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Original Research

A Comparative Study Of Nebulisation With Ketamine Or Magnesium Sulphate On Incidence Of Post Operative Sore Throat Under General Anaesthesia With Endotracheal Tube

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Abstract

Background: Postoperative sore throat (POST) is a common complication of endotracheal intubation. This study aimed to compare the efficacy of nebulization with ketamine or magnesium sulphate in reducing the incidence of POST.

Methods: This comparative observational study included 88 patients undergoing elective surgery under general anesthesia. Patients were randomly divided into two groups: Group 1 received nebulization with 250mg of magnesium sulphate, while Group 2 received nebulization with 50mg of ketamine.

Results: The incidence of POST was significantly lower in the ketamine group compared to the magnesium sulphate group at 4 and 6 hours postoperatively. Pain scores were also lower in the ketamine group at 4 and 6 hours. There were no significant differences in side effects between the two groups.

Conclusion: Nebulization with ketamine is more effective than magnesium sulphate in reducing the incidence of POST and pain scores in patients undergoing elective surgery under general anesthesia with endotracheal intubation.

Keywords: Postoperative sore throat; Ketamine; Magnesium sulphate; Nebulization, Endotracheal intubation.

Introduction

Postoperative sore throat (POST) frequently occurs following general anesthesia with endotracheal intubation and is the second most common minor complication after postoperative nausea and vomiting.[1] Studies suggest that POST affects 21% to 65% of patients and while it may be considered a minor issue, it can cause considerable distress and discomfort if not addressed.[2,3,4] The concern is heightened in the case of extended surgeries, where POST remains a persistent challenge.

Various strategies have been employed to reduce postoperative sore throat (POST), including non-pharmacological approaches such as meticulous airway handling, proper cuff pressure management and careful extubation techniques.[5] These practices have been shown to lower the rate of POST. [5] Pharmacological interventions to alleviate POST encompass a range of

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treatments such as the application of beclomethasone gel,[6] gargling with magnesium sulfate[7] and ketamine gargles.[7-9] Additionally, nebulization with ketamine[10,11] or magnesium sulfate,[12] the use of lidocaine spray,[13] opting for smaller endotracheal tubes, reducing the cuff pressure to less than 20 mmHg[5] and limiting the number of attempts at laryngoscopy are also employed to minimize the incidence of POST.

Research indicates that both ketamine and magnesium are beneficial in reducing the discomfort of postoperative sore throat.[11,14] While a prior study compared the effectiveness of magnesium and ketamine gargles in lessening POST occurrences,[15] it has been established that nebulization with ketamine is more effective than gargling with the same substance.[11]Nebulization with these agents is a preferred method of administration, offering ease of use and reduced risk of aspiration.

Hence, the study was done to determine the efficacy of ketamine and magnesium sulphate nebulisation for prevention of post operative sore throat in patients undergoing general anaesthesia with endotracheal tube. Post operative sore throat is the most common side effect of endotracheal tube insertion. Thus, this study could help to explore the benefits of both these drugs and find out more efficacious drug amongst the two.

Materials and Method

The present comparative observational study was conducted among 88 patientsundergoing elective surgery under general anesthesia in the Department of Anaesthesiology at G.S Medical College, Hapur, U.P. A written informed consent was obtained as per tenets of the Helsinki's Declaration from each patient participating in the study.

The study included patients aged 20-65 years of age, of either gender, with an American Society of Anesthesiologists (ASA) physical status of I or II, patients undergoing elective surgery under general anesthesia with a predicted surgery duration of 30-90 minute and patients who provided informed consent and agreed to participate in the study. Patients were excluded from the study if they declined to participate or were unwilling to provide informed consent. Patients with a known allergy to the study drugs were also excluded. Furthermore, pregnant women and lactating mothers were not eligible to participate in the study.

The patients were randomly divided into two groups with 44 patients in each group using computerized randomization with sealed opaque envelopes. Patients assigned odd numbers were allocated to Group 1, while those assigned even numbers were allocated to Group 2. The two groups received different nebulization treatments: Group 1 received 250mg of magnesium sulphate in 5ml of normal saline, while Group 2 received 50mg of ketamine in 5ml of normal saline.

In the operation theatre, patient was inquired for 8 hrs fasting period and was asked to void the bladder. Intravenous access was established using a 20-gauge cannula on the dorsum of hand.

All patients were monitored using pulse oxymeter-continuous recording, ECG- continuous recording, NIBP-every 5 min interval and EtCO2-was continuously recorded after intubation and baseline parameters such as heart rate, systolic blood pressure, diastolic blood pressure and oxygen saturation were noted. Before the start of general anaesthesia, all patients received nebulisation with study drug with a wall mounted oxygen source at l0L/min. The study drug was prepared by an anaesthetist who were not the part of the study.After 15 min of nebulisation, patients were induced with injection midazolam 0.02mg/kg, injection fentanyl 2.0 microgram/kg and injection propofol 2-2.5mg/kg after pre oxygenation with 100% oxygen for 3 min through hand held face mask. Tracheal intubation was facilitated with injection vecuronium 0.lmg/kg. All male patients were intubated with endotracheal tubes of size 8.0-8.5mm ID and female patients with 7.0-7.5mm ID. The tracheal cuff was inflated with air and cuff pressure was maintained at 20cm water and thereafter for every 30 min till the end of surgery. The duration of laryngoscopy and time taken to intubate was noted. More than 2 attempts for intubation and any traumatic intubation were excluded from the study. After confirmation of tracheal tube position, anaesthesia was maintained with 50:50 mixture of Nitrous oxide and Oxygen, isoflurane l%-2% and intermittent doses of fentanyl and vecuronium.

30 minutes before the end of surgery, injection ondansetron 4mg IV and injection diclofenac aqueous 75mg, slow I.V.infusion was given. At the completion of surgery, patient was adequately anaesthetised, the oropharynx was gently suctioned and the isoflurane and Nitrous oxide was turned off. Inspiratory oxygen concentration was increased to 100%.

The neuromuscular blockade was reversed with neostigmine 0.5 milligram/kg and glycopyrrolate 0.1milligram/kg after return of spontaneous ventilation. During extubation, if the patient was having excessive bucking, IV Lignocaine 1.5mg/kg was given as a rescue measure and patient was excluded from study. After extubation, patient was shifted to post anaesthesia care unit for observation and patient was assessed regarding incidence and severity of Post operative sore throat at 6 hours, 12 hours and 24 hours.

Data so collected was tabulated in an excel sheet. The means and standard deviations of the measurements per group were used for statistical analysis (SPSS 22.00 for windows; SPSS inc, Chicago, USA).The level of significance was set at $p < 0.05$.

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Results

There was approximate equal distribution of male and female in both the study groups. Mean age in group ketamine and magnesium sulphate group was 37.79±9.52 and 38.93±9.85years respectively (table 1). Table 2 shows the comparison of MAP among the study groups at different intervals. Mean MAP increases in both the groups immediately after intubation. After 10 minutes, MAP decreases in both the groups till the end of surgery but it was in appropriate range till the end ofsurgery. MAP was found to be comparable among the study groups at all the intervals as p>0.05.

Table 1: Demographic profile among the study groups

Gender	Ketamine		Magnesium Sulphate		p value
	N=44	%	N=44	%	
Male	23	52.27	20	45.45	0.88^{β}
Female	21	47.73	24	54.55	
Age in years (Mean±SD)	37.79±9.52		38.93±9.85		0.81^{λ}

Table 2: Comparison of MAP (Mean Arterial pressure) among the groups at different intervals

Interval	Ketamine		Magnesium Sulphate		p value
	Mean	SD	Mean	SD	
Baseline	95.73	6.55	96.69	7.73	0.18
Immediately after Intubation	92.63	6.15	91.39	4.58	0.16
5 Min	90.04	6.42	90.83	8.22	0.29
10 Min	91.15	6.74	92.98	7.93	0.24
15 Min	90.88	6.53	92.59	9.25	0.33
30 Min	93.55	7.18	90.02	8.79	0.2
60 Min	89.37	7.44	85.83	12.08	0.1
2 hrs	85.8	7.85	81.44	9.58	0.16
4 hrs	82.82	7.43	81.15	8.29	0.44
6 hrs	81.49	7	80.3	7.5	0.69
8 hrs	81.26	7.84	78.19	7.87	0.58
10 hrs	78.87	7.13	77.48	7.01	0.75
12 hrs	75.80	7.12	74.02	8.7	0.51

Table 3: VAS among the study groups.

VAS	Ketamine		Magnesium Sulphate		t test	p value
	Mean	SD	Mean	SD		
0 hrs	2.59	1.13	2.67	1.34	0.48	0.77
4 hr	2.72	0.87	3.69	0.96	4.05	0.016*
6 hr	2.53	0.98	3.57	1.35	3.94	0.028*
12 hr	2.45	1.02	2.91	1.14	1.07	0.35
24 hr	2.26	1.17	2.92	1.08	0.64	0.61

*: statistically significant

Table 4: Post operative sore throat among the study groups

Sore Throat	Ketamine		Magnesium Sulphate		p value
	N	%	N	%	
0 hrs					
Nil	0	0	0	0	-
4 hr					
1 grade	3	6.82	8	17.78	0.002*
2 grade	2	4.55	4	9.09	
3 grade	0	0	0	0	
6 hr					
1 grade	0	0	0	0	0.039*
2 grade	2	4.55	6	13.64	
3 grade	1	2.27	2	4.55	

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12 hr					
1 grade	0	0	1	2.27	0.81
2 grade	0	0	0	0	
3 grade	0	0	0	0	
24 hr					
Nil	0	0	0	0	-

*: statistically significant

Table 5: Side effects among the study groups

Side Effects	Ketamine		Magnesium Sulphate		p value
	N	%	N	%	
Nausea	2	4.55	2	4.55	0.77
Vomiting	1	2.27	0	0	
Dry mouth	2	4.55	2	4.55	
Shivering	0	0	1	2.27	

Pain score was comparable among both the study groups at baseline. After 4 and 6 hr of surgery; pain was found to be significantly more in magnesium sulphate group as compared to ketamine group with statistically significant as $p<0.05$. At 12 and 24 hr too, pain was more in magnesium sulphate group as compared to ketamine group, though no significant difference was found as $p>0.05$ (table 3).

None of the patients complained of sore throat in both the groups in the immediate postoperative period at 0 h. In ketamine group; 5 patients and in Magnesium Sulphate;12 patients complained of sore throat at 4 h with statistically significant difference ($P = 0.002$). At 6 h, 3 patients in ketamine group and 8 patients in Group B had sore throatand it was statistically significant ($P = 0.039$). At 24 h, none of the patients in both the groups had sore throat (table 4).

Nausea, vomiting, dry mouth and shivering was reported among 4.55%, 2.27%, 4.55%, 0% and 4.55%, 0%, 4.55%, 2.27% of the subjects in ketamine and magnesium sulphate group respectively. Side effects were comparable among the study groups as $p>0.05$ (table 5).

Discussion

Postoperative sore throat (POST) although a self-limiting complication following general anesthesia with endotracheal intubation, it continues to be an important concern for surgical patients. As perioperative physicians, we are entrusted with the deeds of decreasing the sufferings of surgical patients. In POST, complain ranges from minor irritation of throat to severe throat pain, difficulty in swallowingand hoarseness of voice, laryngitis, tracheitis. Although POST was a minor complication, it causes significant morbidity, longer hospital stays and patient dissatisfaction. When reviewing the literature for the prevention of POST, some nonpharmacological and pharmacological interventions have been tried with varying success rates. Nebulization is inexpensive, quick, convenient and easy to administer also, which made this, the route of choice.[176] The present study was done to compare the incidence of post operative sore throat after nebulisation with ketamine or magnesium sulphate in patients undergoing general anaesthesia with endotracheal tube.

There were approximate equal distribution of male and females in both the study groups. Mean age in groupketamine and magnesium sulphate group was 37.79±9.52 and 38.93±9.85 years respectively. More than 63% of the subjects in both the groups were having ASA grade I. Mean duration of surgery was 86.32±11.49 and 81.65±10.59 minutes in ketamine and magnesium sulphate group respectively. All the baseline factors were comparable among the study groups as $p>0.05$ in this study. **Segaran S et al., (2018)**[16] in their study revealed that the distribution of demographic data between the two groups was comparableand there were no significant differences. This is in accordance to the present study. **Aditya AK et al., (2017)**,[17]**Ahuja V et al., (2015)**[11]and **Rajan S et al., (2017)**[10]in their respective studies too reported no significant difference among the study groups w.r.t. demographic variables. **Patel N et al., (2022)**[18]in their research too reported that all the demoghraphic parameter like age, sex and weight, intubation attempts, ASA physical status and mean duration of surgery were comparable between both groups.

Mean MAP increases in both the groups immediately after intubation. After 10 minutes, MAP decreases in both the groups till the end of surgery but it was in appropriate range till the end of surgery and MAP was found to be comparable among the study groups at all the intervals as $p>0.05$. A study done by **Rajan S et al., (2017)**[10]and**Patel N et al., (2022)**[18]did not show any difference in the hemodynamic variables on pre- and post-nebulization which is similar to the present study. According to **Jain S, Barasker SK (2017),**[19] MAP before and after induction was comparable in between

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the groups (p>0.05). The change in MAP within the groups was not significant during induction (p>0.05).

Pain score was comparable among both the study groups at baseline. After 4 and 6 hr of surgery; pain was found to be significantly more in magnesium sulphate group as compared to ketamine group with statistically significant as p<0.05. At 12 and 24 hr too, pain was more in magnesium sulphate group as compared to ketamine group, though no significant difference was found as p>0.05. **Ranjana et al., (2020)**[20] in their study too found that pain was less in ketamine group as compared to magnesium sulphate group.

None of the patients complained of sore throat in both the groups in the immediate postoperative period at 0 h. In ketamine group; 5 patients and in Magnesium Sulphate; 12 patients complained of sore throat at 4 h with statistically significant difference (P = 0.002). At 6 h, 3 patients in ketamine group and 8 patients in Group B had sore throatand it was statistically significant (P = 0.039). At 24 h, none of the patients in both the groups had sore throat. Severity of sore throat was also higher in Magnesium Sulphate as compared to in ketamine group. A study done by **Ahuja V et al., (2015)**[11]evaluated the effectiveness of nebulized ketamine on the severity of POST and concluded that ketamine nebulization significantly reduced the severity of POST at 4 h which is comparable to our study where the incidence and severity of POST were significantly lower in ketamine group at 4 and 6 h. A similar study also conducted by **Aditya AK et al., (2017)**,[17]found that ketamine nebulization significantly reduced the incidence and severity of POST in immediate postoperative period.

Yadav M et al., (2016)[12]evaluated the effect of magnesium sulfate nebulization on POST at rest and swallowing and found that it significantly decreased the incidence of POST at 4 and 24 h. **Borazan H et al., (2012)**[21]also conducted a similar study with magnesium sulfate lozenges and found that it significantly reduced the incidence and severity of POST. In our study, the incidence and severity of POST in the magnesium sulfate group were also decreased but not statistically significant when compared to ketamine group[1].

On comparing ketamine nebulization with magnesium sulfate nebulization in our study on the incidence and severity of POST, there was a significant decrease in the incidence and severity at 4 and 6 h in ketamine group (P < 0.05) which is comparable to the study conducted by **Rajan S et al., (2017)**[10]where they compared ketamine with two different doses of magnesium sulfate (250 and 500 mg) nebulization on POST and found that ketamine and magnesium sulfate (500 mg) nebulization decreased the incidence of POST at 0, 2 and 4 h.

Patel N et al., (2022)[18] in their study showed that there was statistically significant reduction in sore throat was seen in group k compare to group m at 0 hour which is similar to the present study. **Jain S, Barasker SK (2017),**[19]also conducted a similar study comparing ketamine and magnesium sulfate nebulization on POST and found that both decreased the incidence of POST when compared to control group but no significant difference between the ketamine and magnesium sulfate group.

In contrast to our study **Mostafa EA et al., (2018)**[22]observed in their study that incidence of POST was significantly lower in magnesium group compare to ketamine group at 2hr (p=0.023), 4hr (p=0.001)and 8hr (p=0.044). Severity of sore throat was also significantly lower in magnesium group at 4hr (p=0.002) and 8hr (p=0.038). Magnesium sulfate nebulization reduces incidence and severity of POST more effectively than ketamine nebulization.

Nausea, vomiting, dry mouth and shivering was reported among 4.55%, 2.27%, 4.55%, 0% and 4.55%, 0%, 4.55%, 2.27% of the subjects in ketamine and magnesium sulphate group respectively. Side effects were comparable among the study groups as p>0.05. This result can be subjected to the fact that inhaled drugs show very minimal systemic absorption, hence result shows very less systemic side effects.

There was no incidence of any systemic toxicity or any other adverse reaction seen in post operative period in any study group as stated by **Patel N et al., (2022)**[18] in their study.

There were no side effects seen like nausea, vomiting, dry mouth etc., in all three nebulised groups as reported by **Ranjana et al., (2020)**[20] in their study. This finding was in accordance with the results of the studies like **Mostafa RH et al.(2018)**[22]and**Salama AK, El-badawy AM (2016)**[23].

There are a few limitations to our study, the dose we used was a fixed dose and the least effective dose is not known. We did not measure the serum levels of magnesium and ketamine to monitor the drug levels.

Conclusion

To conclude, nebulization with ketamine was more effective than magnesium sulphate in reducing the incidence and severity of POST. The incidence of POST was significantly lower in the ketamine group compared to the magnesium sulphate group at 4 and 6 hours postoperatively. Additionally, pain scores were lower in the ketamine group at 4 and 6 hours. The study's findings suggest that nebulization with ketamine can be a useful adjunct in reducing the incidence and severity of POST in patients undergoing elective surgery under general anesthesia with endotracheal intubation.

References

1. Lehmann M, Monte K, Barach P, Kindler CH. Postoperative patient complaints: a prospective

DOI: 10.69605/ijlbpr_13.12.2024.102

interview study of 12,276 patients. J Clin Anesth. 2010;22:13–21.
2. Chandler M. Tracheal intubation and sore throat: A mechanical explanation. Anaesthesia. 2002;57:155–61.
3. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth. 2002;88:582–4.
4. Loeser EA, Bennett GM, Orr DL, Stanley TH. Reduction of postoperative sore throat with new endotracheal tube cuffs. Anesthesiology. 1980;52:257–9.
5. Ratnaraj J, Todorov A, McHugh T, Cheng MA, Lauryssen C. Effects of decreasing endotracheal tube cuff pressures during neck retraction for anterior cervical spine surgery. J Neurosurg. 2002;97:176–9.
6. Sumathi PA, Shenoy T, Ambareesha M, Krishna HM. Controlled comparison between betamethasone gel and lidocaine jelly applied over tracheal tube to reduce postoperative sore throat, cough, and hoarseness of voice. Br J Anaesth. 2008;100:215–8.
7. Teymourian H, Mohajerani SA, Farahbod A. Magnesium and ketamine gargle and postoperative sore throat. Anesth Pain Med. 2015;5(3):e22367.
8. Ogata J, Minami K, Horishita T, et al. Gargling with sodium azulene sulfonate reduces the postoperative sore throat after intubation of the trachea. AnesthAnalg. 2005;101:290–3.
9. Canbay O, Celebi N, Sahin A, Celiker V, Ozgen S, Aypar U. Ketamine gargle for attenuating postoperative sore throat. Br J Anaesth. 2008;100(4):490–3.
10. Rajan S, Malayil GJ, Varghese R, Kumar L. Comparison of usefulness of ketamine and magnesium sulfatenebulizations for attenuating postoperative sore throat, hoarseness of voice, and cough. Anesth Essays Res. 2017;11:287–93.
11. Ahuja V, Mitra S, Sarna R. Nebulized ketamine decreases incidence and severity of post-operative sore throat. Indian J Anaesth. 2015;59:37–42.
12. Yadav M, Chalumuru N, Gopinath R. Effect of magnesium sulfate nebulization on the incidence of postoperative sore throat. J Anaesthesiol Clin Pharmacol. 2016;32:168–71.
13. Hung NK, Wu CT, Chan SM, Lu CH, Huang YS, Yeh CC, et al. Effect on postoperative sore throat of spraying the endotracheal tube cuff with benzydamine hydrochloride, 10% lidocaine, and 2% lidocaine. AnesthAnalg. 2010;111:882–6.
14. Monu Y, Nitish C, Ramachandran G et al. (2016): Effect of magnesium sulfate nebulization on the incidence of postoperative sore throat, J Anaesthesiol Clin Pharmacol., 32(2): 168–171.
15. Andreas E (2001): Concise anatomy for Anaesthesia. London. Cambridge University Press. Edition 1.
16. Segaran S, Bacthavasalame AT, Venkatesh RR, Zachariah M, George SK, Kandasamy R. Comparison of Nebulized Ketamine with Nebulized Magnesium Sulfate on the Incidence of Postoperative Sore Throat. Anesth Essays Res. 2018;12(4):885-890.
17. Aditya AK, Das B, Mishra DK. Assessment of nebulized ketamine forreductions of incidence and severity of post- operative sore throat. Int JMed Health Res 2017;3:130- 2.
18. Patel N, Dhuliya S, Shah D. Comparative evaluation of incidence of post operative sore throat after nebulization with ketamine and magnesium sulfate in patients undergoing general anaesthesia requiring endotracheal intubation. Indian J Clin Anaesth 2022;9(2):227-232.
19. Jain S, Barasker SK. A comparative study of preoperative ketamine and MgSO4 nebulisation for incidence of post operative sore throat after endotracheal intubation. Int. J Contemporary Med. Res. 2017;4(6):1356-1359.
20. Ranjana, Sharma A, Singh M, Rajitha J. Comparison of Incidence of Postoperative Sore Throat after Nebulisation with Ketamine, Lignocaine and Magnesium Sulphate¬A Randomised Controlled Trial 2020;14(6):UC01-U05.
21. Borazan H, Kececioglu A, Okesli S, Otelcioglu S. Oral magnesium lozenge reduces postoperative sore throat: A randomized, prospective, placebo-controlled study. Anesthesiology. 2012;117:512–8.
22. Mostafa EA, Rahman ASA, Mahmoud MD. Magnesium Sulfate Nebulizer versus Ketamine Nebulizer in Decreasing Incidence and Severity of Post Operative Sore Throat with Endotracheal Intubation in Adults. The Egyptian Journal of Hospital Medicine 2018;73(8):7244-7250.
23. Salama AK, El-badawy AM. Does nebulized dexamethasone decrease the incidence of postextubation sore throat? A randomised controlled study. Ain- Shams Journal of Anaesthesiology. 2016;9:104-07.