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

Indications

- Sub-occipital craniotomy for tumors and aneurysms
- Cervical laminectomies

Contraindications

- Hypovolemia
- Any anatomic cardiac shunts

Preoperative Visit

- Ventriculostomies are often placed preoperatively for intraoperative decompression in order to improve operative conditions. In patients with tumors, ICP can then be monitored to avoid increased ICP and herniation.

- Look for signs of or risks for cardiovascular instability – i.e. elderly, malnourished, dehydrated patients. These patients may require preop hydration and vasopressors during transition from supine to sitting position.

- Premedicate lightly (Midazolam 1-2 mg I.V.) if at all.

- Pre-op. Note: State that the patient has been informed of the risk and possible complications of air embolism, including that of paradoxical air embolism.

The Procedure

Preparation for the Procedure

You will need precordial Doppler. End-tidal CO₂ (and N₂ if available) monitor, neuromuscular blockade monitor, esophageal stethoscope, and phenylephrine infusion (20mg in 500 cc) with Alaris pump, and arterial line. For CVP, see “Placement of Air Aspiration Catheter”. Need Cook or Arrow multi-orificed catheter, 8.4% NaHCO₃ (1 mEq/ml) in 10 cc syringe, Johans adapter or equivalent, and accessory wire lead.
Upon patient’s arrival in O.R.

Start 16 or 14 gauge I.V., arterial line, neuromuscular monitor and blood pressure cuff all on the side of patient that will be closest to the anesthesia machine.

Anesthesia record

- Document the placement of arterial lines, EKG, arterial blood gases, precordial Doppler, multi-orificed CVP, end-tidal CO₂, end tidal N₂ if available, and esophageal stethoscope.
- Document the method used to confirm CVP placement in the right atrium, i.e. chest x-ray or biphasic P-wave on intravascular electrocardiography and that CVP is intravascular, i.e. aspirate blood and blood sampled from catheter does clot.
- Document that the position of the precordial Doppler over the right heart was confirmed by a saline flush via CVP catheter.
- Document that the arterial transducer was placed at the head level.
- Document any air emboli episodes and therapeutic measures taken, i.e. jugular vein compression, CVP aspiration (air present?), N₂O off, increasing tidal volume ventilation, lowering the head, or turning the patient’s position to left lateral decubitus.

Induction Phase

- One way: Vecuronium 0.05 mg/kg (or equivalent short acting non-depolarizer), fentanyl 2-5 mcg/kg, sufentanil 0.5 mcg/kg, or remifentanil 0.1-0.5 mcg/kg/min with voluntary hyperventilation, then propofol 1-2 mg/kg and vecuronium 0.1 mg/kg or equivalent short acting non-depolarizer. Manual hyperventilation and fentanyl 2-5 mcg/kg, sufentanil 0.5 mcg/kg or remifentanil 0.1-0.5 mcg/kg/min. As muscle twitch fades, give additional propofol and/or lidocaine if blood pressure remains high about 1 min prior to laryngoscopy, and intubate. Use bite block rather than pharyngeal airway as the latter may cause excessive pressure on the tongue. Consider taping bite block to tube!

Maintenance Phase

- Maintenance: Fentanyl 1-3 mcg/kg/hr, sufentanil 0.1-0.2 mcg/kg/hr or remifentanil 0.1-0.3 mcg/kg/min and either propofol 100-250 mcg/kg/min or low dose isoflurane, i.e. 0.4-0.6 percent, or sevoflurane, i.e. 0.6-1.0 percent, in O₂ only once incision is made. Although N₂O is used by some, we feel its hazards, i.e. tension pneumocephalus, increased embolism size and increased pulmonary artery pressure outweigh its benefits, i.e. increased sympathetic tone. N₂O can, however, be used up to the time of skin incision.

- Superior vena cava catheterization: Use the Cook or Arrow multi-orifice catheter. Using catheter tip as an EKG lead, locate position showing biphasic P wave and then pull back catheter to position showing largest negative P wave, see “Placement of Air Aspiration Catheter”.
- **Head clamp placement**: may be associated with enormous increases in intracranial and blood pressure. Anesthesia must be deepened or local anesthesia (2% lidocaine) injected at each head clamp pin site.

**Transition from Supine to Sitting**

The anesthesiologist should be capable of placing the table in the correct position.

1. **Supine Neutral Position**
   - Table top sections

2. **Step 1**
   - Full flex
   - Foot down 45 to 60 degrees

3. **Step 2**
   - Back elevating
   - Chassis lowering
   - Foot kept horizontal

4. **Step 3**
   - Ready for stabilization of head

5. **Step 4**
   - Skull pin head holder on patient, clamped to U-Frame on table side rails
   - Table head section off
   - Shoulders taped to frame

- Closely monitor BP, keeping transducer at brow level and mean BP above 50 torr using phenylephrine infusion.
For improved surgical exposure, head is often flexed. Make sure chin does not press on chest, i.e. 1-2 finger breaths clearance. Excessive head flexion or rotation may also cause marked increases in ICP and/or neurological damage. Also check for any change in peak airway pressure as head flexion may kink endotracheal tube.

When final position reached, feet and knees should be at heart level and arms placed in lap or on arm boards at lap level. If arms are allowed to hang at side they may become swollen. May need rolled up blankets behind both upper arm and shoulder to prevent shoulder droop and stretch of nerves over head of humerus.

Keep Johans adapter or equivalent on CVP catheter. Recheck right atrial catheter position as catheter tip often migrates into right ventricle or inferior vena cava (denoted by positive P waves) during transition to the sitting position and flexing of head.

Intraoperative Management

- Maintain low PaCO₂ to keep brain bulk low, unless BP is below 60 torr or ICP normal.
- Position precordial Doppler. Check position with rapid injection of 5 cc agitated saline through the right atrial catheter.
- We prefer maintaining complete muscle relaxation using neuromuscular blockade monitor as a guide. Abdominal muscle contractions increase venous pressure causing brain swelling. Lack of complete paralysis allows initiation of spontaneous ventilation increasing negative pressure in cerebral veins.

Intraoperative Sequelae

- Air Embolism
  1) If air detected (i.e. sounds heard on Doppler, decrease in end-tidal CO₂ or increase end-tidal N₂ or pulmonary artery pressure), notify surgeon.
  2) Discontinue N₂O if being used (it shouldn't be) and place on 100% oxygen.
  3) Aspirate right atrial air aspiration catheter.
  4) Increase cerebral venous pressure: Bilateral jugular vein compression for 5-10 sec allows the surgeon to locate an open vein. This should be done only if there is no anticipated problem with increased ICP. In the presence of increased ICP or a posterior fossa mass, compress jugular veins only if ICP can be monitored and avoid increasing pressure more than 2-4 mm Hg.
  5) Ephedrine 10-25 mg i.v. if the blood pressure decreases. Use other vasoactive drugs (epinephrine, vasopressin, and etc.) if ephedrine not effective.
  6) Check ABG for hypoxia and hypercapnia.
  7) If all else fails: Left lateral decubitus position with 15 degree head down slant (Durante position).
Other intraoperative sequelae

- Vasopressor center activation - dorsal pons and medulla – periventricular grey area (floor of 4th ventricle) and medullary, reticular formation (ventral to periventricular grey).
- Vasodepressor activation – pericentral areas dorsal to inferior olive.
- Increased BP and HR with stimulation of V, IX, or X.
- Increased HR with stimulation of X.
- Hypoventilation/ apnea with interruption of respiratory centers - dorsal pons and medulla.
- Hiccoughs with stimulation of X.

Postoperative Period

Tumors frequently attended by sequelae

- Meningiomas of the posterior petrous
- Acoustic tumors
- Cerebellar hemangioblastomas and astrocytomas with brainstem extension
- Medulloblastomas of the cerebellopontine angle or temporal bone
- Ependymomas
- Pontine epidermoid tumors

Other postoperative sequelae

- All those listed above as intraoperative sequelae.
- Perforation of alimentary tract or G.I. hemorrhage - X.
- Dysphagia, depressed cough/gag reflex, vocal cord paralysis – IX, X, XI.
- Hyperthermia syndrome – X
- Loss of eye protective reflexes – V, VII
- Impaired eye movement – IV, VI.
- Impaired vestibular/ cochlear function – VIII
References


