



Review Article

Evidence-based perioperative management of a child with upper respiratory tract infections (URTIs) undergoing elective surgery; A systematic review

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ABSTRACT

Background: Upper respiratory tract infections are frequently encountered medical problems in paediatric age groups. Children with less than five years may have six up to seven episodes of URTIs per year with each lasting up to two weeks. The issue of whether to proceed with elective surgery on a child with an URTI has been source of debate for many years. The rationale of this review was to avoid traditional approach of blanket cancellation of surgery by stratified risk factors as well as optimization of the patients. Furthermore, this review summarized current evidences regarding perioperative anaesthetic management of children with URTIs.

Methods: The study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. Search engines like PubMed through HINARI, Cochrane database and Google Scholars were used to find high-level evidences that help to draw appropriate conclusions.

Discussion: Performing anaesthesia in children with URTIs increases the risk of perioperative respiratory adverse events (PRAEs) like laryngospasm, bronchospasm, and desaturation and breath holding.

Conclusion: Children with mild and moderate URTIs can safely anaesthetized with optimal preparation and optimization of the patient in the preoperative period. Prevention of stimulation of a potentially irritable airway, use of bronchodilators and induction with propofol are helpful. Furthermore, adequate suppression of airway reflexes with optimal depth of anaesthesia is highly recommended.

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1. Background

Upper respiratory tract infections are the most frequent medical problems in paediatric age groups undergoing surgery and the leading medical causes to defer surgery [1,2].

Approximately, 200 viruses cause the infection that produces the clinical syndrome of cough, nasal congestion, discharge, sore throat, and sneezing. Rhinoviruses, parainfluenza viruses and influenza viruses are the most common viruses causing respiratory illness. The type of virus most commonly causing URTIs varies with different age groups. Respiratory syncytial virus, parainfluenza viruses, adenovirus are the most common viruses infecting the infant and preschool child. URTIs are self-limiting. However, it may produce hyper-reactive airway that can persist for 6 weeks [3].

Children with less than five years may have six up to seven episodes of URTIs per year with each lasting up to two weeks and residual pulmonary effects of 2 to 6 weeks [4–6]. The issue of whether to proceed with elective surgery on a child with an URTI has been source of debate for many years. The purpose of this review is to summarize current evidence regarding perioperative anaesthetic management of children with URTIs undergoing elective surgery and to minimize traditional approach of blanket cancellation of surgery.

1.1. Pathophysiology of upper respiratory tract infections (URTIs)

Viral invasion of the respiratory epithelium and mucosa leads to airway inflammation, edema, dyscriny, and bronchoconstriction, which sensitizes the airway to secretions and volatile agents [7]. Moreover, viral infections damage the ciliary apparatus and mucosal epithelium [8].

The viral infection interacts with the autonomic nervous system by inhibiting the cholinergic muscarinic M₂ receptors, which is

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followed by an increased release of acetylcholine [9]. In addition, viral induced liberation of tachykinin and neuropeptidases with a constriction of smooth muscles in the respiratory tract for weeks may also result in bronchial hyper-reactivity, which can persist for up to 6 weeks or even longer beyond the disappearance of all clinical symptoms [10]. Bronchial hyper-reactivity can trigger severe complications in the perioperative period, particularly laryngospasm and bronchospasm, both of which can lead to fatal hypoxemia, which is the main cause of perioperative morbidity and mortality in children [11–13].

2. Justification

Anaesthesia for elective surgery in paediatric patients with a recent URTI was commonly postponed for several weeks in the past. The blanket defer of surgery can have an impact on social, economic, and emotional consequences for the child, the family and the health service system in general. Furthermore, inadequate optimization of child with URTIs undergoing surgery will cause high incidence PRAEs and unnecessary hospitalization, which could affect the health-care cost and parents satisfaction.

Empirically, postponing surgery in a child suffering from upper respiratory tract infection was usually based on an increased risk of PRAEs, which can occur up to 6 weeks after the disease. Today there is a notable trend for anesthesia to be safely performed in children with URTIs when a careful assessment of potential risks and benefits for the child is implemented and safety precautions are taken.

This review emphasizes on comprehensive assessment, stratification of sign and symptoms of URTIs, optimization in the preoperative period and design appropriate anaesthetic management, which may avoid traditional blanket cancellation of surgery and decrease the risk of perioperative respiratory adverse events (PRAEs) following the surgery.

3. Methods

This study was carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline [14]. A computerized systematic search of the PubMed, Google Scholar, and ScienceDirect databases were used to find articles. Prospective observational, interventional studies, meta-analysis, systematic review and audit studies were included in the review using the following MeSH terms: (Common cold OR upper respiratory tract infections OR URTIs) AND Surgery AND Anesthesia AND (child OR children OR pediatrics) AND perioperative respiratory adverse events. In this review, publication dates were not used as inclusion or exclusion criteria and research papers published before 30 September 2017 were included. Only those articles written in English language were considered for this review. Furthermore, after comprehensive and in-depth appraisal of literature, evaluation of quality was conducted by categorizing them into level 1 (* Meta-analysis, systematic review, randomized control trial) level 2 (** Well designed cohort study) and level 3 (***) case reports, commentaries, and expert opinions). Finally, conclusion has drawn based on the level of evidences and class of recommendation (Fig. 1).

3.1. Selection of studies

Papers fulfilling the following criteria were included in the study: studies presented as original articles, comparative studies on airway intervention for child with common cold undergoing surgery, premedication for child with common cold undergoing surgery, incidence of perioperative respiratory adverse events in child with URTIs undergoing surgery, studies written in English.

Studies done on child with URTIs undergoing emergency surgery, surgery undergoing under local infiltration, studies where full articles were no longer available online were not selected to be included in the current review. All of the research articles that were identified from searches of the electronic databases were imported into the ENDNOTE software version X6 (Tomson Reuters, USA) and duplicates were removed. Before data extraction had begun, full-length articles of the selected studies were read to confirm for fulfilling the inclusion criteria.

4. Discussion

Upper respiratory tract infections affect the apparatus of the upper airways frequently and there is no single universally accepted definition of URTIs. However, most clinical studies define URTI as two of the following symptoms: rhinorrhoea, sore or scratchy throat, sneezing, nasal congestion, and malaise, cough, or fever more than 38 °C [1,15,16]***, **, ** respectively. The most frequent symptoms are rhinorrhoea (66%), followed by nasal congestion (37%), sneezing (29%), productive cough (26%), sore throat (8%), and fever (8%) [4,17]**.

Perioperative respiratory adverse events are the major complications during intraoperative and postoperative period in children with URTI [18]. Typical adverse events in children with respiratory tract infection are laryngospasm, bronchospasm, breath holding, atelectasis, arterial oxygen desaturation, bacterial pneumonia, and unplanned hospital admission [4,16,19]. Hence, these children may benefit from preanaesthetic assessment and specifically targeted perioperative anaesthetic management. When evaluating a child with an URTI for whom elective surgery is planned, preoperative information must be meticulously obtained for the best anaesthetic management, in order to reduce the risk of perioperative respiratory adverse events.

4.1. Preoperative assessment

Identifying sign and symptoms of URTIs in preoperative period for paediatric patients undergoing surgery through medical history and physical examination is very crucial.

Studies classified the severity of URTIs based on clinical manifestations.

- Mild URTIs is considered, if the child has recent Hx of URTI, with no current sign and symptom within the past 2–4 weeks.
- Moderate URTIs is considered, if the child has any symptoms of URTI (runny nose, dry cough), without wheeze and no systemic symptoms such as fever or pyrexia (>38 °C) or irritability (lethargy), for one or two days before the day of surgery.
- Severe URTIs is considered, if the child has any symptoms URTI with systemic manifestation (Fever, >38 °C, productive cough, mucopurulent secretion, nasal congestion, sore or scratchy throat, wheezing, laryngitis and pulmonary involvement) [4,8,10,20].

The potential for a lower respiratory tract infection after URTIs is relatively common in children. So, preoperative evaluation should consist of listening to the child's lungs for rhonchi or wheezing. It is also important to determine if there is a history of asthma or wheezing. Children who are exposed to common colds are at greater risk for reactive airway disease and can hence have a greater propensity for wheezing or bronchospasm during anesthesia [8]*.

Passive smoking, Age below 6 years, particularly infants below 1 year with severe sign and symptoms of URTIs, children with any respiratory or pulmonale comorbidity, ENT surgery or eye surgery,

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