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COMPARATIVE STUDY OF INCIDENCE OF POST OPERATIVE SORE THROAT IN PATIENT WITH MONITORED ENDOTRACHEAL TUBE CUFF PRESSURE V/S BALLOON PALPATION METHOD

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INTRODUCTION

During general anaesthesia that requires tracheal intubation, problems such as post-operative sore throat (POST) and hoarseness of voice can occur. The incidences of sore throat have been observed to range from 11% to 48%, while the incidences of hoarseness have been recorded to range from 18% to 53% (1). Although postpartum syndrome (POST) may be regarded a small issue that disappears on its own after a few days, it has the potential to cause anguish, as well as to minimise the quality of recovery and the level of patient satisfaction (2). It is believed that the mechanism involves the erosion of the mucosa of the trachea, which is induced by the cuff of a tracheal tube, together with the trauma that occurs during tracheal intubation and mucosal dehydration (3).

The purpose of cuff inflation following endotracheal intubation is to limit air leakage, which in turn ensures adequate ventilation, reduces the amount of inhalational anaesthetic drugs that leak out, and prevents pharyngeal content aspiration. Over-inflation of the endotracheal tube cuff (ETTc) can have a negative impact on the blood flow to the tracheal mucosa, which can lead to tracheal mucosal ischemia, ulceration, necrosis, or tracheoesophageal fistula (4). Seegobin and van Hasselt (5) conducted an endoscopic investigation on mucosal blood flow and discovered that when the ETTc pressure was greater than 30 cmH2O, the blood circulation to the tracheal mucosa began to decline. Furthermore, when the pressure in the trachea approached 50 cmH2O, ischemic injury occurred to the tracheal mucosa. As a result, numerous investigations on post-intubation airway problems have shown that the ETTc pressure should be maintained between 20 and 30 cmH2O (6‑9).

When performing treatments that are very brief and only last for a few hours, the majority of clinicians pay little attention to the inflated pressure of the ETTc. Instead, they rely on pilot balloon palpation to calculate the pressure, and they do so based on their previous experiences (7, 9). According to research conducted by faculty emergency physicians, anesthesiologists, anaesthesia residents, and staff members working in critical care units, it has been proven that these practitioners are unable to reliably assess ETTc pressure using pilot balloon palpation (10). Many experienced anaesthesiology specialists continue to utilise the pilot balloon palpation approach to estimate the amount of pressure, and in many facilities, the inflation of the ETTc is assigned to the perioperative nurse or technician. This is despite the fact that numerous studies have demonstrated the significance of monitoring the ETTc pressure.

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A range of complications are associated with high cuff pressure include postoperative throat pain and discomfort, laryngeal nerve palsy, hoarseness and stridor. It can also impair tracheal mucosal blood flow resulting in tracheal mucosal ischemia, ulceration, necrosis or tracheoesophageal fistula. The purpose of this study is to identify the correlation of endotracheal tube cuff pressure and postoperative sore throat and factors associated. This will also pave the way for further research on the topic which may work to reduce more serious complications mentioned above.

METHODS AND MATERIALS

This is a prospective comparative study conducted in the Department of Anaesthesiology at a tertiary care hospital. The patients of ASA I and II planned for elective surgery were divided by simple random sampling (lottery method) to two groups :-

Group A = ETT cuff initially inflated , checked by a cuff pressure gauge , recorded and then set to 25 cmH2O

Group B = ETT cuff inflated using the pilot balloon palpation method .

The sample size was estimated to be100 patients ,with 50 patients in each group.

Exclusion criteria :

Patients who had cough and sore throat before operation

Difficult and repeated endotracheal intubation

Patients requiring double –lumen ETT intubation

Patients undergoing oral and laryngopharyngeal surgery requiring nasogastric tube or throat pack insertion

High risk for aspiration and BMI is more than 35kg /m2.

Procedure:- The patients were randomly assigned into two groups [Group A (measured ETTc pressure) and Group B (ETTc palpation technique)] by the study coordinator using a computer-generated randomized sequence at the operating theatre on the morning of the surgery. The coordinator and the attending anesthesiologists were not blinded to the group allocation, whereas the patients and the outcome assessors were blinded.

The patients were induced with IV fentanyl 2 mcg/kg, IV propofol 2 mg/kg and IV atracurium 0.5mg/kg and are intubated with ETT. Prior to intubation, all ETTs and stylets are lubricated with lidocaine hydrochloride jelly USP, 2% and all the ETTcs are connected to a three-way stopper to prevent air leakage during measurement. All intubations are performed by an anaesthesiologist.

In Group A, the ETTc was initially inflated by the attending anaesthesiologist using a syringe, and this was followed by a check of the cuff pressure using a cuff pressure gauge after securing the endotracheal tube. The initial cuff pressure measured was noted and concealed before setting it to the desired pressure of 25 cmH_2O.

In Group B, the ETTc was inflated by the attending anaesthesiologist with a syringe according to his or her own personal experience using the pilot balloon palpation method. Cuff pressure was not measured in this group. Any patients requiring more than a single attempt for intubation were removed from the study.

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Anaesthesia maintained with sevoflurane or isoflurane using only oxygen/air. Standard monitoring procedures are followed, with a standard three-lead ECG, non-invasive arterial blood pressure, pulse oximetry and capnography. Intraoperative analgesia and post-operative nausea or vomiting prophylaxis are given at the discretion of the attending anaesthesiologist.

At the end of the surgery, the posterior pharyngeal wall is gently suctioned. Following reversal of the neuromuscular blockade, ETTc is deflated. ETT removed when the patient becomes fully awake and displaying adequate recovery of neuromuscular function and spontaneous respiration. The times of tracheal intubation and extubation was recorded in both groups, and the range between them used to define the duration of anaesthesia in the patients.

A medical officer (who was blinded to the study) assigned to follow up the patients on endotracheal intubation related complications (i.e., sore throat, hoarseness and cough) at 1 h, 12 h, 24 h and 48 h post-extubation, and the assessment carried out by interviewing the patients. Sore throat was described as present if patients described pain, scratchiness or irritation of the throat, which was further graded using the visual analogue scale (VAS) from 0–10.

The severity of the sore throat regarded as:

→Mild (VAS score 1–3)

→Moderate (VAS score 4–7)

→Severe (VAS 8–10)

Hoarseness described as an abnormal change in voice, such as the voice being breathy, raspy, strained or altered in volume or pitch. Coughs were described as either dry or productive.

Statistical analysis

The collected data were analysed with IBM SPSS Statistics for Windows, Version 23.0.(Armonk, NY: IBM Corp).To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test was used. To find the significance in categorical data Chi-Square test was used. In both the above statistical tools the probability value .05 is considered as significant level.

RESULTS

This study included 100 patients undergoing elective surgeries. The mean age of the study population was 42.71 +/- 7.91 years. There was no statistically significant difference between the two groups. (p value 0.863).

Similarly, the comparison of gender between groups by Pearson's Chi-Square test was p value was 0.773, which shows no statistical significance between Gender and Groups.

When we compared the ASA grades between

Table 1: Comparison of ASA Grade between the Groups by Pearson's Chi-Square test

	Group	Total		p-value

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			Group A	Group B		χ 2 - value	
Asa Grade	1	Count	13	21	34	3.113	0.211 #
		%	26.0%	42.0%	34.0%		
	2	Count	30	22	52		
		%	60.0%	44.0%	52.0%		
	3	Count	7	7	14		
		%	14.0%	14.0%	14.0%		
Total		Count	50	50	100		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							

The above table shows comparison of ASA Grade between Groups by Pearson's -Square test were $\chi 2=3.113$, $p=0.211>0.05$ which shows no statistical significance between Grade and Groups.

On comparison of BMI between Groups by Unpaired t-test were t-value=0.203, p-value=0.839>0.05 which shows no statistical significance difference at p > 0.0

We compared the ease of the technique by the number of members required for Intubation between groups by Pearson's Chi-Square test were $\chi 2=3.362$, $p=0.339>0.05$ which shows no statistical significance.

The above table shows comparison of Presence of Blood Stain between Groups by Pearson's Chi-Square test were $\chi 2=1.786$, $p=0.181>0.05$ which shows no statistical significance between Presence of Blood Stain and Groups.

Table 2: Comparison of Post OP Grade between the Groups by Pearson's Chi-Square test

			Group		Total	χ 2 - value	p-value
			Group A	Group B			
Post OP Grade	Mild	Count	15	15	30	6.665	0.007*
		%	30%	30%	30%		
	Moderate	Count	0	20	20		
		%	0%	40%	20%		
	Severe	Count	0	6	6		
		%	0%	12%	6%		
	No	Count	35	9	44		
		%	70%	18%	44%		
Total		Count	50	50	100		
		%	100.0%	100.0%	100.0%		
** Highly Statistical Significance at p < 0.01 level							

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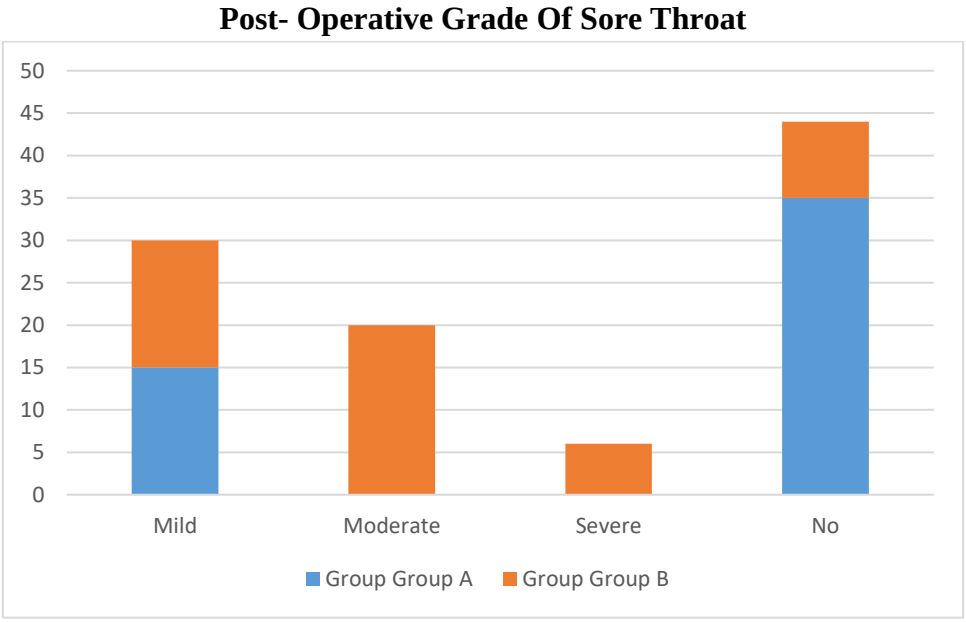

Figure 1

The above table shows comparison of Post OP Grade between Groups by Pearson's Chi-Square test were $\chi 2=6.66$, $p=0.007>0.001$ which shows statistical significance between Post OP Grade and Groups.

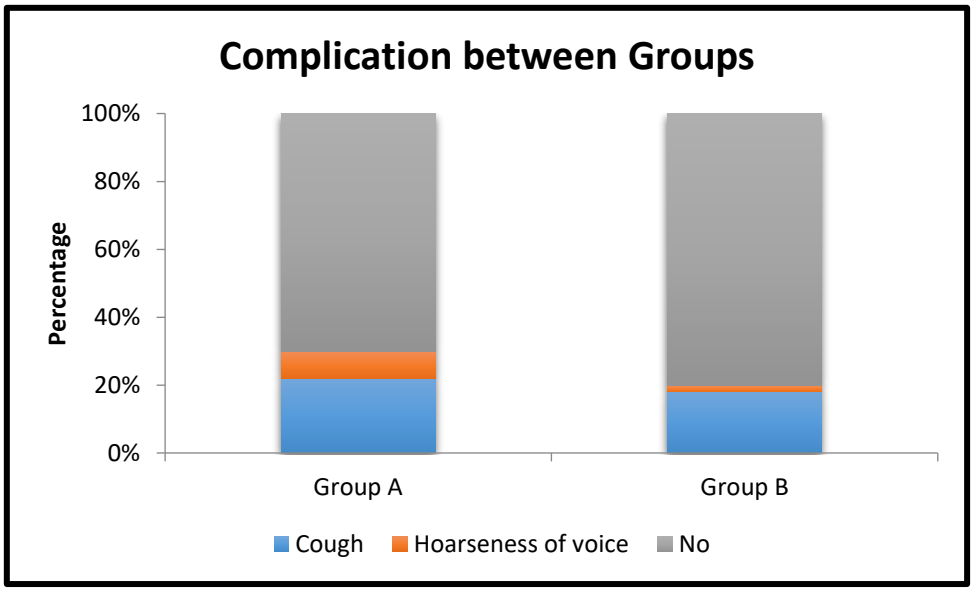

Figure 2

The above figure shows comparison of Complication between Groups by Pearson's Chi-Square test were $\chi 2=2.333$, $p=0.311>0.05$ which shows no statistical significance between Complication and Groups.

The above table shows comparison of Duration of Surgery between Groups by Unpaired t-test were t-value=0.047, p-value=0.963>0.05 which shows no statistical significance difference at $p > 0.05$ level.

DISCUSSION

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Following intubation, POST, coughing, and hoarseness are typically the most prevalent airway problems. The management of airways, female patients, younger patients, gynaecological surgery, and the intraoperative use of succinylcholine may be the cause of this.

According to Higgins et al. (2), the incidence of post-operative sore throat was most significantly impacted by intra-operative airway management. Among 5,264 patients undergoing ambulatory surgery under general anaesthesia, the incidence of intubation was highest (45.5%), followed by patients with a laryngeal mask airway (17.5%); postoperative sore throat was observed in just 3.3% of patients using the face mask (2).

Seegobin and van Hasselt (5) used an endoscopic photographic approach and gradually changed the cuff inflation pressures to monitor the blood flow through the tracheal mucosa in adult patients undergoing surgery that required tracheal intubation. They discovered that the blood flow in the tracheal mucosa started to decrease when the ETTc exceeded 30 cmH2O, and that ischemic damage to the mucosa happened when the pressure in the cuff neared 50 cmH2O for 15 minutes. They recommended that a cuff inflation pressure of 30 cmH2O not be exceeded and came to the conclusion that reduced tracheal mucosal blood flow was a significant contributing factor to the tracheal morbidity associated with tracheal intubation.

Similarly, Nseir et al. reported in an animal study that high pressure was placed on the tracheal wall due to excessive inflation of the ETTc to 50 cmH2O for 30 minutes every 3 hours over a 48-hour period in 12 piglets. This affected the tracheal mucosa's blood perfusion and caused deep mucous ulceration, squamous metaplasia, and intense mucosal inflammation (11). Liu et al. (7) found a significant decrease in the incidence of POST in a similar study involving 509 patients from four tertiary centres and a similar protocol. Of these patients, 34% who had their EETc pressure measured remained between 15 mmHg and 25 mmHg (20 cmH2O–34 cmH2O) as opposed to 44% in the control group, which underwent the palpation method. Their results supported those of this study, which showed that the group whose ETTc pressure was changed to 25 cmH2O experienced a considerable decrease in POST.

Compared to the "just to seal" technique, which requires 32 cmH2O–35 cmH2O, Kaki and Almarakbi found that ETTc inflation guided by pressure volume loop closure resulted in lower ETTc pressure, requiring only 18–19 cmH2O. As a result, there was a lower incidence of POST with the use of volume loop closure (24% versus 38%). This indicates that the occurrence of airway problems can be greatly decreased by having an objective evaluation of the ETTc pressure (12).

A study by Hoffman et al. (10) using a tracheal simulation model showed that 90% of the licenced faculty of emergency medicine physicians over-inflated the ETTc pressure above 120 cmH2O and that only 22% of these physicians could identify over-inflation of ETTc pressure using the pilot balloon palpation method. They came to the conclusion that doctors should think about utilising a device to enable safe inflation and precise measurement of ETTc pressure because they were unable to inflate ETTc to safe pressures or estimate the pressure of ETTc by palpation.

Over-inflation is influenced by syringe size in addition to personnel experience while inflating the ETTc. In a study by Khan et al. (13), a 10 mL or 20 mL syringe was used to inflate the ETTc, followed by assessment using the palpation method and then further measurement

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using an aneroid manometer. They discovered that anesthesiologists were more likely to over-inflate the cuff (86%) while using a 20 mL syringe than when using a 10 mL syringe (52%).

Prior to measurement and setting the ETTc to 25 cmH2O, the majority of patients in Group A in this study had their ETTc inflated to a pressure more than 30 cmH2O. Therefore, even in the hands of skilled anesthesiologists, the palpation method proved to be unreliable.

The fact that multiple operators performed the intubation was one of the study's weaknesses. As a result, there may have been a small variation in the intubation technique and the force used on the airway. In this investigation, the ETTc pressure was only measured, calibrated, and set at 25 cmH2O at the onset of surgery in the study group (Group A). For a better result, the ETTc pressure should have been monitored during the procedure and adjusted appropriately, even if nitrous oxide was not employed.

CONCLUSION

Therefore, in order to prevent airway difficulties, ETTc pressure should be evaluated in all settings, including emergency departments, intensive care units, and remote locations where endotracheal intubation may be necessary.

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