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A COMPARATIVE STUDY BETWEEN LIGNOCAINE NEBULISATION AND MAGNESIUM SULPHATE NEBULISATION FOR ATTENUATION OF POSTOPERATIVE SORE THROAT

Anaesthesiology

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ABSTRACT

BACKGROUND: Postoperative sore throat (POST) is a common complication following general anaesthesia (GA) with orotracheal intubation. Both magnesium sulphate nebulisation and lignocaine nebulisation have been reported to be used successfully to reduce the incidence and severity of POST. Till date, no study has been reported comparing the efficacy of these two drugs for attenuation of POST. Therefore, the aim of this study was to compare the efficacy of preoperative lignocaine nebulisation and magnesium sulphate nebulisation in reducing the incidence and severity of POST in patients undergoing GA with orotracheal intubation.

METHODS: A prospective, double blind, parallel group, randomised, controlled study was conducted on 96 patients, aged between 18-50 years, ASA physical status I and II, undergoing elective surgery under GA with orotracheal intubation. Patients were randomly allocated into two groups, group L and group M. The patients in group L (n=48) received 4% lignocaine nebulisation (3 ml) and those in group M (n=48) received isotonic magnesium sulphate nebulisation (3 ml) over 15 minutes ending 5 minutes prior to induction of GA. The patients were assessed for incidence and severity of POST, cough, hoarseness of voice and dysphagia at 5 minutes and thereafter at 1, 4, 12, 24 and 48 hours in the postoperative period. All data were compared using appropriate statistical tests.

RESULTS: POST four-point scale was found to be significantly lower in group M in comparison to group L at 5 minutes and 1 hour in the postoperative period. Hoarseness severity score and dysphagia severity score were also significantly lower in group M at 1 hour postoperatively.

CONCLUSION: In comparison to lignocaine nebulisation; magnesium sulphate nebulisation was found to be more effective to reduce the incidence and severity of POST, hoarseness of voice, and dysphagia particularly in the early postoperative period.

KEYWORDS

lignocaine, magnesium sulphate, nebulisation

INTRODUCTION

General anaesthesia with endotracheal intubation is a commonly employed anaesthetic technique. Postoperative sore throat (POST) is a well-known complication of this technique. Its incidence varies from 14.4-50%.[1] The complaints range from a minor throat irritation to debilitating pain, inability to swallow and temporary voice changes.[2] Permanent pharyngolaryngeal injury has also been reported in a few patients.[2] It may also prolong the duration of hospital stay.

Various pharmacological and non-pharmacological methods like inhalation of beclomethasone, fluticasone, gargling with ketamine, aspirin, intra cuff administration of alkalized lignocaine, use of smaller sized endotracheal tubes, gentle airway instrumentation, maintaining intra cuff pressures <20 mm Hg and extubation after full deflation of the tracheal tube cuff have been tried with variable success rate.[1,3-5]

Lignocaine is a commonly used amide linked local anaesthetic agent. Use of intravenous (IV) lignocaine, spraying lignocaine on the ETT prior to endotracheal intubation have been reported to decrease the incidence of POST.[6,7] Lignocaine nebulisation used preoperatively was found to reduce the cough and sore throat in the postoperative period.[8,9]

Mechanical trauma during laryngoscopy and intubation and pressure effect of the inflated cuff of the endotracheal tube may cause an aseptic inflammation of the pharyngeal mucosa with resultant POST. N-methyl-D-aspartate (NMDA) receptors, present in the peripheral and central nervous system are important mediators in the pathophysiology of the nociception and inflammation.[10] Magnesium acts as an antagonist of the NMDA receptor ion channel. Magnesium sulphate nebulisation has been reported to reduce the incidence and severity of POST.[11-15] Oral magnesium lozenge also had been successfully tried in reducing incidence and severity of POST.[16]

There was no reported study comparing lignocaine nebulisation and magnesium sulphate nebulisation on POST. Therefore, we conducted this comparative study to evaluate the efficacy of lignocaine nebulisation and magnesium sulphate nebulisation on attenuation of POST.

MATERIALS AND METHODS

A prospective, double blind, parallel group, randomised, controlled study was conducted at Calcutta National Medical College & Hospital over a period of 8 months after obtaining Institutional Ethics Committee approval and written informed consent from each patient. Ninety-six patients belonging to age 18-50 years, either sex, ASA physical status I and II, body weight 40-80 kg, undergoing elective surgery under GA with orotracheal intubation in supine position were included in this study. Patients with history of smoking, persistent cough or sore throat, tracheal or laryngeal surgery, obese patients, patients undergoing head, neck and oral surgeries or surgeries in lateral or prone position were excluded from the study. Patients who required nasogastric tube insertion, undergoing surgeries for > 80 minutes and patients with anticipated difficult intubation were also excluded from the study. It was estimated that 48 patients per group (n=48) were required to detect a 20% difference in the incidence of sore throat in between groups with a 5% probability of type I error. The calculation assumed the proportion of sore throat cases as 48%.[8]

Patients were randomly allocated into two groups, group L and group M. Patients in group L received 4% lignocaine nebulisation (3 ml) and those in group M received isotonic magnesium sulphate 225 mg nebulisation (3 ml) over 15 minutes ending 5 minutes prior to induction of GA. The baseline heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), oxygen saturation (SpO_2), respiratory rate (RR) and electrocardiograph (ECG) were recorded. Patients received glycopyrolate 0.2 mg IV and fentanyl 2 mcg/kg IV.

After preoxygenation with 100% oxygen for 3 minute, GA was induced with propofol in titrated doses till loss of verbal response. Neuromuscular blockade was achieved with vecuronium bromide 0.1

mg/kg IV. After 4 minutes, laryngoscopy was performed by a skilled anaesthesiologist. The duration of laryngoscopy was noted. Patients requiring more than 2 attempts were excluded from the study. Patients were also excluded if the duration of laryngoscopy exceeded 15 seconds. The cuff of the ETT was inflated with air and the intra cuff pressure was kept between18-20 cm of H_2O. Cuff pressure was measured at 20 minutes interval using a cuff manometer and it was kept between18-20 cm of H_2O.

Anaesthesia was maintained with oxygen, nitrous oxide and desflurane. Analgesia was maintained with tramadol 2 mg/kg body weight. Neuromuscular blockade was antagonised with neostigmine 0.05 mg/kg IV and glycopyrrolate 0.01 mg/kg IV. Gentle oral suctioning was done with a 12F suction catheter to remove secretions avoiding trauma to the tissues. Trachea was extubated after fulfilling the criteria of adequate reversal. The cuff of the ETT was completely deflated prior to extubation. The patients were shifted to PACU for further monitoring. The patients were assessed for incidence and severity of POST, cough, hoarseness of voice and dysphagia at 5 minutes and thereafter at 1, 4, 12, 24 and 48 hours in the postoperative period using the respective four-point severity score as shown in Table 1.

Table 1: POST four-point scale, Cough severity score, Hoarseness severity score and Dysphagia severity score

POST four-point scale	
0	No sore throat
1	Mild sore throat (complained of sore throat only on asking)
2	Moderate sore throat (complained of sore throat on his/her own)
3	Severe sore throat (change of voice or hoarseness, associated with throat pain)
Cough severity score	
0	No cough
1	Cough less severe than with a cold
2	Cough similar to that noted with a cold
3	Cough more severe than with a cold
Hoarseness severity score	
0	No hoarseness
1	Mild hoarseness (noticed by the patient only)
2	Severe hoarseness (noticed at the time of the interview by the personnel)
3	Aphonia (inability to speak)
Dysphagia severity score	
0	Absent dysphagia
1	Slight dysphagia
2	Moderate dysphagia
3	Severe dysphagia (could not swallow because of pain)

Severity of POST was considered as the primary outcome variable. The secondary outcome variables included incidence of POST, incidence and severity of cough, hoarseness of voice and dysphagia in the postoperative period.

For statistical analyses, collected data were entered into a Microsoft excel spread sheet and were analysed by Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA, version 25.0 for windows). Data were summarised as count and percentages for categorical variables and mean and standard deviation for numerical variables. Categorical variables were compared using Pearson's Chi Square test/ Fisher's Exact test as appropriate. Independent samples t-test was applied to compare the means for the numerical variables. Differences in the severity of POST, cough, hoarseness of voice and dysphagia among the groups were compared with Mann-Whitney U-test taking mean of sum of ranks into consideration. A p value of less than 0.05 was considered statistically significant.

RESULTS

Total 101 patients were screened for eligibility. Five among them were excluded, 2 of them did not meet the inclusion criteria and 3 of them refused to participate in the study. Finally 96 patients were randomly allocated to the study groups, Group L and Group M, each having 48 patients.

Table 2 shows that the two groups were comparable in terms of demographic profile, Mallampati class, duration of laryngoscopy, Cormack Lehane Grading and duration of GA.

Table 2: Comparison of demograghic parameters, Mallampati class, duration of laryngoscopy, Cormack Lehane Grading and duration of GA between two groups

	Group L (mean ± SD)	**Group M (mean ± SD)**	**P value**
Age (yr)	36.35 ± 7.623	36.81 ± 8.893	0.787
Sex (M:F)	12:36	9:39	0.459
Body weight (kg)	56.40 ± 5.386	56.17 ± 5.677	0.840
ASA class (I/II)	39:9	34:14	0.232
Mallampati class (I/II/III/IV)	32:16:0:0	27:21:0:0	0.294
Duration of laryngoscopy (sec)	13.75 ± 1.139	13.54 ± 1.110	0.367
CormackLehane Grading (1/2a/2b/3/4)	33:15:0:0:0	37:11:0:0:0	0.358
Duration of GA (min)	47.35 ± 11.716	51.06 ± 12.391	0.135

The number of patients developing POST was significantly more in group L compared to group M. Patients in group M showed significantly lower score in POST four-point scale at 5 min and 1 hr in the postoperative period (Table 3). Hoarseness severity score and dysphagia severity score were also lower in group M compared to group L 1 hr postoperatively (Table 4).

Table 3: Comparison of POST four-point scale between two groups

	Group L	**Group M**	**P value**
5 min	13/19/10/6	23/19/4/2	**0.009**
1 hr	34/11/3/0	44/2/2/0	**0.012**
4 hr	44/4/0/0	46/2/0/0	0.402
12 hr	48/0/0/0	48/0/0/0	1.000
24 hr	48/0/0/0	48/0/0/0	1.000
48 hr	48/0/0/0	48/0/0/0	1.000

Table 4: Comparison of cough severity score, hoarseness severity score and dysphagia severity score between two groups

	Cough severity score			**Hoarseness severity score**			**Dysphagia severity score**		
	Group L	**Group M**	**P value**	**Group L**	**Group M**	**P value**	**Group L**	**Group M**	**P value**
5 min	36/10/2/0	41/6/1/0	0.204	18/18/11/1	16/29/3/0	0.420	17/23/6/2	14/33/1/0	0.704
1 hr	46/2/0/0	48/0/0/0	0.155	40/8/0/0	46/2/0/0	**0.046**	38/8/2/0	45/2/1/0	**0.041**
4 hr	48/0/0/0	48/0/0/0	1.000	47/1/0/0	48/0/0/0	0.317	44/4/0/0	46/2/0/0	0.402
12 hr	48/0/0/0	48/0/0/0	1.000	48/0/0/0	48/0/0/0	1.000	48/0/0/0	48/0/0/0	1.000
24 hr	48/0/0/0	47/1/0/0	0.317	48/0/0/0	48/0/0/0	1.000	48/0/0/0	48/0/0/0	1.000
48 hr	46/2/0/0	48/0/0/0	0.155	48/0/0/0	48/0/0/0	1.000	48/0/0/0	48/0/0/0	1.000

DISCUSSION

We found a lower incidence and severity of POST in patients receiving magnesium sulphate nebulisation in comparison to those receiving lignocaine nebulisation. Previous studies have also documented that magnesium sulphate nebulisation is effective in attenuating POST.[11-15] The observation of lower hoarseness severity score in group M was corroborative with that of a previous study conducted by Rajan S et al.[14] Dysphagia severity score was also found to be low in group M. Similar results were also obtained in previous studies conducted by Gupta SK et al and Yadav M et al.[11,12]

In this study, the nebulisation technique was used as it helps in effective and uniform drug distribution all over the pharynx. Moreover, it is safe, easy to administer with good patient compliance. It also negates the user variability associated with gargling method.

Lignocaine attenuates POST by inhibiting the excitatory sensory C fibres in the upper airway with resultant decrease in the release of inflammatory neuropeptide.[17] Lignocaine is a known antiarrhythmic agent which acts by blocking sodium channels. It stabilizes the membrane potential and suppresses the ectopic and spontaneous

discharges from the damaged nerve terminals without hampering the normal nerve conduction in the pharyngeal mucosa. On the other hand, magnesium is a NMDA receptor antagonist. It acts on the peripheral nerve endings of the pharyngeal mucosa and attenuates POST.[12] It reduces the local inflammation following topical administration through nebulisation.

This study had a few limitations. The serum levels of the study drugs were not measured. Majority of the patients in the study population was female. Patients with anticipated difficult intubation were excluded from the study.

In future, further studies may be conducted to evaluate the effect of different doses of magnesium sulphate nebulisation on POST. Similar studies may also be done on patients with anticipated difficult intubation requiring greater degree of airway manipulation.

CONCLUSION:

In comparison to lignocaine nebulisation; magnesium sulphate nebulisation was found to be more effective to reduce the incidence and severity of POST, hoarseness of voice, and dysphagia particularly in the early postoperative period.

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