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A PROSPECTIVE COMPARATIVE CLINICAL ASSESSMENT OF THE EFFECT OF NEBULISED MAGNESIUM SULPHATE ON THE INCIDENCE OF POSTOPERATIVE SORE THROAT

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Abstract

Aim: To determine the effect of Nebulised Magnesium Sulphate on the Incidence of Post Operative Sore Throat.

Methods: This was a prospective comparative study conducted in the department of anaesthesiology and critical care PGIMS Rohtak, Haryana, India for the period of 1 year. 100 Patients included in study were of either gender, aged between 20 and 70 years belonging to American Society of Anesthesiologist (ASA) 1 or 2 statuses undergoing elective surgery of approximately 2 h or more duration under GA requiring tracheal intubation. Patients in the study group were nebulized with 3 ml of 225 mg isotonic nebulized magnesium sulfate for 15 min in the holding area. Presence of sore throat was noted at rest and on swallowing immediately after extubation, and 2 h, 4 h, 10 h and 24 h postoperatively. In the postoperative ward, patients were also monitored for any drug-related side effects.

Results: With respect to age, gender, and ASA status, there was no significant difference in POST between the two groups. POST at rest at 0h and 2h between the two groups didn't show any significant difference. There was a significant. Difference in POST at rest between group A and group B at 4 h (p=0.08), 10 h (p=0.003) and 24 h (p=0.003) using chi square test. With respect to POST on swallowing, there was a significant difference in POST at 2 h (p=0.007), 4 h (0.003), 10 h (0.002) and 24 h (0.003) using chi square test.

Conclusion: When a patient is under general anaesthesia for up to 24 hours, post-operative complications (POST) are prevalent. For the prevention of postoperative sore throat, we discovered that magnesium sulphate in the form of nebulization as a pre-medication agent dramatically reduced the incidence.

Keywords: Post-operative sore throat, normal saline, magnesium sulphate, nebulisation.

Introduction

Postoperative sore throat (ST) is a frequent symptom following tracheal intubation, although it is an important cause of patient discontent and morbidity.[1] Patients undergoing general anaesthesia (GA) with tracheal intubation had a ST incidence of 21%–65%.[2,3] A variety of non-pharmacological and pharmacological experiments have been tried to reduce ST, but there is no one modality that has been demonstrated to be effective. Beclomethasone gel, azulene

sulphonate, ketamine, licorice, magnesium sulphate, etc. are among of the pharmaceutical techniques used to decrease ST.

One of the most common sequelae of endotracheal intubation is post-operative sore throat (POST), as the previous studies have mentioned the prevalence of post-operative sore throat ranging from 20 to 65%. The possible etiologies mentioned in the studies were mucosal erosion, inflammation and dehydration leading onto the irritation of trachea thereby resulting in POST. Though it is considered as a minor complication in the post-operative period but the major issue is, it leads to patient's dissatisfaction and increases the duration of stay in the hospital.[4] Research trials have been conducted on various pharmacological and non pharmacological measures for ameliorating POST but the success rate were varied.[5] The various non-pharmacological measures that were tried are reducing the size of endotracheal tubes, reducing the cuff pressure to less than 20 mm Hg and minimising the attempts made for laryngoscopy and similarly the various pharmacological measures that were attempted are use of ketamine gargle, ketamine nebulisation, lignocaine spray, beclomethasone gel and magnesium sulphate gargle.[6] Among all these measures ketamine gargle or lozenges had shown the maximum success rate, but the major disadvantage is ketamine has a bitter taste because of which the risk of aspiration is high and that might lead onto serious complications. Because of which administration of drug through nebuliser route in the form of aerosol has become popular among anesthetist and the patient's acceptance was also good.[7,8] The major receptors responsible for nociception and inflammation are NMDA receptors (N-methyl D-aspartate) receptors and these receptors are present both in central and peripheral nervous system. Both magnesium and ketamine has antagonistic property towards NMDA receptors and hence it acts as anti-nociception and anti-inflammatory agent.[9,10] Previous studies have been conducted using analgesic drug, ketamine in the form of gargles and aerosols and few studies had been done using magnesium in the form of gargles, lozenges and nebulisation and varied type of results were shown.[11-13] Since very few studies had been conducted using magnesium in the form of nebulisation and not much work has been carried out in this part of the state the current study was conducted to assess the efficacy of use of magnesium sulphate nebuliser in reducing the incidence of post-operative sore throat.

Materials and methods

This was a prospective comparative study conducted in the Department of anaesthesiology and critical care, PGIMS Rohtak, Haryana, India for the period of 1 year, after taking the informed consent form the patients.

Inclusion criteria

100 Patients included in study were of either gender, aged between 20 and 70 years belonging to American Society of Anesthesiologist (ASA) 1 or 2 statuses undergoing elective surgery of approximately 2h or more duration under GA requiring tracheal intubation.

Exclusion criteria

Patients with neuromuscular disease, allergy or hypersensitivity of drugs, undergoing neck surgeries, and laparoscopic surgeries were excluded.

Methodology

All patients were kept fasting overnight and premedicated with oral alprazolam 0.5 mg and ranitidine 150 mg on night before surgery and on the morning of surgery, as per standard department protocol. Five minutes prior to the induction of anesthesia, patients in the study group were nebulized with 3 ml of 225 mg isotonic nebulized magnesium sulfate for 15 min in the holding area. The solution for nebulization was administered by an anesthesiologist not associated with the management of the case. The anesthesiologist anesthetizing the case and those evaluating the post-operative sore throat were blinded. The patient was shifted to the operation theatre, 5 minutes after the nebulization was completed. In the operation theater, after connecting the patient to standard ASA monitoring, anaesthesia was induced with fentanyl 2 mcg/kg and propofol 2 mg/kg. Tracheal intubation was facilitated by atracurium 0.6 mg/kg, and the trachea intubated with soft seal cuffed sterile polyvinyl chloride tracheal tube (Portex Limited CT 21, 6JL, UK) of 7 mm inner diameter in female and 8 mm in male patients. The tracheal tube cuff was inflated with air. The cuff pressure was checked just after intubation using handheld tracheal cuff pressure monitor (Portex Cuff Inflator/Pressure Gauge, SIMS Portex, Hythe, Kent, UK) and then every 30 minutes till end of surgery and maintained at 20 cm of H_2O.Ventilation was controlled, and no nasogastric tube was inserted. Anesthesia was maintained with 66% nitrous oxide in oxygen with MAC value of isoflurane and intermittent doses of atracurium and fentanyl as required. The last dose of atracurium was given 20 min

prior to extubation. At the end of surgery, the muscle relaxation was reversed with a combination of neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg, before the trachea was extubated, and the patients were shifted to post anesthesia care unit. Presence of sore throat was noted at rest and on swallowing immediately after extubation, and 2 h, 4 h, 10hand 24 h postoperatively. In the postoperative ward, patients were also monitored for any drug-related side effects. The results obtained were compared with an equal number of patients fulfilling the inclusion criteria on whom normal saline was used as a standard of nebulization for 15 minutes and in whom the data on post-operative sore throat was already collected and available for use.

Statistical analysis

For categorical data, frequency and percentage of distribution was calculated and for comparison between groups, Chi square /fisher's exact test was used. Fisher's exact test; $P < 0.05$ was considered statistically significant. For quantitative (continuous data), mean, standard deviation and range was calculated. For comparison of quantitative data between groups, student's t test was used.

Results

With respect to age, gender, and ASA status, there was no significant difference in POST between the two groups. POST at rest at 0h and 2h between the two groups didn't show any significant difference. There was a significant. Difference in POST at rest between group A and group B at 4h (p=0.08), 10h (p=0.003) and 24h (p=0.003) using chi square test. With respect to POST on swallowing, there was a significant difference in POST at 2h (p=0.007), 4h (0.003), 10h (0.002) and 24h (0.003) using chi square test.

Table 1: Demographic data presented as either mean with 95% CI for mean or as numbers

Parameter	Normal saline	Magnesium sulfate	P value
Age (years) (mean ± SD)	39.7±10.2	40.8±10.3	0.32
Gender (male/female)	38/12	30/20	0.5
Weight (kg) (mean ± CI)	57.62±3.01	58.11±3.07	0.055

Table 2. Post operative sore throat at rest at different time intervals

Time (h)	Nebulised drug (n=50)	POST (%)	Pearson chi-square value (p-value)
0	NS MgSO4	30 25	0.53
2	NS MgSO4	33 21	0.077
4	NS MgSO4	30 11	0.08
10	NS MgSO4	22 9	0.003
24	NS MgSO4	17 4	0.003

h=hours, NS=normal saline, MgSO4=magnesium sulphate, POST=Post-operative sore throat

Table 3. Post operative sore throat on swallowing at different time intervals

Time (h)	Nebulised drug (n=50)	POST (%)	Pearson chi-square value (p-value)
0	NS MgSO4	28 25	0.63
2	NS MgSO4	35 22	0.007
4	NS MgSO4	30 18	0.003
10	NS MgSO4	23 10	0.0002
24	NS MgSO4	17 4	0.003

h=hours, NS=normal saline, MgSO4=magnesium sulphate, POST=Post-operative sore throat

\Discussion

The current study was attempted to compare the effect of pre-operative nebulization with normal saline versus Magnesium sulphate in reducing the incidence of postoperative sore throat (POST) following GA with endotracheal tube for elective surgeries lasting for less than 4 hrs with ASA grade of 1 or 2 among the age group between 20 and 70years.

The causative mechanism for post-operative sore throat could be multiple in origin, including mechanical injury during laryngoscopy and intubation, continuous pressure by the inflated tracheal tube cuff on tracheal mucosa causing damage and dehydration of the mucosa, along with de-epithelialisation and local inflammatory damage of the mucosa. Literature pertaining to the use of nebulized magnesium sulphate for attenuation of POST is scarce.

Numerous non pharmacological and pharmacological measures have been used for attenuating POST with variable success. Among the non pharmacological methods, smaller sized tracheal tubes, careful airway instrumentation, minimizing the number of laryngoscopy attempts, intubation after the full relaxation of the larynx, gentle oropharyngeal suctioning, filling the cuff with an anaesthetic gas mixture, minimizing intracuff pressures <20 mm Hg, and extubation when the tracheal tube is fully deflated, have been reported to decrease the incidence of POST.[14]

Endotracheal tube related post-operative sore throat might be a consequence of localized traumatic inflammation of the pharyngeal mucosa. It is known that N-methyl-D-aspartate (NMDA) has a role in nociception and inflammation.[15,16] NMDA receptors are found in peripheral nerves and the central nervous system.[17,18] Magnesium is also an antagonist of the NMDA receptor ion channel.[19] We decided to study the efficacy of magnesium sulphate nebulization to reduce the incidence of POST as the drug was easily available and as nebulization may be a simple, cost-effective method to decrease symptoms of POST.

Our results in the control group were consistent with previous findings. We avoided using lignocaine jelly, to minimize the confounding factors, which could cause disparity and confusion in the accuracy of the results of our study. Kori et al.[20] Maruyama et al.[21] found a higher incidence and severity of POST, when lignocaine 2% jelly was used as a lubricant on the tracheal tube.

The effectiveness of magnesium lozenges 30 min preoperatively was studied by Borazan et al.[22] found it effective in reducing both incidence and severity of POST in the immediate postoperative period. These results are comparable to our study results.

Gupta et al[23] also assessed the efficacy of preoperative nebulization of magnesium sulphate and found that the incidence and severity of POST were reduced at rest and on swallowing at all-time points ($P < 0.05$). Though our study couldn't demonstrate an effective reduction in the incidence of sore throat right after extubation at rest and swallowing, a clear advantage of a significant reduction in the incidence of sore throat on swallowing from the two hour period after extubation was observed.

There was no associated risk of local or systemic toxicity as the dose used was around one-tenth of the systemically used dose for the treatment of pre-eclampsia and eclampsia and the mucosal drug absorption would not anywhere match the systemic levels of parenteral administration of the same drug similar to the conclusions of by Blitz et al.[24] who used nebulized magnesium sulphate for treatment of acute asthma.[25] The mucosal absorption although stated to be variable is also low to the level of around 10%.The drawback of our study was the absence of the measurements of serum magnesium levels making it difficult to rule out the contribution of systemic effects of magnesium.

In our study, magnesium sulphate nebulisation reduced the incidence of post-operative sore throat at rest after four hours with a significant difference compared to the group which received nebulisation with normal saline. Magnesium sulphate group also had a significantly lesser incidence of post-operative sore throat on swallowing after two hours in comparison to the normal saline nebulisation group.

Conclusion

Patients who have general anaesthesia with a tracheal tube for up to 24 hours are more likely to get post-operative sore throats. For the prevention of postoperative sore throat, we discovered that magnesium sulphate in the form of nebulization as a pre-medication agent dramatically reduced the incidence compared with normal saline.

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