck mobility, which can make direct laryngoscopy extremely difficult or impossible, often necessitating fiberoptic or video laryngoscopic techniques.

Question: 1264

A term neonate with a known myelomeningocele is scheduled for repair. Which of the following is the most important preoperative consideration regarding the induction of anesthesia?

- A. Maintenance of the patient in a prone position throughout induction
- B. Use of latex-free equipment and environment
- C. Avoidance of succinylcholine due to the risk of hyperkalemia

Answer: B

Explanation: Patients with neural tube defects, such as myelomeningocele, are at an extremely high risk for developing latex hypersensitivity due to repeated exposures from multiple surgeries and catheterizations. Primary prevention by maintaining a latex-free environment from birth is the standard of care. Succinylcholine is generally not contraindicated in the first 24 to 48 hours after a spinal cord injury or in neonates with myelomeningocele, as the up-regulation of extrajunctional acetylcholine receptors takes time to develop. Autonomic dysreflexia is a concern for patients with chronic lesions above T6, not typically in the neonatal period.

Question: 1265

During a pediatric caudal block, the anesthesiologist uses a 1:200,000 concentration of epinephrine in the local anesthetic. What is the concentration of epinephrine in micrograms per milliliter ($\mu\text{g}/\text{mL}$)?

- A. 1 $\mu\text{g}/\text{mL}$
- B. 0.5 $\mu\text{g}/\text{mL}$
- C. 5 $\mu\text{g}/\text{mL}$

Answer: C

Explanation: A concentration of 1:1,000 means 1 gram in 1,000 mL, which equals 1 mg/mL (1000 $\mu\text{g}/\text{mL}$). Therefore:

- 1:100,000 = 10 $\mu\text{g}/\text{mL}$

- 1:200,000 = 5 $\mu\text{g}/\text{mL}$

Epinephrine is added to local anesthetics to serve as a marker for intravascular injection (noted by a rise in heart rate or T-wave changes) and to prolong the duration of the block by causing vasoconstriction.

Question: 1266

A 3-day-old neonate with a prenatal diagnosis of gastroschisis was initially managed with a silo. Today, the patient returns to the operating room for definitive primary closure. After reduction of the bowel and fascial closure, the patient's peak inspiratory pressures increase from 18 to 34 cm H_2O , and the pulse oximetry saturation decreases from 98% to 89%. The surgical team notes that the abdomen is extremely tense. Which of the following is the most appropriate next step in management?

- A. Increase the inspiratory pressure limit and apply 10 cm H_2O of PEEP
- B. Administer a 10 mL/kg bolus of isotonic crystalloid
- C. Request that the surgeons loosen the closure or transition back to a silo

Answer: C

Explanation: Primary closure of a large gastroschisis defect can lead to abdominal compartment syndrome (ACS). The increase in intra-abdominal pressure causes cephalad displacement of the diaphragm, leading to decreased functional residual capacity, increased airway pressures, and impaired ventilation. Furthermore, ACS reduces venous return by compressing the inferior vena cava and decreases renal perfusion. While neuromuscular blockade or fluid resuscitation might offer marginal or temporary stabilization, they do not address the primary mechanical cause of the physiological compromise. The definitive treatment for life-threatening ACS in the setting of abdominal wall closure is the immediate release of the tension, typically by converting the primary closure back to a staged approach using a silo.

Question: 1267

A 10-year-old boy with sickle cell disease is scheduled for an elective cholecystectomy. His preoperative hemoglobin level is 9.0 g/dL, and he reports intermittent pain crises. What is the best perioperative management strategy?

- A. Provide a blood transfusion prior to surgery
- B. Administer intravenous fluids and opioids for pain control
- C. Schedule the surgery during a pain crisis

Answer: A

Explanation: In patients with sickle cell disease, maintaining hemoglobin levels is crucial to prevent sickling crises. A blood transfusion prior to surgery can help raise the hemoglobin level and reduce the risk of complications during the procedure. The other options do not adequately address the need for optimizing hemoglobin levels.

Question: 1268

During a caudal block in a 6-month-old infant, the needle is advanced through the sacrococcygeal ligament. To avoid accidental dural puncture, the anesthesiologist must be aware of the anatomical level where the dural sac terminates in a patient of this age. At what level does the dural sac typically end in a neonate or young infant?

- A. L5
- B. S3
- C. L3

Answer: B

Explanation: In neonates and young infants, the dural sac ends more caudally than in adults, typically at the level of S3 or even S4. As the child grows, the vertebral column grows faster than the spinal cord and dural sac, leading to a relative cephalad migration. By the age of one year, the dural sac ends at the adult level of S2. This anatomical difference is critical when performing caudal anesthesia to minimize the risk of accidental spinal entry.

Question: 1269

A 3-week-old infant born at 34 weeks gestation presents with persistent non-bilious, non-projectile vomiting. On exam, the infant is lethargic with dry mucous membranes and a capillary refill of 4 seconds. Laboratory analysis reveals: Sodium 132 mEq/L, Potassium 3.1 mEq/L, Chloride 88 mEq/L, and Bicarbonate 34 mEq/L. The patient is scheduled for an emergent pyloromyotomy. What is the most appropriate next step in management?

- A. Postpone surgery for aggressive fluid resuscitation and electrolyte correction
- B. Initiate a 10 mL/kg bolus of 5% albumin followed by maintenance fluids
- C. Administer a 20 mL/kg bolus of 0.45% normal saline with 20 mEq/L KCl

Answer: A

Explanation: This clinical presentation describes hypertrophic pyloric stenosis with significant hypochloremic, hypokalemic metabolic alkalosis and dehydration. Pyloromyotomy is never a surgical emergency; it is a medical emergency requiring stabilization. In this state, the kidneys attempt to maintain intravascular volume by reabsorbing sodium in the distal tubule at the expense of hydrogen and potassium ions, leading to paradoxical aciduria. Operating on a patient with significant alkalosis increases the risk of postoperative apnea due to depression of the respiratory drive by high CSF bicarbonate levels. Resuscitation should prioritize restoring volume with isotonic saline and correcting the chloride deficit and hypokalemia before induction of anesthesia.

Question: 1270

During a routine outpatient procedure, a 3-year-old girl is noted to have a preoperative hemoglobin of 9 g/dL. She is asymptomatic and has no significant medical history. What is the most appropriate management regarding her anemia before anesthesia?

- A. Schedule for a blood transfusion
- B. Proceed with surgery without intervention
- C. Administer intravenous iron

Answer: B

Explanation: In asymptomatic pediatric patients with mild anemia, such as a hemoglobin of 9 g/dL, it is often safe to proceed with surgery without immediate intervention. The risk of transfusion-related complications and the need for additional resources often outweigh the benefits in an otherwise healthy child.

Question: 1271

A 3-year-old child is undergoing a procedure requiring general anesthesia. What is the primary concern regarding the use of anesthetic agents in this age group?

- A. Overdose potential
- B. Prolonged recovery
- C. Respiratory depression

Answer: A

Explanation: Young children are at increased risk of overdose due to their lower body weight and varying pharmacokinetics of anesthetic agents. Careful dosing and monitoring are critical to prevent adverse effects during and after anesthesia.

Question: 1272

A 2-year-old child presents with an inhaled foreign body (a peanut) located in the right mainstem bronchus. The plan is for rigid bronchoscopy. Which anesthetic technique provides the best surgical conditions while minimizing the risk of distal displacement of the foreign body?

- A. High-frequency jet ventilation via the side port of the bronchoscope
- B. Inhalational induction followed by neuromuscular blockade and positive pressure ventilation
- C. Sevoflurane induction followed by maintenance of spontaneous ventilation

Answer: C

Explanation: During the removal of a foreign body via rigid bronchoscopy, spontaneous ventilation is often preferred. Positive pressure ventilation (PPV) can push the foreign body further into the distal airway, making retrieval difficult or causing a complete "ball-valve" obstruction. Spontaneous ventilation maintains the negative pressure during inspiration, which tends to keep the airway open and the object stationary or pulled slightly more proximal. While TIVA is an option, inhalational agents are often easier to titrate to maintain spontaneous breaths in a child while providing enough depth to suppress airway reflexes during the stimulation of the rigid scope.

Question: 1273

A 7-year-old child with cystic fibrosis is scheduled for a lung transplant. Which of the following is the most important factor to consider in the anesthetic plan?

- A. The use of neuromuscular blockers
- B. The potential for airway complications

C. The need for postoperative pain management

Answer: B

Explanation: The potential for airway complications is the most critical factor to consider in this patient due to the underlying lung disease and risk of mucus plugging. Ensuring a clear airway is paramount during anesthesia management.

Question: 1274

A 6-month-old infant is undergoing surgery for congenital heart disease. During the procedure, the anesthesiologist notes a significant drop in systemic blood pressure. The infant's current medications include digoxin and furosemide. What is the most appropriate immediate intervention?

- A. Administering an epinephrine bolus
- B. Administering a fluid bolus
- C. Increasing the rate of furosemide administration

Answer: B

Explanation: In a hypotensive infant, the immediate intervention should be to administer a fluid bolus to restore intravascular volume and improve blood pressure. While epinephrine may be considered, it is not the first-line treatment without addressing volume status. Increasing furosemide could worsen hypotension, and atropine is not indicated in this scenario.

Question: 1275

A 7-year-old boy with a history of asthma is scheduled for surgery. His preoperative assessment reveals a peak expiratory flow rate of 60% of predicted. What is the most appropriate action before proceeding with anesthesia?

- A. Delay the surgery until his asthma is better controlled
- B. Provide a nebulized bronchodilator treatment
- C. Administer a high-dose inhaled corticosteroid

Answer: B

Explanation: Administering a nebulized bronchodilator treatment is appropriate to optimize respiratory function before anesthesia. This intervention can help improve airflow and reduce the risk of perioperative respiratory complications in asthmatic patients.

Question: 1276

A 15-kg child is receiving a propofol infusion at 200 mcg/kg/min for total intravenous anesthesia (TIVA). If the propofol concentration is 10 mg/mL, what is the infusion rate in mL/hr?

- A. 24 mL/hr
- B. 18 mL/hr
- C. 12 mL/hr

Answer: B

Explanation: First, calculate the mcg/min: $15 \text{ kg} \times 200 \text{ mcg/kg/min} = 3000 \text{ mcg/min}$.

Convert mcg/min to mg/min: $3000 \text{ mcg/min} \div 1000 = 3 \text{ mg/min}$.

Convert mg/min to mg/hr: $3 \text{ mg/min} \times 60 \text{ min/hr} = 180 \text{ mg/hr}$.

Convert mg/hr to mL/hr: $180 \text{ mg/hr} \div 10 \text{ mg/mL} = 18 \text{ mL/hr}$.

Question: 1277

A 3-week-old neonate with a history of prematurity (born at 28 weeks gestation) is scheduled for a laparoscopic inguinal hernia repair. The surgical team requests a rapid sequence induction (RSI) due to a full stomach. Which of the following physiologic factors most influences the choice of succinylcholine dose in this patient?

- A. Immature acetylcholine receptors at the neuromuscular junction
- B. Higher volume of distribution for water-soluble drugs
- C. Decreased pseudocholinesterase activity

Answer: B

Explanation: Neonates and infants have a significantly higher percentage of total body water compared to older children and adults. As a result, the volume of distribution for water-soluble drugs like succinylcholine is much larger. Therefore, neonates require a higher dose (approximately 2 to 3 mg/kg) to achieve equivalent neuromuscular blockade compared to adults (1 mg/kg). While acetylcholine receptors are immature, it is the volume of distribution that primarily dictates the increased dose requirement for succinylcholine in this age group.

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