

KETAMINE NEBULIZATION VERSUS MAGNESIUM SULPHATE NEBULIZATION FOR PREVENTION OF POST OPERATIVE SORE THROAT IN ADULT PATIENTS UNDERGOING GENERAL ANAESTHESIA WITH ENDOTRACHEAL INTUBATION – A COMPARATIVE STUDY

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Abstract

Background: Postoperative sore throat (POST), one of the most undesirable consequences of endotracheal intubation, has a wide variety of incidence. It is considered to be the most common factor causing prolonged hospital stay and patient dissatisfaction following general anaesthesia with endotracheal intubation. Various pharmacological and non-pharmacological protocols and techniques are being practised to reduce the incidence of POST.

Aim and objective: The aim of our study was to compare the effect of ketamine and magnesium sulphate nebulization on the incidence of Post operative sore throat in adult patients undergoing general anaesthesia with endotracheal intubation and to evaluate the effect of these nebulization on hemodynamic parameters. **Materials and Methods:** This comparative prospective study was conducted at the Department of Anaesthesiology in Trichy SRM medical college, hospital and research centre, among those patients undergoing elective surgery under general anaesthesia with endotracheal intubation. After screening for exclusion criteria, a total of 60 patients were included in the study and were divided into 2 equal groups who received nebulization with ketamine (Group A) and magnesium sulphate (Group B). The incidence and severity of POST at 0, 2, 4, 6 and 24hours were noted. The baseline features of both these groups was compared to ensure similarity and Paired t test and Wilcoxon signed rank test were used to compare hemodynamic variables and Chi square test to compare the incidence and severity of sore throat. A P value of less than 0.05 was considered stastically significant. **Results:** No significant difference was observed with the baseline characteristics, duration of intubation and surgical procedure between both the groups. There was a significant reduction in 4th and 6th hour incidence and severity of sore throat in ketamine group compared to magnesium sulphate group. There was also no significant difference observed with the hemodynamic parameters pre and post intervention. **Conclusion:** In our study it is seen that aerosol ketamine plays a better role in reduction of sore throat compared to magnesium sulphate. Despite various protocols and best measures practiced over years, POST remains one complaint that has never been completely eradicated. We recommend that pre-operative nebulization with ketamine can be used for better patient satisfaction.

INTRODUCTION

POST – postoperative sore throat, due to irritation and inflammation of the airway, which is an undesirable consequence of endotracheal intubation

during administration of general anaesthesia is considered as a minor complication; yet, it affects the patient satisfaction, morbidity and increases the hospital stay. Considering many studies, a wide range of incidence of 21% to 65% is observed in case of

POST. Though there might be several contributing factors for POST, it was seen that higher ASA grading had a significant effect and the airway management had a strong influence on sore throat incidence.^[1-5] Prolonged intubation leading to serious consequences has always been a well-recognised fact; whereas an uneventful intubation for a routine surgical procedure, also leads to pathological changes leading to post operative throat symptoms is not yet been recognised. It was observed that the damage to tracheal and laryngeal epithelium are extensive, even with short tracheal intubation period of 1 hour.^[6] Though it is a self-limiting condition, usually lingering for 12-24 hours, which resolves spontaneously, the prophylactic management serves of a great importance, taking into mind, reduced hospital stay and patient satisfaction.^[2,6]

Though there had been many protocols offered for the prevention of POST, none grasped the attention. Various methods have been tried to reduce the incidence of POST, both pharmacological and non-pharmacological. The common treatment of post operative sore throat was multimodal analgesia and adjuvant drugs like NSAIDs, lidocaine and beclomethasone. Also, ketamine and magnesium sulphate gargle was also experimented to improve the outcome, as these block the N-methyl-D-aspartic acid receptor without direct analgesics effect.^[7,8]

Since there has been various studies explaining the effect of pharmacological agents, endotracheal tube size, cuff pressure and other factors influence the effect of POST. There are only scarce literature showing the effect of ketamine and magnesium sulphate aerosol. This study was aimed to compare the effect of ketamine and magnesium sulphate nebulization on the incidence of Post-operative sore throat in adult patients undergoing general anaesthesia with endotracheal intubation. The objective of this study was to compare the incidence of POST and effect of these nebulization on hemodynamic parameters.

MATERIALS AND METHODS

A comparative interventional study was done among people going through endotracheal intubation during general anaesthesia in a tertiary care hospital in Trichy, Tamil Nadu. This prospective study was done over a period of three months after getting approval from Institutional Ethics Committee. All adult patients (18 years - 65 years) with American Society of Anaesthesiologists (ASA) physical status classes I or II, who underwent elective surgery, requiring general anaesthesia with endotracheal intubation and consented, were included in the study. Those patients who had to undergo surgeries involving oral cavity, nasopharynx, larynx and other surgeries in and around neck region; those presenting with history of preoperative sore throat, common cold, anticipated difficult airway, known case of allergies to study drug, recent NSAID use; pregnant patients; those

patients whose surgery would last more than 3 hours or that requires prone position were all excluded from the study. Thus, a total of 60 patients who fit into the inclusion criteria were divided into 2 groups, group A and group B and the patients were allotted by computer generated randomization.

All the patients who underwent surgery were kept fasting overnight and Tab. Alprazolam 0.5mg and Tab. Ranitidine 150mg were administered per orally both the night before and morning of the surgery. Upon securing the IV line and starting on maintenance fluid in the operating room ASA standard monitors were used to measure the baseline parameters like oxygen saturation, heart rate, systolic and diastolic blood pressure pre-nebulization, post-nebulization and pre-induction. The nebulization with oxygen source at 10L/min along with study drug in 5ml NS was done before 15 minutes of administering general anaesthesia. Group A received 250 mg magnesium sulphate, where 0.5ml of Magnesium sulphate from 1g/2ml ampoule was diluted with 4.5ml of normal saline. Group B received 50 mg ketamine, where 1ml of ketamine 50mg/1ml was diluted with 4ml of normal saline. A standard Portex polyvinyl chloride tube was used for intubation, all male patients intubated with 8.0–8.5 mm ID and all females with 7.0–7.5 mm ID. The cuff pressure was maintained at 20cm H₂O. Duration of laryngoscopy, number of attempts and time taken to intubate were noted, those who underwent traumatic intubation and more than 2 attempts were excluded from the study. And also, those patients who were administered with IV lignocaine for excessive bucking during extubation were also excluded.

After shifting the patient into post anaesthesia care unit, the incidence and severity of POST at 0 hours was assessed by asking the presence and absence of soreness of the throat. The severity of POST was assessed by a four point scale.^[9] (0–3) as follows:

- 0 = no sore throat
- 1 = mild sore throat (complains of sore throat only on asking)
- 2 = moderate sore throat (complains of sore throat on his/her own)
- 3 = severe sore throat (change of voice or hoarseness, associated with throat pain).

Consequently, the incidence and severity at 2, 4, 6, and 24 hours were also assessed. In addition to these, symptoms like cough, hoarseness of voice and dryness of throat were also noted.

The study was started after obtaining approval from the Institutional Ethical Committee. An informed written consent was obtained from all the patients before including them in the study and the purpose of the study was explained in detail. The confidentiality of the data was maintained and the right to withdraw from the study at any given point of time without any loss or penalty was explained to the patient. The data collected was entered in MS excel and analysed using SPSS software version 23. The baseline feature of both the groups was compared to ensure similarity

and Paired t test and Wilcoxon signed rank test were used to compare hemodynamic variables and Chi

square test to compare the incidence and severity of sore throat.

RESULTS

Table 1: Distribution of baseline characters among the study participants

Baseline characteristics		Group A	Group B	p value
Mean ± SD	Age (years)	33.29 ± 9.76	37.18 ± 10.25	0.13
	Height (cm)	164.34 ± 6.25	163 ± 5.75	0.39
	Weight(kg)	59.56 ± 10.25	61.34 ± 9.21	0.48
ASA grade	Grade I	27(90%)	25(83.33%)	0.44
	Grade II	3(10%)	5(16.67%)	
Gender	Male	13(43.33%)	15(50%)	0.60
	Female	17(66.67%)	15(50%)	

The demographic distribution among both the groups were almost similar and there was no significant difference observed. Though there was a mild difference regarding the duration of laryngoscopy, time and attempts taken to intubate and the duration of surgery, there was no statistically significant results obtained upon comparison of both group A & B. 5 patients were intubated in the second attempt in group A while 6 in group B.

Table 2: Intubation and surgery details among both the groups

Durations related to intubation and surgery		Group A	Group B	p value
Duration of laryngoscopy (seconds)		24.10 ± 9.86	23.90 ± 10.21	0.91
Time taken to intubate (seconds)		29.75 ± 10.75	30.12 ± 11.28	0.85
Duration of surgery (hours)		1.87 ± 0.64	1.78 ± 0.59	0.42
Number of attempts to intubate	1st attempt	25(83.33%)	24(80%)	0.63
	2nd attempt	5(16.67%)	6(20%)	

Table 3: Hemodynamic parameters among both the groups

Groups	Para-meters	Pre-nebulization (I)	Post-nebulization (II)	Pre induction (III)	p value (I vs II)	p value (I vs III)
Group A	HR (bpm)	81.54 ± 11.45	81.78 ± 11.20	82.43 ± 10.67	0.93	0.75
	SBP (mmHg)	125.34 ± 9.74	126.89 ± 10.12	127.67 ± 10.32	0.17	0.54
	DBP (mmHg)	74.86 ± 8.98	75.12 ± 7.64	76.01 ± 7.23	0.90	0.59
Group B	HR (bpm)	81.17 ± 10.68	82.32 ± 10.45	83.93 ± 10.09	0.43	0.30
	SBP (mmHg)	127.12 ± 11.73	128.46 ± 11.58	130.32 ± 11.39	0.66	0.28
	DBP (mmHg)	75.98 ± 9.20	77.10 ± 8.78	78.32 ± 8.02	0.63	0.29

While comparing the pre nebulization mean heart rate, systolic and diastolic blood pressure values of both the groups were found to be mildly higher in post nebulization and the same was observed with pre induction values also. In spite of these differences observed the groups at different stages, there was no statistically significant difference observed.

Table 4: Severity of sore throat at different time intervals

Hours	Severity grade	Group A	Group B	p value
0 hour	Nil	Nil	Nil	Nil
2 hours	Grade 0	0	0	0.13
	Grade 1	3	3	
	Grade 2	3	0	
	Grade 3	0	0	
4 hours	Grade 0	0	0	0.016*
	Grade 1	11	5	
	Grade 2	5	2	
	Grade 3	0	0	
6 hours	Grade 0	0	0	0.007*
	Grade 1	7	3	
	Grade 2	2	2	
	Grade 3	0	0	
24 hours	Nil	Nil	Nil	Nil

The over all incidence of sore throat was found to be 23(38.33%) while among group A and group B were

found to be 16(53.33%) and 7(23.33%) respectively. None of the patients in both the group complained of

sore throat immediately (0 hours) after surgery and also after 24 hours of surgery. Of the 30 people in group A who received magnesium sulphate, 3(10%) complained of mild and 3(10%) of moderate sore throat, thus having a total incidence of 40% during 2-hour assessment. Where as only 3(10%) of the group B participants who received ketamine had mild sore throat. In spite of these difference between the groups, the statistical significance was not obtained. While taking into account the 4th hour assessment 11(36.67%) and 5(16.67%) of group A and B had mild sore throat and 5(16.67%) and 2(6.67%) presented with moderate sore throat. The difference between the groups were found to be statistically significant (p value 0.016). Thus, having a total 4th hour incidence of 16(53.33%) and 7(23.33%) in group A and B respectively. These symptoms were found to reduce after 6 hours as 7(23.33%) and 3(10%) had mild and 2(6.67%) and 2(6.67%) had moderate sore throat among group A and B giving a total 6th hour incidence of 9(30%) and 5(16.67%) respectively. These results were also found to be statistically significant with a p value of 0.007. The incidence of throat dryness, cough and hoarseness post intubation was found to be 46(76.67%), 9(15%) and 26(43.33%).

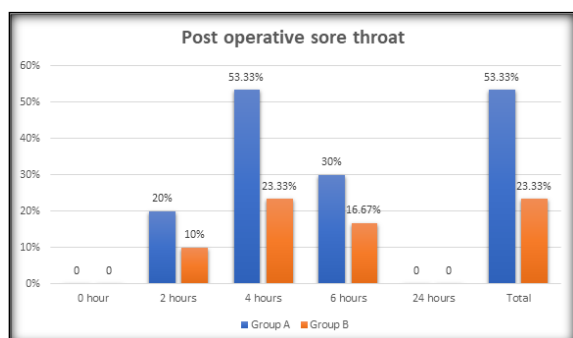


Figure 1: Incidence of sore throat among both the groups

DISCUSSION

In our study the baseline characteristics of both the groups were comparable, thus showing no significant difference. The mean age of 33.29 ± 9.76 and 37.18 ± 10.25 years were observed between both the groups and majority of the participants in both the groups belonged to ASA grade I. Both the groups were also comparable with respect to duration of surgery, time and attempts at intubation and all other drugs and protocols followed during the surgery. There was almost equal distribution of gender among both the groups, thus eliminating any differences these factors would contribute to the study. In our study it is also seen that there is not a significant difference in hemodynamic parameter among both the groups, which is similar to the study done by Houman Teymourian.^[8] where as in a study done by Segaran S et al., the author has stated that there has been a significant difference in the hemodynamic parameters pre-nebulization, post-nebulization and

pre-induction period in the ketamine group. Also, in a study done by Sunil Rajan et al., showing increase in heart rate between the pre and post nebulization as well as with pre induction but only with a dose of 500mg of magnesium sulphate, while ketamine and 250mg of magnesium sulphate showed no significant difference.^[9,10] These variations might be due to the low sample size, difference in dosage of drugs, health care setting and the protocol followed. In our study 250 mg magnesium sulphate and 50 mg ketamine was administered and found that ketamine plays a better role in reduction of sore throat compared to magnesium sulphate. While, Sunil Rajan et al., showed ketamine as well as 500mg magnesium sulphate showing a significant effect over reduction in sore throat.^[10] Though it is seen that ketamine is superior to magnesium sulphate, increasing the dose of magnesium sulphate might improve the control of sore throat among the patients.^[11] It was also seen in a study that 500mg of magnesium sulphate to be more effective compared to ketamine.^[8]

Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist having anti-nociceptive and anti-inflammatory effects, which was used as gargle to reduce the incidence and severity of POST. It was also seen that ketamine nebulization has a protective effect on airway inflammatory injury in animals.^[11,12,13,14] Our rationale of using the nebulized form of ketamine rather than its other forms (oral, IV, gargle) was primarily oriented for safety and ease of administration to the patient in the immediate pre-operative period. The proposed mechanism for the anti-inflammatory and antinociceptive effect of magnesium sulphate is thought to be by reducing the release of inflammatory mediators such as histamine, leukotrienes, and thromboxane.^[15] The incidence of throat dryness, cough and hoarseness post intubation was found to be 46(76.67%), 9(15%) and 26(43.33%) which was similar to 70.5%, 18.5% and 50.1% respectively in a study done by Christensen AM et al., who also showed no correlation between sore throat and duration of intubation or number of attempts at intubation.^[12]

CONCLUSION

In our study it is seen that aerosol ketamine plays a better role in reduction of sore throat compared to magnesium sulphate. Despite various protocols and best measures practiced over years, POST remains one complaint that has never been completely eradicated. The discomfort of a sore throat early in the postoperative period makes the patients reluctant to go home. Thus, the awareness on patient characteristics and operative factors, is increased and helps to improve patient satisfaction. The high variability of incidence may be due to various factors that plays a role in POST at various health settings.

Limitation

It is a single centre study; thus, external validity might be affected. Bigger sample could add strength to the study.

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