

1. While needle-to-nerve proximity correlates with onset of action of a nerve block, injection of local anesthetic within which of the following layers has been implicated in persistent post-operative neurologic symptoms?

- A. Circumneural sheath
- B. Epineurium
- C. Perineurium
- D. Epimesium

2. Which voltage-gated channel is the primary receptor target by which local anesthetics exert their effects?

- A. Calcium channels
- B. Potassium channels
- C. Sodium channels
- D. Proton channels

3. How are local anesthetics in the amino-amide class metabolized?

- A. Hofmann elimination
- B. Cytochrome p450 enzymes of the liver
- C. Plasma cholinesterases
- D. Tissues esterases

4. Which of the following statements is TRUE regarding liposomal bupivacaine?

- A. It is produced by the loading of bupivacaine particles into liposomal spheres surrounded by a lipid bilayer
- B. It is a selective sodium channel blocker that is naturally produced by animals
- C. It is a selective alpha-2 adrenergic agonist in a lipid sphere
- D. The lipids in liposomal bupivacaine counteract local anesthetic inhibition of myocardial fatty acid oxidation

5. Which of the following statements is TRUE with regards to continuous infusion of local anesthetic?

- A. Less than 1 of 5 cases of local anesthetic systemic toxicity is the result of continuous infusions of local anesthetic.
- B. The majority of LAST associated with continuous infusions of local anesthetic is due to undetected placements of intravascular catheters.
- C. Patients with renal failure are at high risk for LAST and should not be offered regional anesthetic continuous infusions.
- D. In the majority of studies measuring total and free local anesthetic with continuous regional anesthetic infusions, both values are found to increase with increased duration of infusion.

6. Which of the following clinical scenarios classically typifies the clinical presentation of local anesthetic systemic toxicity?

- A. 23-year-old man with OSA has an interscalene block performed with 20 mL of 0.5% bupivacaine with 5 mcg/mL epinephrine. 20 minutes after the block is performed he feels short of breath. He requires oxygen support 2L/min via nasal cannula for hours after the surgery is performed.
- B. 82-year-old man with CKD III and cirrhosis has an interscalene block performed for total shoulder arthroplasty. Within minutes of the block, he notes tinnitus, becomes restless, and then has a seizure. Cardiac collapse ensues after.
- C. 53-year-old woman has a spinal anesthetic for total knee replacement. 3 mL 0.5% bupivacaine are used. After the uneventful spinal is completed, she complains of nausea and subsequently becomes bradycardic and hypotensive.
- D. 18-year-old man has a supraclavicular block for a lesion to be removed from the 5th digit. Under sedation in the operating room, he becomes restless when incision is made. Blood pressure and heart rate elevations are noted concurrently.

7. A 79-year-old man with a history of CAD and liver disease is having a supraclavicular block performed for a ganglion cyst removal. Immediately after the block, he complains of perioral numbness and becomes agitated with hypertension and ventricular tachycardia. Within a minute he has a tonic clonic seizure. Which of the following medications is NOT recommended in the treatment of this condition?

- A. Calcium channel blocker
- B. Epinephrine
- C. 20% lipid emulsion
- D. Benzodiazepine

8. Which of the following is a known risk factor for transient neurologic symptoms after a spinal anesthetic?

- A. Lithotomy position
- B. Dose of local anesthetic
- C. Paresthesia during placement
- D. Hypotension

9. A 54-year-old woman presents on POD 1 after a lidocaine spinal anesthetic for right side meniscectomy. She complains of 6/10 "shooting pain" radiating down from her buttocks to her lower leg, and denies loss of bowel or bladder incontinence. Which of the following is the MOST likely cause of her symptoms?

- A. Cauda equina syndrome
- B. Transient neurologic symptoms
- C. Epidural hematoma
- D. Epidural abscess

10. A 56-year-old man with a history of non-invasive bladder cancer is scheduled for a cystoscopy and laser ablation. A spinal anesthetic is performed using 60 mg preservative-free 2-chloroprocaine. The addition of 200 mcg epinephrine to the chloroprocaine spinal solution would INCREASE the risk of which of the following?

- A. Epidural hematoma
- B. Spinal cord ischemia
- C. Fever, malaise, and myalgias
- D. High spinal

11. A 54-year-old man has a peripheral nerve block prior to hand surgery. The pulse oximetry reading changes from 98% on 2L/min oxygen via nasal cannula to 85%. Blood is aspirated from an arterial line in place and is noted to be chocolate colored. An ABG is checked and while the SaO<sub>2</sub> is less than 90%, the PaO<sub>2</sub> is measured to be greater than 70 mmHg. Which of the following local anesthetics is most likely implicated in this clinical scenario?

- A. Bupivacaine
- B. Ropivacaine
- C. Prilocaine
- D. Mepivacaine

12. The use of neuraxial opioids in combination with local anesthetics has proven to be beneficial in providing equal or superior pain relief and less sedation as compared to parenteral opioid dosing. What is the mechanism of action of epidural opioids?

- A. Inhibit descending transmission of nociceptive information
- B. Inhibition of the release of substance P in the substantia gelatinosa.
- C. Systemic absorption through dura mater and uptake into posterior spinal arteries.
- D. Mu receptor agonism in the spinothalamic tract.

13. Which of the following side effects is LEAST likely a direct consequence of the use of neuraxial opioids?

- A. Pruritus
- B. Hypotension
- C. Nausea/vomiting
- D. Urinary retention

14. Which of the following statements is TRUE regarding the use of neuraxial opioids for postoperative analgesia?

- A. There is no increased risk of respiratory depression in patients with OSA
- B. Neuraxial opioid can be used safely in combination with other sedatives, such as benzodiazepines or systemic opioids
- C. The use of a bolus of extended release neuraxial morphine does not require any further monitoring beyond the first 24 hours
- D. The use of lipophilic agents (fentanyl, sufentanil) would result in greater systemic absorption compared to hydrophilic opioids (morphine, hydromorphone).

15. A patient who chronically takes oral morphine in a dose in excess of 100 mg per day for many years is admitted after lumbar spine decompressive surgery and finds that with escalating doses of hydromorphone (greater than 50mg intravenous hydromorphone in a 5-hour window), he is becoming increasingly more uncomfortable. Which of the following therapeutic measures would MOST LIKELY improve this patient's pain?

- A. The patient is experiencing opioid withdrawal due to inadequate doses of hydromorphone. Therefore, hydromorphone dose needs to be increased.
- B. This patient is experiencing opioid-induced hyperalgesia. The hydromorphone should be switched to morphine, and nonopioid multimodal analgesia (NSAIDs, gabapentinoids, ketamine, regional anesthesia) should be used to control his pain.
- C. This patient is experiencing tolerance to opioids and a higher dose of hydromorphone is required for improved efficacy.
- D. This patient is experiencing opioid-induced allodynia, and a low dose naloxone infusion should be initiated to counteract this mu receptor mediated effect.

16. A patient who has been on maintenance oral methadone 80mg once a day for a history of opioid abuse is now scheduled for an open colectomy in one week. Which of the following analgesic management options is LEAST recommended?

- A. Continue methadone therapy, converting methadone to IV with a 2:1 or 3:1 PO:IV ratio once a day while patient is unable to tolerate PO.
- B. Offer regional anesthetic technique such as thoracic epidural for postoperative pain management with local anesthetic and hydrophilic opioid.
- C. Add acetaminophen, nonsteroidal anti-inflammatory agent, and dexamethasone as multimodal analgesics.
- D. Use higher doses of opioids to counteract opioid tolerance

17. Which of the following statements concerning the opioid crisis is FALSE?

- A. Since 2013, opioid abuse has surpassed motor vehicle accidents as the leading cause of preventable deaths in the United States.
- B. In 2012, enough opioids were prescribed that every adult American would have around the clock pills for 3-4 weeks.
- C. Opioid withdrawal results in significant mortality
- D. Due to the rise of deaths from prescription opioids, the CDC recommended more restrictive use of opioid prescriptions for non-cancer pain.

18. Which of the following contributes LEAST to opioid-induced respiratory depression?

- A. Use of opioids with active metabolites in patients with significant renal dysfunction
- B. Multiple concurrent routes of opioid administration (e.g. systemic + neuraxial) or concurrent use of non-opioid sedatives
- C. Obstructive Sleep Apnea
- D. Chronic use of a stable dose of opioids

19. Which of the following is TRUE of tramadol?

- A. In order to achieve analgesic effects, it must be metabolized to its active form, O-desmetholtramadol (ODT).
- B. Its active metabolite is excreted by the kidneys and, therefore, increased vigilance for opioid-induced respiratory depression should occur in patients with severe renal dysfunction.
- C. Use of naloxone is unlikely to improve respiratory depression from tramadol since its mechanism of action is serotonin and norepinephrine reuptake inhibition.
- D. The incidence of tramadol abuse is no different than that of stronger opioids such as morphine and hydrocodone.

20. Which of the following is TRUE regarding the administration of acetaminophen?

- A. The most common adverse effects include nausea, vomiting, and insomnia.
- B. The half-life of a therapeutic dose is 12 hours.
- C. Acetaminophen can affect platelet function and should be used with care in bleeding patients.
- D. Most of the absorption of an oral dose occurs in the stomach.

21. Which of the following statements regarding the use of acetaminophen is FALSE?

- A. Acetaminophen has a relatively safe side effect profile when taken at the recommended doses.
- B. The use of acetaminophen as part of a multimodal analgesic regimen has reduced the incidence of opioid-related adverse events.
- C. Acetaminophen overdose is the leading cause for acute hepatic failure in the United States.
- D. N-acetylcysteine, an antidote for acetaminophen-induced hepatotoxicity, is effective when given within 8 to 10 hours of acetaminophen ingestion.

22. Which of the following statements is NOT true of the use of nonsteroidal anti-inflammatory agents as analgesics?

- A. The use of H2 blockers in concert with non-selective COX inhibitors is as effective as the use of COX-2 inhibitors in reducing rates of upper GI bleed.
- B. NSAIDs have been implicated in increased rates of cardiovascular events with selective COX-2 inhibitors resulting in greater risks than nonselective COX inhibitors of myocardial and cerebral thrombotic events.
- C. All NSAIDs, regardless of COX selectivity, negatively impact renal function through afferent arteriolar constriction, glomerular filtration rate (GFR) reduction and inhibition of the kidneys' ability to excrete salt and water.
- D. NSAIDs are generally regarded unfavorably in parturients during all three trimesters, though the third trimester is the period that can result in potentially greater harm to the fetus due to risks of fetal renal injury, oligohydramnios, ductus arteriosus constriction and intracranial hemorrhage.

23. Which of the following statements regarding the use of gabapentin as an analgesic is FALSE?

- A. Side effects of gabapentin include dizziness, sedation, gait disturbance, headache, difficulty with concentration, peripheral edema, and visual disturbances when used for longer periods of time.
- B. Meta-analyses of perioperative gabapentin use noted no increased risk of sedation and dizziness with short duration prescription of gabapentinoids though this result may be confounded by the use of sedation and general anesthesia in this patient population.
- C. The data is inadequate to recommend the optimal dose and duration of gabapentinoid use for acute postoperative pain control.
- D. Gabapentin's effect as a multimodal analgesic agent has been shown to be very strong, resulting in reducing opioid consumption by greater than a morphine equivalent of 10mg in the first 24 hours after surgery, based on randomized controlled trials with good scientific validity.

24. Which of the following concerning the use of intravenous compared to perineural dexamethasone is TRUE?

- A. There is no evidence of neurotoxicity in animal studies.
- B. Higher doses of perineural dexamethasone such as 8-10 mg are more effective in prolonging analgesic duration compared to lower doses.
- C. Intravenous dexamethasone in doses of 0.1 mg/kg or more have shown to have analgesic benefits.
- D. Efficacy of perineural dexamethasone is highly dependent on the type of peripheral nerve blockade and the type of local anesthetic used.

25. Which of the following statements about the use of nerve stimulation for regional anesthesia is FALSE?

- A. A positive Raj test is due to the fact that local anesthetic spread results in decreased current density surrounding the needle tip.
- B. A lower frequency of current pulses allows the physician to advance the needle more quickly.
- C. The inability to solicit a motor response despite high stimulating currents does not demonstrate a lack of intraneural needle placement.
- D. Motor fibers are more easily activated using shorter pulse duration as compared to sensory fibers, which require longer pulse durations to activate.