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Anesthetic considerations for medications administered to neurosurgical patients

NeuroAnesthesia Quiz #77

Start

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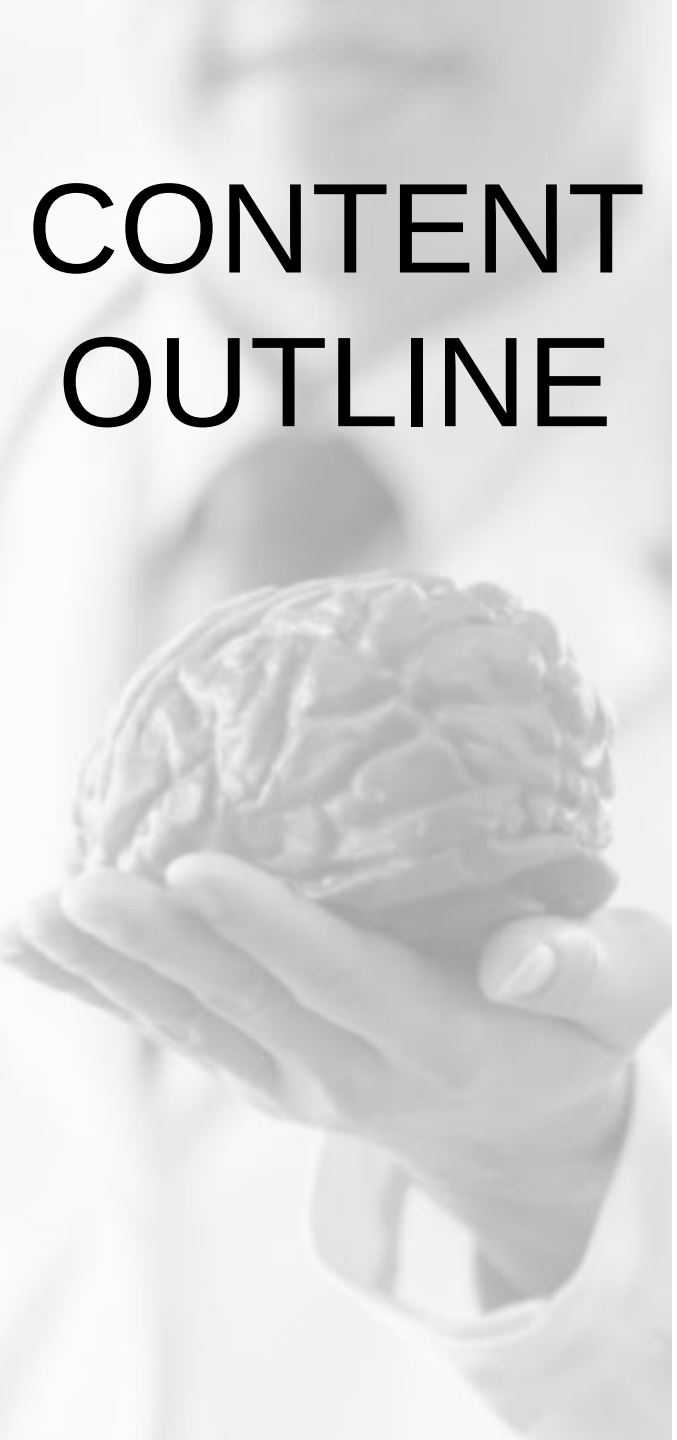
CONTENT OUTLINE



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QUESTION 1

A 68 y/o F, with history of atrial fibrillation on coumadin, presented for emergent evacuation of subdural hematoma after a fall. Her INR was 3.6. The surgeon asked if you could order prothrombin complex concentrate (Human). Which of the following statements regarding prothrombin complex concentrate (Human) is **FALSE**?

Please click on any of the following links to proceed to that question/topic.

A. Prothrombin complex concentrate (Human) is indicated for the urgent reversal of vitamin K antagonist

B. Prothrombin complex concentrate (Human) does not carry a risk of transmitting infectious agents

C. Prothrombin complex concentrate (Human) is contraindicated in patients with known heparin induced thrombocytopenia

D. Patients receiving prothrombin complex concentrate (Human) should be monitored for thromboembolic events

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Sorry! Incorrect.

EXPLANATION

A. Prothrombin complex concentrate (Human) is indicated for the urgent reversal of vitamin K antagonist

This is a true statement.

Prothrombin complex concentrate (Human) contains the Vitamin K-dependent coagulation factors II, VII, IX, and X, as well as the antithrombotic Protein C and Protein S. Prothrombin complex concentrate (Human) is indicated for the urgent reversal of acquired coagulation factor deficiency induced by Vitamin K antagonist (e.g., coumadin) in adult patients with:

- acute major bleeding and/or
- need for an urgent surgery/invasive procedure

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Great Job!! Correct.

EXPLANATION

B. Prothrombin complex concentrate (Human) does not carry a risk of transmitting infectious agents

This is a false statement.

Prothrombin complex concentrate (Human) is made from human blood and may carry a risk of transmitting infectious agents. Despite the use of two dedicated virus reduction steps in manufacturing to reduce risks, this product may still potentially transmit bloodborne infectious agents.

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Next Question

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EXPLANATION

C. Prothrombin complex concentrate (Human) is contraindicated in patients with known heparin-induced thrombocytopenia

This is a true statement.

Prothrombin complex concentrate (Human) is contraindicated in patients with:

- ❑ Known heparin-induced thrombocytopenia. Prothrombin complex concentrate (Human) contains heparin.
- ❑ Known anaphylactic or severe systemic reactions to prothrombin complex concentrate (Human) or any components in prothrombin complex concentrate (Human) including heparin, Factors II, VII, IX, X, Proteins C and S, Antithrombin III and human albumin.
- ❑ Disseminated intravascular coagulation

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EXPLANATION

D. Patients receiving prothrombin complex concentrate (Human) should be monitored for thromboembolic events

This is a true statement.

Both fatal and non-fatal arterial and venous thromboembolic complications have been reported with prothrombin complex concentrate (Human) in clinical trials and post marketing surveillance. Patients receiving prothrombin complex concentrate (Human) should be monitored for signs and symptoms of thromboembolic events.

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QUESTION 2

A 16 y/o obese M had a combined anterior and posterior lumbar spine surgery for scoliosis. Malfunction of his epidural catheter was identified after he complained of significant abdominal and back pain. The surgeon asked if you could perform a transversus abdominis plane (TAP) block with bupivacaine liposome injectable suspension to help control anterior incisional pain. Which of the following statements regarding bupivacaine liposome injectable suspension is **TRUE**?

Please click on any of the following links to proceed to that question/topic.

A. Bupivacaine liposome injectable suspension may be used for TAP block in patients with concurrent infusion of bupivacaine through epidural

B. Multiple doses of bupivacaine liposome injectable suspension may be used for TAP block in an obese patient

C. Bupivacaine liposome injectable suspension is recommended to be used as an epidural local anesthetic

D. Bupivacaine liposome injectable suspension is approved by FDA to be used in pediatric patients aged 6 years and older

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Sorry! Incorrect.

EXPLANATION

A. Bupivacaine liposome injectable suspension may be used for TAP block in patients with concurrent infusion of bupivacaine through epidural

This is a false statement.

Bupivacaine liposome injectable suspension is a sterile, non-pyrogenic white to off-white preservative-free aqueous suspension of multivesicular liposomes containing bupivacaine. After injection of bupivacaine liposome injectable suspension, bupivacaine is released from the multivesicular liposomes over a period of time. Additional use of bupivacaine should be avoided within 96 hours following administration of bupivacaine liposome injectable suspension to avoid toxicity.

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EXPLANATION

B. Multiple doses of bupivacaine liposome injectable suspension may be used for TAP block in an obese patient

This is a false statement.

Bupivacaine liposome injectable suspension is intended for single-dose administration only. The recommended dose of bupivacaine liposome injectable suspension for local infiltration in adults is up to a maximum dose of 266 mg (20 mL). The recommended dose of bupivacaine liposome injectable suspension for interscalene brachial plexus nerve block in adults is 133 mg (10 mL).

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EXPLANATION

C. Bupivacaine liposome injectable suspension is recommended to be used as an epidural local anesthetic

This is a false statement.

Bupivacaine liposome injectable suspension has not been evaluated for the following uses and, therefore, is not recommended for these types of analgesia or routes of administration:

- ❑ Epidural
- ❑ Intrathecal
- ❑ Regional nerve blocks other than interscalene brachial plexus nerve block
- ❑ Intravascular or intra-articular use

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Great Job!! Correct.

EXPLANATION

D. Bupivacaine liposome injectable suspension is approved by FDA to be used in pediatric patients aged 6 years and older

This is a true statement.

Bupivacaine liposome injectable suspension is approved by FDA to be used in pediatric patients 6 years of age and older for single-dose infiltration to produce postsurgical local analgesia.

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QUESTION 3

A 48 y/o M, with history of seizure and liver dysfunction, presented for stereoelectroencephalography (SEEG) procedure. Surgeon requested immobility of the patient throughout the entire procedure. You started cisatracurium infusion. TOF showed only one twitch at the end of surgery. HR 49 BP 124/68 Surgeon asked if sugammadex may be considered or not. Which of the following statements regarding sugammadex is **TRUE**?

Please click on any of the following links to proceed to that question/topic.

A. Sugammadex is contraindicated in patients with liver dysfunction

B. Sugammadex can be used as a rapid reversal of cisatracurium

C. Sugammadex should be used with caution in patients with bradycardia

D. Sugammadex should not be injected into the intravenous line with a running infusion of 5% dextrose

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Sorry! Incorrect.

EXPLANATION

A. Sugammadex is contraindicated in patients with liver dysfunction

This is a false statement.

Sugammadex is known to be substantially excreted by the kidney, but not metabolized nor excreted by the liver. Some studies show sugammadex can rapidly reverse rocuronium in patients with liver dysfunction undergoing hepatic surgery. Sugammadex was found to be safe and well tolerated.

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Fujita A, et al. Rapid reversal of neuromuscular blockade by sugammadex after continuous infusion of rocuronium in patients with liver dysfunction undergoing hepatic surgery. Acta Anaesthesiol Taiwan.2014 Jun;52(2):54-8.

Abdulatif, M, et al. Sugammadex antagonism of rocuronium-induced neuromuscular blockade in patients with liver cirrhosis undergoing liver resection: a randomized controlled study. Minerva Anestesiol .2018 Aug;84(8):929-937.

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EXPLANATION

B. Sugammadex can be used as a rapid reversal of cisatracurium

This is a false statement.

- ❑ Sugammadex is a modified gamma cyclodextrin. It forms a complex with rocuronium and vecuronium, and then reduces the amount of rocuronium and vecuronium available to bind to nicotinic cholinergic receptors in the neuromuscular junction. This results in the reversal of neuromuscular blockade induced by rocuronium and vecuronium.
- ❑ Sugammadex cannot be used to reverse neuromuscular blockade induced by benzylisoquinolinium compounds (e.g., cisatracurium), nor steroidal neuromuscular blocking agents other than rocuronium or vecuronium.

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Great Job!! Correct.

EXPLANATION

C. Sugammadex should be used with caution in patients with bradycardia

This is a true statement.

Cases of marked bradycardia, some of which have resulted in cardiac arrest, have been observed within minutes after administration of sugammadex. Therefore, sugammadex should be used with caution in patients with underlying bradycardia. Patients should be closely monitored for hemodynamic changes during and after administration of sugammadex.

Severe bradycardia and asystole after sugammadex. Bhavani SS. Br J Anaesth. 2018 Jul;121(1):95-96.

Severe Hypotension, Bradycardia and Asystole after Sugammadex Administration in an Elderly Patient. Fierro C, et al. Medicina (Kaunas). 2021 Jan 19;57(1):79.

Next Question

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EXPLANATION

D. Sugammadex should not be injected into the intravenous line with a running infusion of 5% dextrose

This is a false statement.

Sugammadex can be injected into the intravenous line with a running infusion with the following intravenous solutions:

- 0.9% sodium chloride
- 5% dextrose
- 0.45% sodium chloride and 2.5% dextrose
- 5% dextrose in 0.9% sodium chloride
- isolyte P with 5% dextrose
- Ringer's lactate solution
- Ringer's solution

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QUESTION 4

A 56 y/o M, with history of back pain and chronic kidney disease, presents for L2-L3 decompression laminectomy. Patient appears very drowsy in the preoperative area after receiving gabapentin 600 mg per Enhanced Recovery After Surgery (ERAS) protocol. Which of the following statements regarding gabapentin is **FALSE**?

Please click on any of the following links to proceed to that question/topic.

A. Somnolence is a common side effect

B. Lower dose is recommended in those with kidney disease

C. Gabapentin alleviates neuropathic pain by decreasing the activity of a subset of calcium channels

D. Withdrawal has not been reported with chronic use of gabapentin

Sorry! Incorrect.

EXPLANATION

A. Somnolence is a common side effect

This is a true statement.

Somnolence, drowsiness, or sedation has been reported as an adverse event in 20 studies with 4288 participants.

Wiffen PJ, et al. Gabapentin for chronic neuropathic pain in adults. Cochrane Database Syst Rev. 2017 Jun 9; 6(6): CD007938.

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EXPLANATION

B. Lower dose is recommended in those with kidney disease

This is a true statement.

Gabapentin is eliminated in urine unmetabolized at a rate proportional to creatinine clearance. In patients with renal impairment, the half-life of gabapentin can be prolonged up to 132 hours (without dialysis), which places patients with chronic kidney disease at an increased risk for toxicity, including dizziness, drowsiness, confusion, unsteady gait, myoclonus, episodic leg spasm, ataxia, asterixis, and tremulousness.

Zand L, et al. Gabapentin toxicity in patients with chronic kidney disease: a preventable cause of morbidity. Am J Med. 2010 Apr;123(4):367-73.

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EXPLANATION

C. Gabapentin alleviates neuropathic pain by decreasing the activity of a subset of calcium channels

This is a true statement.

Gabapentin is an anti-epileptic agent, and it is also recommended as first line agent in neuropathic pain, particularly in diabetic neuropathy and post herpetic neuralgia. α2δ-1, an auxiliary subunit of voltage gated calcium channels, has been documented as its main target and its specific binding to this subunit is described to produce various actions responsible for pain attenuation.

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Kukkar A, et al. Implications and mechanism of action of gabapentin in neuropathic pain. Arch Pharm Res. 2013 Mar;36(3):237-51.

Great Job!! Correct.

EXPLANATION

D. Withdrawal has not been reported with chronic use of gabapentin

This is a false statement.

There have been case reports describing withdrawal from gabapentin. The onset of withdrawal symptoms begin between 12 hours and 7 days after cessation of use, with the majority of cases occurring between 24 and 48 hours. More than half of the reported withdrawal symptoms consist of some form of agitation. Confusion and disorientation are the next common symptoms, occurring in 45% of the cases. Other symptoms include diaphoresis, nonspecified gastrointestinal symptoms, tremor, tachycardia, hypertension, and insomnia. Some individual cases have also presented as akathisia, catatonia, and seizures.

Next Question

Content Outline

Mersfelder TL, et al. Gabapentin: Abuse, Dependence, and Withdrawal. Ann Pharmacother. 2016 Mar;50(3):229-33.

QUESTION 5

A 42 y/o F, with history of seizure and atrial fibrillation, presents for temporal lobectomy for seizure control. Her home medications include carbamazepine, lamotrigine, warfarin, diltiazem and oral steroid contraceptives. Which of the following statements regarding interactions between antiepileptic drugs, or between antiepileptic drugs and other drugs is **TURE**?

Please click on any of the following links to proceed to that question/topic.

A. The interactions between antiepileptic drugs are not clinically significant

B. Frequent warfarin dose adjustments and INR monitoring are recommended in this patient

C. The efficacy of diltiazem will not be affected by carbamazepine

D. Oral steroid contraceptives have no effects on the metabolism of lamotrigine

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EXPLANATION

A. The interactions between antiepileptic drugs are not clinically significant

This is a false statement.

The pharmacodynamic interactions between antiepileptic drugs (AEDs) may be clinically significant. The four major enzyme-inducing AEDs (carbamazepine, phenytoin, phenobarbital and primidone) stimulate the metabolism and reduce the serum concentration of most other concurrently administered AEDs. Caution is also needed when an enzyme-inducing AED is discontinued, because the serum concentration of the affected AEDs may increase and lead to potential medication toxicity. Similarly, enzyme-inhibiting AEDs may result in decreased metabolic clearance of the affected AEDs, leading to toxic effects.

Zaccara G, et al. Interactions between antiepileptic drugs, and between antiepileptic drugs and other drugs. Epileptic Disord. 2014 Dec;16(4):409-31.

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Great Job!! Correct.

EXPLANATION

B. Frequent warfarin dose adjustments and INR monitoring are recommended in this patient

This is a true statement.

Initiation of cytochrome P-450 inducing AEDs (e.g., carbamazepine) during warfarin therapy may decrease anticoagulant effect of warfarin, which necessitates frequent warfarin dose adjustments to maintain therapeutic response measured by INR.

Clark NP, et al. Warfarin Interaction with Hepatic Cytochrome P-450 Enzyme-Inducing Anticonvulsants. Clin Appl Thromb Hemost. 2018 Jan;24(1):172-178.

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EXPLANATION

C. The efficacy of diltiazem will not be affected by carbamazepine

This is a false statement.

The metabolism of a list of drugs used to achieve rate or rhythm control in atrial fibrillation, including amiodarone, diltiazem and digoxin, can be stimulated by concurrently administered enzyme-inducing AEDs (e.g., carbamazepine). These interactions lead to decreased efficacy of the affected rate control drugs (e.g., diltiazem) or rhythm control drugs (e.g., amiodarone).

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Zaccara G, et al. Interactions between antiepileptic drugs, and between antiepileptic drugs and other drugs. Epileptic Disord. 2014 Dec;16(4):409-31.

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EXPLANATION

D. Oral steroid contraceptives have no effects on the metabolism of lamotrigine

This is a false statement.

Administration of the combined contraceptive pills may decrease serum lamotrigine concentrations by about 50% or even more, leading to loss of seizure control in some women. The interaction is mediated by the induction of lamotrigine glucuronidation by ethinylestradiol, whereas the progestogen component of the pill plays no contributory role. Oral contraceptives can also cause a similar, but less pronounced interaction leading to a decreased serum valproic acid concentration. Oxcarbazepine might be affected in a similar way.

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Zaccara G, et al. Interactions between antiepileptic drugs, and between antiepileptic drugs and other drugs. Epileptic Disord. 2014 Dec;16(4):409-31.