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Efficacy of ketamine soaked laryngeal pack in postoperative sore throat after nasal surgeries

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Background: Post-operative sore throat (POST) occurs in 21-65% of patients which commonly arises after tracheal intubation and throat packing in patients undergoing general anaesthesia. The aim of the study was to see if ketamine soaked laryngeal pack attenuates POST in postoperative period. **Methods:** The present study was conducted as a prospective, randomized, double-blind clinical study. After written informed consent, 80 patients belonging to American Society of Anaesthesiologists physical status I-II in the age group 20-50 years, of either sex undergoing nasal surgery under general anaesthesia were enrolled. Patients were randomized into two groups; control group (C) in which laryngeal packing gauge soaked in 5 ml normal saline and group ketamine (K) in which the laryngeal packing gauge soaked in1 ml of ketamine 50 mg (50mg/ ml) with 4.0 ml of normal saline. Incidence and severity of POST was assessed at 0(on reaching post-anaesthesia care unit), 2, 4, 8, 12 and 24 hours post-operatively and graded on a four-point scale (0-3). **Results:** In present study there was a significant reduction in incidence and attenuation of POST at 0 (on arrival at the post-anaesthetic care unit), 2, 4, 8 hours in postoperative period in ketamine group in comparison to normal saline group. **Conclusion:** Laryngeal pack soaked in 50 mg ketamine is a simple and effective means in reducing the incidence and severity of postoperative sore throat in patients receiving general anesthesia with endotracheal intubation in nasal surgeries.

Keywords: Ketamine, Laryngeal pack, Post-operative sore throat, Tracheal intubation

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Introduction

Postoperative sore throat (POST) is a minor, self limiting, common complaint after tracheal intubation with pharyngeal packing in the patients undergoing general anesthesia with airway instrumentation for various surgical procedures.

Postoperative sore throat was considered as one of the top 10 undesirable complication [1] with an incidence of 21% to 65 % [2-4] and which causes a great deal of patient's annoyance in the postoperative period [5].

POST not only increases the duration of time stays in the post anesthesia care unit, but also increase the need of adjunct pain therapy and cost of care [6].

Numerous instruments are inserted into the airway during surgical or diagnostic procedures, including laryngoscopes, laryngeal mask airways and oral airways, suctioning devices or fiber optic equipment, for visualization of the airway. Irritation and damage to the upper and lower respiratory mucosa due to the introduction of an instrument in the airway can result in postoperative sore throat [7-11].

Pharyngeal packs are commonly used to prevent secretions, blood or other surgical debris from tracking down into the pharynx, esophagus and the lower respiratory tract during oto-rhino laryngeal and dental surgical procedures.

They increase the incidence of postoperative sore throat (POST) but are necessary as surgery in and around the oral cavity necessitate them to soak blood and debris that result as consequence of surgery itself as well as to clear the surgical field [12].

Numerous studies have been carried out to analyze the causes of POST and for its prevention. Various pharmacological and non-pharmacological trials have been used for attenuating POST with having a variable success rate and different limitation.

Ketamine is the most potent of all N-methyl-D-aspartate (NMDA) antagonists and some studies have shown that NMDA receptors are not only found in central nervous system but also in peripheral nervous system and that's why ketamine may contribute to relieve post operative sore throat by its anti-nociception and anti-inflammatory cascade [13].

Therefore, this study was designed to investigate

Materials and Methods

The effects of ketamine soaked laryngeal packing in patients undergoing nasal surgery for attenuating POST.

This was a prospective, randomized, double-blind clinical study conducted at Bundelkhand medical college and associated hospitals, Sagar after approval from the institutional ethical committee.

In this study, inclusion criteria were, American Society of Anaesthesiologists (ASA) Grades I and II, adult patients in the age group of 20 to 50 years of age, of either sex, scheduled for nasal surgery under general anesthesia with endotracheal intubation, having a Mallampatti Grades of I and II and those who were willing to give informed consent.

Patients who underwent nasal surgeries like unilateral or bilateral functional endoscopic sinus surgery, sub mucousal resection, septorhinoplasty, polypectomy were enrolled in this study.

Exclusion criteria included a history of recent respiratory tract infection or sore throat anticipated difficult airway, known allergy to study drug, smokers, and preoperative use of analgesics such as non-steroidal anti-inflammatory drugs or opioids.

Patients who required more than one attempt for tracheal intubation, had a nasogastric tube, or had duration of tracheal intubation of <60 minutes or>300 minutes were eliminated from the study.

Before surgery, the patients were divided randomly into two groups using a computer-generated random number table and the sealed envelope method Ketamine Group (Group-K) - in which laryngeal packing gauge soaked with4 ml normal saline mixed with1ml of 50 mg ketamine.

Control Group (Group-C) - in which the laryngeal packing gauge soaked with 5ml normal saline only. Monitoring in the operating room consisted of three-lead electrocardiography, non-invasive arterial blood pressure, pulse oximetry, and end-tidal CO2.

In both group the induction regimen was standardized for all patients and all were premedicated with injection glycopyrrolate 0.04mg/kg i.v. (intravenous), injection midazolam 0.03mg/kg.intravenously. After 3minutes of preoxygenation with 100% oxygen, general anesthesia induction was accomplished with fentanyl 2 mcg/kg i.v. and propofol (2 mg/kg) i.v.

Followed by intubating dose of injection atracurium 0.5mg/kg.

After adequate muscle relaxation, tracheal intubation was done under direct laryngoscopy with a Macintosh, size 3 number blade, byusing a high volume/low pressure cuff, sterile, portex endotracheal tube (ETT) with an internal diameter of 8.0 or 7.0 mm for male or female patients respectively by experienced anesthesiologist.

After confirmation of endotracheal intubation, the tracheal tube cuff was inflated with room air until no air leakage could be heard at a peak cuff airway pressure of 20 cmH2O. Then, the cuff pressure was checked regularly perioperatively and adjusted to 16-20 cmH2O using a handheld pressure gauge.

In the Patients of ketamine group, laryngeal packing was done with packing soaked in 1ml of 50mg ketamine (50mg/ml) mixed in 4 ml normal saline and Patients in the control group, laryngeal packing was done with packing soaked in5ml saline only.

The study drug was prepared in a syringe labeled with the patient number, but without a drug name, by one anesthesia technician who knew the group allocation.

All anesthetic procedures were performed by experienced anesthesiologists who were blinded to the group allocation. The investigators who collected data and interviewed patients did not perform any of the procedures, and they were blinded to the group allocation. All patients were blinded to the group allocation.

Anesthesia was maintained with 50 % oxygen, 50% nitrous oxide, 1-1.5% MAC of isoflurane and injection atracurium 0.1mg/kg.The end-tidal CO2 was maintained at 35-40 mmHg and no humidifier or heat and moisture exchangers were used in either group.

Injection ondansetron 4mg i.v. was given 15 minutes prior to end of surgery and injection paracetamol 1 gm i.v. every 12 hourly was given for postoperative analgesia in every patient and inj.tramadol 100mg i.v. as rescue analgesic.

After completion of surgery, oropharyngeal secretions were suctioned and laryngeal packing gauge removed under direct vision to avoid trauma and residual neuromuscular blockade was reversed with injection glycopyrrolate 10 μ g/kg mixed with injection neostigmine 50 μg/kg i.v., after return of spontaneous respiratory efforts and extubation done After they accomplished the criteria for adequate reversal. Duration of surgery noted in both the groups.

Postoperatively patients were asked about the intensity of sore throat by blind observer, sore throat was assessed at 0 (on reaching post-anaesthesia care unit), 2,4,8,12, 24 hours postoperatively and graded on four points (0-3 scale) [14].

No sore throat: 0

Mild sore throat (complains of sore throat only on asking): 1

Moderate sore throat (complains of sore throat on his/her own): 2

Severe sore throat (associate with hoarseness of voice and pain in throat): 3

All the data were collected in customized proforma. The online statistical software was used for statistical analysis data.

Mean comparisons between the two groups were done by using unpaired 't' test.

The p-value of <0.05 was taken as statistically significant.

Results

Total 80 patients were enrolled and completed the study. Patients were randomized into two groups of 40 each patient. Both groups were comparable in terms of demographic data.

There were no significant differences between the two groups regarding age, body weight, duration of laryngoscopy, intubation and in duration of surgeries. (TableNo.-1)

Table No.-1: Demographic data, duration of laryngoscopy and surgery in both groups

Variables	Group- C Mean± SD (n=40)	Group- K Mean± SD (n=40)	p-value
Age (years)	42.5+13.3	40.4=+9.2	0.4140
Body Weight (kg)	68.3+11.5	69.2+15.4	0.7679
Duration of laryngoscopy and intubations (seconds)	12.02+1.60	11.54±1.90	0.2253
Duration of surgery (minutes)	118.6+4.56	122.2+21.59	0.3053

Table No.-2: Incidences of POST in Patients at 0, 2,4,8,12,24 hours postoperatively in control (C) group and ketamine group (K). Total forty patient in each group (n=40).

Time	0 hours		2 hours		4 hours		8hours		12 hours		24 hours	
Group	C	K	C	K	C	K	C	K	C	K	C	K
NO sore throat	6(15%)	19(47.5%)	6(15%)	21(52.5%)	5(12.5%)	22(55%)	13(32.5%)	27(67.5%)	30(75%)	33(82.5%)	33(82.5%)	35(87.5%)
Mild sore throat	22 (55%)	16 (40%)	24 (60%)	17 (42.5%)	21 (52.5%)	14 (35%)	15 (37.5%)	11 (27.5%)	8 (20%)	7 (17.5%)	6 (15%)	5 (12.5%)
Moderate sore throat	9 (22.5%)	5 (12.5%)	6 (15%)	2 (5%)	8 (20%)	3 (7.5%)	8 (20%)	2 (5%)	1 (2.5%)	0	1 (2.5%)	0
Severe sore throat	3 (7.5%)	0	4 (10%)	0	6 (15%)	1 (2.5%)	4 (10%)	0	1 (2.5%)	0	0	0
Total sore throat	34 (85%)	21 (52.5%)	34(85%)	19(47.5%)	35(87.5%)	18(45%)	27(67.5%)	13(32.5%)	10(25%)	7(17.5%)	7(25%)	5(12.5%)

The incidence of POST at 0, 2, 4, 8, 12 hours after surgery was 85%, 85%, 87.5%, 67.5%, 25% in the control group and 52.5%, 47.5%, 45%, 32.5%, 17.5% in the ketamine group respectively.

The incidence of POST was higher in control group as compared to ketamine group at 0, 2, 4 and 8 hours of post extubation period. It was also observed that there was statistically significant lesser incidences of moderate to severe POST in the group ketamine at 0,2,4, 8 hours in the postoperative period as compared to the control group (Table No.-2).

Table No.-3: Severity of postoperative sore throat at 0, 2, 4, 8, 12 and 24 hours postoperatively in both the groups

Time	Group C (n=40)	Group K (n=40)	t-value, df	p-value
0 hours	1.22±0.80	0.625±0.66	3.6285,df=78	0.0005
2hours	1.20±0.82	0.525± 0.59	4.2260,df=78	0.0001
4 hours	1.37±0.89	0.575±0.747	4.3273,df=78	0.0001
8 hours	1.07±0.97	0.375±0.585	3.8804,df=78	0.0002
12hours	0.325±0.65	0.175±0.384	1.2566,df=78	0.2126
24 hours	0.2±0.46	0.125±0.334	0.8344,df=78	0.4066

Unpaired 't' test applied. P-value <0.05 was taken as statistically significant.

Highly statistically significant attenuation of postoperative sore throat was observed in ketamine group when compared to control group at 0, 2, 4 and 8 hours post-operatively (Table No.-3). Both groups were comparable at 12 and 24 hours of post-extubation and severity of POST was statistically insignificant.

Discussion

In present study, it was observed that the incidence and severity of POST were reduced in patients with Ketamine soaked laryngeal packing as compared with normal saline soaked laryngeal packs in patients planned for various nasal surgeries under general anesthesia with endotracheal intubation for Up to 8 hours in the recovery period.

The incidence of POST at 0, 2, 4, 8, 12 hours after surgery was 85%, 85%, 87.5%, 67.5%, 25% in the control group and 52.5%, 47.5%, 45%, 32.5%, 20% in the ketamine group respectively.

Similarly, Canbay et al [14]who found the incidence of POST to be 74%, 74%, 56.5%, and 60.8% compared to 35%, 40%, 40%, and 30% at 0 h, 2 h, 4 h, and 24 h for normal saline (NS) and Ketamine (K)group respectively and found ketamine gargle might be effective in reducing the incidence and severity of POST due to its anti-inflammatory effects in patients undergoing septorhinoplasty operation under general anesthesia with endotracheal intubation.

However, because Canbay et al. did not measure plasma ketamine levels, they could not rule out a systemic effect of ketamine. Studies on nasal, oral, and rectal administration of ketamine also suggest that local use of this drug is both effective and conceivable [15-17].

Rudra et al. [18] also found that the incidence of POST at 4 h, 8 h, and 24 h to be 85%, 75%, and 60% compared to 40%, 35%, and 25% for NS and K group respectively.Some contributing factors for sore throat after surgery has been reported, including patient sex, age, use of succinylcholine, large tracheal tube, cuff design, and intra-cuff pressure [6].

In the present study both age and gender weight were comparable and not statistically significant but, in some studies, younger age group [6] and female patients were more prone for POST due to hormonal changes [6, 19, 20].

A few studies reported that incidence of POST increases after 60 minutes duration of surgery [8]. In the present study, the duration of surgery and laryngoscopy was comparable in both groups.

All the patients were intubated by experienced

Anesthesiologist with ETT size of 7.0 mm internal diameter in female and 8.0mm internal diameter in male patients with ETT cuff pressure maintained to -20 cm of H20. Several studies had concluded that incidence of POST increased when intubation was done by inexperienced anesthesiologist due to increases chances of mucosal injuries.

Small sized ETT and cuff pressure are important factor in decreasing the incidence of postoperative sore throat and hoarseness as high pressure decreases tracheal mucosal blood circulation [21]. In a study by Higgins et al found that incidence of POST increases with use of succinylcholine [6].

In present study, it was observed that there was a statistically significant reduction in incidence and attenuation of POST at 0hr (on arrival at the post-anaesthetic care unit), 2, 4, 8 hours in postoperative period in ketamine group with comparison to normal saline group.

Postextubation, there was significantly less moderate-to-severe POST in Group K at 0,2,4,8 hours. At 0 hour, 34 patients experienced sore throat in control group in which 3 patients had severe sore throat while in ketamine group, 21 patients had POST which was mild to moderate in grade.

At 4 hours, 35 patients had POST in control group as compare to 18 patients in ketamine group which was statistically significant.

After 8 hour in postoperative period, 8patients had moderate grade and 4 patients had severe POST in control group as compare to ketamine group in which only 2 patients had moderate grade sore throat.

At 12 and 24 hours, incidence and severity of POST was comparable and statistically insignificant in both groups. The attenuation of severity of POST occurred in ketamine group is possibly due its peripheral analgesic effect of ketamine which attenuated the local infla-mmation. NMDA receptors are present in the central nervous system and in the peripheral nerves.

Ketamine, an NMDA receptor antagonist, is involved in pain pathway and anti-inflammatory cascade [22-26]. In a recent animal study for asthma, Zhu et al [27] have indicated that nebulized K attenuated many of the central components of inflammatory changes.

In the present study, experienced anaesthesiologist Did tracheal suctioning under direct vision with the help of laryngoscope and with precaution to avoid any trauma to the pharyngeal mucosa with the suction catheter.

In the present study, no use of any jelly or spray for lubrication of tracheal tube or local anesthesia for intubation was done. In the study by Hung et al [28]. POST was reduced by spraying the endotracheal tube cuff with benzydamine hydrochloride, 10% lidocaine, and 2% lidocaine or NS. Loeser [4] et al suggested that increased pressure in endotracheal tube could be major cause of POST due to tracheal mucosal damage secondary to cuff-trachea contact. In the present study, the cuff pressure perioperatively was closely observed.

A limitation of the present study was the absence of the measurements of plasma ketamine levels and hence we cannot rule out the contribution of the systemic effect of ketamine in our results.

Conclusion

From the present study we concluded that the laryngeal pack soaked in 50 mg ketamine is a simple and effective means in reducing the incidence and severity of postoperative sore throat in patients receiving general anesthesia with endotracheal intubation in nasal surgeries.

What this study adds to existing Knowledge?

We should endorse the use of ketamine soaked laryngeal packing, along with other non-pharma-cological and pharmacological measures to prevent postoperative sore throat and to improve post-anaesthesia care.

Author's contribution

Dr. S. Uike: Conceptualized the study, prepared protocols and conducted data collection, literature search, finalization of the manuscript.

Dr. M. Ilyas: Involved in data compilation and analysis, interpretation and drafting the manuscript.

Dr. A. Uike: Data collection and analysis the data and made correspondence for additional inputs in this study.

Dr. S. Jain: Guided in the study design and in editing with revising the manuscript for intellectual relevance.

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Reference

01. Macario A, Weinger M, Carney S, Kim A. Which clinical anesthesia outcomes are important to avoid?- The perspective of patients. Anesth Analg. 1999; 89(3)652-658.
doi: 10.1213/00000539-199909000-00022 [Crossref]

02. McHardy FE, Chung F. Postoperative sore throat-cause, prevention and treatment. Anaesthesia. 1999;54(5)444–453.
doi: 10.1046/j.1365-2044.1999.00780.x [Crossref]

03. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. Br J Anaesth. 1994;73(6)786–787.
doi: 10.1093/bja/73.6.786 [Crossref]

04. Loeser EA, Bennett GM, Orr DL, Stanley TH. Reduction of postoperative sore throat with new endotracheal tube cuffs. Anesthesiol. 1980; 52(3)257-259.
doi: 10.1097/00000542-198003000-00011 [Crossref]

05. Mayhood, Jillian, Cress Kayla. Effectiveness of ketamine gargle in reducing the incidence of postoperative sore throat in patients undergoing airway instrumentation- a systematic review protocol. JBI Database of Systematic Reviews and Implementation Reports. 2014;12(7)82-88.
doi: 10.11124/jbisrir-2014-1652 [Crossref]

06. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth. 2002;88(4)582-584.
doi: 10.1093/bja/88.4.582 [Crossref]

07. Chizh BA. Low dose ketamine- a therapeutic and research tool to explore N-methyl-D-aspartate (NMDA) receptor-mediated plasticity in pain pathways. J Psy pharmacol. 2007;21(3)259–71.
doi:10.1177/026 9881105062484 [Crossref]

08. Biro P, Seifert B, Pasch T. Complaints of sore throat after tracheal intubation- a prospective evaluation. Eur J Anaesthesiol. 2005;22(4)307-311.
[Article] [Crossref]

09. Lehmann M, Monte K, Barach P, Kindler C H. Postoperative patient complaints- a prospective interview study of 12,276 patients. J Clin Anesth. 2010;22(1)13-21.
doi: 10.1016/j.jclinane.2009.02.015 [Crossref]

10. Caljouw MA, van Beuzekom M, Boer F. Patient's satisfaction with perioperative care-development, validation, and application of a questionnaire. BJA. 2008;100(5)637-644.
doi: 10.1093/bja/aen034 [Crossref]

11. Scuderi PE. Postoperative sore throat- more answers than questions. Anesth Analg. 2010;111(4)831-832.
doi: 10.1213/ANE.0b013e3181ee85c7 [Crossref]

12. Colbert S, Jackson M, Turner M, Brennan PA. Reducing the risk of retained throat packs after surgery. Brit J Oral Maxillofac Surg. 2012;50(7)680-681.
doi: 10.1016/j.bjoms.2012.01.012 [Crossref]

13. Carlton SM, Coggeshall RE. Inflammation-ind uced changes in peripheral glutamate receptor population. Brain Res. 1999;820(1-2)63-70.
doi: 10.1016/s0006-8993(98)01328-6 [Crossref]

14. Canbay O, Celebi N, Sahin A, Celiker V, Ozgen S, Aypar U. Ketamine gargle for attenuating postoperative sore throat. Br J Anaesth. 2008;100(4)490–493.
doi: [Article] [Crossref]

15. Lauretti GR, Lima IC, Reis MP, Prado WA, Pereira NL. Oral ketamine and transdermal nitroglycerin as analgesic adjuvants to oral morphine therapy for cancer pain management. Anesthesiol. 1999;90(6)1528-1533.
doi: [Article] [Crossref]

16. Weber F, Wulf H, Saeidi G. Premedication with nasal s-ketamine and midazolam provides good conditions for induction of anesthesia in preschool children. Can J Anaesth. 2003;50(5)470-475.
doi: [Article] [Crossref]

17. Malinovsky JM, Servin F, Cozian A, Lepage JY, Pinaud M. Ketamine and nor ketamine plasma concentrations after iv, nasal and rectal administration in children. Br J Anaesth. 1996; 77(2)203-207.
doi: [Article] [Crossref]

18. Rudra A, Ray S, Chatterjee S, Ahmed A, Ghosh S. Gargling with ketamine attenuates the postoperative sore throat. Indian J Anaesth. 2009;53(1)40-43.
[Crossref]

19. Kamble N P, Gajbhare M N. Efficacy of ketamine gargles in the prevalence of postoperative sore throat after endotracheal intubation. Indian J Clinic Anaesthes. 2015;2(4)251-255.
doi: 10.5958/2394-4994.2015.00039.6 [Crossref]

20. Ahmed A, Abbasi S, Ghafoor HB, Ishaq M. Post-operative sore throat after elective surgical procedures. J Ayub Med Coll Abbottabad. 2007;19(2)12-14.
[Crossref]

21. Ratnaraj J, Todorov A, McHugh T, Cheng MA, Lauryssen C. Effects of decreasing endotracheal tube cuff pressures during neck retraction for anterior cervical spine surgery. J Neurosurg. 2002;97(2 Suppl)176-179.
[Crossref]

22. Stenqvist O, Nilsson K. Postoperative sore throat related to tracheal tube cuff design. Can Anaesth Soc J. 1982;29(4)384-386.
doi: 03007531 [Article] [Crossref]

23. Kalil DM, Silvestro LS, Austin PN. Novel pre-operative pharmacologic methods of preventing postoperative sore throat due to tracheal intubation. AANA J. 2014;82(3)188-197.
[Crossref]

24. Ayoub CM, Ghobashy A, Koch ME, McGrimley L, Pascale V, Qadir S, et al. Widespread application of topical steroids to decrease sore throat, hoarseness, and cough after tracheal intubation. Anesth Analg. 1998;87(3)714-716.
doi:10.1097/00000539-199809000-00042 [Crossref]

25. El Hakim M. Beclomethasone prevents post-operative sore throat. Acta Anaesthesiol Scand. 1993;37(3)250-252.
doi: 10.1111/j.1399-6576.1993.tb03709.x [Crossref]

26. Zhao X, Cao X, Li Q. Dexamethasone for the prevention of postoperative sore throat: a systematic review and meta-analysis. J Clin Anesth. 2015;27(1)45-50.
doi: 10.1016/j.jclinane.2014.06.014 [Crossref]

27. Zhu MM, Zhou QH, Zhu MH, Rong HB, Xu YM, Qian YN et al. Effects of nebulized ketamine on allergen-induced airway hyper responsiveness and inflammation in actively sensitized Brown-Norway rats. J Inflamm (Lond). 2007;4(1)10.
doi: 10. 1186/1476-9255-4-10 [Crossref]

28. Hung NK, Wu CT, Chan SM, Lu CH, Huang YS, Yeh CC, et al. Effect on postoperative sore throat of spraying the endotracheal tube cuff with benzydamine hydrochloride, 10% lidocaine, and 2% lidocaine. Anesth Analg. 2010;111(4)882-886.
doi: 10.1213/ANE.0b013e3181d4854e [Crossref]