

## UPPER RESPIRATORY INFECTION AND ANESTHESIA - OUTLINE

### I. PATHOPHYSIOLOGY

- a. Peripheral Airway Changes
  - i. Decreased diffusion capacity
  - ii. Increased closing volumes - predispose patients to intrapulmonary shunting and hypoxemia, especially when combined with negative effects of volatile anesthetics
  - iii. Increased lung oxygen uptake-secondary to inflammation from infection
  - iv. Mechanisms of above not certain, possibly:
    - 1. changes in hypoxic pulmonary vasoconstriction
    - 2. changes in volume and clearance of secretions
    - 3. changes in airflow and distribution
- b. Increased Airway Reactivity
  - i. Secondary to released mediators associated w/infection
    - 1. Histamine
    - 2. Bradykinin
    - 3. Leukotrienes
  - ii. Neurally mediated
    - 1. increased vagal reflex bronchoconstriction
    - 2. damage to M2 muscarinic receptor potentiates release of acetylcholine at the neuromuscular junction
  - iii. Tachykinins increased - breakdown of these substances
    - 1. increase vagal afferent activity
    - 2. normally broken down by neutral endopeptidase (NEP)
    - 3. URIs decrease amount of NEP present to break down tachykinins

### II. PERIOPERATIVE COMPLICATIONS

- a. Bronchospasm
  - i. May have tenfold higher risk of bronchospasm or laryngospasm
- b. Subglottic edema with stridor
- c. Hypoxia
- d. Increased desaturation with apnea - Kinouchi et al., 1992
- e. Increased desaturation, but brief and treatable - Rolf and Cote, 1992
- f. Atelectasis
- g. Death - Konarzewski WH et al, 1992
- h. Increased risk in intubated patients - seems to be *only* clear consensus

- i. Details of the preoperative condition, in particular symptoms of respiratory tract infections (RTI), perioperative management and the occurrence of perioperative complications, were collected in a survey of 2051 children. Logistic regression was used to determine which variables were predictors of anesthetic adverse events. 22.3% of the children had symptoms of an RTI on the day of surgery, and 45.8% had a 'cold' in the preceding 6 weeks. Logistic regression returned eight variables. They were method of airway management, parent states the child has a 'cold' on the day of surgery, child has nasal congestion, child snores, child is a passive smoker, induction agent chosen, child produces sputum, and whether reversal agent used. Orotracheal intubation was associated with an increased probability of complications when compared with laryngeal mask airway and facemask. RTI in the preceding 6 weeks did not increase probability of complications. Wheeze, fever, malaise and age could not be excluded as predictors in this study because children with these symptoms and infants with colds were effectively excluded from the study. Parnis SJ et al. Paediatric Anaesthesia. 11(1):29-40, 2001 Jan.
- ii. Increased risk of adverse respiratory events: laryngospasm, stridor, increased coughing-Tartari et al., 2000
- iii. Several studies suggest that placement of an endotracheal tube (ETT) in a child with an upper respiratory infection (URI) increases the risk of complications. However, the development of the laryngeal mask airway (LMA) has provided anesthesiologists with an alternative means of airway management. This study was therefore designed to evaluate the use of the LMA in children with URIs and to compare it with the ETT. The study sample consisted of 82 pediatric patients (3 mo to 16 yr of age) who presented for elective surgery with an URI. Patients with URIs were randomly allocated to receive either an ETT (n = 41) or a LMA (n = 41) and were followed for the appearance and severity of any perioperative complications. The two groups were similar with respect to age, gender, anesthesia and surgery times, number of attempts at tube placement, and presenting URI symptoms. There were no differences between groups in the incidence of cough, breath-holding, excessive secretions, or arrhythmias. Although one patient in the ETT group required a muscle relaxant for laryngospasm, the overall incidence of laryngospasm was similar between the two groups. There was, however, a significantly greater incidence of mild bronchospasm in the ETT group compared with the LMA group (12.2% vs 0%,  $P < 0.05$ ). The incidence of major arterial oxygen desaturation events ( $SpO_2 < 90\%$ ) during placement of the airway device was also significantly

increased in the ETT group (12.5% vs 0%,  $P < 0.05$ ). Furthermore, the total number of all episodes of respiratory complications, i.e., breath-holding, laryngospasm, bronchospasm, and major oxygen desaturation, was significantly greater in the ETT group (35 vs 19,  $P < 0.05$ ). Despite this, all respiratory complications were easily managed, and there were no adverse sequelae. Although the risks associated with anesthetizing a child with an URI remain controversial, results from this study suggest that the LMA offers a suitable alternative to the ETT for use in children with URIs. Implications: This study compares the use of the laryngeal mask airway with the endotracheal tube for airway management in children with upper respiratory infections. Results suggest that if the decision is made to proceed with anesthesia for the child with an upper respiratory infection, then the laryngeal mask airway provides a suitable alternative to the endotracheal tube. Tait et al. *Anesth Analg* 1998;86:706-11)

### III. PREOPERATIVE ASSESSMENT

- a. Reasons to consider canceling an elective case in presence of a URI
  - i. Case requires intubation (vs mask, LMA)
  - ii. Case is non-emergent
  - iii. Productive cough, stridor, tachypnea, abnormal breath sounds
  - iv. Other systemic symptoms-fever, lethargy, change in activity or appetite. Even though these symptoms may not prevent one from giving an adequate anesthetic, I think that it is a shame to subject a child to the trauma of an operation when already they don't feel well, unless the case is an emergency.
  - v. Concomitant illness - e.g. asthma
  - vi. Parental preference
  - vii. ? environmental tobacco exposure-Parnis et al. found that passive smokers in the presence of a URI had an increased risk of adverse events.
  - viii. Case is an airway case: e.g. tonsils, cleft palate, etc.
  
- b. It is interesting to note that while there is excellent evidence that the frequency of adverse respiratory events goes up with a URI, the evidence also suggests that most of these event are easily dealt with. If one is vigilant and knows what to expect in the child with a URI, it may not be unreasonable to proceed, especially if an LMA can be used, the child is not an asthmatic, and the case is not an airway case. See Tait and Malviya (2005)

#### IV. Period at risk after URI

- a. 4-6 weeks allows for decrease in airway hyper-responsiveness after cold/cough has resolved-this is somewhat controversial. Parnis et al., 2001, found only that cold symptoms on the day of surgery increased the risk of adverse events, NOT a URI in the six weeks prior to surgery.
- b. Realistically, for upper infection alone, 2 weeks may be sufficient although minor desaturation may still be seen. One study suggests no increased incidence of laryngospasm if patient is now asymptomatic and > 2 weeks out from URI.

V. Homer et al. (2007) analyzed several prospective observational and interventional studies and performed logistical regression on results in order to determine risk factors for adverse events during emergence from anesthesia in those patients with preoperative symptoms of URIs. In all studies a blinded observer prospectively recorded the presence of stridor, desaturation, coughing and laryngospasm. In 335 patients there was no correlation between a specific symptom and adverse event. There was correlation between the likelihood of adverse events and airway technique (ETT > LMA), timing of extubation, and if peak symptoms had occurred within the preceding four weeks.

#### VI. Reasons to proceed

- a. BMT or other mask case
- b. Symptoms limited to nasal congestion
- c. Minimal if any cough ("post nasal drip" cough)
- d. No other illness
- e. Surgery is urgent

#### VII. INTRAOPERATIVE THERAPY

- a. Anticipate copious secretions, wheezing, high airway pressure
  - i. Frequent suctioning of ETT, especially if desaturation
  - ii. May need saline irrigation
- b. Tait et al. (2007) investigated the value of pre-treating children with URIs with glycopyrolate. 130 children with URIs were randomized to receive either 0.01 mg/kg glycol or placebo and were monitored for perioperative respiratory events. There was no difference between the two groups in the incidence or severity of perioperative respiratory events. In those patients who had congestion and secretions (vs. the whole group that got glycol.), there was also no significant difference with the placebo group in adverse events
- c. Symptomatic treatment for bronchospasm.
- d. Increased likelihood of laryngospasm
- e. Extubate very awake



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