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TO STUDY THE INCIDENCE OF POSTOPERATIVE SORE THROAT UNDER GENERAL ANAESTHESIA USING ENDOTRACHEAL TUBE

Anesthesiology

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ABSTRACT

Introduction: Amongst others, one important aim of good anesthetic care is to achieve a secure airway and to ventilate the lungs in a proper physiological manner. This can be done in different ways, depending on the patient's characteristics as well as the surgery itself by using an Ambu bag, face mask, LMA, or endotracheal tube (ETT). The ETT is a safe and secure method to secure the airway.

Aims And Objectives:

1. To find out the incidence of postoperative sore throat (POST) in patients using endotracheal tubes under general anesthesia at different time intervals (immediately, 6, 12, and 24 hours after extubation).
2. To compare the incidence of POST in patients intubated with ETT size number 7.0 and ETT size number 8.0

Methodology: The prospective observational study was conducted in MMIMSR Mullana in 60 patients of 20 to 60 years of age undergoing elective surgery under general anesthesia after approval from the Institutional Ethical Committee. A randomized prospective observational study was conducted for six months. The patients were divided into two specific groups:

GROUP A: 30 Patients were intubated with a 7mm inner diameter endotracheal tube. The patients were divided into two groups

Group B: 30 Patients were intubated with an 8mm inner diameter endotracheal tube.

Result: A total number of 60 patients (30 patients in each group) were enrolled in this study and were comparable in terms of age, sex, weight, height, and BMI. There were 19 (63.3%) and 11 (36.7%) patients in the group of 7 mm ID ET tube having ASA Grade of 1 and 2 while in 8 mm ID ET tube there were 17 (56.7%) and 13 (43.3%) patients having ASA Grade of 1 and 2. The difference between the two groups was not significant (p=0.598).

KEYWORDS

LMA, ETT, Anesthesia, Pre & post-operative.

INTRODUCTION

Amongst others, one important aim of good anesthetic care is to achieve a secure airway and to ventilate the lungs in a proper physiological manner. This can be done in different ways, depending on the patient's characteristics as well as the surgery itself by using an Ambu bag, face mask, LMA, or endotracheal tube (ETT). The ETT is a safe and secure method to secure airway[1].

The ETT is made of polyvinylchloride (PVC) and the distal end has a cuff. The cuff is a balloon whose purpose is to protect the lungs against aspiration of gastric contents and to protect the environment in the operating room from anesthetic gases such as sevoflurane, desflurane, and nitrous oxide[1]. In the 1980s when patients were intubated using an ETT the gold standard was an ETT with an 8.0 mm inner diameter (ID) for women and a 9.0 mm ID for men[2]. Nowadays, the tubes are normally smaller-size 7.0 mm for women and 8.0 mm for men[1]. However, Stout et al. showed that both women and men could benefit from smaller tube sizes, which can reduce their chances of suffering from POST[3].

The suitable endotracheal tube size in men and women is still under discussion in the community of anesthesia. The answer might vary depending on whether the patient is intubated in the short term, as during anesthesia and surgery, or for a longer period in the intensive care unit (ICU). A smaller-sized ETT can make it difficult to perform bronchoscopy and to ventilate ICU patients[4]. Also, there are two different types of cuffs of ETT, the low-volume high-pressure (LVHP) cuff, and the high-volume low-pressure (HVLP) cuff. Both cuffs have advantages and disadvantages. The LVHP cuff has a small diameter and requires high intra-cuff pressure to overcome the low compliance in the cuff. There are two disadvantages of this high pressure: the risk of ischemia in the tracheal mucosa, and the risk that the cuff might inflate in a noncircular fashion and injure the trachea. The HVLP is larger and correlates closely to the pressure in the trachea[5]. Nonetheless, the LVHP cuff is associated with a lower incidence of POST than the HVLP cuff[6-8]. The reason for this could be that the HVLP cuff has a larger diameter and a longer cuff length, and thus comes into more contact with the tracheal mucosa[9-10]. High cuff pressure exerts high pressure on the tracheal mucosa. The ideal cuff pressure has been suggested to be between 20-30 cm. H2O. A cuff pressure greater than 34 cm. H2O decreases the perfusion in the tracheal mucosa[11], and a total obstruction of blood flow occurs >50 cm. H2O[12].

Following endotracheal tube intubation, sore throat is said to be the most common complication at the time of general anesthesia with an incidence ranging from 14.4%-50%[13-14]. Causes that might increase the rate of the postoperative sore throat include the history of smoking /respiratory problems, neck procedures, gynecological procedures, challenging intubation, age, period of anesthesia, patient's position, and administration of nitrous oxide and succinylcholine at the time of general anesthesia. The rate is accounted for as higher among females, due to thinner mucosa covering on vocal cords. In endotracheal intubation, the tube is placed below the vocal cords and may irritate the mucosa. More extensive surgery related to the throat, such as thyroid surgery, is also a contributory factor to the increased incidence of sore throat [15-17].

The main complications of ET intubations are said to be POST (postoperative sore throat) and PH (post-operative hoarseness) but besides these complications, pain, cough, and nausea are also seen. Sore throat refers to acute pain and irritation due to local tissue injury in the laryngeal area after general anesthesia with ETT. Sore throat is an acute but transient phenomenon. Post-operative sore throat is the eighth most frequent complication in the postoperative area[18]. Various non-pharmacological and pharmacological interventions are used for attenuating sore throat in the post-operative period.

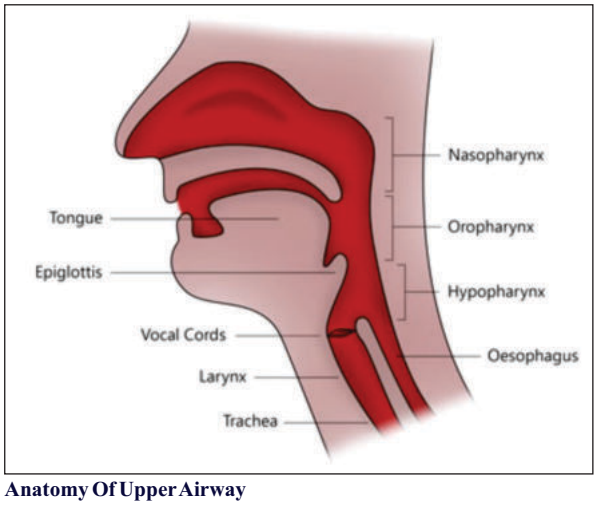
The use of nonpharmacological methods like the use of endotracheal tubes which are smaller in size, and the use of lubrication with water-soluble jelly helps in reducing intracuff pressure19-20. Pharmacological methods like utilization of steroids, ketamine gargles, lozenges, and lignocaine jelly have also been tried[21-23]. Few risk factors can prompt the advancement of POST after an ETT, yet the exact explanation of the development of these symptoms is still indistinct. One conceivable clarification may be the inflammatory process in the mucosa lining[24]. The likely reason for the inflammation is believed to be ETT size as well as the cuff structure and cuff pressure[25].

In one study, the authors discovered that a high cuff pressure, >30 cm H2O, was the reason for tracheal sores, and these corresponded well to the improvement of sore throat[26]. Undertaking tracheal intubation without neuro-muscular blockade may raise the frequency of postoperative sore throat[27]. Endo-bronchial tubes like double-lumen tubes can cause a high risk of sore throat in patients[28]; the use of silicon can decrease the risk of the sore throat than polyvinylchloride[29].

In this study, we hypothesized that a small endotracheal tube size might be better than the higher endotracheal tube concerning a postoperative sore throat.

Anatomy Of Airway

The pharynx consists of three compartments: the nasopharynx, the oropharynx, and the hypopharynx. The hypopharynx starts at the epiglottis and ends at the lower end of the cricoid cartilage. The larynx consists of different cartilage including the cricoid, thyroid, and arytenoid cartilage. The vocal cords run from the arytenoid cartilage through to the posterior surface of the thyroid cartilage. The space between the vocal cords, the rima glottidis, is one of the narrowest parts of the airway, the other being at the cricoid cartilage. Women have a narrower larynx than men. The epiglottis protects the larynx from aspiration or foreign matter. When intubating with the macintosh laryngoscope, the tip of the laryngoscope has to be placed in the vallecula and lifted, which stretches these structures. Below the cricoid cartilage, the trachea begins with the length of 10-20 cm in adults and extends up to the carina. Several nerves supply motor and sensory fibers to the airway. The glossopharyngeal and vagus nerve together innervate the pharynx, larynx, and soft palate. Two branches of the vagus nerve, the superior laryngeal nerve, and the recurrent laryngeal nerve, innervate the hypopharynx. Here, we will describe basic anatomy, particularly of the upper airway. The airway extends from the mouth or nose to the terminal bronchioles. Anatomical structures relevant to endotracheal intubation include the mouth, oral cavity, pharynx, larynx, and trachea.



Anatomy Of Upper Airway

AIMS AND OBJECTIVES

1. To find out the incidence of postoperative sore throat (POST) in patients using endotracheal tubes under general anesthesia at different time intervals (immediately, 6, 12, and 24 hours after extubation).
2. To compare the incidence of POST in patients intubated with ETT size number 7.0 and ETT size number 8.0.

MATERIAL AND METHODS

The prospective observational study was conducted in MMIMSR Mullana in 60 patients of 20 to 60 years of age undergoing elective surgery under general anesthesia after approval from the Institutional Ethical Committee.

Study Design

A randomized prospective observational study
GROUP A: 30 Patients were intubated with a 7mm inner diameter endotracheal tube.
Group B: 30 Patients were intubated with an 8mm inner diameter endotracheal tube.

Inclusion Criteria

1. The age group of 20-60 years.
2. ASA grading I or II
3. `MPG grading I or II
4. Patients undergoing elective surgery under General Anaesthesia
5. No sore throat
6. Duration of surgery > 90 min

Exclusion Criteria

1. ASA grading III and IV
2. Inability to open mouth
3. Patients with known difficult airway
4. Patients with a cervical spine fracture
5. Patients with upper airway tumors
6. Patients with preoperative hoarseness and sore throat
7. Patients with loose teeth

Procedure

The patients were randomly allocated to either of the groups i.e. group A or group B. The patients were intubated with 7 mm I.D. and 8 mm I.D endotracheal tubes. Premedication was given to patients before the surgical procedure and written informed consent was taken. The preoperative investigation was done based on the surgical procedure, physical status, and age of the patient. Before surgery, patients were asked to maintain fasting for 6 hours. General anesthesia was administered in all patients by experienced anesthetists following standard procedures used in the hospital. Induction was be done by midazolam (0.05mg/kg) and Propofol (2.5mg/kg). Before intubation, all patients received muscle relaxants i.e suxamethonium (2mg/kg). After intubation of ETT, its cuff was filled with air and the cuff pressure was measured. Anesthesia was maintained with O2, nitrous, and isoflurane + IV vecuronium in a suitable dose. ECG, SPO2, ETCO2, and NIBP were repeatedly measured.

At the time of extubation, neostigmine 0.05mg/kg and glycopyrrolate 0.01mg/kg was given to the patient intravenously (IV) to reverse the effect of neuromuscular blockade. After successful extubation patients were shifted to the post-anesthesia care unit (PACU) and given O2 supplementation with his/her head end raised. The patients were observed immediately, 6, 12, and 24 hours postoperatively for sore throat. The result of the assessment of patients in both groups (Group A and Group B) was observed and noted accordingly.

Statistical Analysis

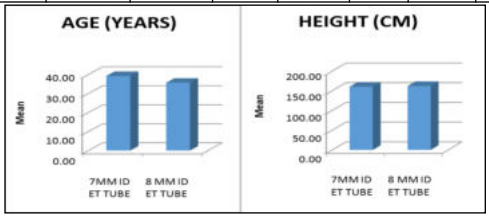
Data were described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases), and relative frequencies (percentages) as appropriate. To determine whether the data were normally distributed, a Kolmogorov-Smirnov test was used. Comparison of quantitative variables between the study groups was done using Student t-test and Mann Whitney U-test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, the Chi-square ($\chi 2$) test was performed and Fisher exact test was used when the expected frequency is less than 5. A (p-value) probability-value less than 0.05 was considered statistically significant All statistical calculations were done using SPSS 21version statistical program for Microsoft Windows.

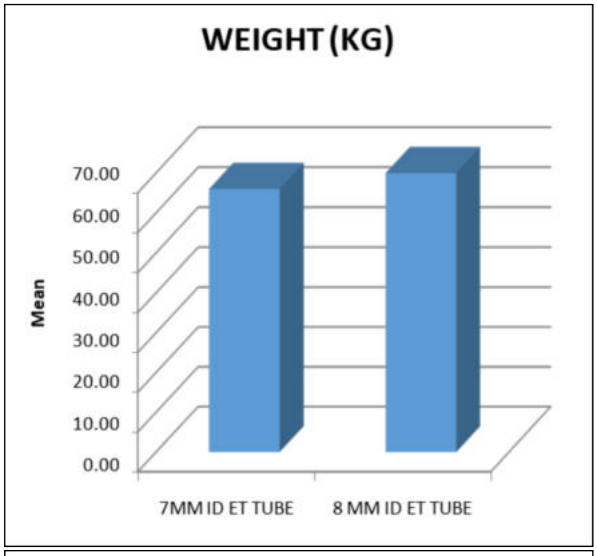
RESULT

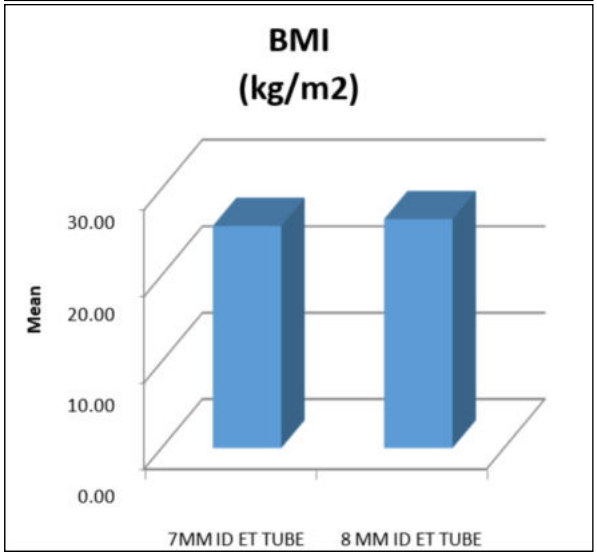
A total number of 60 patients (30 patients in each group) were enrolled in this study and were comparable in terms of age, sex, weight, height, and BMI.

Table 1: Comparison Of Age, Height, Weight, BMI, And Sex In Group A (7 mm ID) and Group B (8 mm ID)

		Group A		Group B		t	p-value
		Mean	SD	Mean	SD		
AGE (YEARS)		39.27	8.32	35.70	9.44	1.552	0.126
HEIGHT (CM)		160.33	6.56	162.23	6.45	-1.131	0.263
WEIGHT (KG)		66.00	7.00	70.00	9.43	-1.865	0.067
BMI (kg/m2)		25.74	2.95	26.53	2.72	-1.084	0.283
		7MM ID ET TUBE	7MM ID ET TUBE	8 MM ID ET TUBE	8 MM ID ET TUBE	Total	Chi-square value	p-value
SEX	F	17	56.7%	12	40.0%	29	1.669	0.196
	M	13	43.3%	18	60.0%	31		
Total		30	100.0%	30	100.0%	60		







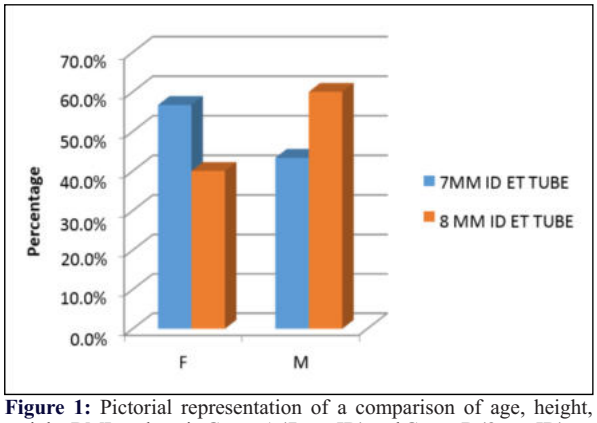


Figure 1: Pictorial representation of a comparison of age, height, weight, BMI, and sex in Group A (7 mm ID) and Group B (8 mm ID)

Table 2: Comparison Of Patients Of ASA Grade 1 And 2 In Group A (7 mm ID) And Group B (8 mm ID).

		GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE	7MM ID ET TUBE	8 MM ID ET TUBE	8 MM ID ET TUBE			
ASA GRADE	1	19	63.3%	17	56.7%	36	0.278	0.598
	2	11	36.7%	13	43.3%	24		
Total		30	100.0%	30	100.0%	60		

There were 19 (63.3%) and 11 (36.7%) patients in the group of 7 mm ID ET tube having ASA Grade of 1 and 2 while in 8 mm ID ET tube there were 17 (56.7%) and 13 (43.3%) patients having ASA Grade of 1 and 2. The difference between the two groups was not significant (p=0.598).

There was 9 (30.0%) and 21 (70.0%) patients in the group of 7 mm ID ET tube having MPG Grade of I and II while in 8 mm ID ET tube there was 10 (33.3%) and 2(66.7%) patients having MPG Grade of I and II. Both the groups did not have any significant difference (p=0.781).

Table 3: Comparison Of Patients With MPG Grade I And II In Group A (7 mm ID) And Group B (8 mm ID)

		GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE		8 MM ID ET TUBE				
MPG GRADE	I	9	30.0%	10	33.3%	19	0.077	0.781
	II	21	70.0%	20	66.7%	41		
Total		30	100.0%	30	100.0%	60		

The sore throat was measured at time intervals immediate, 6, 12, and 24 hours post-extubation and graded accordingly into Grade 0 (no sore throat), 1 (mild sore throat), 2(moderate sore throat), and 3(severe sore throat). Immediate post-extubation (t=0): 24 patients of group A and 14 patients of group B were found to have no incidence of postoperative sore throat (p=0.028). 3 patients of group A and 4 patients of group B had a postoperative sore throat of the grade of 1 (p= 0.688). While 3 patients from group A and 10 patients from group B were found to have an incidence of the postoperative sore throat of grade 2 (p= 0.028), but only 2 patients from group B were found to have a sore throat of grade 3 (p= 0.492). The overall result was statistically significant (p= 0.036)

Comparison of the postoperative sore throat immediately after extubation in Group A (7 mm ID) and Group B (8 mm ID).

	Grading	GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE		8 MM ID ET TUBE				
IMMEDIATELY AFTER EXTUBATION	0	24	80.0%	14	46.7%	38	4.800	0.028
	1	3	10.0%	4	13.3%	7	0.162	0.688
	2	3	10.0%	10	33.3%	13	4.812	0.028
	3	0	0.0%	2	6.7%	2	2.069	0.492
Total		30	100.0%	30	100.0%	60	8.544	0.036

At 6 hours (t=1): 28 patients of group A and 20 patients of group B were found to have no incidence of postoperative sore throat (p=0.009). 2 patients of group A and 8 patients of group B had the postoperative sore throat of a grade of 1(p= 0.038). While only 2 patients from group A and 10 patients from group B were found to have an incidence of the postoperative sore throat of grade 2 (p=0.492). The overall result was statistically significant (p=0.031)

Comparison Of Postoperative Sore Throat After 6 Hours Of Extubation In Group A (7 mm ID) And Group B (8 mm ID)

	Grading	GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE		8 MM ID ET TUBE				
POST EXTUBATION 6 HOURLY	0	28	93.3%	20	66.7%	48	6.667	0.009
	1	2	6.7%	8	26.7%	10	4.320	0.038
	2	0	0.0%	2	6.7%	2	2.069	0.492
Total		30	100.0%	30	100.0%	60	6.933	0.031

At 12 hours (t=2): 29 patients of group A and 23 patients of group B were found to have no incidence of postoperative sore throat. 1 patient of group A and 7 patients of group B had a postoperative sore throat of the grade of 1. The overall result was statistically significant (p= 0.023)

Comparison Of Postoperative Sore Throat After 12 Hours Of Extubation In Group A (7 mm ID) And Group B (8 mm ID)

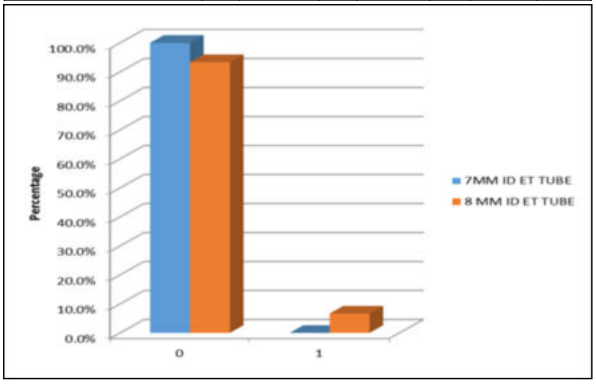
	Grading	GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE		8 MM ID ET TUBE				
POST EXTUBATION 12 HOURLY	0	29	96.7%	23	76.7%	52	5.192	0.023
	1	1	3.3%	7	23.3%	8		
Total		30	100.0%	30	100.0%	60		

At 24 hours (t=3): 30 patients of group A and 24 patients of group B were found to have no incidence of postoperative sore throat. While

only 6 patients from group B had a postoperative sore throat of grade 1. The overall result was statistically significant (p=0.024)

Comparison Of Postoperative Sore Throat After 24 Hours Of Extubation In Group A (7 mm ID) And Group B (8 mm ID)

	Grading	GROUP				Total	Chi-square value	p-value
		7MM ID ET TUBE		8 MM ID ET TUBE				
POST EXTUBATION 24 HOURLY	0	30	100.0%	24	80.0%	54	6.667	0.024
	1	0	0.0%	6	20.0%	6		
Total		30	100.0%	30	100.0%	60		



Pictorial Representation Of Postoperative Sore Throat After 24 Hours Of Extubation In Group A (7 mm ID) And Group B (8 mm ID)

DISCUSSION

POST is a common adverse event affecting patients with endotracheal intubation after general anesthesia. The symptoms are most common in the early postoperative period, but they can last several days postoperatively. Both men and women report discomfort from POST. The participants were randomly allocated to Group A and Group B intubated with size 7.0 mm ETTs or 8.0 mm ETT respectively. The incidence of postoperative sore throat (POST) in patients using endotracheal tubes under general anesthesia at different time intervals (immediately, 6, 12, and 24 hours after extubation) was recorded.

In our study, the incidence of POST after extubation varied depending on ETT size; with a smaller 7 mm ETT 6 (20%) patients experienced POST in group A and with a larger 8 mm ETT 16 (53%) patients experienced POST. The overall incidence of postoperative sore throat during our study was 36%. The risk of POST thus increased more than twofold if an ETT size 8.0 was used compared to 7 mm ETT. Similar results with increased incidence of POST with the use of larger ETT have been reported. Linda G et al [34] in 2014 Sore throat was recorded in 29.5 percent of those intubated with a size 6.5 mm ETT right after surgery and 39.5 percent of those intubated with a size 7.0 mm ETT post-surgery. Stout et al [3] in 1987 found an incidence of sore throat in 22% of women who were intubated with size 6.5 mm, and the incidence increased to 53% among those intubated with size 8.5 mm ETT. Jaeneson et al [36] in 2010 ETT 7.0 saw a greater proportion of patients with a sore throat after 1–2 hours of surgery than ETT 6.0 (51.1 percent vs. 27.1 percent). Baoji et al [32] conducted a systematic review in 2013 and the smaller ETT (6.0 mm) greatly reduced the occurrence of POST in the post-anesthesia treatment unit, according to the report (PACU). Jaensson et al [37] 2012 found three variables that were significant risk factors for postoperative sore throat of which one was a size 7.0 mm ETT compared with size 6.0 mm ETT (p = 0.02). Ali et al [31] in a recent study in 2021 In women having breast surgery, the use of ETT sizes resulted in a large difference in the prevalence of postoperative sore throat. Edomwonyi et al[35] in 2006 found that regular ET intubation can cause injury and changes related to pathology resulting in POST complications. Xu et al [38] in 2012 found that the use of smaller diameter ETTs in conjunction with intravenous lidocaine among women who had thyroid surgery, there was a reduction in the incidence and severity of postoperative sore throat. Biro et al [15] in 2005 found postoperative sore throat was present in 40% of patients; Females scored slightly higher than males (44 percent vs. 33 percent; P=0.001). The above studies have reported a higher incidence of POST in larger diameter ETT compared to smaller ETT; which reflects the same results as found in our study. Routine endotracheal intubation can cause trauma and pathological modifications, which can result in sore throat symptoms after surgery.

CONCLUSION

POST (postoperative sore throat) complaints are common in the first two days of tracheal intubation for general anesthesia, although they are usually mild and short-lived. The incidence of POST was significantly less in group 7 mm ID ETT as compared to 8 mm ID ETT. According to our findings, patients that were under general anesthesia who have a smaller ETT had a lower risk of POST. No gender differences in the postoperative sore throat were found during the study.

Further studies should focus on possible factors to decrease the incidence of postoperative sore throat. Nevertheless, the results were statistically significant.

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