

NEUROANESTHESIA IN PREGNANCY

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Quiz team

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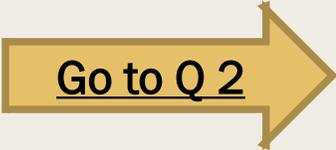
On behalf of the education committee of the SNACC

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Q1. Which of the following is an absolute indication for surgery during pregnancy?

- A. Disc herniation causing symptomatic nerve root compression
- B. ER/PR positive meningioma causing headaches in pregnancy
- C. Macroprolactinoma in pregnancy.
- D. Ruptured berry aneurysm presenting with headache

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A. Disc herniation causing symptomatic nerve root compression

Incorrect

- **FALSE:** Hormonal changes during pregnancy like increased concentration of relaxin and altered body posture from the enlarging uterus may cause or exacerbate previous spinal problems. 85% of these patients get better with conservative management.
- Surgery is only indicated in those with worsening neurological deficit with conservative treatment. In contrast, cauda equina syndrome requires urgent neurosurgical decompression.

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Ng J, Kitchen N J Neurol Neurosurg Psychiatry 2008; 79: 745-752

B. ER/PR positive meningioma causing headaches in pregnancy

Incorrect

FALSE: Estrogen and progesterone receptor positive meningiomas may grow during pregnancy due to water retention, engorgement of vessels and presence of sex hormone receptors in the tumor. Advances in non invasive fetal monitoring combined with close neurological evaluation of the mother allows most such pregnancies to continue to term. Neurological intervention is reserved for 1. Malignancy 2. Acute hydrocephalus 3. Signs of impending herniation 4. Progressive neurological deficit

Imad Kanaan M.D., (Edin.), Ashraf Jallu M.S. et al. Management Strategy for Meningioma in Pregnancy: A Clinical Study Skull Base. 2003 Nov; 13(4): 197 -203

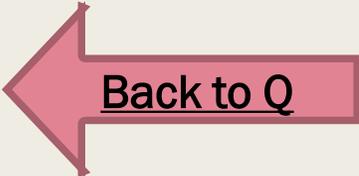
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C. Macroprolactinoma in pregnancy

Incorrect

FALSE: There is no evidence that Bromocriptine or Cabergoline cause obstetric or neonatal complications. Bromocriptine is considered the drug of choice, and it usually decreases the size of the adenoma and eliminates symptoms. Cabergoline may be considered if the adenoma does not respond to bromocriptine. If the enlarged tumor does not respond to both or if there is rapidly deteriorating visual deficits, alternative treatments include transphenoidal surgery in the second trimester, or delivery if the pregnancy is advanced enough.

Maurizio Guida Roberto Altierim et al.. Aneurysmal Subarachnoid Haemorrhage in Pregnancy: A Case Series. *Transl Med UniSa*. 2012 Jan-Apr; 2: 59–63.



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D. Ruptured berry aneurysm presenting with headache



TRUE: SAH is an indication for immediate neurosurgical intervention. The involvement of an experienced neurosurgeon and a neuroradiologist play a central role in management of SAH in pregnant women. Endovascular coiling is one of the treatment modalities for cerebral aneurysms which is a minimally invasive technique to reduce the risk of rebleeding.

Maurizio Guida et al, Aneurysmal Subarachnoid Haemorrhage in Pregnancy:A Case Series. *Transl Med UniSa*. 2012 Jan-Apr; 2: 59–63.

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Q2. A 32 year old female who is 30 weeks gestation comes to the hospital with C/O headache and numbness over the face. Imaging was done and she was found to have an intracranial AV malformation. When is a pregnant woman with intracranial AVM at greatest risk of rupture?

A. 2nd Trimester

B. 3rd Trimester

C. During labor

D. Immediate post partum

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A. 2nd Trimester

Incorrect

FALSE :. For both AVMs and aneurysms, there is a rising incidence of hemorrhage with more advanced gestational age

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B. 3rd Trimester



TRUE: The risk of rupture for both AVMs and aneurysms is highest in the 3rd Trimester. Incidence of hemorrhage increases with advanced gestation, possibly due to increases in cardiac output or, possibly, from hormonal influences on vascular integrity.

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C. During labor

Incorrect

FALSE: Interestingly, few of the women bleed during labor and delivery. This finding is consistent with the observation that more than 90% of all hemorrhages in non-pregnant patients occur at rest. Thirty-four percent of the patients whose rupture occurred during labor and delivery had hypertension, proteinuria, or both, suggesting that the differentiation between SAH and preeclampsia may be difficult on clinical grounds alone.

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D. Immediate post partum

Incorrect

FALSE: Few women bleed post partum.

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Q3. Which of the following parturients are not candidates for neuraxial block during Cesarean section?

- A. Patients with pseudotumor cerebri
- B. Parturients with Intracranial aneurysm
- C. Parturients with tethered cord
- D. None of the above parturients qualify

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A. Patients with pseudotumor cerebri

Incorrect

- **FALSE:** Idiopathic or benign intracranial hypertension (also known as pseudotumor cerebri) is a common condition, in which increased ICP does not imply herniation risk after dural puncture. This disorder, usually occurs in obese women of childbearing age, is defined by increased ICP (>20cm H₂O) with normal CSF composition and the absence of a known underlying cause (e.g., a space-occupying or vascular lesion, mass effect, or hydrocephalus). Extraventricular CSF volume and ICP are thought to be elevated in these women, who often experience symptoms of headache, neck stiffness, papilledema, and visual loss. However, there is no obstruction to CSF flow and no baseline pressure differential between the intracranial and spinal CSF compartments. Therefore, a sudden drop in CSF volume during lumbar dural puncture will be rapidly accommodated by caudal flow of CSF and should not result in brain shift or herniation. In fact, lumbar punctures for deliberate removal of large volumes of CSF, coupled with weight control, diuretics, and steroids are mainstays of therapy for the disease

Lisa R. Leffert, M.D., Lee H. Schwamm, M.D. Neuraxial Anesthesia in Parturients with Intracranial Pathology. *A Comprehensive Review and Reassessment of Risk* .
Anesthesiology, V 119 • No 3

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B. Parturients with intracranial aneurysm

Incorrect

- **FALSE:** For cesarean delivery in a patient who does not require aneurysm repair at that time, a neuraxial anesthetic (spinal, epidural, or combined spinal– epidural anesthesia) can be used if the patient is stable. This anesthetic has the advantage of (1) avoiding the hemodynamic responses associated with intubation, (2) minimizing fetal exposure to general anesthetics, and (3) allowing the mother to be awake and participate fully in the birth experience. Hypotension is typically well-controlled with a prophylactic phenylephrine infusion 25–120 µg/min or intermittent 120-µg boluses

Lisa R. Leffert, M.D. Lee H. et al. Neuraxial Anesthesia in Parturients with Intracranial Pathology. *A Comprehensive Review and Reassessment of Risk* . Anesthesiology, V 119

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C. Parturients with tethered cord



- **TRUE:** Spinal anesthesia for adult TCS (Tethered Cord Syndrome) should be avoided because it can cause complex neurological complications. When a patient has mild symptoms such as back pain, neurogenic bladder, motor, or sensory change, it is extremely important for the anesthesiologist to be aware of the possibility of TCS. When acute onset of paresthesia or weakness in the lower extremities occurs after surgery, MRI should be promptly performed to make the diagnosis.

Jing-Jie Liu, MD, Zheng Guan, MD et al. Complications after spinal anesthesia in adult tethered cord syndrome. *Medicine (Baltimore)*. 2016 Jul; 95(29)

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D. None of the above parturients qualify.

Incorrect

■ FALSE

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Q4. All of the following pertain to the anesthetic management of pregnant women undergoing neurosurgery **except**:

A. The MAC value decreases by 30% leading to greater risk of cardiovascular depression

B. FRC decreases by around 20% and closing capacity remains unchanged.

C. Placental transfer of highly ionized drugs is rapid.

D. Placental transfer of propofol, etomidate and thiopental are high

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A. The MAC value decreases by 30% leading to greater risk of cardiovascular depression

Incorrect

- **TRUE:** The minimum alveolar concentration (MAC) for inhalation anesthetics is decreased by approximately 30% during pregnancy, a change that occurs as early as the first trimester. This change has been postulated to be a result of higher levels of circulating endorphins. Alternatively, an increase in the concentration of progesterone, a hormone with known sedative effects, might account for the diminished anesthetic requirement.

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B. FRC decreases by around 20% and closing capacity remains unchanged.

Incorrect

- **TRUE:** Functional residual capacity (FRC) decreases by as much as 20% by the end of the third trimester, whereas closing capacity remains unchanged. The FRC drops further in the supine position, a situation in which closing capacity exceeds FRC. This decrease leads to closure of small airways, increased shunt fraction, and a greater potential for arterial desaturation. Additionally, because FRC represents the store of oxygen available during a period of apnea, decreases in FRC can be expected to lead to the more rapid development of hypoxemia when a patient becomes apneic. Hence, these patients require adequate pre-oxygenation during induction of anesthesia.

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C. Placental transfer of highly ionized drugs is rapid



This statement is false and is the correct answer for this question. Highly ionized agents like depolarizing and non-depolarizing muscle relaxants is minimal. The muscle relaxant reversal drugs like neostigmine and edrophonium are also highly ionized and demonstrate minimal placental transfer.

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D. Placental transfer of propofol, etomidate and thiopental are high

Incorrect

TRUE: The induction drugs, thiopental, etomidate and propofol are highly lipophilic and un-ionized at physiologic pH, hence placental transfer is quite rapid. However, most of the blood returning to the fetus from the umbilical vein passes through the fetal liver, extensive first-pass metabolism occurs and therefore neonatal depression after an induction dose of these drugs is uncommon.

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Q5. Which of the following is recommended during **craniotomy** in a pregnant patient with raised intracranial pressure?

- A. Moderate hypothermia should be implemented for neuroprotection
- B. Simultaneous Cesarean section should be considered if pregnancy is 28 weeks.
- C. Slow neuro induction with propofol, fentanyl and rocuronium is advisable
- D. Modest hyperventilation to decrease ICP

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A. Moderate hypothermia should be implemented for neuroprotection

Incorrect

FALSE: Although mild permissive hypothermia is still used by a number of practitioners and has no significant fetal effects, moderate hypothermia can cause fetal arrhythmias and should be avoided.

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B. Simultaneous Cesarean section should be considered if pregnancy is 28 weeks

Incorrect

FALSE: Whenever craniotomy during pregnancy is contemplated, the physician must decide whether pregnancy must be allowed to proceed to term or whether simultaneous Cesarean Section will occur. The choice is decided by the gestational age of the fetus with 32 weeks commonly used as a cut off for Cesarean section even though viability is achieved at 28 weeks. The reason for this is that lung maturity occurs at 32 weeks and the risk of prematurity is less compared to the harm to the fetus by maternal therapies during craniotomy like osmotic diuresis and hyperventilation.

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C. Slow neuro induction with propofol, fentanyl and rocuronium is advisable

Incorrect

FALSE: A rapid-sequence induction is mandatory in a Cesarean section since it is designed to prevent aspiration. However, it does little to prevent the hemodynamic response to intubation that can be catastrophic for the patient who has an intracranial aneurysm or increased ICP. At the same time, a slow “neuro-induction” with propofol, an opioid to obtund hemodynamic responses, a nondepolarizing muscle relaxant, and mask ventilation does little to reduce the risk of aspiration and causes neonatal depression. RSI would still be preferred taking care to prevent hemodynamic responses with short acting drugs like esmolol.

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D. Modest hyperventilation to decrease ICP



TRUE: Modest hyperventilation (PaCO₂- 25-30 mmHg) should be instituted within physiological parameters appropriate for gestational age. Maternal hyperventilation can facilitate surgical exposure by decreasing cerebral blood volume. However, severe hypocarbia may impair fetal oxygen delivery and also decrease maternal cardiac output by raising intrathoracic pressure.

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