



Anesthetic management for patients with implanted DBS undergoing non-neurosurgical procedures

NeuroAnesthesia Quiz # 60

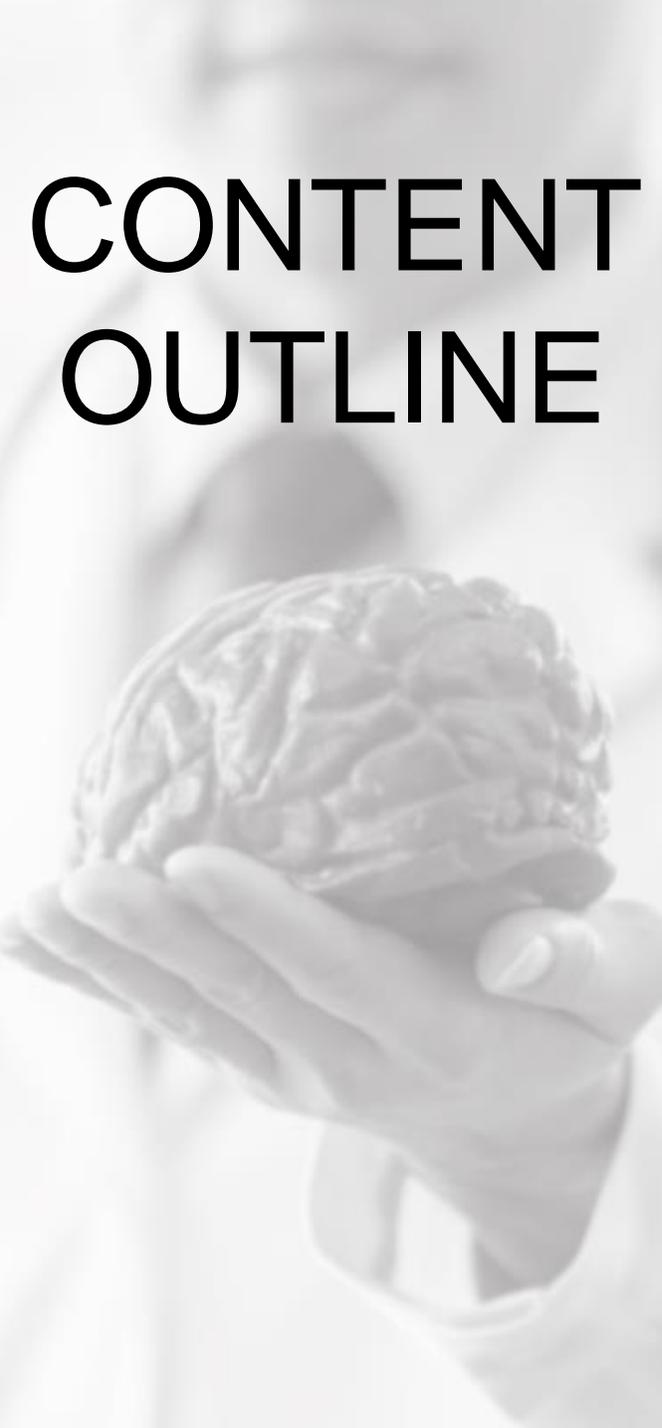
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Objectives

- ✓ Review preoperative evaluation of a patient with an implanted DBS
- ✓ Review perioperative management of a DBS device
- ✓ Review procedure-specific precautions for an implanted DBS
- ✓ Understand the risks of intraoperative monopolar electrocautery
- ✓ Understand the interactions between implanted DBS and cardiac devices

CONTENT OUTLINE

A grayscale image of a hand holding a human brain, positioned on the left side of the slide. The hand is cupped, supporting the brain from below. The background is a blurred image of a person's face, suggesting a medical or scientific context.

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

Question 1: [Preoperative evaluation](#)

Question 2: [Risks of intraoperative electrocautery](#)

Question 3: [Perioperative DBS device management](#)

Question 4: [Procedure-specific precautions](#)

Question 5: [Interactions between implanted DBS and cardiac devices](#)

QUESTION 1

A 55-year-old female with left breast cancer is scheduled for left mastectomy. She has a deep brain stimulator (DBS) placed for tremor three years ago. The implantable pulse generator (IPG) is located under her right clavicle. Preoperative evaluations should include all the following **EXCEPT**:

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

A. [Indications for the DBS implantation](#)

B. [Device information and interrogation of the DBS](#)

C. [Health care communication to primary DBS manager and/or manufacturer representative](#)

D. [A neck CT for delineation of the DBS wires](#)

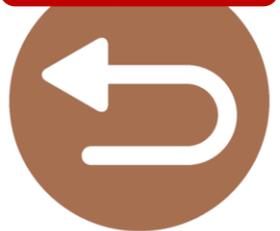
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EXPLANATION

- ❑ DBS has a variety of clinical applications, such as Parkinson's disease, essential tremor, dystonia, chronic pain, and obsessive-compulsive disorder.
- ❑ The disease-specific concerns, such as autonomic dysfunction, orthostatic hypotension, laryngeal dysfunction and risk of aspiration, difficult ventilation secondary to muscle rigidity and dystonia, potential drug interactions, and tremor-related artifacts on BP and EKG monitoring, warrant meticulous pre-anesthetic evaluation and preparation.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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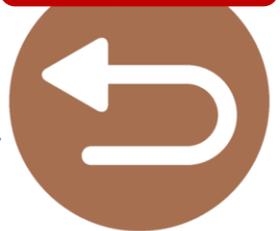
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EXPLANATION

- ❑ The DBS should be checked preoperatively by primary DBS manager or manufacturer's representative for interrogation, in order to ensure sufficient battery life and integrity of the device and its settings.
- ❑ It is essential to ascertain the model, device number, DBS components location, and the use of the patient programmer to turn the device ON and OFF, especially if device deactivation is needed during surgery.

Weinstein AS, et al. Preanesthetic evaluation of a patient with a deep brain stimulator: practical guide and checklist for patient safety. J Clin Anesth. 2016 31:278-281.

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EXPLANATION

- ❑ It is important to consult primary DBS manager and/or manufacturer representative preoperatively for: 1) device information and interrogation 2) potential adjustment of the DBS settings 3) severity of symptoms when the DBS is turned off and potential changes in medication dosing perioperatively 4) intraoperative device management and specific precautions 5) assistance in deactivating or reactivating the DBS perioperatively 6) postoperative assessment of both the patient and the device

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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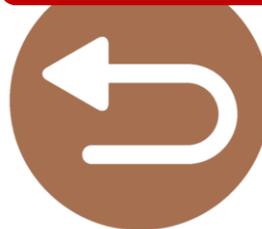
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EXPLANATION

- ❑ The wires connecting intracranial DBS leads to the IPG are usually tunneled subcutaneously around the neck and the IPG is most often placed subcutaneously in the upper chest. A chest x-ray, instead of a neck CT, is commonly obtained preoperatively to identify the locations of the DBS wires and IPG.

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QUESTION 2

The above patient is medically cleared for her surgery. Intraoperative use of monopolar electrocautery may pose the following risks to the patient **EXCEPT**:

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

A. [Malfunction of the DBS device](#)

B. [Heat production at the tip of the DBS electrodes leading to brain damage](#)

C. [Skin burns from improper placement of the grounding pad](#)

D. [Damage of the wires which connect the DBS electrodes and IPG](#)

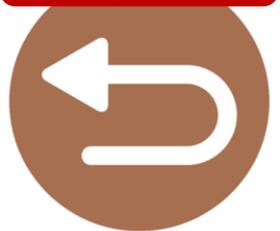
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EXPLANATION

- ❑ Monopolar electrocautery, if used in close proximity to the DBS, may produce electromagnetic interference (EMI) that potentially affects the functioning of the DBS, such as suppressed or increased stimulation or complete cessation of output. Bipolar electrocautery may reduce the potential for EMI.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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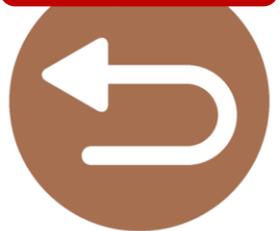
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EXPLANATION

- ❑ Induced current can pass through the DBS IPG along the conducting wires, leading to heat generation at the tip of the DBS electrodes and causing thermal injury to brain tissue in proximity to the electrodes. Even when the neurostimulator is turned off, the metallic case, leads, and DBS unit remain conductive, allowing current to pass through.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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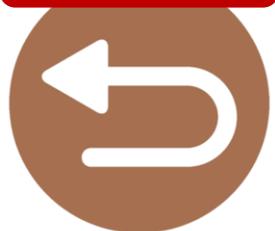
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EXPLANATION

- ❑ In monopolar electrosurgery, the electric current that enters the patient through one electrode travels throughout the body and is collected outside the surgical field by a large, wide-area, well-jelled grounding pad (i.e., the dispersive electrode).
- ❑ Skin burns can occur if the grounding pad is in poor contact with the patient. In that case, the electric current collected by the grounding pad is required to traverse small surface areas with high electrical resistance, and/or the electric current exits the body from an alternative path (ECG lead, metal jewelry, etc.), which leads to electrical burns of the skin.

Miller RD, ed. Miller's Anesthesia. 7th ed. Philadelphia, PA: Churchill Livingstone; 2009:3049-3050.

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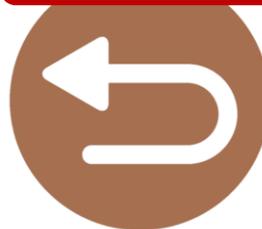
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EXPLANATION

- ❑ In this case, since the surgical site is on the opposite site of the DBS system, it is very unlikely that the use of electrocautery will cause damage to the wires connecting the DBS electrodes and IPG.

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QUESTION 3

A 68-year-old male, with implanted DBS for advanced Parkinson's disease, is now scheduled for a cholecystectomy. His home medications include aspirin, sinemet and amantadine. The patient has [difficult IV access](#). Which of the following perioperative management is **NOT** appropriate?

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

A. [Deactivate the DBS after induction of general anesthesia](#)

B. [Reactivate the DBS before emergence from general anesthesia](#)

C. [Adjust the dose of anti-Parkinson medications perioperatively](#)

D. [Place an internal jugular \(IJ\) central venous catheter on the same side of the DBS device](#)

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EXPLANATION

- ❑ Those patients with advanced Parkinson's disease may have significant muscle rigidity and dystonia when the DBS is deactivated, which may interfere with bag mask ventilation, endotracheal intubation and IV line placement. In that case, it may be preferable to leave the DBS on during induction of anesthesia and endotracheal intubation, then deactivate the device afterwards.

Poon CCM, et al. Anaesthesia for deep brain stimulation and in patients with implanted neurostimulator devices. Br J Anaesth 2009 103:152-165.

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EXPLANATION

- ❑ For patients with advanced Parkinson's disease, it is preferable to reactivate the DBS (if possible) before emergence from general anesthesia to avoid recurrence of symptoms, and ensure airway security and patient's comfort.

Weinstein AS, et al. Preanesthetic evaluation of a patient with a deep brain stimulator: practical guide and checklist for patient safety. J Clin Anesth. 2016 31:278-281.

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EXPLANATION

- ❑ If the DBS is to be temporarily deactivated during surgery, a patient with advanced Parkinson's disease may benefit from a temporary increase in dose of his or her anti-Parkinson medications to avoid recurrence of symptoms, and ensure airway security and patient's comfort.

Venkatraghavan L, et al. Non-cardiac implantable electrical devices: brief review and implications for anesthesiologists. Can J Anaesth 2009 56:320-326.

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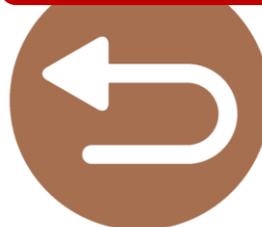


EXPLANATION

- ❑ The wires connecting intracranial DBS leads to the IPG are usually tunneled subcutaneously around the neck and the IPG is most often placed subcutaneously in the upper chest, thus both the wires and IPG are at risk of injury during placement of an IJ central venous catheter. The opposite side of the DBS system should be chosen for an IJ central venous catheter placement.

Weinstein AS, et al. Preanesthetic evaluation of a patient with a deep brain stimulator: practical guide and checklist for patient safety. J Clin Anesth. 2016 31:278-281.

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QUESTION 4

Which of the following statements regarding procedure-specific concerns for a patient with implanted DBS is **FALSE**?

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

[A. Electroconvulsive therapy \(ECT\) may cause dislodgement of the DBS electrodes](#)

[B. Recurring symptoms during MRI may interfere with adequate image acquisition](#)

[C. A lead shield is recommended for protection of the DBS device during radiation therapy](#)

[D. Therapeutic ultrasound does not affect the functioning of the DBS when used in close proximity](#)

Sorry! Incorrect.

EXPLANATION

- ❑ During ECT, induced seizure activity could potentially shift the position of the DBS electrodes leading to electrodes displacement. It is recommended that ECT electrodes should be placed as far away as possible from the DBS electrodes, and the lowest possible energy should be used for seizure induction.

Bailine S, et al. Bitemporal electroconvulsive therapy for depression in a Parkinson disease patient with a deep-brain stimulator. J ECT 2008 24:171-172.

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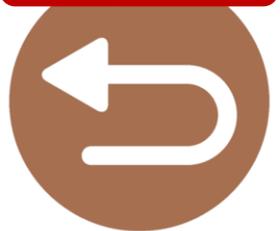
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EXPLANATION

- ❑ When the DBS is deactivated during MRI, some patients may have recurring or worsening symptoms such as tremor, muscle rigidity or dystonia, which may lead to artifacts and distortions of MRI images, thus interfering with adequate image acquisition.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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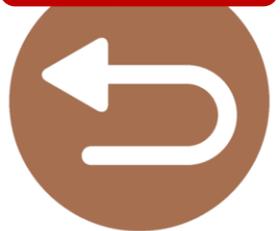
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EXPLANATION

- ❑ Radiation therapy may damage the DBS device. Administration of radiation therapy within the vicinity of the DBS should be avoided. The amount of radiation exposure should be limited, a lead shield should be used to protect the DBS device, and the DBS should be checked after every treatment.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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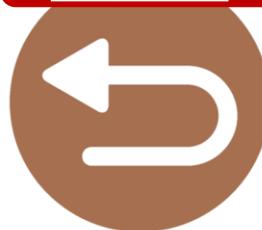


EXPLANATION

- ❑ Diagnostic ultrasound can be safely performed in patients with implanted DBS. The use of ultrasound during phacoemulsification for cataract removal has been shown to be safe. Whereas, there could be potential interactions between the DBS and therapeutic ultrasound such as lithotripsy. It is recommended that the practitioner should avoid placing the ultrasound transducer directly over the DBS, the ultrasound beam should not be directed within 15 cm of the DBS, the DBS should be turned off during the procedure and rechecked following the procedure.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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QUESTION 5

Which of the following statements regarding the interaction between implanted DBS and cardiac device is **TRUE**?

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

[A. The DBS does not affect the functioning of diagnostic or therapeutic cardiac device](#)

[B. Artifacts on ECG monitoring can be completely eliminated by turning the DBS off](#)

[C. It is risky to apply a magnet over the cardiac pacemaker \(which is in close proximity to a DBS IPG\) for reprogramming](#)

[D. Monopolar sensing configuration is recommended for cardiac pacemaker and defibrillator in order to minimize the interference from the DBS](#)

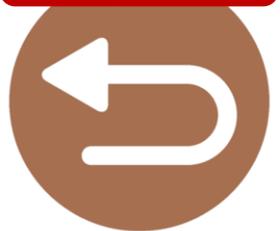
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EXPLANATION

- ❑ Depending on the configuration of the DBS, bipolar vs monopolar stimulation, the DBS may produce artifacts on ECG and make interpretation of ECG difficult.
- ❑ DBS may also interfere with cardiac pacemakers and defibrillators, resulting in inappropriate sensing and response by cardiac pacemakers, and inappropriate discharges by defibrillators.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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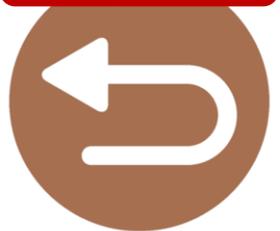
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EXPLANATION

- ❑ When the DBS is turned off, recurrence of symptoms, such as tremor, may lead to movement-related artifacts that preclude accurate ECG recording.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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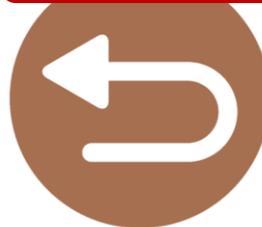


EXPLANATION

- ❑ Magnets may affect the functioning and programming of both cardiac and neurostimulator IPGs. If the IPGs of the cardiac pacemaker and the DBS are close to each other, the use of a magnet to reprogram the cardiac pacemaker should be avoided to prevent unintentional reprogramming or suspension of the DBS device.

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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EXPLANATION

- ❑ Bipolar sensing configuration, not monopolar sensing configuration, is recommended for cardiac pacemaker and defibrillator to avoid inappropriate sensing and response as a result of the interference from the DBS IPG (which is in close proximity to cardiac device).

Yeoh TY, et al. Anesthesia considerations for patients with an implanted deep brain stimulator undergoing surgery: a review and update. Can J Anaesth. 2017 64(3):308-319.

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