

## Postoperative Sore Throat and Duration of Surgery - An Observational Study

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### Abstract

**Introduction:** Postoperative Sore Throat (POST) is a common complication following tracheal intubation which even though is self-resolving, increases immediate postoperative morbidity. Multiple risk factors have been suggested but these remain unclarified. So it's important to identify risk factors and methods to prevent them. **Objectives:** Primary objective was to compare the effect of cuff inflation using a manometer (Group M) versus conventional technique (Group C) on the incidence of POST. Secondary objective was to identify association of duration of surgery on incidence of POST in two groups. **Methodology:** This observational study includes two groups of 50 patients each, ASA 1 and 2. The patients are in the age group between 18 to 60 years, who had undergone surgery under General Anaesthesia with Controlled Ventilation of less than 3 hours duration. High-volume low-pressure cuffs of standard size were used, in which two methods of cuff inflation were done in consecutive subjects until sample sizes were achieved. Duration of surgery and incidence of POST at 6 and 12 hours in PACU were noted. **Result:** Incidence of POST was significantly less in group M where cuff pressure was maintained at 20 cm H<sub>2</sub>O than in group C (p<0.01). There was a significant increase in incidence of POST with duration of surgery in Group C but not in Group M. **Conclusion:** Cuff inflation guided by manometer and maintenance of the cuff pressure at 20 cm of H<sub>2</sub>O throughout the surgery significantly reduces the incidence of POST, and its significance is more when duration of surgery is more than one and a half hours.

**Keywords:** Sore throat, General Anaesthesia, cuff, cough at emergence, hoarseness, manometer

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### Introduction

Endotracheal tube (ETT) is the definitive airway used during General Anaesthesia. Adult ETT has got a pilot balloon to inflate its cuff. Position of the cuff is below the vocal cord and it helps to prevent gas leakage, pulmonary aspiration and displacement of ETT. Excessive cuff pressure decreases the tracheal capillary perfusion and insufficient cuff pressure leads to aspiration of the oropharyngeal content. Postoperative Sore Throat (POST) is considered as a common adverse event in patients undergoing GA with Endotracheal intubation. Incidence of POST ranges from 21% to 71.8% [1-3] and it varies with cuff pressure, cuff design, length of the cuff trachea contact area, duration of procedure, size of endotracheal tube, anaesthetic skill, high suction pressures and lack of humidification. According to previous studies Continuous lateral wall cuff pressure of more than 30 cm H<sub>2</sub>O compromises blood flow and more than 50 cm H<sub>2</sub>O completely obstructs the tracheal wall blood flow [4]. Compromised blood flow for 15 min leads to superficial damage to tracheal mucosa [5]. All these increase the incidence of POST. There are various modes of cuff pressure estimation. Conventionally adjusted cuff pressure when measured in different settings, often

leads to over inflation of the cuff. The reported cuff pressures in most of the cases is between 40 and 62 cm H<sub>2</sub>O [6-9]. The gold standard method in cuff pressure estimation is use of a manometer to measure the cuff pressure directly. Ideal cuff pressure has not been established firmly. Recommendations are between 20- 30 cm H<sub>2</sub>O [6,9]. The main aim of this study is to draw comparison between cuff inflation using manometric method where cuff pressure is maintained at 20cm H<sub>2</sub>O throughout the procedure against conventional method where cuff pressure is not monitored, on occurrence of POST and the effect of duration of surgery on its occurrence in both groups. The relevance of this study is to check whether the manometric method of cuff inflation to be made a routine practice in operation theatres so as to decrease the incidence of sore throat post operatively and thus improving postoperative well-being of the patient.

### Methodology

#### Study Design

This was an observational study with 2 groups of patients undergoing General anaesthesia with controlled ventilation for short surgical procedures, Group C where patients with ETT cuff pressure maintained at a value identified by manually inflating the cuff with air to a clinical endpoint of loss of an audible leak and Group M where ET Tube cuff pressure was set and maintained at 20cm of H<sub>2</sub>O by monitoring every 15 minutes via manometric method. Study was done at the Department of Anaesthesiology, Pushpagiri Institute of Medical Sciences and Research Centre Thiruvalla after obtaining approval from institutional review board and institutional ethics and scientific research committee.

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**Sampling Technique**

Assuming 95% CI and 80% power with incidence as 31.7 % in Group M and 68.3% in Group C, the required minimum sample size was 30 per each. But for statistical considerations we included 50 participants in each group. Two methods of cuff inflation were done in consecutive subjects satisfying inclusion and exclusion criteria till sample size was attained. ASA 1 AND 2 patients with age between 18-60 years undergoing elective short surgical procedures within 3 hours duration were included in the study. Patients with anticipated difficult intubation, risk of aspiration, known anatomical laryngotracheal abnormalities, those with pre-operative sore throat, those undergoing tonsillectomy and thyroidectomy, those who were not extubated after the procedure were excluded from the study.

**Methods of Data Collection**

Patients planned for elective procedures were approached prior to the study, pre-anaesthetic check-up was done on the day before surgery and written informed consent was obtained. Patients were kept nil per oral for 8 hours prior to surgery. Premedication with Tab Pantoprazole 40mg, Tab Metoclopramide 10mg and Tab Alprazolam 0.25 mg was given on the previous night and 2 hours prior to surgery. IV access was secured before the procedure. Anaesthesia management was standardized. Standard monitoring including continuous ECG, continuous Pulse oximetry, etCO2 and intermittent non-invasive blood pressure. All patients had a common protocol for intubation :Preoxygenation for 3 minutes, anxiolytic : Inj. Midazolam

.02 mg/kg iv stat, antiemetic : Inj. Ondansetron 4mg iv stat, analgesia by morphine 0.15mg/kg iv stat, Inj. preservative free lignocaine 1.5mg/kg iv stat, induction with Propofol 2mg/kg iv, muscle relaxant for intubation with Succinylcholine 2mg/kg, oral endotracheal intubation performed with a Macintosh laryngoscope and ET Tube size of 8.5mm ID (internal diameter) for males and 7.5mm ID for females. Intubation was done by a trained anaesthesiologist on a single attempt and duration of intubation not lasting for more than 30 seconds. Anaesthesia was maintained with O2+ N2O+ Sevoflurane + Vecuronium.

Patients who satisfy the inclusion criteria were randomly assigned to one of the two groups: •Group C: patients with ET Tube cuff pressure maintained at a value identified by manually inflating the cuff with air to a clinical endpoint of loss of an audible leak

•Group M: patients with ET Tube cuff pressure set at 20cm of H2O by cuff pressure manometer and intracuff pressure was measured every 15 mins and maintained at the initial level.

Patient was reversed with Inj. Neostigmine 0.05mg/kg and Inj. Glycopyrrolate 0.01mg/kg and extubated on table. Duration of surgery was also noted.

The assessment for POST was sought in PACU, done at 6 hours and 12 hours postoperatively as per proforma and questionnaire and was graded. To prevent investigator error and bias data collection in PACU was done by my colleague.

**Table 1: Grading of sore throat**

Grade	Severity
0	No sore throat at any point after surgery
1	Minimal- patient answered in the affirmative when asked about sore throat
2	Moderate – patient complained of sore throat on his/her own
3	Severe – patient is in obvious distress

**Statistical Analysis**

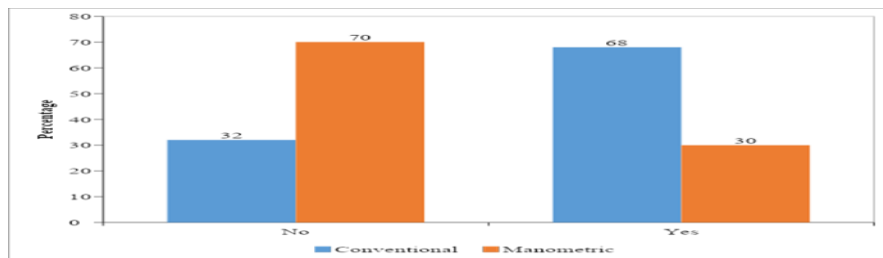
Categorical and quantitative variables were expressed as frequency (percentage) and mean ± SD respectively. Wilcoxon Signed Rank Test was used to compare postoperative sore throat between 6 hours and 12 hours. Mann-Whitney U Test and Fisher exact were used to association between categorical variables. For all statistical interpretations, p<0.05 was considered the threshold for statistical significance. Statistical analyses were performed by using a statistical software package SPSS, version 20.0

**Result**

The distribution of patients in two groups were matched with respect to age, gender and ASA status. Duration of surgery varied with shortest duration being 30 minutes and longest being 3 hours. We further divided the patients in each group based on duration of surgery into those with duration of surgery less than 1.5 hours and those with more than 1.5 hours. Occurrence of sore throat was assessed at sixth and twelfth hour post operatively. The overall occurrence of postoperative sore throat was less in the manometric group and the result was statistically significant(p<0.01).

**Table 2: Comparison of POST based on groups**

Postoperative sore throat	Conventional		Manometric		χ <sup>2</sup>	p
	Count	Percentage	Count	Percentage		
No	16	32	35	70	14.45	p<0.01
Yes	34	68	15	30		



**Fig 1: Comparison of POST based on groups**

Occurrence of postoperative sore throat was less in the manometric group at sixth and twelfth hour post operatively(p< 0.01). At 6 hours

post operatively, 70% of patients in Group M had no sore throat in comparison with 30% in Group C. In Group M 24% had minimal and

6% had moderate sore throat while in Group C 36% had minimal and 32% had moderate sore throat. At 12 hours postoperatively, 74% of patients in Group M had no sore throat in comparison with 40% in Group C. In Group M 26% had minimal and no one had moderate

sore throat, while in Group C 44% had minimal and 16% had moderate sore throat. None had a severe sore throat at any point of time.

**Table 4: Comparison of occurrence of POST based on cuff inflation method at 6 hours and 12 hours**

	Severity	Conventional		Manometric		Z#	p
		Count	Percentage	Count	Percentage		
Postoperative sore throat at 6 hours	No sore throat	16	32.0	35	70.0	4.11	p<0.01
	Minimal	18	36.0	12	24.0		
	Moderate	16	32.0	3	6.0		
Postoperative sore throat at 12 hours	No sore throat	20	40.0	37	74.0	3.74	p<0.01
	Minimal	22	44.0	13	26.0		
	Moderate	8	16.0	0	0.0		

#Mann-Whitney U Test

In conventional method, occurrence of Postoperative Sore Throat was more in surgeries lasting for more than 1.5 hours (at 6 hours: 88.4% and at 12 hours: 77%) compared to those lasting for less than or equal to 1.5 hours (at 6 hours: 45.8% and at 12 hours: 41.7%) and

the difference was statistically significant(p<0.01) while in Manometric method, there was no statistical difference in occurrence of sore throat with duration of surgery (p > 0.01).

**Table 5: Association of POST and duration of surgery**

	Post Operative Sore Throat	Duration of Surgery				Z#	p	
		<=1.5 Hours		>1.5 Hours				
		Count	Percent	Count	Percent			
Conventional method	6 Hours	No sore throat	13	54.2	3	11.5	3.85	p<0.01
		Minimal	9	37.5	9	34.7		
		Moderate	2	8.3	14	53.8		
	12 Hours	No sore throat	14	58.3	6	23.1	3.16**	0.002
		Minimal	10	41.7	12	46.1		
		Moderate	0	0.0	8	30.8		
Manometric method	6 Hours	No sore throat	15	83.3	20	62.4	1.44	0.151
		Minimal	2	11.1	10	31.3		
		Moderate	1	5.6	2	6.3		
	12 Hours	No sore throat	15	83.3	22	68.7	1.12	0.264
		Minimal	3	16.7	10	31.3		
		Moderate	0	0.0	0	0.0		

# Mann-Whitney U Test, \*\*: - Significant at 0.01 level

**Discussion**

Postoperative Sore Throat (POST) is a common minor complication following endotracheal intubation. This can add on to the immediate post operative morbidity and discomfort of already anxious patients. Thus it is important to prevent occurrence of sore throat in these patients so as to improve the quality of post anesthesia care. In our study, the occurrence of Postoperative sore throat was significantly reduced in the Manometric group where the cuff pressure was maintained at 20 cm of H2O, compared to the conventional group (70 % in the manometric group doesn't had sore throat versus 32 % in the conventional group). This difference between the two groups can be due to over inflation of the cuff in conventional methods as it is a blind technique, thus increasing the chances of postoperative sore throat. This result was similar to the study by N Puthenveetil et al which showed cuff inflation to 25 cm H2O by manometer significantly reduces the incidence of POST compared to conventional method (31.7% vs. 68.3%). Study by Ganason N et al [11] found that there was a significant reduction in the incidence and severity of sore throat up to 24 h post-operatively when cuff pressure is set at 25 cm of H2O when compared to cuff inflation using the pilot balloon palpation method. Overall incidence of post-operative sore throat was 39.0% versus 75.3% (P < 0.001). Liu et al [12] conducted a similar study on 509 patients from four tertiary centres and found similar result, in which sore throat was there in 34% of patients who had their ETT cuff pressure measured and

maintained between 20 cmH2O–34 cm H2O, compared to 44% in the control group, in which the palpation method was used.

Thus, it can be inferred that having an objective assessment of the ETT cuff pressure can significantly reduce the incidence of airway complications. In our study it was also observed that the incidence of postoperative sore throat increased with the duration of surgery at a statistically significant rate only in conventional group. Incidence was more when duration of anaesthesia lasted for more than 1.5 hours. In conventional groups where the cuff pressure was neither monitored nor maintained at the initial level, occurrence of POST increases with duration of surgery as cuff pressure increases throughout the procedure due to diffusion of N2O, while in manometric group we have maintained the cuff pressure at 20 cm H2O throughout the procedure. S Shrestha et al in their study found that risk of POST increased when duration of anaesthesia lasted for more than two hours [13]. Tu et al demonstrated higher cuff pressures with use of air vs a nitrous oxide air mixture to inflate cuffs [14].

**Limitations of the Study**

In our study sample size was small, only a single cuff pressure was evaluated in manometric method and different cuff pressures were not compared, study was conducted in short surgical procedures only (<3 hours), we have only checked the occurrence of POST at 6 hours and 12 hours postoperatively; checking at 2, 4, 6, 8, 10 and 12 hours would have given better results.

**Conclusion**

Based on our comparative study, incidence of POST varied with the method of cuff inflation and duration of surgery. It can be inferred that postoperative sore throat can be prevented upto a great extent by using cuff pressure manometer for inflating and maintaining the cuff pressure at 20 cm of H<sub>2</sub>O throughout the surgery. So manometric method of cuff inflation should be made a routine practice in operation theatres in order to improve immediate post anaesthesia comfort. As duration of surgery increases, incidence of POST also increases but this can be overcome by maintaining cuff pressure at recommended range throughout the procedure by using manometric method.

#### References

1. Park SY, Kim SH, Lee SJ, Chae WS, Jin HC, Lee JS et al. Application of triamcinolone acetonide paste to the endotracheal tube reduces postoperative sore throat: a randomized controlled trial. *Can J Anaesth J Can Anesth*. 2011; 58(5):436–42.
2. Thomas S, Beevi S. Dexamethasone reduces the severity of postoperative sore throat. *Can J Anaesth J Can Anesth*. 2007; 54(11):897–901.
3. Scuderi PE. Postoperative sore throat: more answers than questions. *Anesth Analg*. 2010; 111(4):831–2.
4. Nseir S, Brisson H, Marquette C-H, Chaud P, Di Pompeo C, Diarra M et al. Variations in endotracheal cuff pressure in intubated critically ill patients: prevalence and risk factors. *Eur J Anaesthesiol*. 2009; 26(3):229–34.
5. Mencke T, Knoll H, Schreiber J-U, Echternach M, Klein S, Noeldge-Schomburg G et al. Rocuronium is not associated with more vocal cord injuries than succinylcholine after rapid-sequence induction: a randomized, prospective, controlled trial. *Anesth Analg*. 2006; 102(3):943–9.
6. Sultan P, Carvalho B, Rose BO, Cregg R. Endotracheal tube cuff pressure monitoring: a review of the evidence. *J Perioper Pract*. 2011; 21(11):379–86.
7. Sathish Kumar S, Young P. Over-inflation of the tracheal tube cuff: a case for routine monitoring. *Crit Care*. 2002; 6(1):P37.
8. Braz JR, Navarro LH, Takata IH, Nascimento Júnior P. Endotracheal tube cuff pressure: need for precise measurement. *Sao Paulo Med J Rev Paul Med*. 1999; 117(6):243–7.
9. Seegobin RD, van Hasselt GL. Endotracheal cuff pressure and tracheal mucosal blood flow: endoscopic study of effects of four large volume cuffs. *Br Med J Clin Res Ed*. 1984; 288(6422):965–8.
10. Puthenveetil N, Kishore K, Paul J, Kumar L. Effect of Cuff Pressures on Postoperative Sore Throat in Gynecologic Laparoscopic Surgery: An Observational Study. *Anesth Essays Res*. 2018; 12(2):484–8.
11. Ganason N, Sivanaser V, Liu CY, Maaya M, Ooi JSM. Post-operative Sore Throat: Comparing the Monitored Endotracheal Tube Cuff Pressure and Pilot Balloon Palpation Methods. *Malays J Med Sci MJMS*. 2019; 26(5):132–8.
12. Liu J, Zhang X, Gong W, Li S, Wang F, Fu S et al. Correlations between controlled endotracheal tube cuff pressure and postprocedural complications: a multicenter study. *Anesth Analg*. 2010; 111(5):1133–7.
13. Shrestha S, Maharjan B, Karmacharya RM. Incidence and Associated Risk Factors of Postoperative Sore Throat in Tertiary Care Hospital. *Kathmandu Univ Med J (KUMJ)*. 2017; 15(57):10-13.
14. Tu HN, Saidi N, Lieutaud T, Bensaid S, Menival V, Duvaldestin P. Nitrous Oxide Increases Endotracheal Cuff Pressure and the Incidence of Tracheal Lesions in Anesthetized Patients. *Anesth Analg*. 1999; 89(1):187–190.

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