Pediatric Direct Laryngoscopy

Return to: Pediatric Airway

Also see: Maximum Recommended Doses and Duration of Local Anesthetics

see videos: Pediatric Airway Session (videos) - May 31, 2011

GENERAL CONSIDERATIONS

a. The Lindholm scopes come in four sizes, including the Infant (for < 1 year), the Toddler (1-3 years), the Child (3-12 years) and the Adolescent scopes (or Adult, for 12 years of age or older)
   i. **Indications**: Diagnostic and Surgical
   ii. **Placement**: Vallecule
   iii. **Suction/Jet/Insufflation**: Matched Cannula (8587PM)
   iv. **Illumination**: Light tube or Benjamin Havas Clip
   v. **Advantage**: Panoramic View however difficult to jet through.

b. The Pierre Robin scopes are formally known as the Holigner-Benjamin (9.5 cm for infant/newborn) and the Holinger-Tucker (11 cm toddler/child) scopes. There are two sizes and they are slotted on the left.
   i. **Indications**: Diagnostic and Intubation
   ii. **Placement**: Anterior Commissure slotted
   iii. **Suction/Jet/Insufflation**: N/A
   iv. **Illumination**: Prism
   v. **Advantage**: Used for intubation of difficult airway, slimline.
c. The Benjamin Operating scopes come in two sizes, including the Infant (9.5 cm left), and the Child (15 cm, right) scopes.
   i. **Indications:** Diagnostic and Surgical (8574J)
   ii. **Placement:** Midline, tip at Anterior Commissure
   iii. **Suction/Jet/Insufflation:** Cannula
   iv. **Illumination:** Light tube or Benjamin Havas Clip
   v. **Advantage:** Binocular vision for laser or micro direct laryngoscopy.

d. The Benjamin Subglottis Scope comes in two sizes, for both the Neonate and Child.
   i. **Indications:** Mostly Surgical (lasering can be performed).
   ii. **Placement:** Subglottis at midline

2. **PREOPERATIVE PREPARATIONS**
   a. Case preparation:
      i. The resident should have thorough knowledge of the patient’s history
including:
1. Results of office flexible laryngoscopy (dynamic exam),
2. Details of previous airway procedures including dates, outcomes and techniques,
3. History of reflux and treatments including prophylactic PPI or Nissen fundoplication.

ii. Prior to the procedure, one should calculate the appropriate amount of Lidocaine that is available for use.
1. Typical dosage for topical Lidocaine is 4 mg/kg
   a. This dosage should not be repeated for 2 hours
   2. 1% Lidocaine contains 10 mg/mL

b. Positioning
   i. Patient will be in the supine position
   ii. Eyes will be taped shut
   iii. Head will be supported on a donut

3. NURSING CONSIDERATIONS
   a. Equipment should be reviewed and ensured to be functional by the surgeon performing the procedure
      i. The light should be tested on the laryngoscope of choice
      ii. The rigid bronchoscope should be assembled and ensured to be functional
      iii. The percentage of lidocaine used should be confirmed, and the syringe prepared with addition of a 20 gauge angiocatheter attached.
      iv. Laryngeal spreaders, and other biopsy forceps should be ensured to be functional
      v. Suction should also be available (5 and 7 French catheters to fit in the side port of the bronchoscope)
      vi. A gump or tooth guard should also be present, or alternatively a moist raytec may be used in children without dentition.
      vii. A head donut
      viii. De-fogging solution and a sponge arranged on the table, appropriate endoscope camera focused and white balanced, mitomycin C 10 mg/mL if needed, Triamcinolone 10 mg/mL if needed, a video tower should be set up, appropriate grasping instruments, ½ inch and 2 inch neuro-pledgets

4. ANESTHESIA CONSIDERATIONS
   a. Communication with the anesthesiologist should include your desire for the patient to be breathing spontaneously for the length of the procedure.
   b. The bed will be rotated 90 degrees.
   c. Patient will be in the supine position.
   d. The patient should be kept spontaneous. Usually, the induction is performed with an inhalational agent, and once the patient is asleep, an IV is obtained (if this had not been done previously). The patient is then run primarily on propofol, due to the ability to titrate the depth of anesthesia quickly.
   e. Despite the plan to have the patient spontaneous, a set of appropriately sized ET tubes should be available for both airway sizing, as described below, and for intermittent intubation if needed.

5. OPERATIVE PROCEDURE
   a. The patient is mask ventilated by Anesthesia, and is properly pre-oxygenated.
   b. The patient should be positioned appropriately including a shoulder bump if needed, and a head rest. This elevates the patient into the sniffing position,
to allow visualization of the carina upon suspension.

c. The bed is then rotated 90 degrees, and the Otolaryngologist is now in charge of the airway.

d. The Miller or Mac blade is used to obtain initial visualization of the vocal cords, and to anesthetize the true vocal cords with Lidocaine.
   i. Calculations for the allowable amount of lidocaine are made here at 4 mg/kg Q2 hrs
   ii. *It is paramount at this point in the procedure to make a mental note of the visualized airway
   iii. It is important to allow the lidocaine to take effect.

e. A moistened piece of gauze is used to protect the upper gums/teeth in small children, while a tooth guard is utilized in older children.
   i. KY jelly is applied to the larygoscope prior to insertion

f. The Laryngoscope is held in the left hand, and is carefully introduced into the oral cavity at a right angle.

g. Rotate the laryngoscope 90 degrees into its native position and begin to advance the scope.

h. The anterior upper lip of the Lindholm scope will be placed into the vallecula.

i. Appropriate placement will elevate the epiglottis to allow for a full view of the glottis.

j. If the sub-glottis, trachea and carina are viewable through the glottic inlet the laryngoscope is well positioned, if not you may adjust your head position up and down with towels or by dropping the head of the bed or your laryngoscope position or both. When you are satisfied with your view place the laryngoscope in the suspension device and secure it into position.

k. With the laryngoscope in suspension pass a de-fogged laryngeal length 4mm Hopkins Rod telescope through the laryngoscope and take video and photo documentation of the glottis and if possible the sub-glottis.
   i. If the laryngeal inlet won’t admit a 4mm scope switch to a bronchoscopy length 2.7mm Hopkins rod telescope.
   ii. Pass this telescope through the cords and take video and photo documentation of the findings.

l. Specifically you should be looking for evidence of laryngeal cleft, follicular mucosal changes indicative of reflux and glottic/sub-glottic/tracheal stenosis (measure length and caliber of stenotic segments as well as distance below the TVF). You should also look for membranous tracheal pouches or defects as well as areas of complete tracheal rings, extrinsic narrowing noting whether or not it is pulsatile and bronchial / segmental bronchial anatomy. It may be necessary to use a 30 or 70 degree endoscope in the trachea to best grade a sub-glottic or tracheal stenosis for presence of a shelf.
   i. *An aside, if not previously completed, you should size the airway if any suspicion of narrowing exists. This is done by placing a series of increasing sized ET tubes through the laryngeal inlet and observing for leak evidenced by air bubbles around the ET tube at the level of the cords. Bubbles should be present at 25mm H2O to qualify as a true leak and the size of the endotracheal tubes should be increased until one is no longer able to obtain a leak at 25mm H2O. Using the age/size chart below one can determine the % stenosis based on the age of the patient and size of the largest ET tube which allowed a leak at 25mm H2O (See Airway Sizing Protocol)

m. Assuming the patient has been adequately evaluated and has a short segment area of sub-glottic or tracheal stenosis treatable by radial incisions and balloon dilation you may begin that portion of the procedure.

5. Under direct endoscopic visualization

The Procedure
1. POSTOPERATIVE CARE
   i. Post-operative care is dependent on the level of procedural intervention performed. For patients with airway evaluation only, Decadron given pre-operatively at a dosage of 0.25 mg/kg with post operative Tylenol is generally sufficient for medical management. The patient should be monitored for stability following the procedure in the PACU.

2. SUGGESTED READING