

## Comparative Study of Magnesium Sulphate and Lignocaine Viscous Gargle in Prevention of Postoperative Sore Throat – A Experimental Study

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### Abstract

**Background:** Postoperative sore throat (POST) is a common occurrence following endotracheal intubation in general anaesthesia. Pharmacological agents like local anaesthetics, corticosteroids, ketamine, magnesium sulphate (MgSO<sub>4</sub>) are tried for attenuating POST. In this study, we compared efficacy of magnesium sulphate with lignocaine gargle on attenuating incidence and severity of POST.

**Methods:** In this randomized double blind controlled study, total 60 adult patients were randomly allocated to two equal groups, Group M (n~30) and group L (n~30). In group M patients received Magnesium sulphate 20mg/kg, dissolved in 20 ml of 5% dextrose solution. In group L patients received 20ml of 2% lignocaine viscous solution. Patients were allowed to gargle slowly for 30 s, 15 min before induction of anaesthesia with the solution as per allotment of the group. In post operative period patients were assessed for POST in a four-point scale (0-3) at 0, 1, 2, 4, 8, 12, and 24 hrs.). Heart rates (HR), SpO<sub>2</sub>, mean arterial pressure (MAP), were recorded.

**Results:** Incidence of POST in group M recorded lower than group L, and they are 26% vs. 56%, 16% vs. 46%, 10% vs. 40%, 6.6% vs. 33% 3% vs. 20% at 0,1,2,4,8 hrs respectively. Severity of POST was lower in Group M compared to Group L at 0,1,2,4 and 8 hrs. Hemodynamic variables were comparable and statistically insignificant.

**Conclusion:** We suggest the use of MgSO<sub>4</sub> gargle before induction of GA as an effective measure to decrease the incidence & severity of POST compared to lignocaine gargle.

**Keywords:** Lignocaine; Magnesium sulphate; Post-operative sore throat.

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### Introduction

Postoperative sore throat (POST) is most common adverse effect following endotracheal intubation in general anaesthesia. Incidence of POST following

endotracheal intubation ranges from 21-65%.<sup>1,2</sup> Various factors contribute to POST, foremost cause being trauma to airway mucosa, tracheal tube cuff pressure leading to mucosal erosion, mucosal inflammation and dehydration.<sup>2,3</sup>

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Multiple non pharmacological and pharmacological trials have been done for reducing incidence of POST. Using smaller size endotracheal tube, alternative airway devices such as LMA, gentle airway instrumentation, minimizing intracuff pressure, oral suctioning under direct visualization are the various non pharmacological measures attempted.<sup>4,5,6</sup> Pharmacological agents like local anaesthetics, corticosteroids, ketamine, magnesium sulphate ( $MgSO_4$ ) are tried for attenuating POST.<sup>7-14</sup>

Magnesium sulphate a NMDA antagonist acts both on central and peripheral nervous system, it has both anti- nociceptive and anti- inflammatory properties which helps in reducing POST.<sup>15</sup> Various studies have been tried and results were controversial.<sup>14,16,17</sup>

To test this hypothesis, we compared efficacy of magnesium sulphate with lignocaine gargle on attenuating incidence and severity of POST.

## Methodology

The study was conducted in Melmaruvathur adhiparasakthi institute of medical sciences and research in department of anaesthesiology after obtaining permission from institutional ethical committee. In this randomized double blind study, 60 patients undergoing elective surgery under general anaesthesia with endotracheal intubation were selected. After obtaining written informed consent, total 60 adult patients were randomly allocated to two equal groups every odd numbers allocated to Group M (n~30) and alternative patients to group L (n~30).

Patients undergoing elective surgery under general anaesthesia with endotracheal intubation of age group between 20-50 years of both sexes and American society of anaesthesiologist (ASA) grading I & II were included in this study. ASA III & IV, Patient refusal, Hypersensitivity to  $MgSO_4$  and lignocaine, smoker, pregnant and lactating mothers, long term analgesic therapy and upper and lower respiratory tract infections are excluded from this study.

In preoperative assessment, general examination, systemic examinations and assessment of the airway were done. Patients received premedication of tab. Alprazolam 0.25mg and tab. ranitidine 150 mg orally the night before surgery and the morning of surgery with sip of water. Preoperative fasting of minimum 8hrs ensured before the surgery.

Patients were clinically examined, checked

for written informed consent and procedure to be done were explained in detail as per patient information document. In group M patients received Magnesium sulphate 20mg/kg, dissolved in 20 ml of 5% dextrose solution. In group L patients received 20ml of 2% lignocaine viscous solution. According to group patients were asked to gargle for 30 s, 15 min before induction of anaesthesia. The gargling solutions were given in nontransparent glasses and the person distributing the solution for gargling was also unaware of constituent of the solution and allotment of group.

On entering the operative room baseline monitors such as ECG, pulse oximeter (SPO<sub>2</sub>), noninvasive blood pressure (NIBP) were attached and parameters were recorded. Intravenous (IV) infusion of Ringers lactate started.

Patients were preoxygenated with 100% oxygen for 3mins, Inj. glycopyrolate (0.01 mg/kg), and Inj. Fentanyl (2 mcg/kg) were given intravenously. For induction, Inj. Propofol (2mg/kg) was given, followed by Inj. Succinylcholine 2 mg/kg IV was given. After 1 min of succinylcholine administration, laryngoscopy was done and intubated with a low pressure high volume cuffed polyvinyl chloride endotracheal tube of internal diameter 8-8.5 mm for men, and 7-7.5 mm for women. Procedure was performed by a trained anesthesiologist. The endotracheal tube cuff was inflated until no air leakage could be heard with a peak airway pressure at 25cm H<sub>2</sub>O and cuff pressure measured by handheld pressure gauge and pressure maintained between 15-20 cm H<sub>2</sub>O. Capnograph was connected and ET CO<sub>2</sub> was monitored throughout the procedure. Anaesthesia maintained with O<sub>2</sub>:N<sub>2</sub>O in the ratio of 1:2, and isoflurane maintained with 1-2% alveolar concentration. Muscle Relaxation provided using inj. Atracurium 0.5mg/kg of loading dose and maintenance dose was 0.1mg/kg. Fifteen minutes before the end of surgery inj. Ondansetron 4mg iv given. Inj. Myopyrrolate 5ml was used for reversal at end of surgery, oropharyngeal suction was performed under direct vision to avoid trauma to the tissues and to confirm that the clearance of secretions was complete. After extubation criteria was fulfilled, patient was extubated.

In post anaesthesia care unit (PACU) patients were assessed by an anesthesiologist at 0, 1, 2, 4, 8, 12, and 24 hrs. Four-point scale (0-3) was used for grading POST. Grade 0 = no sore throat; Grade 1 = mild sore throat (complains of sore throat only on asking); Grade 2 = moderate sore throat (complains of sore throat on his/her own); Grade 3 = severe sore throat (change of voice or hoarseness,

associated with throat pain). Heart rate (HR), SPO2, mean atrial pressure (MAP), were recorded in the post operative period. Cough, hoarseness of voice and any other adverse effects are noted.

**Statistical analysis**

Incidence of POST was 21-65% based on previous studies. Taking  $\alpha$  error of 0.05, confidence interval of 95%, sample size calculation was made. On adding 10% for possible loss to follow-up, the sample size required was 30 patients per group. The collected data were analyzed using recent version of Statistical Package for Social Sciences (SPSS). Categorical variables were analyzed using the test. Normally, distributed continuous variables were analyzed using the independent sample t-test. Hemodynamic variables between the groups were compared with t-test. Differences in the incidence of POST among the groups were compared with Pearson's Chi-square test. p value <0.05 was considered as statistically significant.

**Results**

In this study total of 60 patients were included and they are randomly allocated in two groups of Group M and Group L and there was no attrition in this study. Demographic data such as age, sex, weight were analyzed and they are comparable in between groups. Duration of surgery were also comparable in both groups. Demographic variable and duration of surgery was not found statistically significant in between two groups. (Table 1)

Incidence of POST in group M recorded lower than group L, and they are 26% vs 56%, 16% vs 46%, 10% vs 40%, 6.6% vs 33%, 3% vs 20% at 0,1,2,4,8 hrs respectively. (Figure 1)

Severity of POST was lower in Group M compared to Group L at 0,1,2,4 and 8 hrs, they were significant with p value (<0.05) of 0.031,0.027, 0.023, 0.031 and 0.049 respectively. (Table 2). At 12hrs even though 3 patients of Group L had POST scoring of 1 compared to Group M but they are not significant. At 24hrs none of the patients had post operative sore throat.

Hemodynamic variables such as HR, SPO2 and MAP monitored over post operative period at 0,1,2,4,8,12, 24 hrs, they were comparable and statistically insignificant. (Table 3)

There were no significant adverse effects such as cough, hoarseness of voice in both groups.

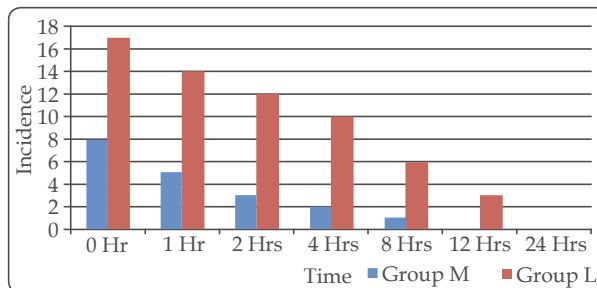
**Table 1:** Patient demographics.

Variables	Group	Mean	Standard deviation	p-value
Age	M	35.73	11.93	0.575
	L	35.27	11.03	
Weight	M	59.53	6.30	0.648
	L	58.49	6.42	
Duration	M	115.00	30.34	0.678
	L	116.58	27.20	

**Table 2:** POST scoring.

Time	POST scoring	Group M	Group L	p-value
0 HR	0	22	13	0.031
	1	8	14	
	2	0	3	
1 HR	0	25	16	0.027
	1	5	11	
	2	0	3	
2HRS	0	27	18	0.023
	1	3	10	
	2	0	2	
4HRS	0	28	20	0.031
	1	2	8	
	2	0	2	
8HRS	0	29	24	0.049
	1	1	6	
	2	0	0	
12HRS	0	30	27	0.076
	1	0	3	
	2	0	0	
24HRS	0	30	30	0.095
	1	0	0	
	2	0	0	

\*-none of the patients had a post score of 3 at any time of study.



**Fig. 1:** Incidence of POST.

**Table 3:** Hemodynamic variables.

Variables	Group	0HR	1 HR	2HRS	4HRS	8HRS	12HRS	24HRS
HR (Min)	M	91.83±3.42	87.17±4.34	83.47±4.10	82.10±4.70	80.52±4.71	78.30±4.30	78.30±4.82
	L	91.07±3.62	85.87±5.17	83.86±5.4	82.87±4.3	80.25±4.74	79.57±4.25	78.00±3.41
	p-value	0.871	0.195	0.520	0.766	0.927	0.744	0.933
MAP (mm hg)	M	93.07±2.13	88.73±2.44	86.33±2.36	85.87±2.96	84.63±2.35	84.86±1.97	83.97±2.31
	L	92.73±2.49	89.37±2.71	88.00±2.24	87.33±2.79	85.63±3.48	85.17±3.30	85.00±2.92
	p-value	0.139	0.908	0.811	0.722	0.359	0.065	0.117
SPO2 (%)	M	99.23±0.81	99.40±0.56	99.40±0.56	99.43±0.72	99.43±0.62	99.40±0.62	99.47±0.62
	L	99.33±0.80	99.17±0.79	99.43±0.77	99.47±0.68	99.37±0.55	99.33±0.71	99.27±0.74
	p-value	0.96	0.81	0.31	0.63	0.31	0.40	0.40

## Discussion

POST even though a minor complication, its incidence is very high after ETGA. Most common cause of POST being aseptic inflammation due to injury of pharyngeal mucosa, leading to oedema and congestion.<sup>2,3</sup> Even though it has delayed patient recovery, increased hospital stays and cost, there was only limited research were made in POST.<sup>27</sup> Various pharmacological and non-pharmacological were tried with variable success rate for decreasing severity and incidence of POST.<sup>4-14</sup> So in this study we compared MgSO<sub>4</sub> and well known commonly used topical lignocaine 10% gargle for reducing severity and incidence of POST.

MgSO<sub>4</sub> has antinociceptive effects that are primarily based on inhibition of Calcium entry into cell and block NMDA-type glutamate receptors.<sup>15</sup> Schempp CM et al also proved anti-inflammatory and antinociceptive properties of MgSO<sub>4</sub> after topical application.<sup>19</sup> Lignocaine the most common pharmacological agent used in preventing POST in several ways such as jelly, topical application, intravenous as well as spray with inconclusive effect.<sup>7,8,10</sup>

Demographic data such as Age and sex between group M and group L were found similar and they are statistically insignificant. Study conducted by Surajit Chattopadhyay et al showed similar results that age/sex has no implication over POST.<sup>17</sup> But controversy exists with age and gender in study conducted by Higgins et al. They found that female gender has more likely to have POST compared to male. Higgins et al also found elderly patients have higher incidence of POST.<sup>18</sup>

In our study duration of surgery in both

groups were almost similar and comparable, they statistically insignificant. Surajit Chattopadhyay et al showed similar results that duration of surgery has no statistically significance for POST.<sup>17</sup> Aliya et al in controversy found that duration of surgery has a direct relationship with the occurrence of POST.<sup>26</sup>

Incidence of POST in MgSO<sub>4</sub> group recorded lower than lignocaine group at 0,1,2,4,8 hrs. Narinder P singh & suritit c in their respective studies found incidence of POST is less with use of MgSO<sub>4</sub> as compared to other drugs.<sup>23</sup> In other study conducted by SO Aigbedia lignocaine jelly group had higher incidence of POST when compared to ketamine gargle.<sup>25</sup>

Severity of POST is lower in group M compared to group L and they are statistically significant at 0,1,2,4,8 hours. Teymourian et al in their study comparing MgSO<sub>4</sub> and ketamine gargle observed lesser severity score in MgSO<sub>4</sub> group similar to our study.<sup>20</sup> Hung NK et al and Agarwal A, et al in both studies comparing benzydamine hydrochloride & lignocaine 10% spray in ET tube showed decreased severity score of POST in benzydamine hydrochloride than lignocaine group.<sup>21,22</sup>

Hemodynamic variables in both groups were comparable & statistically insignificant. This results similar to study conducted by Surajit Chattopadhyay et al.<sup>27</sup>

## Conclusion

In this prospective randomized study MgSO<sub>4</sub> (Group M) gargle has lesser incidence & severity of POST when compared to lignocaine gargle (Group L). Hence we suggest the use of MgSO<sub>4</sub> gargle before induction of GA as an effective measure to

decrease the incidence & severity of POST.

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