Lesson S32: PreAnesthetic Assessment of the Child with Rhinitis

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Practice Gaps

Anesthesiologists are often presented with children having symptoms of an upper respiratory infection such as a runny nose. Despite several large studies that indicate that it is safe to proceed with general anesthesia under identified circumstances, many anesthesiologists are concerned with complications, the consequences of delays, as well as adverse financial and psychological consequences.

Objectives

At the conclusion of this lesson, the reader will be able to:

1. Define rhinitis.
2. Describe the signs and symptoms of an upper respiratory infection.
3. Identify situations in which surgery for a child with rhinitis can proceed.
4. Formulate a means to reduce postoperative respiratory incidents.
5. Discuss risk of critical respiratory events in children with URI receiving anesthesia.
6. Describe the appropriate preoperative assessment of a child with rhinitis.
7. Note the considerations in the use of a supraglottic airway in a child with an upper respiratory infection.
8. List criteria that should be met prior to discharging a child with a cold.
9. Formulate an appropriate anesthetic plan for a child with a cold.
10. Outline the effects of infection on the airway and the interaction with anesthetics.

Case Presentation

A 5-year old boy was brought by his parents to the ambulatory surgical unit where he was scheduled for tonsillectomy and adenoidectomy. Past medical history was remarkable for frequent “colds”, treated with a nebulizer and antibiotics. He was a mouth breather and his parents confirmed that he
snored loudly. They described symptoms suggestive of obstructive sleep apnea. He was not prescribed any regular medication. His mother said that he complained of an earache on several occasions recently and she had given him a baby aspirin, the last time being the previous evening. The boy had a clear nasal discharge that appeared to be resolving. He had been sneezing but only coughed on one or two occasions. Although his mother thought that he was slightly febrile at one point, temperature was normal. He was not wheezing. In the past he had experienced asthma symptoms during the spring when pollen counts were high. Both older siblings had recent colds. The father noted that it was not uncommon for at least one member of the family to have an upper respiratory infection at any time. All three children attended a school in which two cases of chickenpox were reported in the last month, but not among their close friends. None of the children in the family had developed a rash.

Physical examination showed an appropriate 5 year old. There was some crusting around his nose and slight throat redness. Tonsils were noted to be very large, red and touching in the midline. Inspection of the eardrums was normal. Auscultation of the chest revealed clear breath sounds. Pulse was 110 beats/min; blood pressure was recorded at 95/60; temperature was 98.9°F.

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**Introduction**

Traditionally, anesthesia and surgery have been delayed in patients with signs and symptoms of upper airway infection. The rationale supposes that stress imposed on a body weakened by some other process might somehow adversely affect outcome. Others have argued that intubation and administration of general anesthesia may spread an upper respiratory infection (URI) throughout the pulmonary system leading to bronchitis and/or pneumonia. Even regional anesthetic techniques, typically preferred if respiration is impaired, are thought to worsen respiratory diseases. However, there have been few clinical studies reporting data to confirm these beliefs. Experimental evidence in support of these statements is also lacking.

With the increasing prevalence of ambulatory surgical procedures, it is not uncommon for children to be prepared perioperatively as outpatients and seen by the anesthesiologist and/or pediatrician minutes before the scheduled procedure. Respiratory infections are common in children - occurring about 5-10 times per year - and are characterized by mild disease, as compared to symptoms experienced by adults. Economic factors for families and hospitals should be considered before any case is cancelled. Last minute postponement of a case may have traumatic psychological effects on both patients and parents who may have been preparing for days or weeks.

Children presenting with apparent respiratory infection on the day of surgery remains a major issue. A recent article on the effectiveness of an anesthesia preadmission clinic in minimizing surgical cancellation rates noted that 33% of all anesthetic cancellations were due to respiratory infections.¹

**Rhinitis**

Rhinitis affects about 10-30% of the adult population in the United States and up to 40% of children.² Irritation and inflammation of the mucous membrane inside the nose generates large amounts of mucus resulting in stuffy or runny nose and post-nasal drip.
There are 3 types of rhinitis: infectious rhinitis, including acute and chronic bacterial and viral infections; nonallergic (vasomotor) rhinitis associated with autonomic, hormonal, drug-induced, atrophic, and gustatory rhinitis, as well as rhinitis medicamentosa (rebound nasal congestion due to extended use of topical decongestants); and allergic rhinitis, triggered by pollen, mold, animal dander, dust and other similar inhaled allergens.

Infectious rhinitis, known as the common cold or sinusitis, is typically caused by rhinovirus, coronavirus, or influenza virus. Other infective agents include adenovirus, human parainfluenza virus, human respiratory syncytial virus, enterovirus and metapneumovirus. Bacterial sinusitis is commonly caused by Streptococcus pneumoniae, Haemophilus influenzae, or Moraxella catarrhalis.

Vasomotor rhinitis refers to a runny nose not due to allergy or infection. It can be classified as either non-inflammatory or inflammatory rhinitis. It can be triggered by nonspecific stimuli, including changes in the environment (temperature, humidity, barometric pressure, or weather); airborne irritants (odors, fumes); dietary factors (spicy food, alcohol); or emotional factors. It is thought that these non-allergic triggers cause dilation of the blood vessels in the lining of the nose, which results in swelling, and drainage. Vasomotor and allergic rhinitis can coexist. In general, age of onset for vasomotor rhinitis is after 20 years of age, in contrast to allergic rhinitis which can occur at any age. Individuals suffering from vasomotor rhinitis typically experience symptoms year-round, although they may be exacerbated in the spring and autumn when rapid weather changes are more common.

Allergic rhinitis, or hay fever, is the most common type of rhinitis. It occurs when an allergen, such as pollen or dust, is inhaled by an individual with a sensitized immune system, triggering antibody production. Most antibodies bind to mast cells, which contain histamine. Histamine is released causing itching, swelling, and mucus production. Symptoms vary in severity and range from sneezing, nasal itching, coughing, headache, to hives or rash. Characteristic physical findings include conjunctival swelling and erythema, eyelid swelling, lower eyelid venous stasis, lateral crease on the nose, swollen nasal turbinates, and middle ear effusion.

The diagnosis of URI is determined by the finding of 2 or more of the signs and symptoms listed in Table 1.

**Preoperative Evaluation: Cancel or Proceed**

Several studies have looked at the effects of anesthetics on viral and bacterial infections. There are some contradictory findings and conclusions.

McGill et al studied 11 children who developed wheezing, hypoxia and coarse breath sounds after intubation. All children were intubated and anesthetized with halothane and nitrous oxide. Two required bronchoscopy to treat atelectasis that occurred shortly after intubation. Ten had a recent viral URI. The authors recommended: a) postponing elective surgery for children who were actively
sneezing or had a recent URI; and b) performing a chest X-ray in a child with URI within the preceding month.

A prospective study compared 25 children with recent URI with 25 asymptomatic children. Oxygen desaturation to less than 95% was found immediately in 20% of the study group in the postanesthetic care unit but not in the control group. The children did not receive supplemental oxygen. There were no adverse outcomes or further morbidity. Liu et al, reviewing the anesthetic management of 93 infants and 295 children (most of whom were intubated) found that critical incidents (i.e. wheezing, laryngospasm, hypoxia, breath holding) could be identified in 71% of infants with URIs as compared to 26% of controls, and in 30% of children with URIs versus 12% of controls.6

Utilizing a pediatric database of 29,220, Cohen and Cameron identified 1283 children with URIs.7 All patients had clear nasal secretions, normal chest examinations and normal white cell counts. Throughout the perioperative period, children with URI had a 2-7 fold increased risk of a respiratory related event. Children with URI who were not intubated, were almost 9 times more likely to develop problems than control patients. All intubated children had a 5 times increased risk of a critical respiratory incident. Intubation in the presence of URI was associated with an 11 fold risk increase. Similar to other studies, morbidity and mortality rates were not increased by URI.

These studies implicate URI as a triggering factor in respiratory complications, but there was no reported mortality and morbidity was mild and brief. The authors advise postponing anesthesia and surgery for up to 6 weeks or until resolution of a potentially “reactive airway”, although 6 weeks is sufficient time for a child to acquire another cold, and the window for administration of a ‘safe’ anesthetic would appear to be very small.

Tait and Knight studied 3,585 cases and found no increase in complications of anesthesia in symptomatic patients, but a 3 fold increase in bronchospasm and laryngospasm in asymptomatic patients with a history of recent URI.8 Recognizing that patient selection may have been skewed towards selection of patients with chronic symptoms of nonviral origin (i.e., an allergic pattern), the authors performed a prospective cohort study of 489 patients undergoing myringotomies between the ages of 1-12 to investigate the prevalence of perioperative respiratory complications.9 The research demonstrated no increase in morbidity in mostly nonintubated patients; and administration of general anesthesia to 78 children (combined with surgery to relieve chronic ear infection) appeared to decrease the appearance and duration of several respiratory symptoms. The anesthetic technique included halothane and nitrous oxide. These authors also showed that different anesthetic agents may attenuate the histopathologic response to viral influenza infections in animals and halothane may even inhibit viral replication.10

Other studies found no increase in morbidity. The frequency of laryngospasm or desaturation in children with an active URI was similar to the control group.11 In contrast to the DeSoto study, Glazener and Motoyama, in a study of 97 healthy ASA I infants and children, found a mean SpO2 on admission to the postanesthetic care unit of 93% (with no oxygen given during transport).12 Review of a database of 24,165 anesthetics performed over a 30 month period in a pediatric teaching hospital revealed 724 adverse events.13 Respiratory events represented 53% of all intraoperative events and were more frequent in infants during ENT surgery, in children who were intubated, and in those with an ASA (American Society of Anesthesiologists) score of 3-5. There were no deaths related to any of these episodes.
Course of Action and Decision Making

While the presence of a cold may increase the incidence of adverse events perioperatively, the effects are temporary and other factors merit consideration such as the ability of the surgery to decrease future URIs (e.g. tonsillectomy, myringotomy), the difficulty in scheduling the surgery at a time when the child does not have a cold or a reactive airway, younger age and the requirements of the family and surgical team.

Based on this information, a large cohort study was designed by von Ungern-Sternberg et al to examine respiratory complications in healthy children and in children with clinical symptoms of respiratory co-morbidities. The authors reviewed 9297 questionnaires. A positive history of pathology included nocturnal dry cough, wheezing during exercise, or wheezing more than 3 times in the past 12 months; or a history of eczema associated with an increased risk for bronchospasm, laryngospasm, perioperative cough, desaturation or airway obstruction. Upper respiratory tract infection was associated with an increased risk for perioperative respiratory adverse events only when symptoms were present for less than 2 weeks before the procedure (a time previously thought of as a period for a hyperactive airway). Symptoms of URI 2-4 weeks before the surgery were correlated with a significantly lower incidence of adverse occurrences. A history of at least 2 family members with asthma, atopy or smoking, increased the risk. Risk was decreased by intravenous rather than inhalation induction and maintenance of anesthesia, airway management by a pediatric anesthesiologist and use of a face mask instead of intubation. The authors concluded that even though the incidence of URIs is high in children, cancellation of procedures, as done in the past, is not indicated. The literature supports selective decisions on a case-by-case basis.

In a more recent review, Becke underscored von Ungern-Sternberg’s findings, emphasizing the notable trend of anesthesia safely performed in children with colds when a careful assessment of potential risks and benefits are implemented and safety precautions taken. Anesthesia in children with symptomatic infections including wheezing, purulent secretions, and fever should be postponed for 2 weeks, if possible. Treatment options for children with infections of the upper airway include the following: perioperative inhalational therapy with salbutamol; avoidance of endotracheal intubation whenever possible and substitution with a face mask or supraglottic airway; use of propofol and avoidance of desflurane.

TABLE 2: Risks for Increased Perioperative Adverse Events

<table>
<thead>
<tr>
<th>CHILD SPECIFIC</th>
<th>ANESTHESIA SPECIFIC</th>
<th>SURGERY SPECIFIC</th>
</tr>
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<tbody>
<tr>
<td>Age &lt;6 years; especially infants &lt;1 year</td>
<td>Manipulation of the airway; endotracheal intubation, bronchoscopy</td>
<td>Airway surgery: ear, nose throat, eye surgery</td>
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<tr>
<td>Clinical signs of URI: nasal congestion; purulent secretions; moist cough; otitis media. Parental belief.</td>
<td>Airway management; intubation&gt; supraglottic airway&gt; face mask</td>
<td>Upper abdominal surgery</td>
</tr>
<tr>
<td>Primary pulmonary co-morbidity (syncitial virus, asthma, prematurity, bronchopulmonary dysplasia; cystic fibrosis, pulmonary hypertension, neuromuscular disease)</td>
<td>Anesthetic agents: desflurane&gt; sevoflurane&gt; propofol</td>
<td>Pulmonary surgery: bronchoscopy</td>
</tr>
<tr>
<td>Other infectious disease: malaise, febrile, bacterial superinfection</td>
<td>Lack of experience by the anesthetic provider</td>
<td>Cardiac surgery</td>
</tr>
<tr>
<td>Passive smoke inhalation; morbid obesity</td>
<td>Transport without monitoring and oxygen</td>
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Tait et al were among the first researchers to point out that the use of a supraglottic airway was associated with fewer instances of adverse events than intubation in a sample group of 82 pediatric patients aged 3 months to 16 years. They found no differences between the groups in the incidence of cough, breath holding, and excessive secretions or dysrhythmias. The overall incidence of laryngospasm was similar. They found a significantly higher incidence of mild bronchospasm in the intubated group and a much greater incidence of major arterial desaturation during placement of the endotracheal tube. The total number of episodes of respiratory complications was greater in the intubated group (35 vs. 19). Gharaei et al confirmed these results, adding that in children with uncomplicated URI, the administration of inhalation anesthetics by a supraglottic airway is likely to cause fewer adverse events than the use of a face mask. Von Ungern-Sternberg and colleagues added that even with the use of a supraglottic airway, the incidence of laryngospasm, cough and desaturation was higher when compared with healthy children, even though the overall incidence was low. The authors then assessed whether deep vs. awake extubation influenced the risk of respiratory complications in high risk children undergoing adenotonsillectomy. One hundred children with at least one risk factor for adverse events were randomized to awake or deep extubation. The overall incidence of complications did not differ between the groups, but extubation in fully awake children was associated with a greater incidence of coughing (60 vs. 35%) while the incidence of airway obstruction requiring simple airway maneuvers was greater in those with deep extubation (26% vs. 8%). Thus, both extubation techniques are acceptable provided the child is closely monitored in the postoperative period.

A special circumstance arises in children with both asthma and rhinitis. While the incidence of asthma is increasing worldwide, morbidity and mortality are decreasing due to improvements in medical care. The incidence of severe perioperative bronchospasm is relatively low in asthmatics undergoing anesthesia but can be life threatening. Perioperative assessment of asthmatic children should include a specialized medical history and physical examination as well as pulmonary function testing. Potential triggers should be identified and avoided. In some cases, systemic corticosteroids and bronchodilators are indicated to prevent the inflammation and bronchoconstriction associated with intubation. Acute bronchospasm can still occur during induction and emergence and must be promptly managed.

Clinical practice guidelines for pediatric tonsillectomy have recently been presented in France. These guidelines address patient selection, general risk assessment and assessment of cases with obstructive sleep apnea, technical principles and postoperative care. The guidelines do not provide any in-depth information regarding anesthetic technique except to suggest balanced general anesthesia with a cuffed endotracheal tube and awake extubation.

**Management of the case presented**

After consultation with the anesthesiologist, the surgeon and the parents, it was decided to proceed with the tonsillectomy since the diseased tonsils were a key factor in the child’s frequent URIs. The surgery had been planned for several weeks and both parents had taken time off from work. The child was afebrile and chest auscultation was clear. The surgeon had several cases scheduled that day. The case was postponed to the second slot, allowing time for an EMLA® patch to take effect. A vein was cannulated with a #22 gauge needle and atropine 0.1mg was administered. Propofol, 25mg, mixed with lidocaine was infused slowly and after the child lost consciousness, anesthesia was continued with sevoflurane. An endotracheal tube, size 4, was inserted. The surgery proceeded smoothly and was
completed within 20 minutes with minimal bleeding. Extubation was performed as the child began to awaken but before he detected the tube. He was transferred to the recovery room with supplemental oxygen where his parents were waiting for him. There were no episodes of desaturation. He was discharged home in the early evening hours.

**Conclusion**

Administration of anesthesia to a child with URI increases the risk of an adverse respiratory event. However, a vigilant anesthesiologist can identify and address these occurrences quickly and take appropriate action to prevent morbidity and mortality. Each case should be reviewed individually. Children with a greater number of symptoms or more severe symptoms are at greater risk of complications. Risks decrease with age, especially over the age of 6 years, probably because of the anatomically larger airways. Hospitals, post-anesthesia care units, and ambulatory surgery centers should establish discharge criteria for children presenting for surgery with URIs.

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References


POST-TEST

1. **Administration of anesthesia to a child with URI:**
   a. increases the risk of critical respiratory events
   b. typically results in prolonged morbidity
   c. requires at least two anesthesiologists
   d. should only be undertaken if special consent is obtained

2. **In children with both asthma and rhinitis who require anesthesia:**
   a. risk of bronchospasm is very high
   b. bronchospasm is easily managed and not life threatening
   c. corticosteroids and bronchodilators should be given prior to intubation
   d. pulmonary function testing is seldom necessary

3. **Studies of deep vs. awake extubation in high risk children show:**
   a. awake extubation is preferred
   b. deep extubation is safer
   c. airway obstruction is more likely with awake extubation
   d. either method is acceptable with proper post-op monitoring

4. **Which of the following patients does not meet the criteria for URI:**
   a. A 2 year old girl with rhinorrhea and sore throat
   b. A 10 year old boy with temperature of 100.6 F and ear ache
   c. A 6 year old boy with a slightly red throat and non-productive cough
   d. A 12 year old girl with malaise and WBC 9,000/mm3

5. **The most common infective agents in URIs are**
   a. rhinovirus and coronavirus
   b. herpes simplex
   c. staphylococcus
   d. varicella
6. The incidence of rhinitis in children is:
   a. unknown
   b. around 100%
   c. 40% in the United States
   d. much less than in adults

7. Use of a supraglottic airway rather than intubation:
   a. prevents adverse respiratory events in children with colds
   b. significantly decreases the incidence of laryngospasm
   c. has no effect
   d. is not widely recommended

8. With regard to anesthesia specific risk factors for complications in children with colds:
   a. propofol induction is preferred
   b. intubation is preferred over face mask
   c. manipulation of the airway does not increase risk
   d. desflurane is safer than sevoflurane

9. Recommendations for anesthetic administration to a child with a cold call for:
   a. careful preanesthetic assessment
   b. decision to proceed on a case-by case basis
   c. early recognition and immediate treatment of complications
   d. all of the above

10. Risk of respiratory complications in a child with URI increases with:
    a. age of the child > 6 years
    b. perioperative salbutamol inhalation
    c. greater number or more severe symptoms
    d. all of the above