Anesthesia for Seizure Surgery

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Part I: Asleep, 2-Stage Craniotomy for Seizure Surgery

Objectives:

1. Describe the selection process and work-up of a typical pediatric patient for epilepsy surgery.
2. Describe the two operative phases in the 2-stage asleep approach.
3. Know the anesthetic goals for each of the two stages and what drugs would be most appropriate to achieve these goals.
4. Discuss anesthesia for the patient having placement of depth electrodes.
5. What are the advantages and disadvantages of asleep vs awake approaches?
6. Discuss the indications for and perioperative care for the patient undergoing placement of a vagal nerve stimulator.

Case

JL is a 14-year old male with an intractable seizure disorder and severe developmental delay. He developed normally until age nine months at which time seizures and developmental regression began. Metabolic work-up is negative. He is currently non-verbal and has some “autistic features”. His seizures are characterized by staring or eyes rolling back, blinking, apnea, and alteration of consciousness, occurring several times a week. He has failed multiple past anticonvulsant regimens including phenobarbital and carbamazepine, and suffered adverse effects from lamotrigine. Current medications are valproic acid and aripiprazole, which have been held for 24 hours. Apart from this he has no other medical problems or any drug allergies. He had an uneventful T & A in the past. MRI 8 years ago showed possible left temporal volume loss. He was admitted for video/EEG monitoring 4 months prior to this surgery which showed bilateral extremity movements and bilateral, multi-focal EEG spikes. He is now admitted for placement of bilateral hippocampal depth electrodes to localize the seizure foci better.

Discussion questions: Would any labwork be indicated? What are depth electrodes and how are they placed?

Discussion questions: What medications would you use to induce and maintain anesthesia? Do anticonvulsant drugs have any effects on anesthesia?
The patient is induced and the stereotactic frame applied. He is to be transported to MRI/CT and then back to the OR.

Discussion question: What would you give the patient for transport and CT scanning? Upon return to the OR, would you place a central line or arterial line?

The patient is extubated and observed by video-EEG monitoring. Despite being off all anticonvulsants and monitoring for 11 days, the only definitive information obtained is that the seizures are originating somewhere on the right side. Due to the increasing risk of infection, the electrodes are removed on post-operative day 11 and the patient is discharged.

Three weeks later, he is readmitted for placement of subdural (surface) electrode arrays.

Discussion questions: Should the patient have had Wada test? What are your anesthetic goals? What would you use to induce and maintain anesthesia? IV access and monitors?

Subdural grids are placed over the temporal, frontal and parietal lobes and the wound is closed. The patient needs to be transported to CT scan to document the exact location of the grids.

Discussion questions: Would you extubate the patient before going to CT? If you decide to keep the patient intubated, what would you use to keep him motionless?

While in CT, the patient develops a generalized tonic-clonic seizure.

Discussion questions: Would you treat the seizure? What can you use?

Video and EEG monitoring are performed and several seizures are documented emanating from the temporal and frontal lobes. Right temporal lobectomy and frontal topectomy are planned.

Discussion questions: What IV access and monitors do you place? What are your anesthetic goals? What drugs do you use for anesthesia?

The surgeon asks for a loading dose of fosphenytoin.

Discussion questions: what are the differences between fosphenytoin and phenytoin and how do you dose it?

The patient did well and was discharged 9 days later. Common scenario—especially with structural lesions such as tuberous sclerosis: after 5-6 years of being seizure-free, the patient re-develops frequent seizures which are shown to be bilateral, multi-focal, and drug-resistant.

Discussion question: would this be an appropriate scenario for placement of a vagal nerve stimulator? Why or why not? What are the anesthetic considerations for this procedure? If the patient returns to the OR in the future for surgery does the vagal NS need to be turned off similar to a pacemaker?
References


Part II: Awake Craniotomy Approach for Seizure Surgery

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Learning objectives:

1. Develop a process to attain appropriate patient selection for the awake craniotomy approach.
2. Construct an anesthetic plan for the awake craniotomy approach including recognition of the advantages and disadvantages of different techniques.
3. Anticipate and generate a management plan for potential intraoperative problems during an awake craniotomy.

Case and Questions:

The patient is a 12-year-old boy with a history of intractable epilepsy. The patient has no other past medical history and past surgical history is significant for an appendectomy at age eight without apparent anesthetic complications. He has had partial complex seizures for five years with approximately 1-2 seizures per day. The patient has no drug allergies; his only medication is oxycarbazepine. The patient has tried several antiepileptic drugs over the last several years without reduction of seizure episodes. The patient is not developmentally delayed, plays soccer, and is a solid “B” student in middle school. Physical exam is unremarkable. Airway exam: Mallampatti Class I, full range of motion of the neck, and no dental defects. Vital signs are normal. Laboratory studies ordered by the surgeon which include hemoglobin, electrolytes, and coagulation function (PT, PTT) are all within normal limits. The patient underwent intraoperative subdural electrode placement under general anesthesia 3 days ago without apparent complications. By using the EEG and MRI to map the proposed seizure foci, the locations are near critical speech and motor regions. As a result, the surgeon schedules the patient for an awake craniotomy with resection of seizure foci using intraoperative speech and motor testing.

1. What is meant to do a craniotomy by the “awake” approach?

2. How will you determine if this patient is a good candidate for an awake craniotomy?

The patient and parents both agree on your proposed anesthesia plan. The patient is medically optimized to go to the operating room. The patient has been NPO for 8 hours and vital signs are stable. A peripheral IV is present and the patient has been off oxycarbazepine for over one week.

3. How will you manage the airway in this case? What are the advantages and disadvantages of your airway management selection?

4. Which drug(s) will you select for your primary anesthetic?
Your case is underway without apparent problems. The patient’s head is secured in head pins. Estimated blood loss is approximately 100 cc and vital signs are stable. How would you manage the following situations?

5. The patient is becoming very uncooperative during the awake testing segment despite multiple increases of your primary anesthetic.

6. The patient is receiving propofol and remifentanil. Airway management consists of a natural airway with nasal cannula. Upon opening of the bone flap, the surgeon informs you that the brain appears “tight”.

7. During the awake testing segment, the patient tells you, “I’m about to have a seizure.”

8. The patient vomited as you were decreasing the primary anesthetic for the upcoming awake testing segment.

References: