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Post intubation sore throat and associated risk factors in patients undergoing spine surgeries: An observational study

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Abstract: Introduction: Sore throat following endotracheal intubation is a long-standing concern for anaesthesiologists worldwide.
Objectives: To determine the occurrence of post-intubation sore throat and associated risk factors in patients undergoing surgeries under general anesthesia.
Materials and Methods: A total number of 400 patients, ASA Grade I and II, aged between 18 to 75 years of either gender posted for surgery under general anesthesia were selected. Body Mass Index and history of smoking were noted. Intubation-related factors including technique, number of attempts, size of endotracheal tube, Cormac-Lehane grade, need for external laryngeal pressure during intubation, endotracheal tube cuff pressure, duration of surgery, patient position during surgery, and coughing during emergence were observed to determine the relation of sore throat with the above factors in patients undergoing surgery.
Results: The results from this study showed that intracuff pressure at intubation (p value 0.009), extubation (p value 0.001), and cough at emergence had significant association with sore throat by multivariate analysis (p value 0.001). Number of intubation attempts, duration of surgery, body mass index of patients, and need of external laryngeal pressure during intubation had significant association with sore throat by bivariate analysis (p value ≤ 0.05).
Conclusion: The discomfort in patients in the postoperative period due to sore throat occurs due to a number of factors. Endotracheal tube cuff pressure at intubation and extubation, and cough at emergence being significant among them.

Keywords: Intubation; Sore throat; Intracuff pressure; External laryngeal pressure; Extubation; Cough.

1. Introduction

Postoperative sore throat causes discomfort in the majority of patients during recovery from anesthesia. It not only leads to dissatisfaction after surgery but can also delay a patient's return to normal routine activities [1,2]. The occurrence of postoperative sore throat has been associated with various factors, including patient-related factors such as age, sex, and smoking, as well as intubation-related factors such as technique, duration, and size of the endotracheal tube. Furthermore, it has also been linked to intra-cuff pressure, cuff design, intraoperative tube movement, and suctioning [2]. The manipulation of the airway during laryngoscopy can cause trauma to the glottis, resulting in sore throat postoperatively [2].

Several studies have been undertaken to explore the role of the technique of endotracheal tube insertion and the effect of cuff pressure modification in limiting postoperative throat symptoms [1]. In most cases,

postoperative sore throat complaints resolve spontaneously without specific treatment. However, in certain cases, pain and dysphagia may require intervention and management [3].

During the intraoperative period, changes in position from supine to prone can increase the intra-cuff pressure of the tracheal tube. Additionally, flexion of the head can cause an increase in cuff pressure in both supine and prone positions, while head extension only increases the cuff pressure in the prone position [4]. Specifically, in anterior cervical spine surgeries, the use of a retractor to approach the spine has been shown to increase endotracheal tube cuff pressure, potentially leading to the occurrence of postoperative pain in the throat, dysphagia, and hoarseness [5].

2. Material and methods

The study was conducted in the operation theatres at XXX hospital with permission from Institutional Ethical Committee and Research Review Board and with written informed consent. The study was conducted in accordance with the Helsinki Declaration of 2013. It was a hospital based observational study and a total of 400 patients were included. Inclusion criteria were: age group – 18 to 75 yrs, ASA grade I, II, and patients willing to participate. Exclusion criteria were: Patients with anticipated difficult intubation, loose teeth, acute upper respiratory tract symptoms or pre-existing sore throat and/or hoarseness, or those requiring nasogastric tube insertion, or those with psychiatric disorders preventing evaluation of complaints or undergoing emergency surgeries.

All patients selected were undergoing similar type of surgeries. Each patient had pre-anaesthetic check-up done prior to surgery which included detailed history, complete physical examination, blood biochemistry, electrocardiography(ECG) and chest x-ray. Patients were kept overnight fasting after 10 PM and their written informed consent was checked. Patients' age, gender, height, weight, Body Mass Index (BMI), smoking habits and type of surgery were noted. One day prior to surgery, patients were explained how to report post operative sore throat. In the operating room, a 18gauge peripheral venous cannula was inserted and a saline drip was started for all patients. Monitoring in the operation theatre included electrocardiogram (ECG), pulse oximetry, non invasive blood pressure, end tidal carbon dioxide (ETCO2) and respiratory gas monitoring. Then the patients were pre-medicated with inj. ranitidine (1mg/kg), inj. metoclopramide (0.1mg/kg), inj. glycopyrrolate (0.004mg/kg), inj. midazolam (1mg) and inj. fentanyl l.5 mcg /kg. All patients were preoxygenated with 100% oxygen for 3-5 minutes. General anaesthesia was induced with inj.propofol 2mg / kg and inj. succinylcholine 2 mg /kg IV was given to facilitate intubation and patients were ventilated with 100% oxygen. Endotracheal intubation was then done with appropriate size of endotracheal tube with Macintosh laryngoscope. Cormac-Lehane grading was assessed by laryngoscopic view. Endotracheal tube cuff was inflated manually with air to a clinical end point of loss of audible leak and intra cuff pressure was measured using a handheld manometer. Maintenance of anaesthesia was done with N2O:O2 in 50:50, sevoflurane and inj. atracurium (loading dose 0.5mg/kg followed by intermittent doses of 0.1 mg/kg) throughout the surgery. After completion of the procedure, sevoflurane was discontinued and inj. ondansetron 0.1mg/kg iv was given. On return of spontaneous efforts, nitrous oxide was discontinued and neuromuscular block was reversed with inj. neostigmine (0.05mg/kg) and glycopyrrolate (0.01mg/kg). On emergence endotracheal tube cuff pressure was measured before deflation of the cuff. After complete reversal of neuromuscular blockade, extubation was done and cough response at emergence was noted if present. Cough was defined as a sudden, strong abdominal contraction. Even a single cough instance was recorded as a 'Yes'. Post operatively patients were shifted to ward. Sore throat was defined as pain in the throat. It was asked with a direct questionnaire survey, 'Do you have a sore throat after operation?' These symptoms were scored by an independent nurse. It was recorded either 'Yes' or 'No' at 1,6, and 24 hrs post operatively. After the survey, patients with moderate post operativesore throat were treated with IV paracetamol 15 mg/kg. The following characteristics were recorded for all patients: patient's position during surgery, duration of anaesthesia, intubation attempt, need for external laryngeal pressure during intubation, Cormack-Lehane grade, cuff pressures at intubation and extubationand cough at emergence.

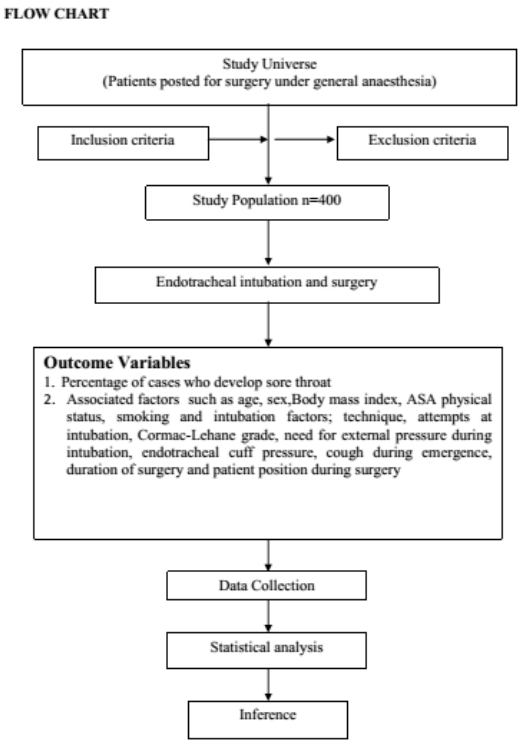

Figure 1

2.1. Statistical Analysis

A sample size of 400 cases was required to verify the expected 57.5 % proportion of cases which develop sore throat after surgery within 24hsr at 95% confidence level and 10 % relative error. Continuous data were summarized in form of mean and SD. Difference in means of two groups was analysed using Student's t test. Categorical data were expressed in form of proportion; difference in proportion was analysed using Chi-square test. Multivariate analysis was done using logistic regression for prediction of outcome on the basis of independent factors. The level of significance was kept 95% for all statistical analysis.

3. Results

This hospital based prospective observational study was conducted on a total of 400 patients undergoing surgery under general anaesthesia. Patients of either sex between the age group 18-75 years and ASA grade I & II were included. Out of 400 patients, 256 had sore throat, overall incidence was64 percent. No statistically significant difference in occurrence of post operative sore throat was seen among male and female patients(p value0.821) or in patients of different age groups (p value 0.766)or in terms of ASA status (p value 0.439) or history of smoking(p value0.765) or in terms of Cormac-Lehane grading(p value 0.155) or in cases with different ET tube size (p value 0.081) or patient position during surgery(p value 0.316). The proportion of sore throat was 63.58% and 65.78% in groups of patients with intra cuff pressure at intubation between15-20 cm H2O and between 21-25 cm H2O respectively. This difference was not statistically significant (p value 0.819) by bivariate analysis but it was significant with multivariate analysis. Statistically significant difference (p value 0.001) in occurrence of sore throat was seen in patients in different BMI groups. Maximum occurrence was seen in 23.1-25 BMI group (77.14 %) and minimum in 15.1-17 BMI groups (40%). The maximum proportion of sore throat was seen in patients with intra cuff pressure at extubation in range 26-30 cm H2O (87.83%) and minimum in 20-25 cm H2O (49.18%) intra cuff pressure group. This difference was statistically significant (p value 0.001).Similarly, the proportion of sore throat increased with increased duration of surgery. Sore throat occurred maximum in 251–300-minute group (85.71%) and minimum in 50–100-minute surgery duration group (53.57%) with statistically significant difference (p value 0.013). The occurrence of sore throat in patients who had cough at emergence (73.58%) was more than those with no cough (53.19%) with p value of 0.001.Patients requiring two intubation attempts had more sore throat complaints than those in tubated in single attempt. The proportion of sore throat was more (71.64%) in patients who required external laryngeal

pressure during intubation than those who did not require (60.15%). All the above mentioned factors showed results by bivariate analysis using chi-square and student t-test. However, multivariate analysis done using logistic regression for prediction of outcome on the basis of independent factors revealed different results. It was demonstrated that only intra cuff pressure at intubation, intra cuff pressure at extubation and cough at emergence ($p \leq 0.05$) made a significant contribution to prediction. The baseline demographic data and statistical data are summarised in Table 1.

Table 1. Comparison of base line demographic and other factors in relation oto the occurrence of post operative sore throat in patients by bivariate and multivariate analysis

Characteristic	Number of patients	Sore Throat (Yes)	Sore Throat (No)	Bivariate Analysis	Multivariate Analysis
Sex(male/female)	268/132	170/86	98/46	NS	NS
ASA (I /II)	310/90	202/54	108/36	NS	NS
History of Smoking(present)	38	26	12	NS	NS
CL Grade(1 / 2)	394/6	250/6	144/0	NS	NS
Need for external laryngeal pressure (Applied/not applied)	134/266	96/160	38/106	NS	NS
BMI (kg/m2) 15.1-17 23.1-25	-	40 % 77.14%	60 % 22.86%	P=0.001(S)	NS
Surgery duration less than 100 min more than 250 min	-	53.57% 85.71%	46.43% 14.29%	P=0.013(S)	NS
Patient position during surgery Supine/Prone	56/344	32/224	24/120	NS	NS
Intubation attempts(1 / 2)	384/16	242/14	142/2	P=0.005(S)	NS
ETT cuff pressure at intubation [<20/>20cm H2O]	324/76	206/50	118/26	P=0.819(NS)	P=0.009(S)
ETT cuff pressure at extubation (<25/>25/>30)cm H2O	244/148/8	120/130/6	124/18/2	P=0.001(S)	P=0.001(S)
Cough at emergence (present/absent)	212/188	156/100	56/88	P=0.001(S)	P=0.001(S)

ASA: American Society of Anaesthesiology.
CL: Cormack lehane grade.
ET: Endotracheal.
NS: Non significant.
Min: Minute.
S: Significant.

4. Discussion

Sore throat is consideredan undesirable outcome in the post-operative period [6]. Its may result from an inflammatory process as the tracheal mucosa has been found to release inflammatory mediators following local responses to cell damage which exert their effects on sensory nerves in the airways after intubation. The overall incidence of sore throat after general anaesthesia varies from 21 to 71.8% [7]. It was 64% in our study.

In our study multivariate logistic regression showed that intra cuff pressure at intubation and extubation had statistically significant association with sore throat. Our findings are in conformation by those given by Ansari L et al. [8] and Ryu J-H et al. [9]. Lopa T et al. [10] had also reported that sore throat and hoarseness can occur when intra cuff pressure is high. Intra cuff pressure depends on both tracheal and cuff compliance [11]. Evidence suggests that mucosal blood flow impairment at the tracheal cartilage occurs above cuff pressure of 30cmH2O [12]. This has been linked to tracheal mucosal hypo perfusion, ischaemia, ulceration and pain [6,11]. In our study cough at emergence was significantly associated with sore throat by multivariate and bivariate analysis. This finding coincides with the study conducted by Lee JY et al. [6] in which the incidence of cough was 66.4% in sore throat group and 38.6% in group without sore throat. Cough is essentially a reflex for airway protection. It can be evoked by either mechanical and/or chemical stimuli, which activates sensory receptors distributed along the respiratory tract. In light plane of anaesthesia or during emergence, endotracheal tube movement may irritate the trachea and laryngeal mucosa, leading to cough. Studies suggest that at the time of extubation, patients who are almost awake may have more head and neck movement, leading to an irritated airway and intra cuff pressure changes associated with increased postoperative laryngotracheal morbidity [6,13]. In our study increased duration of surgery showed significant association with sore throat by bivariate analysis but on multivariate analysis it was found to be non significant predictor. Ahmed et al. [14] and Mokhtar Choy [15] also found a relation between duration of surgery and sore throat. Body Mass Index is shown as a significant factor by bivariate analysis. The proportion of sore throat was higher in patients with high BMI in our study. This was in contrast to the observation by Fenta et al. [16] that showed nonsignificant association of sore throat with BMI.

External laryngeal manipulation during intubation leads to mucosal damage and sore throat [17]. This could have resulted in higher rate of sore throat patients in our study. Higher number of patients with multiple

attempts of laryngoscopy complained of sore throat which could be contributed by direct trauma to larynx causing pain in throat in post operative period [16,18].

5. Conclusion

The overall occurrence of post operative sore throat in patients was 64% in our study. Bivariate analysis showed that body mass index, increased duration of surgery, need for external laryngeal pressure during intubation, multiple intubation attempts, raised intracuff pressure at intubation and extubation and cough at emergence were significantly associated factors. However on multivariate analysis only intracuff pressure at intubation, intracuff pressure at emergence and cough at emergence were shown as significant predictors of sore throat.

5.1. Limitations

- We monitored intracuff pressure after intubation and at emergence. Monitoring at more frequent intervals intraoperatively could be done for further interpretation.
- Scale to grade severity of postoperative sore throat and other laryngeal symptoms could be used in future studies.

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Conflicts of Interest: Authors declare no conflict of interests.

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