UPPER RESPIRATORY INFECTION AND ANAESTHESIA

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Introduction:

Controversy still prevails as to whether a patient, particularly, a child with URI can be taken up for anaesthesia for elective surgeries. It has been proved by many studies that children with URI have more incidences of complications following anaesthesia[1,2,3]. It is McGill who presented a series of 1979 cases of children with URI who were administered anaesthesia. Eleven of them developed significant respiratory complications including atelectasis[4].De Soto et al concluded that children with URI desaturated more readily than the normal children, though it can be corrected by the administration of oxygen[5]. Cohen and Cameron found that in a study of 20000 children who underwent anaesthesia, there were 2 to 7 times more respiratory complications in children with URI and the incidence rose to 11 times if they were to be intubated[1]. Malviya et al found that presence of URI in the preoperative period predicted a higher incidence of bacterial infections in the postoperative period and multiple complications following cardiac surgery though the overall stay in the hospital was not increased and there were no long term sequelae[6]. There are many more such studies indicating a higher incidence of respiratory complications in the postoperative period in children with URI. But, except one incidence of cardiac arrest (attributed to negligence on the part of the anaesthesiologist), there were no serious or long term complications. In the present day anaesthesia practice, with high load of surgical cases, it is not possible to postpone the surgeries on the basis of URI alone. In a study among the anaesthesiologists, it was noted that younger anaesthesiologists are less likely to postpone the surgeries than the senior persons on the basis of URI alone.

Incidence:

The most common infection in human being is URI. In USA every year two million patients are admitted in the hospital for the complaints of URI (from among 500 million attacks of URI). The in-patients days are eight million amounting to an expenditure of two billion dollars.

Common cold or mild URI occurs once or twice a year in adults. Nasal symptoms include nasal discharge, obstruction and sneeze. Throat symptoms include soreness and non productive cough. Systemic symptoms include malaise, myalgia and pyrexia.

In children the incidence is more frequent occurring once in two months. Because of the very frequent incidence in children, it is difficult to find URI-free period for elective surgeries.

Pathophysiological changes:

Cold can be caused by a variety of viruses – rhino, influenza, parainfluenza, entero, herpes etc. Cold should be distinguished from vasomotor rhinitis, asthma, bronchiolitis, croup (laryngotracheobronchitis), influenza, herpes simplex, pneumonia, epiglottitis, and streptococcal pharyngitis, bacterial infections and prodromal stages more serious infections like dengue, pox infections etc. Certain viraemia can cause viral myocarditis and may be responsible for unexplained death following anaesthesia.

The viral infection of the respiratory tract causes inflammation and oedema of the nose, throat and lower airways. This causes airway obstruction and increased airway reactivity and is responsible for the cough, laryngo and bronchospasm. One mm oedema causes just a marginal increase in the airway resistance in adults, but in infants with narrow trachea, this may lead to 75% reduction in the airway causing serious airway obstruction. This is the main reason why infants desaturate faster than children and URI exacerbated this problem [7].

Viral invasion of the respiratory mucosa may render the airway sensitive to secretions or potentially irritant anesthetic gases. Chemical mediators and neurologic reflexes play an important role in the etiology of bronchoconstriction. For example, release of inflammatory mediators, such as bradykinin, prostaglandin, histamine, and interleukin, at the sites of viral damage, has been associated with bronchoconstriction. The bronchial hypersensitivity is partly mediated through vagal autonomic reflex. This may be through two mechanisms. The first is through the production of viral neuraminidase which increase concentration of acetylcholine at the muscarinc receptor sites. Secondly, viral infection causes decrease in the airway neutral endopeptidase which in turn increases the concentration of tachykinins. Tachykinins are sensory neuropeptidase found in the vagal nerve endings and which enhance the bronchoconstriction and also the action of the acetylcholine[8]. The incidence of laryngospasm and bronchospasm and the airway resistance is increased. The increase in the airway resistance persist for six weeks and even longer, long after the clinical resolution of the URI. These changes are further aggravated during general anaesthesia and these complications are mediated through autonomic reflexes. Bronchodilators are expected to prevent these complications. But studies by Tom Elwood et al showed that prophylactic use of ipratropium and albuterol did not change the incidence of airway resistance or laryngo / bronchospasm[9].

URI causes changes both in the upper and lower respiratory tract. There is an increase in the amount and consistency of the secretion in the respiratory tract. This will lead to increased incidence of postoperative atelectasis and desaturation which can be relieved by positive pressure ventilation.

Changes in PFT:

URI decreases FEV_1, FVC, VC, forced expiratory flow and increases the airway resistance. There is a seven fold increase in the bronchial reactivity. Rhinovirus infection causes significant decreases in diffusion capacity.

Clinical effects of URI during anaesthesia:

Patients with URI are prone to develop coughing attacks, breath holding spells (especially in infants), laryngospasm, bronchospasm, stridor, atelectasis and systemic effects like fever, body pain etc. Tait and knight published reports that patients with URI have more

incidences of laryngo and bronchospasm than others [10]. They also found that if the trachea is not instrumented, the incidence of respiratory complications is much less than when intubated (five times against eleven times the incidence of complications in normal persons).

Studies were made to prove that capnography would predict postoperative complications and preoperative bronchodilator like albuterol would prevent those complications. But the study proved that the adverse events were neither predicted nor prevented.

Risk factors:

However, Parnis et al. [11], in a study of 2051 pediatric surgical patients, identified eight clinical predictors of anesthetic complications – 1)airway management (endotracheal tube [ETT] > laryngeal mask airway [LMA] > face mask), 2) the parents' statement that the child had a "cold," 3) a history of snoring, 4) passive smoking, 5) induction agent (thiopental > halothane > sevoflurane > propofol), 6) presence of sputum, 7) presence of nasal congestion, and 8) use of an anticholinesterase (muscle relaxant not reversed > reversed). The presence of a respiratory infection was also implicated as a risk factor for airway complications in a study by Bordet et al. [12].

Independent risk factors for adverse respiratory events in children with active URIs included use of an ETT in a child <5 yr old, prematurity (<37 wk), history of reactive airway disease, paternal smoking, surgery involving the airway, presence of copious secretions, and presence of nasal congestion[3]. Tait AR, Malviya S, Voepel-Lewis T, et al found that in series of 1078 children 3 developed adverse sequelae requiring rehospitalization[3]. Two children with active URIs were admitted for pneumonia after surgery, and one child with a history of a recent URI was readmitted for stridor in the postoperative period. All children had uneventful recoveries.

There are reports of deaths in children with URIs after surgery. In one report [13], a 15-mo-old girl with a history of URI in the 2 wk before surgery developed laryngospasm after tracheal extubation and had a subsequent cardiac arrest. Although the URI was implicated in her death, several other factors, including premature tracheal extubation and inadequate monitoring, were likely contributory [14]. In another case report, a 3-yr-old child died after anesthesia for cautery of the nose [15]. The child had a history of URI within 2 wk before surgery. Postmortem examination elicited evidence of viral myocarditis. Among high-risk children with URIs undergoing cardiac procedures, Malviya et al. found no increase in mortality. In a recent study by Malviya et al., the presence of a URI was found to be predictive of postoperative bacterial infections and multiple complications in children undergoing corrective cardiac surgery[16]. Passive smoking is an additional risk factor for increased tracheobronchial irritability associated with URI. The parents have additional responsibility in this respect.

Most of the time patients who were scheduled for surgery, present with URI on the previous evening or on the day of surgery. Postponing the surgery is not the only answer. This causes lot of inconvenience to the parents, surgeons, surgical schedule and nothing is gained by simple postponement.

Anaesthetic management of patients with URI:

Airway reflexes are heightened in patients with URI and in those with recent history of URI. This hypersensitivity is highest in the first three days of URI, though persisting for two to three weeks to a lesser degree. Hall A. et al tried nebulised lidocaine in patients undergoing general anaesthesia and measured the ammonia-threshold which decreases the respiratory air

flow in patients with and without URI and concluded that in adult subjects, nebulized lidocaine attenuated the heightened airway reflex sensitivity associated with symptoms and signs of upper respiratory tract infection [17].

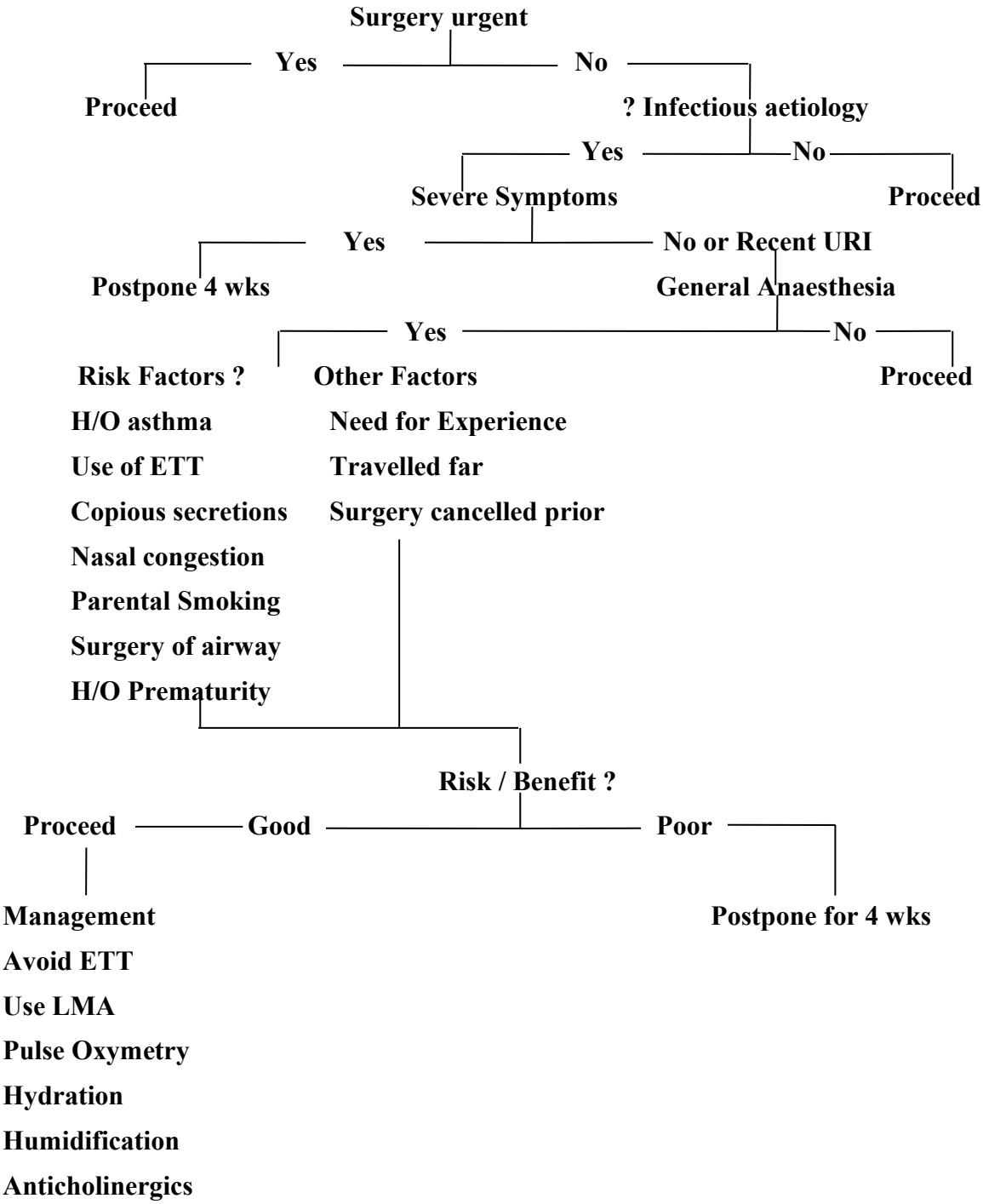
Patients should be adequately hydrated and humidification of the anaesthetic gases should be employed to avoid inspissations of respiratory secretions. The tracheobronchial tree should be suctioned well before extubation (under deep anaesthesia)

In elective surgeries, if the URI is mild and without constitutional symptoms, patients can be taken for surgery, preferably avoiding intubation of the trachea. If the URI is severe with constitutional symptoms and wheezing or if intubation is required for the anesthetic management, the surgery should be postponed for 4 to 6 weeks.

In emergency surgeries, it is preferable to manage the patients without intubation. LMA is an alternate technique, though it can still produce epiglottic irritation. If intubation is mandatory, it is preferable to give atropine premedication and salbutamol nebulisation in the preoperative period. If possible, patient may be extubated awake. Respiratory depressant drugs which can increase the incidence of postoperative atelectasis may be avoided in the postoperative period.

Halothane was originally used in children with URI because of the lesser incidence of respiratory complications. Now, sevoflurane is preferred for its smoother induction and equal or lesser incidence of respiratory complications.

Alan Tait's algorithm:



Conclusion:

There are recent developments in the management of children with URI. Recombinant neutral endopeptidase has been developed which can replace the loss caused by viral infection. Antiviral agents can modify the incidence, duration and severity of tracheobronchial sensitivity.

Search is on for the development of anticholinergic drugs that would selectively block the M3 receptors on airway smooth muscle that cause bronchoconstriction without blocking the vagal M2 receptors responsible for the inhibition of acetylcholine.

Postponement of surgery should always be individualized based on the indication and nature of surgery and the experience of the anaesthesiologists. Being armed with the knowledge of the possible perioperative complications in children with URI is an asset for the anaesthesiologists. He can very well anticipate, prevent and effectively manage any complications that occur in children with URI.

Nearly 2,000 procedures would have to be canceled to prevent 15 cases of laryngospasm. We have muscle relaxants to relieve laryngospasm, bronchodilators and inhalation agents to treat bronchospasm, laryngeal mask airways to avoid intubation in appropriate cases, and oxygen to treat hypoxemia.

Let the topic be concluded with two popular and opposing quotes.

"Common sense dictates that a patient with an active but self limited disease not be subject to elective anaesthesia and surgery until resolution of the illness". – Statement by McGill in 1979.

In a 1955 commentary, Ellis (6), while recognizing the potential for complications, made a case for proceeding with surgery despite the presence of a URI: "…although anesthesia may not be good treatment for the common cold, might it not be a good way of passing the time till the cold is gone?"

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