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Pre operative nebulization with ketamine decreases incidence and severity of post-operative sore throat

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Abstract

Postoperative sore throat (POST) is unavoidable outcome of endotracheal intubation, occurs in 21-65% of the patients. There are some pharmacological and non-pharmacological methods for prevention of POST. Nebulization is better as small volume of drug required for effect, easy way of administration, better patient compliance and most importantly no risk of aspiration as seen with gargle.

Method: 100 patients of ASA grading I and II, aged between 20-60 years undergoing general anaesthesia on elective basis were randomly divided in two groups. 50 patients received pre-operative nebulization with 1.0ml ketamine (50mg) with 4.0ml normal saline while others received nebulization with 5ml normal saline for 15 min. General anesthesia was given. The POST and hemodynamic monitoring were done pre-nebulization, pre-induction, on reaching post-anaesthesia care unit and till 24 h post-operatively.

Results: Incidence of POST was reduced with ketamine nebulization. The primary outcome was incidence of POST significantly reduced in group K till 24 h post operatively.

Conclusion: Preoperative ketamine nebulization is simple, safe and effectively reduced the incidence and severity of POST, with no adverse effects.

Keywords: Post-operative sore throat, ketamine, nebulization, tracheal intubation

Introduction

Post-operative sore throat is usual outcome after endotracheal intubation associated with complications like voice change, pain on swallowing, cough etc. Incidence of post-operative sore throat is about 21-65% in patients receiving general anesthesia with endotracheal tube [2, 3, 4, 5]. Even though a minor complication, it makes Patient feel disappointed with the quality of recovery from anesthesia [2]. Sometimes trauma during intubation, unanticipated difficult airway intubation or nerve damage can lead to Post operative sore throat (POST).

Various nonpharmacological and pharmacological methods have been studied for reducing POST [2, 4]. Most commonly used non-pharmacological methods are small size endotracheal tube, lubrication of tracheal cuff with water soluble jelly, gentle laryngoscopy, low Intracuff pressure and smooth extubation. Pharmacological methods include gargling or nebulization with different drugs like Ketamine, lignocaine, Budesonide, Beclomethasone, etc [2].

An NMDA receptor antagonist, Ketamine has been used for attenuating POST because it has anti-nociceptive and anti-inflammatory action, as gargle as well as in nebulized form [1, 2, 4]. Nebulization is better tolerated in patients due to some advantages: It saves the patient from the bitter taste of ketamine, also much lesser volume is needed as against larger volumes required for gargle [2, 4].

The main objective of this study was to evaluate the role of ketamine nebulization in reducing POST in patients undergoing surgeries under GA with tracheal intubation.

Materials and Methods

After obtaining written and informed consent, a prospective randomized study was conducted in 100 patients belonging to ASA grade I-II, in the age group of 18-60 years, of either sex, undergoing GA. Patients with a history of pre-operative sore throat, oral surgeries, asthma, chronic obstructive pulmonary disease, head and neck surgeries, Mallampati grade >2, known allergies to study drug, and those who required more than one attempt at intubation were excluded from the study. Preoperative evaluation of patient was done including history taking, general and systemic examination of patients and airway assessment.

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Patients undergoing study were divided randomly into two groups: Group K (Ketamine) and Group S (Normal saline). After obtaining written informed consent, Patients received nebulization with either of study drug according to group allotted to them 10 minutes before shifting to operation theatre. Patients in group K received nebulization with Inj. Ketamine 1ml (50mg) with 4ml normal saline while group S patients received nebulization with 5ml normal saline. The patients received the study drugs via nebulization mask connected to wall mounted oxygen driven source (8L, 50psi).

Baseline vital parameters like electrocardiography (ECG), non-invasive blood pressure, percentage saturation of oxygen (SpO₂), respiratory rate (RR) and were recorded. Preoxygenation was done with 100% O₂ for 3 minutes. Induction was done with Inj. Fentanyl 2 µg/kg and Inj. Propofol 2-2.5 mg/kg I.V. and neuromuscular blockade was achieved with Inj. Vecuronium 0.1mg/kg. Patients were ventilated for 3 minutes to achieve muscle relaxation. Intubation was done with appropriate size of endotracheal tube. Single skilled anaesthetist performed laryngoscopy in all cases. Patients who required more than one attempts were excluded from this study. Patients were maintained on O₂/N₂O 50%/50%, isoflurane and Inj. Vecuronium. After completion of surgery, residual neuromuscular blockage was reversed with a combination of Injection Neostigmine 0.05mg/kg and Injection Glycopyrrolate 0.01mg/kg. Extubation was done after adequate reversal of muscle tone, power, reflexes and respiration.

Demographic data of study participants

Table 1: Patients characteristics

Characteristics	Group S (N=50) Mean (SD)	Group K (N=50) Mean (SD)
Age (Year)	34.76 (10.23)	33.62 (10.40)
Sex (M: F)	24/26	28/22
Weight (KG)	57.04 (6.8)	57.88 (5.43)
Duration of Surgery (MIN)	53.04 (6.77)	55.16 (5.43)

Both groups were comparable in distribution of age, gender, body weight and duration of surgery [Table 1].

Incidence of post operative sore throat

In this study, the overall incidence of POST in the present

After shifting patient to recovery room, vitals were recorded. Patients were observed at 0, 2, 4, 6, 12 and 24th hr after extubation for postoperative sore throat. POST was graded on a four-point scale (0–3): 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). Other side effects if noted, IV paracetamol 1gm 6hrly given for post operative pain relief.

The sample size was calculated using OPEN EPI software considering Post operative sore throat in Ketamine (20%) and Saline group (46%) from previous study. With level of significance 95%, and Power 80% the sample size was calculated to be 100 (50 patients in each group).

Observation and Result

Study was conducted over 100 patients posted for elective surgeries undergoing general anesthesia using endotracheal tube. The collected data was subjected to statistical analysis. Continuous variables were presented as mean ± SD. The nominal and ordinal data was presented as number and percentage. Quantitative data was analyzed using student's t-test and qualitative data was analyzed by chi-square test or Fisher's exact t-test. Thus, Student's t-test was used to compare age, weight, duration of surgery, heart rate, blood pressure and SpO₂. Chi square test or Fisher's exact test was used for comparison of sex and incidence of post operative sore throat.

study was 35%: POST occurred 24(48%) patients in group S and 11(22%) patients in group K (Fisher's exact $P=0.0113$). Incidence of POST was significantly lower in group K when compared to group S post operatively up to 24hrs ($P<0.05$) [Figure 1].

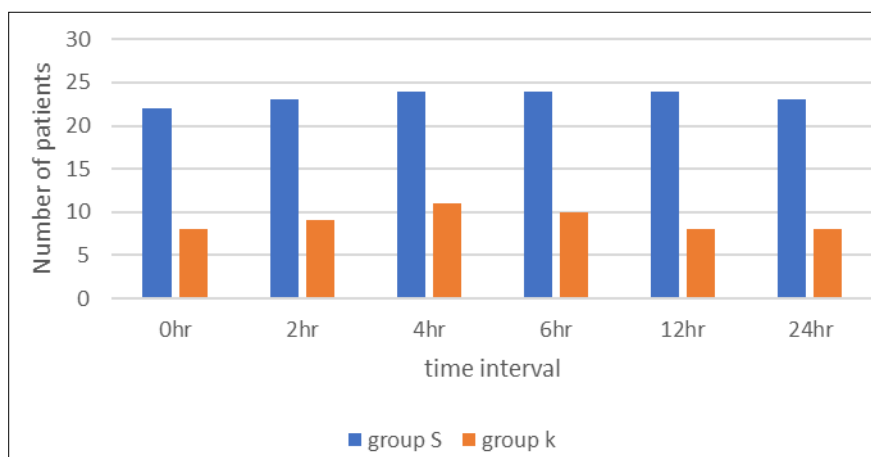


Fig 1: Incidence of post operative sore throat

POST occurred in 23 patients in group S versus 9 patients in group K ($P = 0.004$) at 2 hr, which was significant. 24

patients in group S versus 11 patients in group K ($P = 0.001$) experienced POST at 4 h post-operatively [figure 1].

Severity of post operative sore throat

Patients who experienced POST were compared for severity of POST. POST was significantly attenuated at 2 h in group K compared to group S; 5 patients in group S and none in group K experienced POST score 2. While comparing, a higher incidence of grade 2 (moderate) sore throat was in saline group. In our study, significant attenuation of POST was observed at 2hr in group K compared to group S ($P=0.0064$). [Table 2]

Table 2: Severity of post in patients

Time	Post-score	Group S	Group K	P value
0hr	1	9	3	0.0407
	2	2	0	
2hr	1	9	3	0.0064
	2	5	0	
4hr	1	12	4	0.0037
	2	4	1	
6hr	1	12	4	0.0095
	2	3	0	
12hr	1	11	3	0.0122
	2	2	0	
24hr	1	9	2	0.0076
	2	2	0	

No hemodynamic instability or any adverse reaction like nausea, vomiting, stridor, laryngospasm, cough, hoarseness were noticed during the entire observation in both the groups.

Discussion

POST is a most common complaint after endotracheal intubation, which results in patient discomfort and disappointment with the quality of care. Many trials had been done recently with ketamine, an NMDA-receptor antagonist, in different routes such as gargle, nebulization also as an IV, in reducing POST.

Pre-operative nebulization with ketamine have shown to be effective in reducing incidence of sore throat after extubation. Ketamine is a NMDA receptor antagonist. Its primary site of action in CNS and parts of the limbic system. NMDA receptor have a role in nociception and inflammation. This anti-nociceptive and anti-inflammatory effect may be associated to prevent post-operative sore throat.

The present study is for evaluation of role of ketamine nebulization on incidence and severity of POST. We observed reduction in the incidence and no severity of POST up to 24h in patients receiving ketamine nebulization, following GA with tracheal intubation lasting for up to 1hr. In earlier study overall incidence was 33%, out of this only 20% of the patients in ketamine group had a complaint of POST.

Many studies have been done regarding post operative sore throat. In 2010, Chan *et al.* [1], in his study using ketamine gargle for reducing POST, measured intraoperative serum ketamine levels. They demonstrated low serum levels of ketamine and suggested a topical action of ketamine resulted in the attenuation of POST rather than a systemic effect. However, there are few disadvantages of gargle over nebulization due to its bitter taste, large volume required with risk of aspiration. Hence, the significant reduction in the incidence and severity of postoperative sore throat in our study can be attributed to the topical effect of ketamine

nebulization.

In 2015, a study done by Ahuja *et al* [2], they observed a decrease in the incidence of POST in ketamine group, which was statistically significant only at 2 h and 4 h postoperatively and concluded that ketamine nebulization when given preoperatively lessened the incidence and severity of POST, particularly during the initial hours of postoperative period. However, in the present study, we noticed that the incidence of POST in ketamine group showed a statistically significant decrease at 2, 4, 6, 12, and 24 h, post extubation.

Our inclusion and exclusion criteria were well-defined and experienced anesthesiologists performed tracheal intubation. We used nebulized form of ketamine in this study instead of its other forms such as oral, IV or gargle, mainly due to the fact that, it was safe and more easy to administer to the patient, especially at a time immediately before surgery. For this, we used a wall-mounted oxygen driven nebulization method. In this method, liquid is broken up into droplets by the compressed air. Largest droplets are filtered within the nebulizer, but larger particles (10–25 μm) mostly deposit in mouth and throat and those of 5–10 μm diameter get deposited in a passage from mouth to airway. This settling of aerosol in mouth and upper airway might probably be the reason for the decreased incidence and severity of POST in ketamine group, due to its topical analgesic, anti-inflammatory, and NMDA-receptor antagonistic effect.

Conclusion

Pre-operative use of nebulized ketamine effectively reduced the incidence and severity of POST in patients undergoing GA with endotracheal intubation without any adverse effects.

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