

ORIGINAL RESEARCH

Comparison of Magnesium Sulfate Nebulisation and Magnesium Sulfate Gargle for Attenuation of Postoperative Sore Throat

Deep Shikha¹, Rohit Kumar Varshney^{2*}, Mukesh Kumar Prasad³, Pallavi Ahluwalia⁴, Payal Jain⁵, Pratiksha Gogia⁶

¹PG Resident 3rd Year, Department of Anaesthesiology, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India.

^{2*}Professor and Head of Department of Emergency Medicine, Teerthankar Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

³Professor & HOD, Department of Anaesthesiology, Teerthankar Mahaveer Medical College & Research Centre, Bagadpur, Mordabad, Uttar Pradesh, India.

⁴Professor, Department of Anaesthesiology, Teerthankar Mahaveer Medical College & Research Centre, Bagadpur, Mordabad, Uttar Pradesh, India.

⁵Associate Professor, Department of Anaesthesiology, Teerthankar Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

⁶Assistant Professor, Department of Anaesthesiology, Teerthankar Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

Corresponding Author: Dr. Rohit Kumar Varshney, Professor and Head of Department of Emergency Medicine, Teerthankar Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

ABSTRACT

Background: Post operative sore throat is a very dreadful and 2nd most common complications in patients undergoing tracheal intubations and is developing as major reason of patient's dissatisfaction.. Incidence of 21-68% has been reported in studies. We compared Magnesium sulphate gargle and nebulization in preventing POST.

Materials and Method: After obtaining written informed consent and permission from institutional ethical committee, 70 patients scheduled for surgery under GA were enrolled and equally divided randomly by chit and box method in two groups: **Group A:** nebulized with 3ml of isotonic Magnesium sulfate for 15 minutes at 5mins before induction of anaesthesia. **Group B:** Patients were given Magnesium sulfate gargle (20mg/kg in 30ml of 25 % Dextrose water) at 15 minutes before induction of anaesthesia. Haemodynamic parameters –H.R, SBP, DBP, R.R and SpO₂ was measured intraoperatively. After extubation, severity of POST was assessed at 0hr, 2hrs, 4 hrs, 6hrs, 12 hrs, 24hrs and 48 hrs by VAS scale and grading of POST was done by 4 point scale (0-3) and compared between the groups.

Results: On comparing the groups, no significant statistical difference was found between haemodynamic parameters. The mean score of POST was significantly more in group N at 2,4,6 and 12 hours (p value-0.001,0.01,0.002 and 0.001).VAS score was observed significantly more in group N patients in compare to group G at 0,2,4,6 and 12 hours after extubation (p value-0.018,0.007,0.012,0.001 and 0.022).No significant complications were found.

Conclusion: It was concluded that Magnesium Sulphate relieves sore throat and complaint of cough and hoarseness by both route But Gargle proved to be simple and effective way to reduce POST.

Keywords: POST, Magnesium Sulphate, Nebulisation, Gargle

INTRODUCTION

In the present scenario assurance of quality anaesthesia and minimal postoperative complication is the utmost goal for the overall improvement of patients. So various measures have been taken to reduce anaesthesia related postoperative complications like feeling of nausea, incidences of vomiting, pain or complaint of sorethroat associated with hoarseness after surgery other than management of post operative pain.^[1]

Surgeries under GA with endotracheal intubation predominantly causes sore throat by injury of airway mucosa, incidences of 20-74% is found among patients in previous studies. It is second most common complication after general anaesthesia and is one of the reason of patient's dissatisfaction.^[2-7]

It has been seen in several studies that various factors causes POST which are addiction habit of patient like smoking^[10], among female patients,^[9] anticipated airway difficulty and problems in intubation, use of depolarizing muscle relaxant – Succinyl Choline.^[11] This is also caused by factors like increased pressure of cuff after fixation of ET tube, more attempts of intubation causing mucosal injury to airway, aggressive suctioning of airway, or if more than required size of ET tube used during surgery or usage of laryngeal airways.^[12-14] Time taken for the surgery also affects development of sore throat.

In previous studies, instances of sore throat have been reduced with use of several drugs and non pharmacological techniques.^[17]

Non pharmacological methods like usage of small sized ET tubes, lubricating tubes with lignocaine jelly before intubation, gentle laryngoscopy, applying minimal cuff pressure, use of supraglottic devices, careful and gentle oropharyngeal suctioning, and doing extubation after complete deflation of cuff have been reported to reduce its incidences to some extent.^[17- 18]

Pharmacological agents like steroids, NSAIDS like Aspirin gargle, Ketamine gargles, topical magnesium sulphate, nebulization of Ketamine and nebulization of gargle has shown improvement in post operative sore throat.^[17-20] Magnesium is known for pain relief and anti inflammatory properties. It lowers down complaint of sore throat by reducing inflammatory response of airway by inhibiting production of histamine and factors like thromboxane and mediators like leukotrienes, thus, it helps in controlling inflammation.^[22,23]

The available data suggest that magnesium acts as an important drug in improving postoperative pain relief. It decreases opioid consumption after surgery and its associated postoperative complications like nausea & vomiting and improves pain scores. It was usually given as magnesium sulphate infusion preoperatively and post-operatively and used earlier as lozenges.

To the best of my knowledge gargle and nebulisation of Magnesium Sulphate have never been compared in a single study for reduction or prevention of POST. This drug is easily available and the two techniques being used are easy to perform, cost effective and convenient method to lower down the complaint of POST and it also acts as a better method to deliver drug to the mucosa of pharynx.

In our present study, the goal of study was to evaluate better route for the action of drug Magnesium Sulfate by giving it through gargle or nebulization for reduction of incidences of sore throat and to assess haemodynamic parameters among patients who were included in study.

MATERIALS AND METHOD

After obtaining written informed consent and Institution Ethical Committee clearance, the present study was planned in Department of Anaesthesiology, Teerthanker Mahaveer Medical College and Research Centre, Moradabad from July 2021 to June 2022. Our sample size was time bound study and started from 30 June 2022 after ethical clearance and in total of 70 patients were taken. with 35 patients in each of the group. Patients were randomly divided by chit and box method in two equal groups with 35 patients in each group.

The patients aged 18-65 years of BMI 18.5-22.9kg/m² and ASA grade I and II scheduled for surgeries under General Anaesthesia were included in the study. Patients with anticipated difficult airway, having reactive airway disease or with history of URTI or LRTI and respiratory illness or allergic to drug used were excluded from study. Also the patients scheduled for surgeries involving oral cavity, area of neck, larynx and part of nasopharynx, or requiring prone position, or for surgeries of more than 2 hours and pregnant patients were not included in the study.

Pre anaesthetic examination was done for all the patients. Patients were allocated to the groups to receive magnesium sulphate by one of the two techniques: Group G (gargle) and Group N (Nebulization). In the preoperative room, Group G patients were asked to do gargle of magnesium sulfate (20mg/kg in 30ml of 25% Dextrose water) at 15 minutes before induction of anaesthesia and Group N patients were nebulized with 3ml of Isotonic Magnesium Sulphate for 15 minutes at around 5 minutes before induction.

Then patient was shifted to O.T., and all standard ASA monitors were attached. Baseline haemodynamic parameters was noted. Patients were premedicated as per standard protocol. They were preoxygenated with O₂ 100% for 4 deep breaths or for 3 minutes. Induction was done by Inj. Propofol in dose 2mg/kg and ventilation was checked with bag and mask. After observing adequate ventilation, Inj. Vecuronium at dose of 0.1mg/kg was given and oxygenation was done minimum for the period of 3 minutes.

After attaining adequate relaxation, laryngoscopy done and intubation was done with ET tube of appropriate size cuff by an experienced anaesthesiologist, in male size of 8mm and in female 7mm were used. Intubation was done very gently so as to prevent occurrence of any stress response. After intubation and inflation of the cuff to pressure of 20cm H₂O, bilateral air entry was checked and tube was fixed at 21-22 cm and attached to ventilator.

Haemodynamic parameters was measured intraoperatively after 5minutes of intubation and at every 5minutes for the first 30 minutes then at every 10 minutes till the end of surgery.

Maintenance of anaesthesia was done using 60:40 mixture of Nitrous Oxide and Oxygen, Isoflurane 1-2% & intermittent doses of Vecuronium.

Intraoperatively vitals were monitored. Low dose opioids and NSAIDs were given for the pain relief of patient. During the surgery any change in vitals that includes heart rate or blood pressure (SBP, DBP, MAP) was noted. After surgery ended, for reversal Inj. Neostigmine in dose of 0.05 mg/kg and Inj. Glycopyrolate in dose of 0.02 mg/kg was given intravenously.

After surgery extubation was done after thorough oral suctioning, reversal of adequate respiratory effort, opening of eye on verbal command and good limb movements.

Patient was moved to the post operative room and vitals were recorded and POST grading was done at 0hrs, 2hrs, 4 hrs, 6hrs, 12 hrs, 24hrs and 48 hrs by.

- The severity of POST will be assessed by 4 point scale (0-3)^[10]
 - 0 = no sore throat
 - 1 = mild sore throat [complains of sore throat only on asking]
 - 2 = moderate sore throat [complains of sore throat on his/her own]
 - 3 = severe sore throat [change of voice or hoarseness, associated with throat pain].
- The response of patient was measured in terms of pain scale by Visual Analogue Scale.^[14]

If postoperative VAS>4, then Inj.Diclofenac 75mg Intramuscular was given as rescue analgesia.

Patients were followed up in the ward for the evaluation of degree of sore throat till 48 hours after surgery and presence any complication was noted.

Statistical Analysis was performed using SPSS version 20. Quantitative data was calculated through mean and standard deviation. Qualitative data was determined by frequency and percentages. Independent T- test and Chi square test had been used for carrying out the comparisons and considered 0.05 as the standard check for level of significance of p-value.

RESULTS

In present study total of 70 patients were recruited and study was completed successfully, there was no dropout. On comparing demographic characteristics between two groups, the mean age in group G was 48.32±12.3 and group N was 49.23±11.23 (p value-0.74) (Table 1). There was no significant statistic difference between patients with respect to weight, height, and BMI (p value- 0.21,0.34 and 0.35) and in the ASA grade (p value- 0.59)(Table 1).

Table 1: Showed Demographic Characteristic Distribution between Groups

Test Variable	Group G	Group N	P value
Age (years)	48.32±12.3	49.23±11.23	0.74
Weight (kg)	56.25±7.87	58.68±8.32	0.21
Height (cm)	161.05±8.71	162.97±8.09	0.34
BMI (kg/m ²)	21.85±0.83	22.07±1.10	0.35
ASA grade I	20	21	0.59
ASA grading II	15	14	

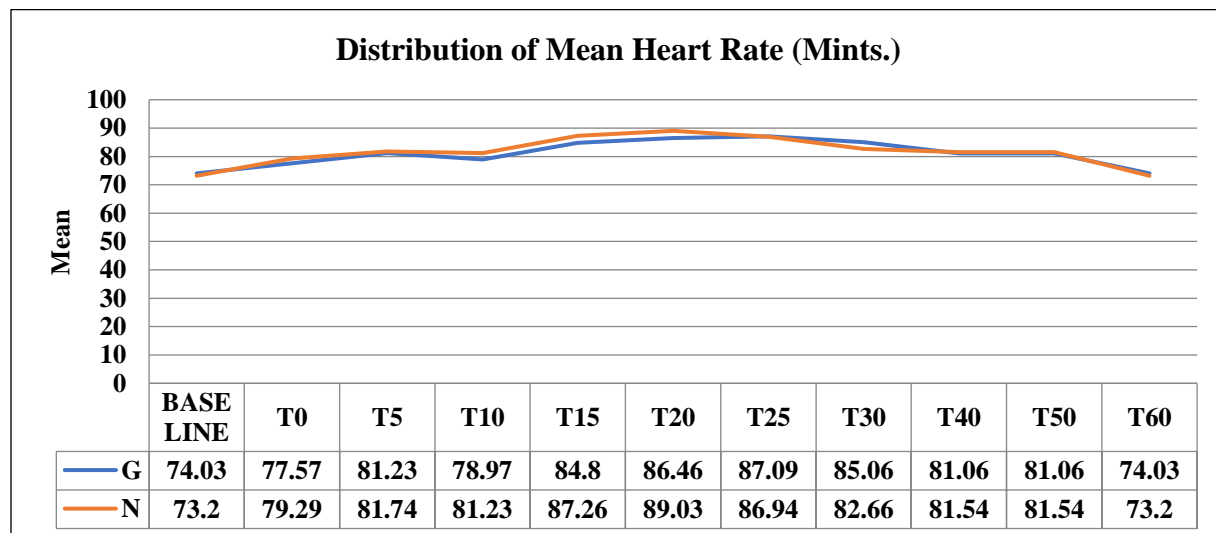


Figure 1: Comparison of mean heart rate between groups

Figure 1 shows, the mean heart rate of group G and group N was 74.03 and 73.2 (p value – 0.439) at baseline. Heart rate was monitored for first 60 minutes after induction.

The difference between Mean HR distribution between Group G and Group N at 20th minute 86.46±5.27, 89.03±5.91 and it was not significant (p-value=0.059). The result of difference between Mean HR distribution between Group G and Group N at Baseline, T0, T5, T10, T15, T20, T25, T30, T40, T50 and T60 were found not Significant as the P-values are >0.05

Table 2: Comparison of mean distribution of MAP between the groups

MAP (mmHg.)	G (Mean± SD)	N (Mean± SD)	P-value
BASELINE	92.41±4.07	91.41±4.94	0.359
T0	88.8±4.64	89.14±9.53	0.849
T5	90.73±6.53	89.38±5.25	0.343
T10	87.55±4.23	86.99±5.18	0.620
T15	86.6±3.68	86.16±4.37	0.651
T20	85.39±4.61	86.02±4.1	0.548
T25	84.45±4.68	85.49±4.84	0.365
T30	89.84±4.41	88.68±4.62	0.285
T40	91.73±5.81	90.52±4.43	0.331
T50	91.73±5.81	90.52±4.43	0.331
T60	92.41±4.07	91.41±4.94	0.359

Table 2 depict difference between Mean MAP distribution between Group G and Group N.

When patient was induced the Mean MAP of Group G was 88.8±4.64 and the Mean MAP of Group N was 89.14±9.53 at 0 hour (p value :0.359).

Intra operatively MAP was monitored for 60 minutes then Mean MAP of Group G was 92.41±4.07 and the Mean MAP of Group N was 91.41±4.94 (p value: 0.359).No significant difference was found between Mean MAP distribution between Group G and Group N at 20th minute 85.39±4.61, 86.02±4.1 (p-value=0.548). The result of difference between Mean MAP distribution between Group G and Group N at Baseline, T0, T5, T10, T15, T20, T25, T30, T40, T50 and T60 were found not Significant as the P-values are >0.05.

Table 3: Comparison of mean of scoring of POST between groups

Scoring of POST	Group		P-value
	G (Mean± SD)	N (Mean± SD)	
T0	2.1±0.6	2.3±0.7	0.15
2Hrs	1.5±0.9	2.5±0.6	0.001**
4Hrs	1±1	2.4±0.8	0.01**
6Hrs	1.05±0.1	1.75±0.9	0.002**
12Hrs	1.01±0.02	1.9±1.2	0.001**
24Hrs	0±0	0.8±0.7	--
48Hrs	0±0	0±0	--

Table 3 depict difference between Mean Scoring of POST distribution between Group G and Group N.

The Mean Scoring of POST observed at 0th hour of Group G was 2.1±0.6 and the Mean Scoring of POST observed at 0th hour of Group N was 2.3±0.7 and it was not significant (p-value=0.15).

Then after intra operatively Scoring of POST was monitored for 48 hours then Mean Scoring of POST of Group G was 0±0 and the Mean Scoring of POST of Group N was 0±0.The difference between Mean Scoring of POST distribution between Group G and Group N at 4th Hour 1±1, 2.4±0.8 and it was Statistically significant (p-value=0.01).The result of difference between Mean Scoring of POST between Group G and Group N at, 2Hrs, 4Hrs 6Hrs and 12 Hrs were found Statistically Significant (p value-0.001,0.01,0.002,0.001).

Table 4: Comparison of mean VAS scores between the groups

VAS Score	Group		P-value
	G (Mean± SD)	N (Mean± SD)	
T0	7.5±1.1	6.8±1.3	0.018*
2Hrs	4.8±1.6	5.6±0.9	0.007*
4Hrs	3.5±1.2	4.3±1.1	0.012*
6Hrs	2.4±1.1	3.5±1.2	0.001*
12Hrs	1.7±1.2	2.4±1.2	0.022*
24Hrs	0±0	1.2±0.8	--
48 Hrs	0±0	0±0	--

Table 4 depict difference between Mean VAS Score distribution between Group G and Group N. Mean of VAS Score at baseline for Group G was 7.5±1.1 and for Group N was 6.8±1.3 (p value-0.018). Intraoperatively VAS Score was monitored for 48 hours then Mean VAS Score of Group G was 0±0 and Group N was 0±0.

The difference between Mean VAS Score distribution between Group G and Group N at 6th Hour 2.4±1.1, 3.5±1.2 and it was statistically significant (p-value=0.001). The result of difference between Mean VAS Score distribution between Group G and Group N at, T0, 2Hrs, 4Hrs, 6Hrs and 12Hrs were found statistically significant (p-values :0.018,0.007,0.012,0.001 and 0.022).

Only 2 case of hypotension and 1 case of bradycardia was observed. No other complication like respiratory distress, bradycardia, hypotension and cardiac arrhythmia was not observed.

DISCUSSION

POST is one of the main reason for patient's unpleasant feeling and dissatisfaction. It affects recovery of patients and quality of their life after hospital discharge. Development of complaint of sore throat and cough with surgeries is assumed to occur due to irritation of mucosa of airway during intubation and leads to release of mediators which causes inflammation and leads to irritation of airway.^[18]

In previous studies, instances of sore throat have been reduced with use of several drugs and nonpharmacological techniques.^[17]

Non pharmacological methods like usage of small sized ET tubes, lubricating tubes with lignocaine jelly before intubation, gentle laryngoscopy, applying minimal cuff pressure, use of supraglottic devices, careful and gentle oropharyngeal suctioning, and doing extubation after complete deflation of cuff have been reported to reduce its incidences to some extent.^[17-18]

Pharmacological agents like steroids, NSAIDS like Aspirin gargle, Ketamine gargles, topical magnesium sulphate, nebulization of Ketamine and nebulization of gargle has shown improvement in post operative sore throat.^[17-18]

M.O.Orji^[19] et al conducted study by comparing nebulisation of Magnesium and Ketamine with saline for reduction of complaint of POST and observed that both the drug reduces complaint of sore throat in compare to saline. A study was conducted by Derlin Thomas et al^[3] compared nebulisation of Ketamine with Dexmedetomidine for attenuation POST in patients undergoing thyroidectomy and observed reduced incidence of sore throat with Ketamine but showed increase in heart rate and blood pressure. However, a study conducted by Houman Teymourian^[20] compared gargle of Magnesium Sulfate with Ketamine for attenuation POST in patients scheduled for appendectomy and observed that magnesium sulfate gargle was more effective. Therefore we compared nebulisation of Magnesium Sulfate with gargle of Magnesium Sulfate for reduction of complaint of sore throat.

In the present study, use of magnesium sulfate by gargle and nebulisation both reduced complaint of sore throat but gargle of magnesium sulfate showed significant reduction in post operative sore throat. This was similar to the study done by Surajit Chattopadhyay^[21] et al who compared preoperative gargle of aspirin with Magnesium Sulfate and observed marked reduction of POST incidences with gargle of Magnesium Sulfate. Similarly study done by S K Gupta et al compared nebulisation of Magnesium Sulfate with saline and observed reduction in incidences of POST with nebulisation of Magnesium Sulfate. Narinder P singh et al^[2] studied metaanalysis evaluating topical Magnesium on ET tube preoperatively and observed attenuation in complaint of sore throat.

In the present study, on comparing hemodynamic characteristics (heart rate and MAP) showed no significant differences between the groups. In regards to our study, a comparison can be done with the study of the researchers Bhavani et al^[22], who studied effect of the magnesium sulfate by nebulization over the complaint of the postoperative sore throat couldn't find any difference in the heart rate and systolic and diastolic blood pressure between the groups. Also the studies conducted by Monu Yadav et al^[23] compared nebulisation of Magnesium Sulfate with saline and found no significant difference in haemodynamic parameters between the groups.

In the present study, scoring of POST was done by four point scale at 0,2,4 ,6,12,24 and 48 hours and significant reduction was observed in patients with magnesium gargle at 2,4,6 and 12 hours. It was similar to the results of the researchers Rajan et al., who observed that ketamine as well as magnesium sulfate showed significant reduction of POST and hoarseness during 0th, 2nd and 4th hour. Also study done by M.O.orji et al[19] found that nebulisation of Magnesium Sulfate in compare to Ketamine nebulisation significantly reduced POST at 2nd, 4th and 24 hours after induction.

The present study also compared severity of post operative sore throat through VAS score at 0,2,4,6,12,24 and 48 hours after induction and observed significant reduction in incidences of POST at 0,2,4,6 and 12 hours after induction.

Adverse events were also reported in the present study, 2 patients showed episodes of hypotension and 1 patient showed episode of bradycardia. However an insignificant difference was observed between other complications among the study groups. Our observations were similar to research done by several authors and they also observed insignificant adverse events between the groups. On contrary to our study Shivkumar Segaran et al^[24] compared nebulisation of Ketamine with nebulisation of Magnesium sulfate for reduction of incidences of POST and observed improved outcome of POST with nebulisation of Ketamine.

Limitation

The present studies carries some limitation. The result would have been better if the plasma level of Magnesium sulfate was monitored and their adverse effect would have been recorded. This study could have been done in surgeries of more than 2 hours and with anticipated difficult intubation which would have helped to assess sore throat in patients with prolonged surgeries. The results would have been more precise if large sample size would be taken for the study

CONCLUSION

It can be concluded from our research findings that magnesium gargle is being considered to be a very good option for treating the postoperative sore throat in comparison to that with the magnesium nebulizer.

Though nebulization of Magnesium Sulphate also relieves sore throat and complaint of cough and hoarseness. But Gargel proved to be simple yet effective way to reduce the postoperative sore throat. No adverse events were also noticed in this study among the cases which were treated with the magnesium sulfate Gargle.

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