



Quiz 39

HEPATIC DISEASE AND NEUROANESTHESIA

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Start 

1. A 56 Y/O FEMALE PATIENT WITH A H/O OF ALCOHOLIC CIRRHOSIS IS SCHEDULED FOR EMERGENT LUMBAR FUSION AFTER A MVC. WHICH OF THE FOLLOWING IS **NOT** A RISK FACTOR FOR DEVELOPING PERIOPERATIVE COMPLICATIONS:

- A. High Child score.
- B. Increased operative blood loss.
- C. Duration of surgery.
- D. Pre-existing ascites.

Go to Q2

A. HIGH CHILD SCORE.

This is True. Child- Turcotte- Pugh system is used to assess the risk of mortality in cirrhotic patients. Liao et al, found that patients with Child Class B cirrhosis had a significantly higher incidence of complications than those who had a better hepatic reserve (Child Class A) (p=.006).

Child-Turcotte-Pugh Classification for Severity of Cirrhosis			
	Points*		
	1	2	3
Encephalopathy	None	Grade 1-2 (or precipitant induced)	Grade 3-4 (or chronic)
Ascites	None	Mild to moderate (diuretic responsive)	Severe (diuretic refractory)
Bilirubin (mg/dL)	< 2	2-3	>3
Albumin (g/dL)	> 3.5	2.8-3.5	<2.8
INR	<1.7	1.7-2.3	>2.3
*Child-Turcotte-Pugh Class obtained by adding score for each parameter (total points)			
Class A = 5 to 6 points (least severe liver disease)			
Class B = 7 to 9 points (moderately severe liver disease)			
Class C = 10 to 15 points (most severe liver disease)			

J.-C. Liao et al. / The Spine Journal 13 (2013) 908–913

Incorrect
Try again

B. INCREASED OPERATIVE BLOOD LOSS.

This is true. Cirrhotic patients develop coagulopathies and have a higher tendency to bleed. Higher blood loss leads to perioperative hemodynamic instability and increased fluid resuscitation leading to increased coagulopathy adding to the pre-existing coagulopathy .

J.-C. Liao et al. / The Spine Journal 13 (2013) 908–913

Incorrect
Try again



C. DURATION OF SURGERY.

This is false. Duration of surgery was not found to be an independent risk factor for development of complications.

J.-C. Liao et al. / The Spine Journal 13 (2013) 908–913

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D. PRE-EXISTING ASCITES

This is true. There is a higher incidence of postoperative complications in patients with pre-existing ascites. Presence of ascites suggests advanced cirrhosis, edema, hepato-renal syndrome. Ascites can cause compressive atelectasis, hydrothorax leading to hypoxemia. Patients with ascites are hypervolemic and hyponatremic.

Incorrect
Try again

2. A 39Y/O MALE PATIENT WITH A H/O LIVER TRANSPLANT, DEVELOPS SEIZURES IN THE PACU S/P INTERMEDULLARY NAILING. POSSIBLE CAUSES COULD BE ALL **EXCEPT**:

- A. Electrolyte abnormality .
- B. Low dose tranexamic acid.
- C. Immunosuppressive drugs.
- D. Brain lesion.

Go to Q3

A. ELECTROLYTE ABNORMALITY .

It is true that electrolyte derangements can occur in patients s/p liver transplant – hypocalcemia, hypomagnesemia and hyponatremia, leading to seizures hence this is not the right answer. Cyclosporine A is known to cause depletion of magnesium, hence magnesium levels should be monitored carefully.

Wszolek, ZK, Steg, RE Seizures after orthotopic liver transplantation. *Seizure* 1997; 6:31–9

Incorrect
Try again



B. LOW DOSE TRANEXAMIC ACID.

This is the correct answer. Higher doses of TXA can cause seizures and low doses are unlikely to do so. Tranexamic acid is structurally similar to the amino acid glycine and may cause seizures and myoclonus by acting as a competitive antagonist of glycine receptors. Glycine is an obligatory co-agonist of the *N*-methyl-D-aspartate (NMDA) subtype of glutamate receptors. Receptor blockade only occurs at high concentrations, similar to those that occur after topical application to peripheral tissues, or high doses of TXA, or in cases of renal insufficiency.

Lecker, I, Wang, DS, Whissell, PD, Avramescu, S, Mazer, CD, Orser, BA Tranexamic acid-associated seizures: Causes and treatment. *Ann Neurol* 2016; 79:18–26

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C. IMMUNOSUPPRESSIVE DRUGS

Calcineurin inhibitors (cyclosporine, tacrolimus) used for immunosuppression are neurotoxic and commonly implicated in seizures, hence is not the right answer. Seizures related to immunosuppression have a better prognosis than other etiologies. For drug-induced etiologies, diagnosis is usually by exclusion, with cessation of seizures after altering the dose or discontinuing the drug.

Choi, EJ, Kang, JK, Lee, SA, Kim, KH, Lee, SG, Andermann, F New-onset seizures after liver transplantation: Clinical implications and prognosis in survivors. *Eur Neurol* 2004; 52:230–6

Incorrect
Try again

D. BRAIN LESION

A focal seizure should prompt investigation for a brain lesion, hence this is not the correct answer. Could be a brain bleed s/p trauma or a preexisting lesion-infectious/tumor.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014.

Incorrect
Try again

3. ALL OF THE FOLLOWING STATEMENTS REGARDING THE HEPATIC ENCEPHALOPATHY ARE CORRECT **EXCEPT** :

- A. Ammonia causes astrocyte swelling.
- B. Acute fulminant hepatic failure is a common cause of encephalopathy.
- C. High Manganese levels can cause encephalopathy.
- D. Hypoxia exacerbates cerebral edema.

Go to Q4



A. AMMONIA CAUSES ASTROCYTE SWELLING.

This is true. Ammonia causes hepatic encephalopathy. Portosystemic shunting results in impaired first pass clearance of ammonia. Ammonia crosses the blood brain barrier and leads to an increase in glutamine in astrocytes resulting in osmotic imbalance and astrocyte swelling.

Incorrect
Try again



B. ACUTE FULMINANT HEPATIC FAILURE IS A COMMON CAUSE OF HEPATIC ENCEPHALOPATHY

This is false. Acute fulminant failure is fatal but not a common cause of encephalopathy. Cerebral edema and brain herniation is usually the cause of death. Cytotoxic effects of ammonia, glutamine, cytokines and disruption of the blood brain barrier lead to increased ICP.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014

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C. HIGH MANGANESE LEVELS CAN CAUSE ENCEPHALOPATHY

This is True. Manganese clearance is diminished in liver failure and the high manganese levels are neurotoxic resulting in changes in astrocyte morphology and function leading to neuronal cell death and cerebral dysfunction- which can lead to hepatic encephalopathy

Incorrect
Try again

D. HYPOXIA EXACERBATES CEREBRAL EDEMA

This is true. Hypoxia exacerbates neuroinflammatory process, disrupts vascular integrity hence increasing cerebral edema and worsening brain injury.

Incorrect
Try again

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014

4. ALL ARE USED FOR THE PERIOPERATIVE MANAGEMENT OF HEPATIC ENCEPHALOPATHY, **EXCEPT**:

- A. Mannitol.
- B. Moderate Hypothermia.
- C. Corticosteroids.
- D. Dexmedetomidine.



Go to Q5

A. MANNITOL.

This is true. Mannitol should be administered to treat sustained ICP > 25 mm Hg. Plasma osmolality should be kept < 320 Osm/L, as mannitol is less effective with increasing osmolality. If patient is oliguric, mannitol may not be cleared and can only be used with concomitant haemofiltration.

D. Kiamanesh, J. Rumley and V. K. Moitra. Monitoring and managing hepatic disease in anaesthesia; British Journal of Anaesthesia 111 (S1): i50–i61 (2013)

Incorrect
Try again

B. MODERATE HYPOTHERMIA

This is true. Moderate hypothermia (temp 32-33 degrees) can reduce cerebral edema and reduce ICP, but may increase the risk of infection, coagulopathies, cardiac arrhythmias. Hypothermia produces a sustained and significant reduction in arterial ammonia concentration, cerebral blood flow, brain cytokine production, and markers of oxidative stress.

Castillo L, Bugedo G, Rovegno M. Therapeutic hypothermia as a bridge to transplantation in patients with fulminant hepatic failure. *Revista Brasileira de Terapia Intensiva*. 2015;27(1):72-76. doi:10.5935/0103-507X.20150012.

Incorrect
Try again



C. CORTICOSTEROIDS.

This is false. Corticosteroids tend to reduce focal swelling rather than the diffuse brain edema of encephalopathy. They have not shown improvement in survival and are not indicated.

J. Canalese, A. E. S. Gimson, and C. Davis, "Controlled trial of dexamethasone and mannitol for the cerebral oedema of fulminant hepatic failure," *Gut*, vol. 23, no. 7, pp. 625–629, 1982

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D. DEXMEDETOMIDINE

This is true. Xu et al demonstrated that administration of Central α_2 agonist, dexmedetomidine decreased the levels of β -amyloid and τ -proteins, (compared to control group) which have been linked to hepatic encephalopathy.

Xu, G, Li, LL, Sun, ZT, Zhang, W, Han, XP Effects of dexmedetomidine on postoperative cognitive dysfunction and serum levels of β -amyloid and neuronal microtubule-associated protein in orthotopic liver transplantation patients. *Ann Transplant* 2016; 21:508–15

Incorrect
Try again

5. ALL OF THE STATEMENTS REGARDING MONITORING TECHNIQUES FOR CLINICAL CARE GUIDANCE IN PATIENTS WITH END STAGE LIVER DISEASE TO PREVENT/REDUCE PROGRESSION ,ARE *TRUE EXCEPT*:

- A. Invasive arterial blood pressure monitoring.
- B. Transcranial doppler.
- C. Intracranial pressure monitor.
- D. Electroencephalography is not useful.

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A. INVASIVE ARTERIAL BLOOD PRESSURE MONITORING

This is true. Since cerebral blood flow is blood pressure dependent in disrupted autoregulation, an arterial catheter would provide accurate blood pressure measurements. Periods of hypotension can be observed closely and brain hypoperfusion could be avoided.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014.

Incorrect
Try again

B. TRANSCRANIAL DOPPLER

This is true. Transcranial doppler can provide information on cerebral blood flow.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014

Incorrect
Try again

C. INTRACRANIAL PRESSURE MONITOR

This is true. Intracranial pressure monitor along with an arterial blood pressure monitoring can be used to measure cerebral perfusion pressure which is $MAP - ICP$. Coagulopathy in liver failure patients may deter some to place the monitor because of fear of intracranial hemorrhage, but it is a useful tool for guidance.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014

Incorrect
Try again

D. ELECTROENCEPHALOGRAPHY IS NOT USEFUL.



This is false. EEG can actually give functional information on the perfusion of the brain and hence can guide therapy.

Sathish S. Kumar, George A. Mashour, Paul Picton; Neurologic Considerations and Complications Related to Liver Transplantation. *Anesthesiology* 2018;128(5):1008-1014.

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End of set

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