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Original Research Article

Comparative Study of Magnesium Sulphate Nebulization Vs Lignocaine Nebulization in Prevention of Postoperative Sore Throat (Post), Hoarseness of Voice and Cough in Patients Undergoing General Anaesthesia

Deepika Meena[1], Gangubai Biradar[2], Veena Patodi[3], Sharanagouda S. Patil[4]

[1]Associate Professor, Department of Anaesthesiology, Jawahar Lal Nehru Medical College, Ajmer, Rajasthan, India

[2]PG Student, Department of Anaesthesiology, Jawahar Lal Nehru Medical College, Ajmer, Rajasthan, India

[3]Senior Professor, Department of Anaesthesiology, Jawahar Lal Nehru Medical College, Ajmer, Rajasthan, India

[4]Senior Resident, Department of Anaesthesiology, Jawahar Lal Nehru Medical College, Ajmer, Rajasthan, India

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Corresponding author: Dr. Deepika Meena

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Abstract

Introduction: Both lignocaine and magnesium sulfate have been tried as gargle and nebulization to reduce the incidence and severity of post-operative sore throat. Lignocaine (2%, 4 ml) and magnesium sulphate (250 mg in 4 ml 6.25%) nebulization has been used in prevention of post-operative sore throat. This study was done to evaluate and compare the efficacy of lignocaine nebulization pre-operatively with that of magnesium sulphate nebulization as preemptive intervention to decrease postoperative sore throat (POST).

Methodology: After ethical committee approval study population was divided into 2 groups of 50 subjects each. In Group L (Lignocaine) - Nebulization with Lignocaine (2%) 4 ml 15 minutes before induction. In Group M (Magnesium Sulphate) - Nebulization with 250 mg magnesium sulfate (0.5 ml) and 3.5 ml normal saline 4 ml (total volume) 15 minutes before induction.

Results: The incidence and severity of post-operative sore throat, cough score and hoarseness of voice was significantly lower in Magnesium Sulphate group compared to Lignocaine group, after extubation and at 2 hours ($p<0.05$).

Conclusion: Preoperative nebulization with magnesium sulphate more effectively reduces the incidence of postoperative sore throat, cough and hoarseness of voice compared to lignocaine.

Keywords: POST, Lignocaine, Magnesium sulphate.

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Introduction

Endotracheal intubation is one of the most common procedures performed under general anaesthesia (GA), but it can lead to a series of airway complications. Postoperative sore throat (POST) is one of the most undesirable outcomes that occurs in approximately 21-65% or more patients following GA with endotracheal intubation. [1] The etiology of POST is accountable to many factors, which includes patient related factors such as age, sex, smoking and various intubation and surgery factors like technique of intubation, length of surgery, tube size, cuff pressure and design, intraoperative tube movement and suctioning etc. [2]

Both non-pharmacological and pharmacological methods have been explored to for prevention of POST, with varying degrees of success. Non-pharmacological techniques include using a smaller endotracheal tube (ETT), applying water-soluble gel to the ETT, being careful during airway instrumentation, waiting until complete relaxation before intubation, performing gentle oropharyngeal suction, reducing intra-cuff pressure, minimizing cuff inflation, and deflating the tracheal tube completely. [3] Pharmacological measures, such as using lignocaine, steroids, non-steroidal anti-inflammatory drugs, and gargling with azulene sulfonic acid, have also been shown to decrease the incidence of POST. [4] Lignocaine, is an amino amide local anaesthetic. It is also used to decrease airway reflexes, bronchial hyper-reactivity and

suppress hemodynamic response of intubation because of its analgesic and anti-inflammatory actions by decreasing the excitation of airway sensory C fibers plus the release of sensory neuropeptide. [5]

Magnesium is also an antagonist of the NMDA receptor ion channel. It is known that N-methyl-D-aspartate (NMDA) has a role in nociception and inflammation, and these receptors are found in peripheral nerves and the central nervous system. The available data suggest that both have potential role in reducing POST. [6]

The aim of this study was to compare the efficacy of preoperative nebulization with Lignocaine or magnesium sulphate in attenuating the incidence and severity of post-operative sore throat as our primary objective, incidence and severity of hoarseness of voice and cough as secondary objectives in patients undergoing various surgeries under general anaesthesia with endotracheal intubation.

Methodology

This hospital based, prospective randomized double-blind comparative study was conducted in the Department of Anaesthesiology, Jawahar Lal Nehru Medical College and the associated group of hospitals, Ajmer. It was approved by Institutional Ethics Committee (letter no – 02555/Acad-III/MCA/2024, dated-24/08/2024) and registered at Clinical Trials Registry of India (CTRI/2025/04/085866). The study was conducted over the period of 1 year. (1/10/2024 to 30/10/2025). Patients willing to participate in the study and providing written informed consent, aged 18–60 years, of either gender, belonging to ASA physical status I and II, Mallampati grade I and II scheduled to undergo elective surgeries under general anesthesia with surgery duration <3 hours were included in the study. Exclusion criteria includes patients with age < 18 years and > 60 years, ASA grade III and IV, patients not willing to participate in the study, patients with chronic pre-existing disease like Asthma, Renal or Hepatic dysfunction, diabetes mellitus, neuro muscular diseases, severe respiratory diseases etc. patients with anticipated difficult intubation, patients who require more than one attempt of intubation and in whom the time taken for intubation is > 20 sec. head and neck surgeries and emergency surgeries.

The sample size calculation was based on previous studies assumption that the incidence of POST was 65% and to show a 38% reduction in the incidence. with an alpha error of 0.05, beta error of 0.20 and power of 80% with 95% confidence interval, sample size calculation determined that 90 patients would be needed in the study. (Two groups Group L and Group M each of 45 patients).

The total study population of 100 patients were randomly divided into two groups with 50 patients in each group utilizing computer generated tables ensuring an equitable distribution of participants.

Group M (Magnesium Sulphate) - patients in this group received nebulization with 250 mg magnesium sulfate (0.5 ml) and 3.5 ml normal saline = 4 ml (total volume) for(remove) 15 minutes before induction of anaesthesia.

Group M (Magnesium Sulphate) **-** patients in this group received nebulization with 250 mg magnesium sulfate (0.5 ml) and 3.5 ml normal saline = 4 ml (total volume) for 15 minutes before induction of anaesthesia.

Patient was identified, PAC done, informed written consent and fasting status checked. The patients received the study drug via nebulization mask connected to wall mounted oxygen driven source (8 L/min, 50 psi) for(remove) 15 minutes prior to surgery according to group allocation. General anaesthesia was induced 10 minutes after completion of nebulisation. All patients were pre-medicated with IV Midazolam (0.02 mg/kg), IV Glycopyrrolate (0.01 mg/kg), IV Fentanyl (2 µg/kg) and the patient was pre-oxygenated with 100% oxygen for 3 minutes. Intubated with appropriately sized cuff endotracheal tube (7-7.5 mm for females, 8-8.5 mm for males) and intubation was done by an experienced anesthesiologist. The cuff was inflated with air till the cuff pressure is 20cm H2O and pressure in the cuff was maintained at 20 cm of water using cuff pressure manometer. General anaesthesia was maintained with Oxygen (33%)remove + Nitrous oxide (66%)remove + Sevoflurane (0.5-1%) + Atracurium (0.5 mg/kg). Patients were reversed with Inj. Neostigmine (0.05 mg/kg) and Glycopyrrolate (0.01mg/kg). During extubation, if patient have excessive coughing intravenous lignocaine 1.5 mg/kg was given as a rescue measure.

Incidence and severity of POST graded subjectively on a scale from 0 to 3 which includes- 0- No sore throat, 1- Mild sore throat, less than common cold, 2- Moderate sore throat, as seen in common cold, 3- Severe sore throat, more than common cold. Incidence and severity of cough graded subjectively on a scale from 0 to 3 which includes- 0- No cough at any time after operation, 1- Mild cough, less than common cold, 2- Moderate cough, as seen in common cold, 3- Severe cough, more than common cold. Sore throat, hoarseness of voice and cough, assessment was be done at - Immediate recovery (0 hour after extubation) - Post-operative (2, 4, 6, 12, 24 hours post-operatively). The data from patients were collected on preformed Proforma and collected data were analyzed using Statistical Package for Social

Sciences (SPSS Inc., Chicago, IL, USA, version 28.0 for windows). Kolmogorov–Smirnov Test was used to see normality of age, weight and haemodynamics and differences in the age and weight was done using an independent t-test.

Haemodynamic variables between the groups were compared with t-test and within the group over time were compared using analysis of variance. Differences in the incidence of POST among the groups were compared with Fisher's exact test or Chi-square test whichever is applicable. Groups were compared with Mann–Whitney U-test for severity of POST. All tests are two-sided. $P < 0.05$ was considered as statistically significant.

STUDY FLOW (CONSORT)

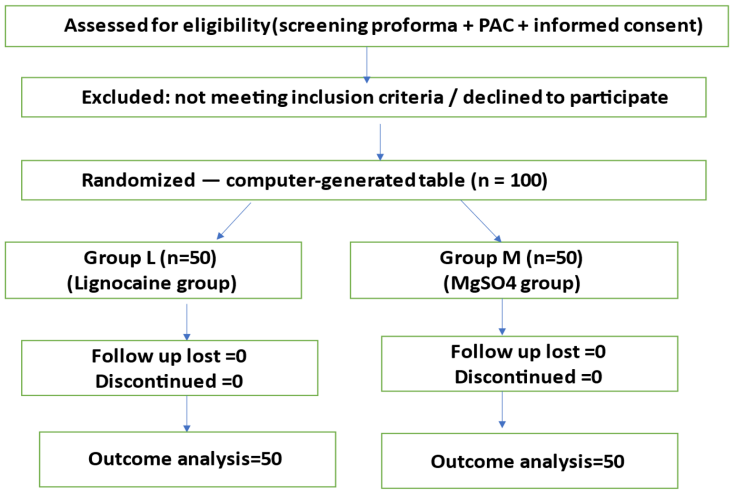


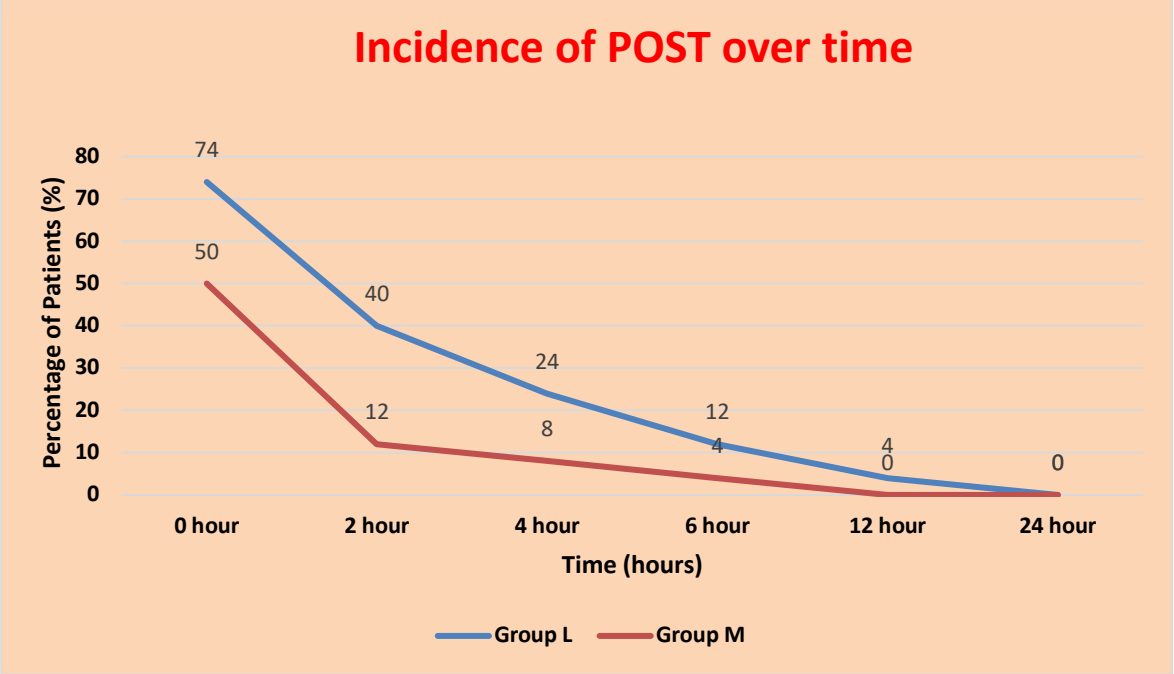
Figure 1: Study Flow

Observations and Results

Table 1: Comparison of POST among the study groups

Time	Severity	Group L (n=50)		Group M (n=50)		P value
		Number	%	Number	%	
0 Hour (after Extubation)	**Nil**	13	26.00	25	50.00	**0.020(S)**
	Mild	19	38.00	19	38.00	
	Moderate	12	24.00	4	8.00	
	Severe	6	12.00	2	4.00	
2 Hour (after Extubation)	**Nil**	30	60.00	44	88.00	**0.013(S)**
	Mild	15	30.00	4	8.00	
	Moderate	4	8.00	2	4.00	
	Severe	1	2.00	0	0	
4 Hour (after Extubation)	**Nil**	38	76.00	46	92.00	0.069(NS)
	Mild	10	20.00	4	8.00	
	Moderate	2	4.00	0	0	
	Severe	0	0	0	0	
6 Hour (after Extubation)	**Nil**	44	88.00	48	96.00	0.292(NS)
	Mild	5	10.00	2	4.00	
	Moderate	1	2.00	0	0	
	Severe	0	0	0	0	
12 Hour (after Extubation)	**Nil**	48	96.00	50	100.00	0.155 (NS)
	Mild	2	4.00	0	0.00	
	Moderate	0		0	0	
	Severe	0	0	0	0	
24 Hour (after Extubation)	**Nil**	50	100	50	100.00	1.00 (NS)
	Mild	0	0	0	0	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	

Table 1 shows that incidence and severity of POST were lower in group M as compared to group L with statistically significant difference at just after extubation and 2 hours post extubation. ($p<0.05$).



Graph 1: shows the percentage of patients with any degree of POST at different time points after extubation in Group L and Group M.

Table 2: comparison of hoarseness of voice

Time	Severity	Group L (n=50)		Group M (n=50)		P value
		Number	%	Number	%	
0 Hour (after Extubation)	**Nil**	13	26.00	25	50.00	**0.020(S)**
	Mild	19	38.00	19	38.00	
	Moderate	12	24.00	4	8.00	
	Severe	6	12.00	2	4.00	
2 Hour (after Extubation)	**Nil**	30	60.00	44	88.00	**0.013(S)**
	Mild	15	30.00	4	8.00	
	Moderate	4	8.00	2	4.00	
	Severe	1	2.00	0	0	
4 Hour (after Extubation)	**Nil**	45	90.00	46	92.00	0.728(NS)
	Mild	5	10.00	4	8.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
6 Hour (after Extubation)	**Nil**	48	96.00	49	98.00	0.559(NS)
	Mild	2	4.00	1	2.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
12 Hour (after Extubation)	**Nil**	50	100	50	100.00	11.0011.00(NS)
	Mild	0	0	0	0.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
24 Hour (after Extubation)	**Nil**	50	100	50	100.00	1.00 (NS)
	Mild	0	0	0	0	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	

Table 2 shows that incidence and severity of hoarseness of voice were lower in group M as compared to group L with statistically significant difference at just after extubation and 2 hours post extubation. ($p<0.05$).

Table 3: comparison of incidence and severity of cough

Time	Severity	Group L (n=50)		Group M (n=50)		P value
		Number	%	Number	%	
0 Hour (after Extubation)	**Nil**	15	30.00	25	50.00	**0.023(S)**
	Mild	19	38.00	19	38.00	
	Moderate	10	20.00	6	12.00	
	Severe	6	12.00	0	0.00	
2 Hour (after Extubation)	**Nil**	43	86.00	45	70.00	0.761(NS)
	Mild	5	10.00	3	28.00	
	Moderate	2	4.00	2	4.00	
	Severe	0	0	0	0	
4 Hour (after Extubation)	**Nil**	45	90.00	46	92.00	0.728(NS)
	Mild	5	10.00	4	8.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
6 Hour (after Extubation)	**Nil**	48	96.00	49	98.00	0.559(NS**)**
	Mild	2	4.00	1	2.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
12 Hour (after Extubation)	**Nil**	50	100	50	100.00	11.0011.00(NS)
	Mild	0	0	0	0.00	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	
24 Hour (after Extubation)	**Nil**	50	100	50	100.00	1.00 (NS)
	Mild	0	0	0	0	
	Moderate	0	0	0	0	
	Severe	0	0	0	0	

Table 3 shows that incidence and severity of cough were lower in group M as compared to group L with statistically significant difference at just after extubation. ($p<0.05$).

Discussion

One of the common complications of general anaesthesia requiring the placement of an endotracheal tube is a post-operative sore throat, reported in 21% to 65% of patients. This is the eighth most common complication following endotracheal intubation, leading to various pharmacological and non-pharmacological techniques. The current study was undertaken to find the ideal agent to either reduce or relieve the throat pain after tracheal intubation. So, the aim of this study was to compare the effect of preoperative-nebulized magnesium sulfate versus lidocaine on the prevention of post-intubation sore throat.

Both Lignocaine and Magnesium sulphate groups patients were comparable regarding age, sex, weight and duration of surgery with no statistically significant difference ($p>0.05$).

There was no statically significant difference in number of attempts made for intubation in between the groups. As multiple number of intubation attempts can cause injury and inflammation of airway leading to increased incidence of POST and hoarseness of voice. The endotracheal tube cuff pressure was monitored throughout the surgery duration and was maintained within normal limits in both groups. As longer duration of anaesthesia and higher endotracheal tube cuff pressure increases the occurrence of postoperative sore throat.

On comparison of POST, we found that just after extubation and at 2 hours, Incidence and severity of POST were significantly lower in MgSO4 group compared to lignocaine group. After 2 hours, the incidence and severity of POST was more in Lignocaine group compared to MgSO4 group at 4 hours, 6 hours, 12 hours and 24 hours, but the difference was statistically not significant. ($P>0.05$).

This protective effect is likely related to the anti-inflammatory properties of magnesium sulphate and its action as an NMDA receptor antagonist, which reduces cytokine release, airway inflammation, and mucosal edema. In contrast, lignocaine acts predominantly through sodium channel blockade, providing local anesthetic effects of shorter duration and limited anti-inflammatory action.

These findings were consistent with those of Neogi D al (2021) [8] and Sharma G et al (2023) [9] who demonstrated a lower incidence of postoperative sore throat with nebulized magnesium sulphate compared to lignocaine or placebo.

Similarly, on comparison of cough and hoarseness of voice, we found that just after extubation and at 2

hours, Incidence and severity of hoarseness was significantly lower in MgSO4 group compared to lignocaine group. After 2 hours, the incidence and severity of hoarseness was more in Lignocaine group compared to MgSO4 group at 4 hours, 6 hours, 12 hours and 24 hours, but the difference was statistically not significant. (P>0.05).

Our study results were in consistent with the study done by Supriya G et al (2026) [10] where, Magnesium sulphate was associated with the lowest incidence of postoperative cough, while the highest incidence was observed in the control group.

Rajan S et al (2017) [7] reported comparable findings, demonstrating reduced airway complications, including cough, in patients receiving magnesium based nebulization. In the study done by Neogi D et al (2021) [8] Hoarseness severity score and dysphagia severity score were also lower in group M compared to group L 1 hour postoperatively. Perioperative haemodynamic monitoring like HR, SBP, DBP, and MAP was comparable between the study groups without any significant difference. No significant adverse effects were found in both groups.

Conclusion

Preoperative nebulization with magnesium sulphate effectively reduces the incidence of postoperative sore throat, cough and hoarseness of voice in patients undergoing general anaesthesia with endotracheal intubation, without causing significant hemodynamic adverse effects. Lignocaine nebulization offers partial benefit but is comparatively less effective. Given its safety, cost effectiveness, and ease of administration, nebulized magnesium sulphate represents a valuable adjunct for minimizing postoperative airway-related morbidity and enhancing patient comfort in the perioperative period

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