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# A Prospective Observational Cohort Study on the Incidence of Postoperative Sore Throat in the Pediatric Population

**Shashank Prabhakar Mohale[1], Rucha Nitin Tipare[2], Ramesh Kothari[3], Sunil Natha Mhaske[4]**

[1]Assistant Professor, Department of Anesthesia, [2]Resident, [3]Professor and Head, [4]Professor and Dean, Department of Pediatric, Padmashree Dr. Vithalrao Vikhe Patil Foundation's Medical College and Hospital, Vilad Ghat, MIDC, Ahmednagar 414111, India.

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**Abstract**

*Background:* Postoperative sore throat is common after general anesthesia. The incidence in pediatric anesthesia is variable, and the etiology unclear. Establishing risk factors would enable prevention and could improve quality of care.

*Aims:* We performed a prospective single center cohort study aiming to establish the incidence of postoperative sore throat in children undergoing GA with an endotracheal tube (ETT) or laryngeal mask airway (LMA). Secondary aims were to identify independent risk factors for sore throat and the incidence of other postoperative complications including stridor, laryngospasm, nausea and vomiting.

*Methods:* Between November 2018 and April 2019, perioperative data were collected from children aged 5–16 years undergoing general plastic, urology, renal and orthopedic surgery. Patients completed all postoperative questionnaire within 24 hours of surgery.

*Results:* We screened 256 children for inclusion at a tertiary pediatric hospital in the United Kingdom. One hundred and ninety-seven patients were included in the final analysis. The frequency of postoperative sore throat was 35.8%. Stridor occurred in 1.7%, laryngospasm 1% postoperative vomiting in 4.0%. Nausea, vomiting, thirst and pain were associated with a sore throat. Over 50% of children with an endotracheal tube cuff pressure <20 cm $H_2O$ had a postoperative sore throat.

**Keywords:** Incidence; Sore Throat; Endotracheal Tube; Laryngeal Mask Airway

## Introduction

Postoperative sore throat is one of the commonest short-term morbidities after general anesthesia (GA) and a top patient complaint of minor adverse events.[1] It can be defined as pain or discomfort in the throat postoperatively, which may worsen with swallowing. It has the potential for increased analgesic requirements, delayed oral intake, and delayed discharge with cost implications. We also believe that there is a discrepancy between patients and clinicians perspective on the impact of postoperative sore throat. In recent years, the focus on postoperative sore throat has been mainly on endotracheal tube (ETT) and laryngeal mask

**Corresponding Author: Rucha Nitin Tipare,** Resident, Department of Pediatric, Padmashree Dr. Vithalrao Vikhe Patil Foundation's Medical College and Hospital, Vilad Ghat, MIDC, Ahmednagar 414111, India.

**E-mail:** ruchatipare93@gmail.com

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air-way (LMA) cuff pressures.[2-4] Hyperinflation of the cuff may result in airway trauma from excessive pressure reducing mucosal tissue perfusion resulting in the release of inflammatory mediators.[3] In 2015, the Association of Anesthetists of Great Britain and Ireland (AAGBI) recommended that both ETT and LMA cuff pressures are checked after insertion and inflation.[5] However, its likely that the etiology for postoperative sore throat is multifactorial, and other research groups have emphasized that more research is needed for prevention.[6] With excellence in healthcare quality and patient satisfaction being of key importance in anesthetic practice, optimal preventative strategies to avoid postoperative sore throat need to be identified. Based on the hypothesis of multifactorial etiology, we performed a prospective single center observational cohort study aimed at establishing the incidence of postoperative sore throat in children undergoing GA with an ETT or LMA. Secondary aims included identification of independent risk factors for postoperative sore throat and the incidence of other postoperative complications including stridor, laryngospasm, postoperative nausea and vomiting, and delayed oral intake due to postoperative sore throat.

## Materials and Methods

This prospective observational cohort study was done between November 2018 and April 2019, and perioperative data were collected.

### *Inclusion criteria*

(a) Children aged 5–16 years.

(b) Children undergoing general anesthesia for general, plastic, urology, renal, and orthopedic surgery with LMA or cuffed/uncuffed ETT.

### *Exclusion Criteria*

Children were excluded from the study if there were documented learning difficulties, a need for an translator, and if they were undergoing surgery where postoperative sore throat was mainly related to surgery itself or difficult to screen, for example, ENT or neurosurgery.

On the day of surgery, all screened patients that met inclusion criteria were included and the intraoperative and recovery data collection forms were given to the anesthetist in charge of the child's care, which after completion by the anesthetist and recovery nurse, respectively, remained with the anesthetic chart and were collected postoperatively at the time of follow-up. ETT and LMA cuff pressure measurement and the consequent adjustment to be within the normal range (<20 mm Hg for ETT; <60 mm Hg for LMA) were reported, when available. Recovery data included any occurrence of stridor, laryngospasm, vomiting, coughing, and suctioning requirements. The primary endpoint was the occurrence of sore throat from the end of anesthesia to discharge for day cases, and within 24 hours for inpatients. Other postoperative complications occurring in the same time frame were collected as secondary endpoints. Follow-up was performed immediately before discharge for those having day-care procedures; in the afternoon for inpatients that underwent surgery in the morning; and the following morning for in patients that underwent surgery in the afternoon. Patients and parents were not informed that the study was investigating postoperative sore throat to avoid bias. Questions were asked about a range of symptoms postoperative nausea, pain, itching, thirst, hunger, and sore throat. Children who documented suffering with a sore throat at any point since waking up went on to complete a more detailed questionnaire, including details on severity (1–3 score; 1 less than with a cold, 2 like having a cold, 3 worse than having a cold).

## Results

During the enrollment periods (November 2018–April 2019) we screened and included 256 children for inclusion in the study at. Eighty-three patients were excluded from the final analysis due to incomplete intraoperative data, cancellations, no general anesthetic, discharge prior to follow-up, and follow-up declined. Complete data were analyzed on 173 patients.

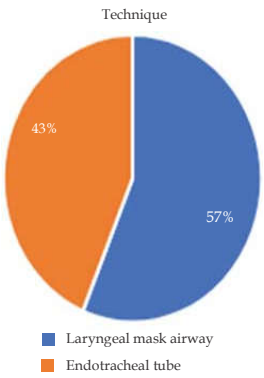


**Fig. 1:** Types of technique.

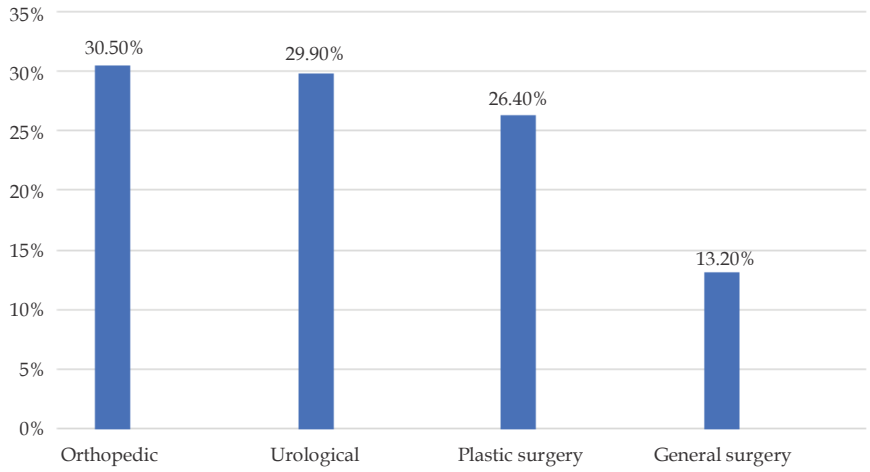


**Fig. 2:** Types of surgical intervention.

Overall, 35.8% of patients complained of a postoperative sore throat, reporting different grades of severity from 1 to 3. Postoperative sore throat occurred more frequently in children with an ETT vs LMA. Our results indicate that those with a severe sore throat all had an ETT, compared to no severe sore throats reported in the LMA group as shown in Table 1.

**Table 1:** Sore throats reported in the LMA group

| | LMA (*n* = 97) | ETT (*n* = 76) |
|---|---|---|
| *Sore throat* | | |
| Yes Grade 1–3 | 21 (22.5%) | 41 (54.7%) |
| Grade 1 | 14 (15.3%) | 20 (26.7%) |
| Grade 2 | 7 (7.2%) | 14 (18.6%) |
| Grade 3 | 0 (0%) | 7 (9.3%) |
| Stridor | 3 (2.7%) | 0 (0%) |
| Laryngospasm | 2 (1.8%) | 0 (0%) |
| Vomiting | 3 (2.7%) | 5 (7%) |
| Suctioning required | 20 (20.7%) | 5 (7%) |
| Coughing | 10 (10.8%) | 6 (8.1%) |
| Feeling sick | 31 (32.4%) | 39 (51.2%) |
| Pain | 70 (72.1%) | 55 (73.3%) |
| Itching | 25 (26.1%) | 26 (34.9%) |
| Thirst | 61 (63.1%) | 54 (72%) |
| Hunger | 70 (72.0%) | 39 (52.3%) |

Table 2 summarizes post-anesthesia adverse events and the occurrence of postoperative sore throat. Nausea, vomiting, thirst, and pain occurred more frequently in children that suffered from postoperative sore throat.

**Table 2:** Post-anesthesia adverse events and the occurrence of postoperative sore throat

| | Sore throat-yes (*n* = 73) | Sore throat-no (*n* = 100) |
|---|---|---|
| Stridor *n* = 2 | 2 (2.8%) | 0 (0.8%) |
| Laryngospasm *n* = 1 | 1 (1.4%) | 0 (0.8%) |
| Vomiting n = 8 | 7 (9.7%) | 1 (1.6%) |
| Suctioning required *n* = 25 | 11 (15.3%) | 14 (14.4%) |
| Coughing *n* = 16 | 8 (11.1%) | 8 (8.8%) |
| Feeling sick *n* = 71 | 36 (50%) | 35 (35.2%) |
| Pain *n* = 127 | 61 (84.5%) | 66 (66.9%) |
| Itching *n* = 51 | 22 (30.6%) | 29 (29.6%) |
| Thirst *n* = 117 | 60 (83.3%) | 57 (57.6%) |
| Hunger *n* = 109 | 46 (63.9%) | 63 (63.2%) |

## Discussion

Postoperative sore throat occurred in over a third of our pediatric population. The presence of an endotracheal tube compared to a laryngeal mask airway was identified as risk factors for postoperative sore throat in our cohort.

This study adds to the evidence that the use of an ETT results in more postoperative sore throat than an LMA. The results of previously published meta-analyses are contradictory, demonstrating a postoperative sore throat frequency of 9.8% vs 15.3% for LMA and ETT, respectively.[7] Uncuffed ETTs have been shown to result in more postoperative sore throat compared to cuffed ET.[4] Due to the small numbers of uncuffed tubes used in this study, we cannot rule out the possibility of them being responsible for a higher postoperative sore throat occurrence than cuffed ETTs, in this

specific cohort. The use of primarily cuffed ETTs is in keeping with current trends in pediatric anesthesia.[4,8] Manufacturer recommendations for cuff pressures in pediatric practice are <20 cm $H_2O$ for ETT and <60 cm $H_2O$ for LMA. Children with ETTs were more nauseous compared to those with an LMA. Even if a higher incidence of postoperative sore throat in those who vomited is not a surprising result, the possible explanation could be that as a more invasive airway, ETTs may result in more gagging than an LMA. In addition, thirst and nausea occurred more often in children with a sore throat compared to those without a sore throat.

With regard to the pharmacological prevention or treatment of postoperative sore throat, there is good evidence in adults that 0.1–0.2 mg/kg of intravenous (IV) dexamethasone reduces the incidence and severity of postoperative sore throat.[9-11] IV lidocaine in addition to IV dexamethasone has been shown to be superior to dexamethasone alone.[12] A recent study demonstrates that the application of topical corticosteroid to the ETT reduces postoperative sore throat compared to both lidocaine and non-analgesic controls.[13] A Cochrane Database systematic review has shown dexamethasone to reduce postoperative pain scores in children undergoing tonsillectomy,[14] but to the best of our knowledge there are no prospective studies evaluating the effects on IV or topical dexamethasone or lidocaine on postoperative sore throat in the pediatric population in non–airway-related surgery (Table 3).

**Table 3:**

| | Sore throat-yes (*n* = 73) | Sore throat-no (*n* = 100) |
|---|---|---|
| *Duration of Anesthesia* | | |
| <2 hrs *n* = 107 | 33 (45.2%) | 74 (74%) |
| >2 hrs *n* = 66 | 40 (54.7%) | 26 (26%) |
| *Airway management* | | |
| LMA | 26 (36.9%) | 71 (71%) |
| ETT | 47 (63%) | 29 (29%) |
| *Ondansetron* | | |
| Yes | 63 (86.3%) | 91 (91%) |
| No | 10 (13.6%) | 9 (9.1%) |
| *Dexamethasone* | | |
| Yes | 40 (54.7%) | 54 (54%) |
| No | 33 (45.2%) | 46 (46%) |

## Conclusion

Over a third of the children in our cohort study experienced postoperative sore throat, with the use of ETT resulting in greater sore throat than LMA. Our sample size calculation was based on the aim of identifying the frequency of postoperative sore throat, and consequently, we would recommend a large prospective multi-center study to better identify independent risk factors, as well as potential associations between sore throat and other common adverse effects of GA, for example, nausea and thirst. It would also be appropriate to follow-up patients for longer than 24 hours to establish duration of postoperative sore throat and its effect on oral intake, analgesic requirement as well as patients and parents satisfaction.

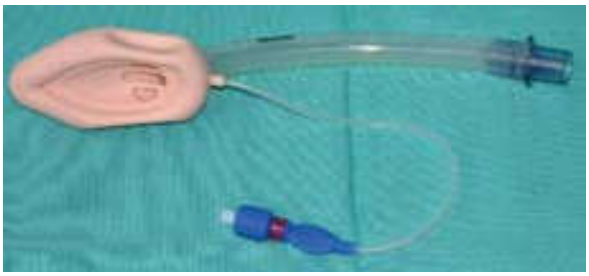

**Fig. 3:** Laryngeal mask airway.

**Fig. 4:** Endotracheal tube.

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