Supraglottoplasty

Christina J. Yang, MD and Meryl Kravitz

1. General Considerations
   a. Indications
      i. Severe laryngomalacia diagnosed on flexible fiberoptic laryngoscopy
      ii. Symptoms and signs of severe laryngomalacia, including:
         a. Airway obstruction
            1. Stridor
            2. Supraglottic collapse partially or completely obscuring view of vocal cords on laryngoscopy
            3. Deep retractions/pectus deformity
            4. Apneic/cyanotic spells
            5. Obstructive sleep apnea on polysomnography
            6. Pulmonary hypertension or cor pulmonale
         b. Feeding difficulty
            1. Failure to thrive / poor weight gain
            2. Regurgitation / aspiration
         c. Gastroesophageal reflux disease and laryngopharyngeal reflux
            1. Most common medical comorbidity in infants with laryngomalacia
      d. Surgery usually reserved for severe cases refractory to treatment (acid suppression, thickened feeds)
   b. Contraindications
      i. Multilevel airway obstruction
      ii. Relative: neuromuscular disease / hypotonia. Weigh improvement in airway obstruction against risk of worsening aspiration
      iii. Active upper or lower respiratory tract infection
   c. Advantages
      i. Supraglottoplasty shortens length of symptomatic disease compared to wait-and-see for severe laryngomalacia
   d. Pertinent Anatomy

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Epiglottis: Thin elastic fibrocartilage structure that projects up behind the tongue and body of hyoid bone, partly covers laryngeal entrance. Sides are attached to arytenoid cartilages by aryepiglottic folds.

Arytenoid Cartilage: Two pyramidal hyaline cartilages at upper border of cricoid cartilage in posterior larynx. On the apices sit the corniculate cartilages.

Aryepiglottic Folds: Triangular folds of mucous membrane extending from the lateral borders of the epiglottis to the arytenoid cartilages.

Cuneiform cartilage: Small, paired cartilage which resides in the aryepiglottic fold.

Multiple classification systems exist to characterize laryngomalacia, describe mucosal vs cartilaginous collapse, and define which anatomical structures are involved. The Olney classification is as follows:**

1. Type 1: Prolapse of mucosa overlying the arytenoid cartilages
2. Type 2: Foreshortened arytenoid cartilages
3. Type 3: Posterior displacement of the epiglottis

2. Preoperative preparations
   
a. Evaluation:
      1. History: Duration and severity of stridor, feeding or respiratory difficulties, apnea, cyanosis, tachypnea, obstructive sleep apnea, failure to thrive, aspiration/pneumonia, or cor pulmonale.
      2. Diagnosis confirmed by flexible laryngoscopy + symptoms
      3. Consider formal swallow evaluation
      4. Patients may be considered candidates for surgery when medical management has failed as evidenced by failure to thrive, acute life-threatening events, or frequent unplanned visits to the doctor’s office for airway complaints
   
b. Consent for surgery
      1. Potential complications:*
         1. Intraoperative:
            a. Injury to local structures: Epiglottis, esophagus
            b. Bleeding
         2. Early:
            a. Infection
            b. Granuloma
            c. Airway edema
            d. Feeding difficulties including choking and aspiration

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3. Late:
   a. Fibrous webs
   b. Supraglottic stenosis
   c. Aspiration

3. Nursing Considerations
   a. Room Setup:
      i. Head turned 90 degrees counterclockwise from anesthesiology (patient’s left shoulder
         at anesthesia machine) as for all rigid bronchoscopy
      ii. Mayo stand for suspension
   b. Instrumentation and equipment
      i. Microlaryngeal instruments
      ii. Operative microscope (focal length 400 mm)
      iii. Benjamin-Lindholm scope or Parsons laryngoscope and suspension apparatus
      iv. Pledgets
      v. CO2 laser or laryngeal microdebrider if applicable. Authors prefer “cold steel” technique
         for primary supraglottoplasty
   c. Medications (Specific to nursing)
      i. 1% lidocaine
      ii. Oxymetazaline (for pledgets)
   d. Prep and drape
      i. Consider shoulder roll to facilitate neck extension (if no Down syndrome or other
         contraindication)
      ii. Tape patient’s eyes
      iii. Mouth guard or wet gauze to protect the teeth/ maxillary alveolus

4. Anesthesia Considerations
   a. General
      i. Bed turned 90° counterclockwise from the anesthesiologist
      ii. General anesthesia with spontaneous ventilation in most cases. Oral or nasotracheal
          intubation may be necessary in some cases
   b. Perioperative steroids
      i. 0.5mg/kg dexamethasone before endoscopy to minimize perioperative edema.
5. Operative Procedure

a. When plane of anesthesia is adequate, protect upper dentition and perform direct laryngoscopy and rigid bronchoscopy\(^7\)
   
   a. Laryngotraheal anesthesia: spray 1% topical lidocaine solution (4-5 mg/kg) to decrease risk of laryngospasm
   
   b. Rigid telescope (without ventilating bronchoscope) adequate for majority of cases
   
   c. Allows for pre-intervention assessment of supraglottic collapse and evaluation of concomitant pathology such as laryngeal cleft, subglottic stenosis, tracheal stenosis, tracheo- or bronchomalacia.

b. Expose larynx with Parsons or Lindholm laryngoscope, place in suspension

c. Maintain oxygenation (blow-by, 3.0 endotracheal tube connector inserted into laryngoscope suction evacuator, or endotracheal tube in pharynx). *If using laser, follow laser precautions (FiO\(_2\), wet gauze over eyepads, wet towels around face)

d. Use operating microscope (400mm lens) for visualization

e. Surgical resection can be performed using microlaryngeal scissors, carbon-dioxide (CO\(_2\)) laser, or microdebrider\(^8\). Address affected structures as follows:

   a. Shortened Aryepiglottic folds (type 2 laryngomalacia)
      
      i. Grasp and retract arytenoid mucosa posteromedially with microlaryngeal forceps, placing tension on the aryepiglottic fold
      
      ii. Incise aryepiglottic fold along the lateral edge of the epiglottis
      
      iii. A small vessel is often encountered at the inferior limit of dissection. Apply pressure with cotton pledgets with oxymetazoline (or saline) for hemostasis

   b. Redundant arytenoid mucosa or cartilage (type 1 laryngomalacia)
      
      i. Grasp and retract arytenoid mucosa anterolaterally with microlaryngeal forceps
      
      ii. Microscissors and laser: make medial incision first to avoid inadvertent interarytenoid mucosal stripping. Maintain grasp on redundant arytenoid tissue and retract medially. Make lateral/posterior-to-anterior incision, connect it to medial incision.

      iii. Microdebrider: 3000 rpm skimmer setting, gently debulk posterolateral mucosa (avoid interarytenoid space)

   c. Avoid multiple re-grasps to minimize edema

d. Preserve interarytenoid mucosa and normal strip of mucosa between arytenoid and AE-fold incisions to prevent scarring and stenosis

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6. **Postoperative Care**

   a. Overnight admission to a monitored unit with continuous pulse oximetry. HOB 30 degrees.
   b. Airway control:
      a. Intubation, though unlikely, is sometimes required overnight in young infants
   c. Medications:
      a. If postoperative stridor or respiratory distress (laryngeal edema), consider dexamethasone 0.5 mg/kg POD 1 and/or racemic epinephrine
      b. PPI or H2 blocker
   d. Feeding: Once fully awake, proceed with regular feeding if no significant aspiration history. If feeding issues, consult a swallowing therapist. If severe aspiration, a temporary nasogastric tube may be required.
   e. Reassess at 1 and 3 months to evaluate GERD/LPR, airway obstruction, and feeding disorders

7. **Suggested reading:**


8. **CPT Code:**

   No specific code exists. Discuss with your billing department. Consider 31541 (direct laryngoscopy with biopsy) vs 31588 (unlisted code).

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