FUNCTIONAL ENDOSCOPIC SINUS SURGERY

Surgical Specialty:	Otolaryngology
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Background:

- General Considerations
  - Functional endoscopic sinus surgery (FESS) is an endoscopic surgical procedure to treat chronic rhinosinusitis, nasal polyps, deviated nasal septum (FESS with septorhinoplasty), and other causes of nasal obstruction (e.g., infection).
- Patient Considerations
  - Patients are typically healthy older children who have failed medical management of chronic rhinosinusitis, have obstructive nasal polyps, or a deviated septum
  - Patients who are immunocompromised are at risk for opportunistic infections, such as invasive fungal sinusitis that require debridement.
  - Associated Comorbidities/Syndromes
    - Obstructive sleep apnea (OSA) secondary to chronic airway obstruction.
    - Immunosuppression due to chemotherapy.

Anesthetic Planning:

- Pre-Anesthetic Evaluation
  - A thorough pre-anesthetic evaluation focusing on the airway exam, degree of nasal obstruction/OSA, need for a sleep study, coexisting pulmonary disease, and coagulation status
  - An endotracheal tube is preferred for protecting the airway from blood and secretions
  - May encounter difficulty with bag-mask ventilation if nasal obstruction is severe
  - Chronic rhinosinusitis often coexists with reactive airway disease
  - Determination of baseline blood pressure if deliberate hypotension requested
  - Discussions to have with surgeon/family
    - Code Status
- Specific or Unique Room Set-Up Requirements
  - Airway
    - An oral RAE endotracheal tube protects the airway from blood and is out of the surgical field.
      - Studies in adults have demonstrated the safety and efficacy of supraglottic devices for sinus surgery but these are lacking in children.[1]

- Drugs/Infusions
  - Drug-soaked pledgets are inserted into the nasal passages and/or injected submucosally prior to the start of the procedure for vasoconstriction of nasal capillaries. They typically require 15-30 min to work.
    - Local anesthetic with epinephrine
    - Oxymetazoline
    - Phenylephrine
  - Calculate the maximum local anesthetic dose
    - Lidocaine with epinephrine = 7mg/kg (without epinephrine = 5 mg/kg)
    - If using an epinephrine only solution (no local anesthetic), the maximum dose is 10mcg/kg injected submucosally
  - Maintenance of anesthesia varies
    - Total intravenous anesthesia (TIVA) with propofol and remifentanil
      - Studies show improved operating conditions due to lower mean arterial blood pressure.[2]
    - Sevoflurane with intermittent boluses vs. infusion of anesthetic adjuncts (opioids, dexmedetomidine, propofol)
  - Dexamethasone
    - Antiemetic and reduces edema
      - 0.5 mg/kg (max 10 mg)
- Monitors
  - Standard American Society of Anesthesiologists monitors.
  - Cerebral oximetry if inducing hypotension
  - Bi-spectral index monitor if TIVA
- Blood Availability (if indicated)
  - Usually not required
    - Hematology/Oncology patients may present with anemia and coagulopathy requiring a preoperative transfusion.
- PICU Bed Availability (if indicated)
  - Often a same day surgery procedure and PICU only required in select scenarios.
- Other Indicated Resources (e.g., ECMO standby)
  - Unlikely required

Intraoperative Considerations:

- General
  - Anesthetic and Physiologic Implications of the Surgical Procedure
    - The goal is to provide as near bloodless operating conditions as possible while maintaining cerebral perfusion.
      - A clear visual field decreases the incidence of serious surgical complications.[3]
- Induction
  - Inhalational vs. intravenous induction, as indicated
  - An oral airway may be helpful if significant nasal obstruction is present or difficulty with mask ventilation is encountered.
- Positioning
  - Supine position with the head of head elevated 15 degrees
    - Surgeons often stand near the head of the bed
    - There is limited access to the airway.
- Maintenance

  - Varies by institution, with many options available
  - TIVA with propofol and remifentanil has been shown to be safe and effective at inducing hypotension (mean arterial pressure (MAP) of 50 mmHg) and improving operating conditions. [2,3,4]
  - Inhalational maintenance can be used with satisfactory results
    - Preoperative vasoconstriction, head-up positioning and an intermittent opioid/alpha 2 agonist bolus or infusion strategy can provide acceptable operating conditions and minimize the risks of hypotension
- Hemodynamic/Physiologic goals
  - Be aware of risks associated with systemic absorption of oxymetazoline or epinephrine.
    - Increase in BP may not be tolerated in certain patients (e.g., cardiac disease)
  - Unless contraindicated (cardiac disease, intracranial pathology), the MAP may be lowered to reduce bleeding (varies by institution)
  - Can reduce MAP by lowering HR, SV, or SVR via various medications (beta blockers, calcium channel blockers, anesthetic agents, alpha 2 agonist, etc.)
    - Labetalol, nicardipine, propofol, sevoflurane, and dexmedetomidine are common medications to facilitate a reduction of MAP.
  - The patient can be placed in slight reverse Trendelenburg to improve venous drainage from the head.
- Surgical Considerations
  - Overall blood loss is minimal, although a small amount can make the procedure difficult due to impaired visualization.
  - Cerebral oximetry may be used to monitor cerebral perfusion if using a hypotensive strategy.
  - Muscle relaxation should be considered to maintain an immobile patient while instruments are in the nasal passages.
- Emergence/Disposition
  - A smooth emergence is desired to reduce coughing and straining which can cause bleeding.
  - Most patients will go to PACU with routine care and home on the same day.
- Post-op Care
  - Pain is mild to moderate
    - Acetaminophen +/- NSAIDs, opioids in the PACU as needed
  - PONV risk is elevated given the surgical site (ENT procedure), the potential for blood to be swallowed, and anesthetic exposure.
    - Consider pre-op scopolamine patch & low dose propofol infusion (25 mcg/kg/min). Routine ondansetron and dexamethasone administration
    - If significant N/V in the PACU, consider another anti-emetic and a crystalloid fluid bolus (10-20 mL/kg)
      - Antagonists of dopamine, histamine, and NK1 receptors may be considered.

Case-Specific Complications/Pitfalls

- Hemorrhage
    - Procedure may need to be aborted due to poor visualization
        - However, blood loss rarely requires transfusion and routine pre-operative type and screen is typically not required
- Cerebrospinal fluid leak
- Intracranial infection
- Orbital complications (vision loss, hematoma)
- Air embolism with head-up or reverse Trendelenburg positioning
    - Flood area with saline
    - Position patient with operative site below the level of the heart to prevent further entrainment of air while supporting cardiac output as necessary.

References

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