



Neuro Quiz 58

Spinal Cord Stimulators (SCS)

*THIS QUIZ IS BEING PUBLISHED ON BEHALF OF THE
EDUCATION COMMITTEE OF THE SNACC*

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1. A 55y male with an implanted SCS is scheduled for MRI of the brain.
Which of the following statements is CORRECT?

- A. Newer SCS are conditional for MRI of the head
- B. The risk of thermal injury is mainly around the pulse generator
- C. The risk of thermal injury is reduced if the device is turned off before the MRI
- D. MRI is absolutely contraindicated



1.A. Newer SCS are conditional for MRI of the head

- According to the American Society for Testing and Materials, newer SCSs are regarded as conditional-5, meaning they are acceptable for a patient undergoing an MRI procedure or an individual in the MRI environment as long as specific guidelines or recommendations are followed.
- The current terminology used by FDA
 - MR safe
 - MR compatible
 - MR conditional
 - MR unsafe

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1. B. The risk of thermal injury is mainly around the pulse generator

- Thermal injury can occur at all parts of the device including the electrodes. The magnetic pull can result in extraction of the pulse generator and create a missile.

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1. C. The risk of thermal injury is reduced if the device is turned off before the MRI

- Although the device should be turned off for any procedure under anesthesia, the risk of thermal injury is due to the induction of current at any ferro-magnetic component of the SCS and therefore the risk is present even if the device is turned off.

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1. D. MRI is absolutely contraindicated

- The three forces, namely the strong magnetic field, the pulsed radiofrequency field and the pulsed magnetic field can result in heating of the spinal cord lead and create a magnetic pull on the device leading to damage and unwanted stimulation.
- However, newer SCS devices are MRI conditional for the whole body or restricted areas, depending on the manufacturer's specification.

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2. A 64y old man with a SCS for chronic back pain is scheduled for transurethral resection of prostate. Which of the following statements is CORRECT?

- A. The SCS should be programmed to a higher level to combat perioperative pain
- B. A bipolar cautery will interfere with the SCS and should not be used
- C. The SCS should be turned down to the lowest and turned off for the procedure
- D. No adjustment of the SCS is needed for the procedure

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2. A. The SCS should be programmed to a higher level to combat perioperative pain

- The SCS should be reprogrammed to the lowest possible amplitude and then turned off prior to induction of anesthesia
- The SCS may not cover the area of the perioperative pain

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2. B. A bipolar cautery will interfere with the SCS and should not be used

- The current in a monopolar electrocautery passes from the probe through the surgical wound to the grounding pad. If the SCS generator lies along this path, it can be damaged.
- The current in a bipolar electrocautery passes between the two probes of the forceps. It is safe to use a bipolar in the presence of any implanted electrical device.
- If a monopolar has to be used, the grounding pad should be placed away from the SCS generator.

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2. C. The SCS should be turned down to the lowest and turned off for the procedure

- The SCS should be reprogrammed to the lowest possible amplitude and then turned off prior to induction of anesthesia
- This ensures that if the device is inadvertently turned on the stimulation would be low. Turning the device off reduces the risk of accidental reprogramming by electromagnetic interference.

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2. D. No adjustment of the SCS is needed for the procedure

- The SCS should be reprogrammed to the lowest possible amplitude and then turned off prior to induction of anesthesia

3. Which of the statements regarding a SCS in a pregnant woman is CORRECT?

- A. A parturient can continue to have an active SCS
- B. An active SCS interferes with fetal scalp monitoring
- C. Epidural for labor analgesia is contraindicated if a SCS is in place
- D. Spinal anesthesia is acceptable for cesarean section

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3.A. A parturient can continue to have an active SCS

- There are no studies examining the effects of SCS on human fetal development ... and likely there never will be!
- All manufacturers recommend the device be deactivated at the time of diagnosis of pregnancy and remain so till delivery.
- However, it is suggested that SCS may be better than continuing certain drugs that may be harmful to the fetus.

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3. B. An active SCS interferes with fetal scalp monitoring

- Although, SCS should be turned off during pregnancy and delivery, there are reports of use of SCS without interference with fetal scalp monitoring and external fetal monitoring using Doppler.

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3.C. Epidural for labor analgesia is contraindicated if a SCS is in place

- Although there is a possibility of damage to the SCS system during epidural placement, prior knowledge of the location of the electrodes and the leads can guide safe epidural placement if done at a level below the level of SCS lead entry.
- The fibrous deposits around the SCS wires can potentially interfere with adequate spread of the local anesthetic administered in the epidural space.

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3. D. Spinal anesthesia is acceptable for cesarean section

- Spinal anesthesia is possible in the presence of SCS if performed armed with the knowledge of the location of the electrodes and wires.

4. In a patient with implanted SCS, which of the following statements is CORRECT?

- A. There is no restrictions to undergo lithotripsy provided the device is turned off
- B. An SCS is acceptable if the patient has a permanent pacemaker but not an internal cardiac defibrillator
- C. Radiation therapy is acceptable provided the pulse generator is turned off
- D. CT scan is the preferred method of imaging, but the device should be turned off

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4. A. There is no restrictions to undergo lithotripsy provided the device is turned off

The recommendations by the manufacturers include

- Turn off the stimulator prior to procedures
- The focus of the lithotripsy beam should be more than 15 cm of the SCS
- Ensure functionality at the end of the procedure by powering up the device and slowly increasing the stimulation amplitude

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4.B. An SCS is acceptable if the patient has a permanent pacemaker but not an internal cardiac defibrillator

- The stimulation from a SCS could suppress the pacing function of a pacemaker or prompt the delivery of an inappropriate defibrillation from an ICD.
- The manufacturers advise against simultaneous use of SCS and cardiac implanted electronic devices (CIED).
- However, if needed, placing the CIED in bipolar mode and implanting the pulse generator of the SCS on the contralateral side of the CIED is recommended.

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4. C. Radiation therapy is acceptable provided the pulse generator is turned off

- The high dose ionizing radiation can cause permanent damage to implanted devices.
- The severity of the damage depends on the radiation type, total dose and type of device. The damage can occur whether the device is on or off
- It is recommended that the dose be less than 5 gray(Gy) and the pulse generator should be more than 1cm outside of the direct beam, or it should be removed prior to the treatment

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4. D. CT scan is the preferred method of imaging, but the device should be turned off

- CT scan is the preferred method of diagnostic imaging in patients with SCS.
- There have been concerns that patients with SCS experience a shocking sensation when high levels of radiation is used.
- It is recommended to use the lowest dose necessary for adequate images and to turn the device off during a scan.

5. Currently, SCS is FDA approved for the following indications EXCEPT...

- A. Chronic neuropathic pain of legs
- B. Radicular pain from failed back surgery
- C. Chronic intractable angina
- D. Complex regional pain syndrome of upper limbs

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5 A. Chronic neuropathic pain of legs

- SCS is an effective treatment for chronic pain syndrome and approved by the FDA

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5. B. Radicular pain from failed back surgery

- SCS is an accepted modality of treatment for patients who have not improved after back surgery and this indication is approved by the FDA



5. C. Chronic intractable angina

- SCS has been shown to improve ischemic pain syndrome such as angina, but this is NOT FDA approved
- However, in Europe, it is approved for refractory angina pectoris and peripheral limb ischemia.

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5. D. Complex regional pain syndrome of upper limb

- Use of SCS for treatment of complex regional pain syndrome is approved by FDA

References

- Harned ME, Gish B, Zuelzer A, Grider JS. Anesthetic Considerations and Perioperative Management of Spinal Cord Stimulators: Literature Review and Initial Recommendations. Pain Physician 2017; 20:319-329
- Walsh KM, Machado AG, Krishnaney AA. Spinal cord stimulation: A review of the safety literature and proposal for perioperative evaluation and management. Spine J 2015; 15:1864-1869.