Awake Craniotomy for Excision of Seizure Foci or Tumors

Anesthesia Guidelines
University of Washington Medical Center
Department of Anesthesiology and Pain Medicine

Goals of the Procedure

**Careful monitoring** to prevent undetected airway obstruction, to allow prompt treatment of grand mal seizures, and to prevent acute anxiety reactions by the patient.

Sufficient analgesics and sedatives to allow the patient to tolerate the injection of local anesthetic around the surgical field, and also to tolerate the subsequent surgical procedure.

The operative procedure is comprised of 6 stages (see below). Almost all patients are allowed to be “asleep” (heavy sedation) during the resection, closure and application of dressing. Most patients (and almost all children and almost all adult patients who are highly anxious or in whom proximity of tumor to language is less of a concern) can be heavily sedated with propofol for injection of local anesthetic and the craniotomy.

Patients usually go through a short excitement phase as they waken. Therefore, the sedation is best continued until the skull clamp is secured (the skull clamp holds the electrocorticography [ECoG] electrodes but can also be used to control the head if the patient attempts to move) or until the head is secured in the pin head holder (frequently used for craniotomy for excision of tumors). Patients need re-orientation as they waken. Most are fully alert 15 min after stopping propofol.

An awake and alert patient capable of carrying out verbal and motor tasks is essential during identification of critical cortical areas.

The attainment of these somewhat disparate goals occasionally proves difficult and requires careful titration of drugs and communication between anesthesiologist, surgeon, and patient.

Preoperative Considerations

**Carefully evaluate** the patient's mental and physical status.

Establish a rapport with patient. Describe the procedure and your part in it. Identify the risk factors for: **Coughing** (smoker, URI), **Regurgitation** (GERD, diabetes, gastroparesis, obesity), and **Airway Obstruction** (obesity, history of OSA, anatomical factors).
Preoperative Orders

- NPO after midnight
- Nothing for sleep or Benadryl 50-100 mg p.o. – no Dalmane or midazolam
- Give no premed

The Procedure

Pre-Op Holding Area

In rare circumstances, may consider meds in pre-op holding area to reduce the risk of:

- Coughing (glycopyrrolate, low dose opioid)
- Regurgitation (Reglan 10 mg IV, Benadryl 12.5 mg IV, ranitidine 50 mg IV and citrate p.o.)

Preparation for the Procedure

Usual Set-up for General Anesthesia: Suction, anesthetic machine, nasal airways, oral airways, LMA s, endotracheal tubes, etc. May need to add extensions onto circle circuit.

Drugs

- Drugs always used: Propofol infusion (either via glass bottles, vented IV administration set, and appropriate infusion pump, or via syringe in a syringe pump) and propofol in a syringe for bolus administration.

- Drugs frequently used: Mannitol 0.5–1.0 gm/kg, dexamethasone 10 mg, and midazolam 2mg (to treat stimulation-induced seizures).

- Drugs available but almost never used: Pentothal 2.5% (20 cc syringe), succinylcholine 200 mg, methohexital 1.0% (10cc syringe), droperidol 2cc, and fentanyl 5cc.

Monitoring and I.V.’s

- I.V.: Normal saline or Ringers Lactate at 3-4 cc/kg/hr
- Monitors: Noninvasive BP, EKG, nasal prongs configured to both detect end-tidal CO2 and deliver oxygen, pulse oximeter

Operative Procedure

The actual operating procedure is divided into 6 stages:

1) Craniotomy
2) Corticography (ECoG) (may not be used for excision of tumor)
3) Functional Mapping
4) Cortical Resection
5) Post Resection ECoG and/or functional testing
6) Closure

Preparation for craniotomy is the most painful part. It lasts 1.5 to 2 hours.
Induction Phase

After moving the patient to the OR table, administer oxygen at 3-5 l/min using nasal cannula (sometimes a face mask works better) taped to cheek with Tegaderm. Use type of nasal cannula that also permits one lumen to be attached to continuous expired CO2 detector. If face mask is used to deliver oxygen, insert flexible portion of 14 gauge IV catheter through mask and attach via tubing to expired CO2 detector. Once monitors are in place and oxygen is being given, start the antibiotic. Antibiotics should not be given more than 1 hour prior to incision. The exception is vancomycin, which can be given up to 120 minutes prior to incision.

Consult with surgeon regarding administration of propofol. A bladder catheter often is placed while the patient is in the supine position. Propofol usually is started prior to the time the bladder catheter is inserted. The patient is then turned to the lateral position and the skin is prepped. Be sure the head is positioned so as to permit unobstructed breathing! If not already started for bladder catheter insertion, propofol should be started prior to the scalp infiltration of local anesthetic.

Neurosurgeon usually does field block prior to draping with mixture of lidocaine 0.5% and bupivacaine 0.25% with epinephrine 1:400,000. 70-100 cc total can be used.

Patient is draped. Steri-drape and/or sterile towels should be peeled back from patient’s face. Horizontal transducer rod holder is useful to keep drape off patient’s face.

Maintenance Phase

Induction dose of propofol may be administered in divided doses with a total loading dose of 1.0-2.5 mg/kg or more PRN. Propofol maintenance varies widely but for starters use 0.1-0.2 mg/kg/min. In cases where excision of seizure foci is planned, propofol is continued until skull clamp is placed (for attaching ECoG electrodes). Skull clamp is placed after craniotomy is completed. Surgeon usually requests discontinuation of propofol after clamp is secure. In cases where excision of tumor is planned, pin head holder usually is placed prior to craniotomy and opening of the dura. Surgeon usually requests continuation of propofol until dura is opened. For both excision of seizure foci or excision of tumor, occasionally nasal airway or oral airway is needed during propofol administration to provide unobstructed breathing. Very rarely LMA or tracheal intubation is needed.

Neurosurgeons may use additional small amounts of lidocaine to infiltrate around dural vessels.

If necessary, may consider low dose opioid (e.g. fentanyl 25 mcg) at times of painful stimulation (placement of pin head holder [if used] and skull infiltration) early in case. Omit opioids after this to facilitate awakening for cortical mapping. Other meds, singly or in combination, may be used as a complement to or as an alternative to propofol.

Corticography: Begins about 10:00am. Lasts 20 minutes to 1.5 hours. During this time, ECoG recording is done directly from cortical surface using interictal spiking to identify seizure focus and delineate extent of planned resection.

Functional Mapping: Begun sometime between 10:30 am and 11:30 am. Lasts about 1.5 hours. An awake, alert patient is desired.

Different cortical areas are stimulated occasionally resulting in grand mal seizures. (About 4% of the time when anticonvulsant continued up to time of surgery). Notify surgeons at once and be prepared to give midazolam 2 mg IV. Airway needs to be watched carefully!
Note: Focal motor or psychomotor seizures do not usually require treatment. Identification of motor cortex, language areas (slide show) and memory tests are done during this time.

Cortical Resection

Resection usually takes about 1 hour. Generally, continuous infusion of propofol is resumed, but first check with surgeons.

Post Resection ECoG or Functional Testing

Done to assure surgeon that seizure foci or tumor has been removed. For ECoG, “light” patient desired to prevent drug effects on ECoG but patient does not have to be awakened ordinarily. For functional testing patient must be awake and cooperative.

Craniotomy Closure

This part of the procedure takes about 2 hours. Usually quite painless, especially if bupivacaine has been used. May require additional infiltration of lidocaine. Propofol infusion for sleep generally given during closure. Wait until head dressing is in place before discontinue propofol. Patient goes to PACU at end of procedure with head elevated.

References


