

Awake Craniotomy

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Why on earth...

Performed when “eloquent” cortical tissue is in close proximity to a lesion being resected

- Eloquent: area of brain involved in speech/language, motor, or visual function
- Allows for patient cooperation and functional testing of cortex
 - Reduces morbidity related to resection of eloquent brain tissue
 - Reduces anesthetic interference with brain mapping

Benefits & common complaints

Benefits

- Reduce size of resection
- → Fewer postoperative neurologic deficits
- Less PONV
- Vasopressor use and hypertension during head pinning decreased
- Better postoperative pain scores and less opioid use
- Reduce surgical time
- Shorter hospital stay
- Lower postoperative ICU costs

Common complaints

- Pain from head holder
- Inadequate local anesthesia
- Uncomfortable position
- Dry mouth
- Foley catheter discomfort
- Claustrophobia

Possible Adverse Events

- Seizures
- Respiratory depression from sedation → hypercarbia/hypoxemia
- Nausea/vomiting
- Anxiety
- Discomfort/pain
- Agitation
- Laryngospasm with LMA if using asleep-awake-asleep technique with GA
- Movement in pins
 - Scalp/soft tissue injury
 - Injury to C-spine
 - Brain swelling from straining

Preoperative Considerations

Appropriate patient selection and preparation is paramount to success

- Age (children under 14 should generally not be considered)
- Maturity
- Anxiety/Claustrophobia
- Psychiatric disorders
- Medical comorbidities (e.g. DM, HTN)
- Airway (difficult airway/mask, risk of obstruction); sudden conversion to GETA may be difficult
- Reflux/nausea/vomiting
- Coffee drinker?

Anesthetic goals

- Keep patients safe and comfortable
- Monitor and guide patients through conscious mapping and testing

Risk factors for sedation failure

- Hypertension
- Alcohol abuse
- Lack of maturity

Preoperative Consultation

Clearly outline what to expect during the procedure

- Varying states of sedation and awareness:
 - **NOTE:** While unlikely, they may remember everything
 - Lines/foley/scalp blocks placed under deep sedation
 - Cranial opening under deep sedation
 - After dura is open, patient is allowed to emerge
 - Brain mapping, testing, and resection while awake
 - Sedation is resumed for dural, cranial, and skin closure
- Testing process
 - Direct cortical stimulation may cause uncomfortable sensation/involuntary movement
 - Risk of seizure during testing and resection phases
- Positioning: pressure from pins, neck pain
- Possible discomfort: foley, incision, sound and/or vibrations from drill, dry mouth
- Build strong rapport: assure patient that the above can be addressed
- Alleviate anxiety and discomfort as much as possible: ensure that patient knows they will be able to communicate with OR staff at all times

*Neurologist should be involved in preoperative preparation

Workflow Overview

- Extensive preoperative consultation in the days-weeks preceding surgery
- In preop:
 - Review anesthetic and surgical plan in detail and continue building rapport
 - Perform thorough neurological examination for preoperative baseline
 - Ensure patient has received preoperative medications (e.g. aprepitant, caffeine prn, AED)
 - Begin sedation with midazolam unless otherwise contraindicated
- Enter the operating theatre:
 - Place patient on table - head 180 from anesthesia machine
 - Apply monitors, nasal cannula (secure and escalate airway plan prn)
 - Continue titrating sedation
 - Midazolam 1-2mg prn
 - Dexmedetomidine 1mcg/kg bolus over 10min + 0.3-0.7mcg/kg/hr infusion
 - Propofol infusion 25-50 mcg/kg/min (10-20mg boluses helpful for breakthrough pain)
 - Place lines, foley, scalp and pin site blocks
 - Dose antiemetics and antibiotics (slowly)
- Allow surgeons to begin. Be vigilant.
 - Discontinue sedation when bone flap is removed and start chronometer
 - Patient should begin to emerge in 20-30min
 - If not, titrate flumazenil 0.1mg q2-3min
 - Be vigilant and help reorient patient as they emerge; be ready to address emergencies
- Brain testing and mapping with neurologist's assistance
 - Watch for rhythmic twitching, reported presence of aura
 - Communicate with surgeon and intraop neuromonitoring team
 - Be ready to abort seizure with cold saline in surgical field or propofol
- Continue resection while patient awake and cooperative
- Once resection is complete, resume sedating infusions and bolus sedatives prn for closure

Workflow

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Lines & access

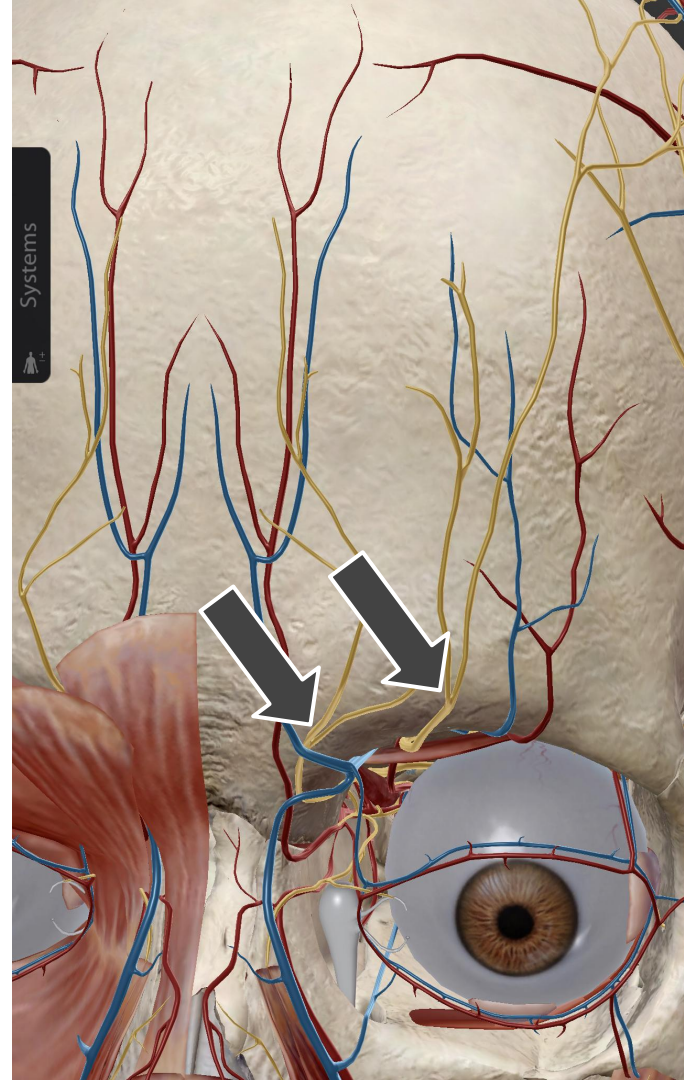
PIV x2
Arterial line
Central line

Monitors

Standard
5-lead ECG
Temperature
Urine output
ABP
CVP
Neuromonitoring
± Precordial doppler

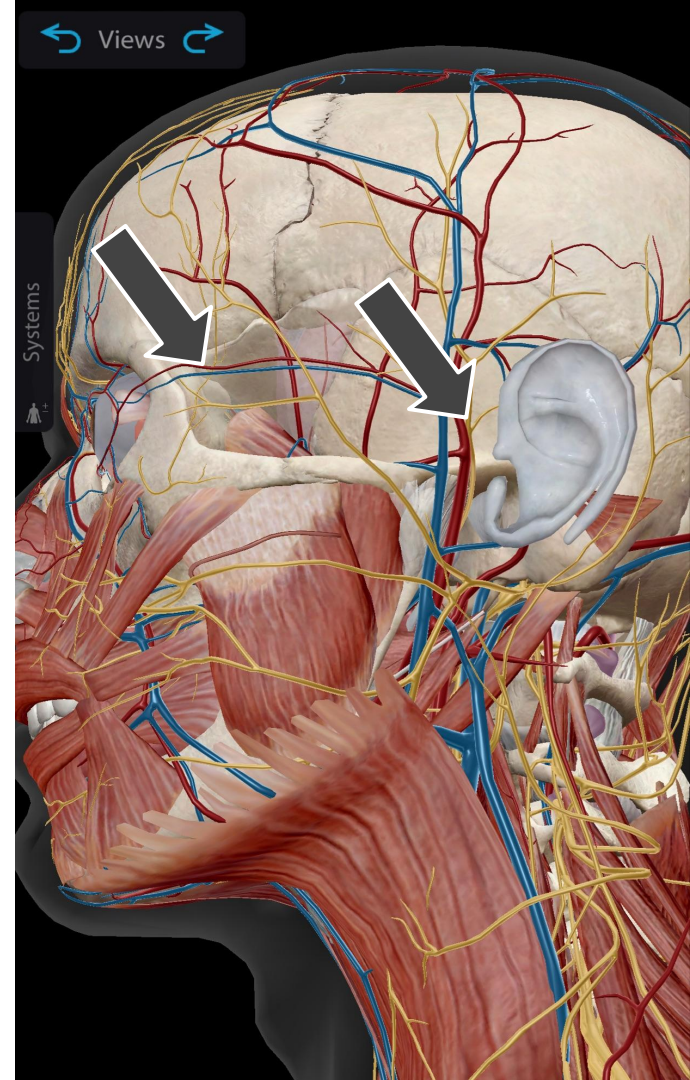
Scalp Blocks

- Supraorbital
- Supratrochlear



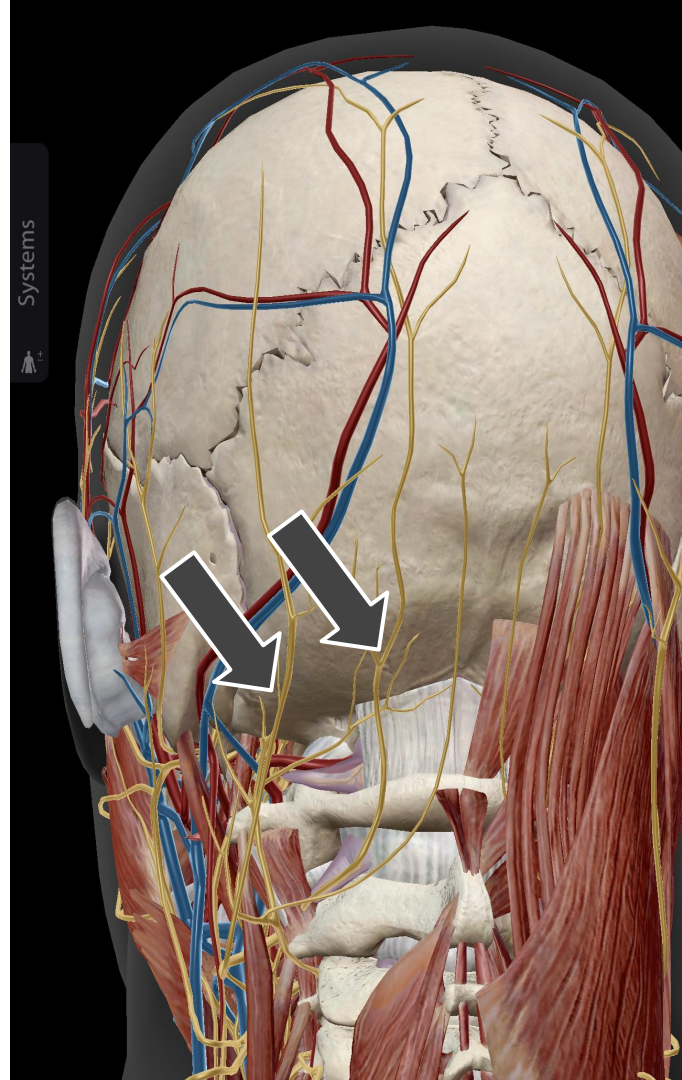
Scalp Blocks

- Zygomaticotemporal
- Auriculotemporal



Scalp Blocks

- Greater occipital nerve
- Lesser occipital nerve
- +/- Least occipital nerve



Positioning

- Lateral or semi-lateral positioning is common, tenting drapes upward
 - Improves patient comfort
 - Provides anesthesia team access to the patient
 - May reduce sense of claustrophobia
- Ensure adequate padding and pillows; check pressure points
- Stabilize position, strap/tape patient to table, apply restraints
- Ideally, patient should confirm acceptable level of comfort prior to sedation
- Patient must remain still upon emergence from sedation

Workflow

Allow surgeons to begin. Be vigilant.

- Discontinue sedation when bone flap is removed and start chronometer
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- Be vigilant and help reorient patient as they emerge
 - Be ready to address emergencies

Workflow

Brain testing and mapping with neurologist's assistance

- Watch for rhythmic twitching, reported presence of aura
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- Continue resection while patient awake and cooperative

Resume sedating infusions and bolus sedatives prn for closure.

Typically, patients will go to ICU for close monitoring.

Room Setup

Medications

Sedating gtts

- Propofol
- Dexmedetomidine

Vasoactive gtts

- Phenylephrine
- Nitroprusside vs clevidipine

Misc gtts

- IVF carrier
- +/- insulin

Bolus sedatives

- Midazolam 10mg in 10mL
- Dexmedetomidine 1mcg/kg in 20mL
- Propofol in 3mL syringes for seizures

Bolus vasoactives

- Phenylephrine
- Ephedrine
- Nitroprusside 25mcg/mL vs clevidipine

Local anesthetics

- 20mL buffered 2% lidocaine
- 20mL 0.5% bupivacaine with epi 1:200k
- 27g needles for scalp and pin site blocks

Misc Rx

- Dexamethasone
- Ondansetron
- Acetaminophen IV

Emergency Rx

- Have mannitol in room
- Propofol 200mg syringe for emergent induction
- Rocuronium vs succinylcholine for emergent intubation

Equipment

Airway equipment

- Nasal cannula vs facemask vs optiflow with appropriate extensions and tegaderms
- Ambu regular with 6.0 wire reinforced ETT

Invasive lines

- PIV start kits
- PICC vs CVC
- Arterial line

Misc supplies/equipment

- Microphone for patient
- Wrist restraints
- Verify scrub tech has cold/slushed saline
- Disposable oral swabs and water
- +/- precordial doppler

Stanford Pharmacy Shopping List

- 20mL 0.5% bupivacaine
- 0.5mg flumazenil
- Dexmedetomidine gtt +/- concentrated vial to make 20mL bolus syringe
- +/- midazolam 10mg in 2mL to dilute to 1mg/mL (vs. get 5-2mg vials from omni)
- Phenylephrine
- Mannitol
- +/- clevidipine
- +/- insulin
- IV acetaminophen

fin