

Effect of Ketamine Nebulization in Reduction of Incidence and Severity of Post-Operative Sore Throat-A Prospective Comparative Study

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Abstract: ***Objective:** The main objective of this study was to evaluate the role of nebulized ketamine for attenuation of Post-operative sore throat (POST) in patients undergoing surgeries under GA with tracheal intubation. **Methods:** After written informed consent, 40 patients of ASA PS I,II scheduled for surgery under general anaesthesia were enrolled in this study. Patients were randomized into two groups; Group saline (S) received saline nebulization 5.0 ml and group ketamine (K) received ketamine 50 mg (1.0 ml) with 4.0 ml of saline nebulization for 15 min. GA was induced 10 min after completion of nebulization. The POST and hemodynamic monitoring were done pre-nebulization, pre-induction, post-extubation, and at 2, 4, 6, 8, 12 and 24 h post-operatively. POST was graded on a four-point scale (0–3). **Results:** The incidence of POST was more in saline group than in ketamine group (9/20 vs 3/20; 45% vs 15%) with $P = 0.04$. The use of ketamine nebulization attenuated POST at 0, 2 h, 4 h, 6h, 8h, 12h, 24h post-operatively ($P < 0.05$). The severity of POST was more at 0, 2, 4, 6, 8 hr after surgery in saline group than ketamine group ($p < 0.05$). **Conclusion:** Ketamine nebulization significantly attenuated the incidence and severity of POST, especially in the early post-operative period, with no adverse effects.*

Keywords: Ketamine nebulisation, Post Operative sore throat

1. Introduction

Post-operative sore throat (POST) occurs in 21–65% of patients receiving general anaesthesia (GA) with tracheal intubation. Though considered as a minor complication, it may cause significant post-operative morbidity and patient dissatisfaction. Various non-pharmacological and pharmacological trials have been used for attenuating POST. The aim of this study was to evaluate the role of nebulized ketamine for attenuation of POST in patients undergoing surgeries under GA with tracheal intubation

2. Materials and Methods

This study was carried out in Kanyakumari government medical college hospital operation theatre in patients undergoing surgeries under GA with tracheal intubation after institutional ethical committee approval. Randomized prospective double blinded comparative study studied for a period of 3 months with 40 patients with ASA physical status I, II patients coming surgeries done under General anaesthesia randomised into two groups group (K, S) - 20 patients each, Group K-ketamine received ketamine 50 mg (1.0 ml) (with 4.0 ml of the saline) nebulisation. and group S - received a saline nebulisation 5.0 ml. Age 18–65 years, Weight 40–100 kg, ASA I, II were included. Patient with H/O pre op sore throat, Oral surgeries, Asthma, COPD, MMS > 2, > 1 attempt at intubation were excluded from the study. Randomization was done using closed envelope technique

After 8 h fast, patients were taken into the operation theatre, where an 18-G IV cannula was secured and monitors (pulse oximeter, NIBP, ECG) applied. Baseline measurements such

as heart rate (HR), non-invasive blood pressure and peripheral oxygen saturation was recorded. Group saline (S) received saline nebulisation 5.0 ml and group ketamine (K) received ketamine 50 mg (1.0 ml) (with 4.0 ml of the saline) nebulisation. (Preservative free Ketamine, Aneket, 50mg/2ml, neon laboratories limited). The patients received the study drug via nebulizer (manufacturer: ReadyMist). GA was induced 10 min after completion of nebulization in the patients. Heart rate (HR), non-invasive blood pressure and peripheral oxygen saturation was recorded preinduction and intraoperatively. GA was induced with glycopyrolate 0.2mg/kg, midazolam 1 mg, fentanyl 2mcg/kg and propofol 2 mg/kg administered IV, and the trachea was intubated with a soft seal cuffed sterile polyvinyl chloride tracheal tube (Sterimed Healthcare Technologies) with an internal diameter of 7–7.5 mm for women and 8–8.5 mm for men after facilitated by atracurium 0.5mg/kg IV for muscle relaxation. Tracheal tube cuff was inflated and pressure was set at 24 cm H₂O using portex cuff inflator/pressure gauge (Smith Medical International Ltd). Anaesthesia was maintained with oxygen, nitrous oxide and 1–1.5% sevoflurane to maintain MAC of 1.0 and graded doses of atracurium. The lungs were ventilated to maintain an end-tidal carbon dioxide of 32–45 mmHg. At the completion of surgery, the oropharynx was gently suctioned, and the sevoflurane was then turned off. The neuromuscular block was reversed with IV neostigmine $\mu\text{g}/\text{kg}$ and glycopyrrolate 10 $\mu\text{g}/\text{kg}$ while awaiting the return of spontaneous ventilation. Trachea was extubated when the patient fully conscious

Sore throat assessment, and haemodynamic recording were done at pre-nebulisation (baseline parameters before

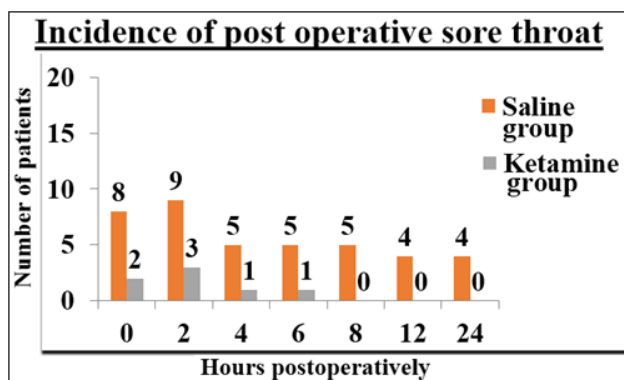
nebulisation of patient), pre-induction (parameters after nebulization and just before induction of GA), immediate recovery (0 h), 2, 4, 6, 8, 12 and 24 h post-operatively.

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)

Hemodynamic parameters-HR,BP,SPO2 recorded pre-nebulisation, pre-induction, immediate recovery (0 h), 2, 4, 6, 8, 12 and 24 h post-operatively.

3. Results

The observations are tabulated and analysed statistically using SPSS statistical package Version 23. The incidence of POST was more in saline group than in ketamine group (9/20 vs 3/20; 45% vs 15%) with $P = 0.04$. The use of ketamine nebulization attenuated POST at 0, 2 h, 4 h, 6h,8h,12h,24h post-operatively ($P < 0.001$). The severity of POST was more at 0,2,4,6,8 hr after surgery in saline group than ketamine group ($p < 0.001$).



Incidence of Post Operative Sore Throat Comparison of Severity of Post between two groups

Hr	Saline Group	Ketamine Group	Post Score	Saline Group	Ketamine Group	P value
0	8	2	1	5	2	<0.0001
			2	3	0	
2	9	3	1	6	3	<0.0001
			2	3	0	
4	5	1	1	2	1	<0.0001
			2	3	0	
6	5	1	1	2	1	<0.0001
			2	3	0	
8	5	0	1	2	0	<0.0001
			2	3	0	
12	4	0	1	3	0	<0.0001
			2	1	0	
24	4	0	1	4	0	<0.0001
			2	0	0	

4. Discussion

The incidence of POST was more in saline group than in ketamine group (9/20 vs 3/20; 45% vs 15%) with $P = 0.04$. The use of ketamine nebulization attenuated POST at 0, 2 h, 4 h, 6h,8h,12h,24h post-operatively ($P < 0.05$). The

severity of POST was more at 0,2,4,6,8 hr after surgery in saline group than ketamine group ($p < 0.05$). Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist and has been used as a gargle for reducing the incidence and severity of POST due to its anti-nociceptive and anti-inflammatory effects. Ketamine nebulization has a few advantages over gargle. It spares the patient from the bitter taste of ketamine, much smaller volume is required as opposed to larger volumes required for gargle with risk of aspiration if accidentally swallowed. The mechanism of topical effect of ketamine nebulization is attenuation of the local inflammation and also due to peripheral analgesic effect of ketamine. The pneumatic nebulisation method produces larger particles (10–25 μm) which mostly deposit in the mouth and throat and for those of 5–10 μm diameter deposit in a transition from mouth to airway. Deposition of aerosol in the mouth and upper airway probably reduced incidence and severity of POST due to topical analgesia, anti-inflammatory effect and NMDA receptor antagonist effect of nebulized ketamine. Other pharmacological agents used earlier, include aspirin gargles, benzydamine hydrochloride (BH) gargles, transdermal ketoprofen, lignocaine 10% spray, IV dexamethasone, beclomethasone gel on tracheal tube and magnesium lozenges. None of the patients in Saline group had any complications in the study window of 24 hours. One patient in Ketamine group had nausea which completely recovered in 12 hours.

5. Conclusion

We conclude that The use of pre-operative ketamine nebulization reduces the incidence and severity of POST during post-operative period in patients receiving GA with tracheal intubation

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