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Dexmedetomidine versus Ketamine Nebulization in Attenuation of Sore Throat after Long Operations

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Abstract

To investigate the efficacy of dexmedetomidine and ketamine nebulization previous to tracheal intubation; to evaluate its pain-relieving effects on decrease and prevention of postoperative sore throat (POST) in patients after long operations. This study enrolled in sixty patients their age 20 to 65 years with ASA 1or 2, were planned for elective operation with GA, they were assigned randomly to three groups, group D patients (dexmetomidine group) took dexmetomidine 50 µg plus 4 ml of normal saline for nebulization, K Patients (ketamine group) took ketamine (preservative-free) 50 mg plus 4 ml of normal saline for nebulization. C Patients (control group) took normal saline (total volume of 5 ml) for nebulization, fifteen minutes before GA, the primary outcome was severity and onset of sore throat and scaled by four-point scale and secondary outcome was hemodynamic stability and if any side effects of the used drugs. we found the incidence of POST was 17% whose was experienced by 4(20%), 3(15%) in ketamine and dexmedetomidine group respectively. There was not statistical important change in the prevalence of POST among the both groups at time intervals of 2, 4, 6, 12, and 24 hours postoperative. At all-time intervals, the intensity of sore throat was notably decreased in both group. In the ketamine group, there was a statistical significant rise in systolic, diastolic, and heart rate. There were no adverse effects identified following nebulization. our study revealed that dexmedetomidine nebulization is efficient as ketamine nebulization in reducing POST with less hemodynamic disruption. As a result, nebulized dexmedetomidine may be a suitable substitute to nebulized ketamine to lower POST.

Keywords: Dexmetomidine, Hemodynamics, Nebulization, POST, Ketamine.

1. Introduction

Endotracheal tube (ETT) may cause irritation and agony. This Irritation from tube cuff pressure stimulates secretions of airway, aggravates coughing, and causes greater discomfort[1] .

Postoperative sore throat (POST) follow general anesthesia (GA) with an ETT is an unfavorable result, with prevalence fluctuated from 20% to 65%. Even though the symptoms improve naturally without

therapy, preventive intervention to reduce their frequency and intensity is nevertheless indicated to improve post-anesthesia care quality[2]. Extubation during deep anesthesia, intravenous lidocaine and administration of intravenous short-acting opioids have all been tried to reduce this response. Each of these strategies has its own set of restrictions[3] . Various pharmaceutical experiments have been utilized to reduce POST, but no single modality has been proven as using of beclomethasone emollient, rinsing with azulene sulfonate, clonidine, licorice, Dexmedetomidine and ketamine.

Ketamine is NMDA receptor antagonist and has been used as a gargle or nebulization to decrease the severity and frequency of POST due to anti-inflammatory effects, to avoid aspiration complication result from gargle form; nebulized form is used in a fixed dose of 50 mg plus 4 ml normal saline [4] . While Dexmedetomidine is α 2 agonistic action causes sedation and painkilling effect, It has already been used in a nebulized form by transmucosal injection, and it is highly fat permeable with good absorption [5]. Our main objective was to appraise the role of nebulized dexmetomidine versus ketamine for decreasing the POST in patients go through operations per GA with endtracheal intubation.

2. Patients and Methods

This randomized controlled study was agreed by the ethical board of Al-Azhar Faculty of Medicine, Al-zahraa University Hospital at Anesthesia department. Conducted on 60 patients undergo long operations aged 21-65 years. Printed informed consent was gained from all study candidates.

2.1 Inclusion criteria

1. Group Aged from 21-60 years of males and females.
2. Anesthesiologists' Society of America physical status (PS) I and II.
3. Patients were arranged for optional invasive surgical procedures in the supine position under general anesthesia with endotracheal intubation.

2.2 Exclusion criteria

1. Participants have a recent sore throat.
2. Participant using steroids or NSAID.
3. Use of succinylcholine.
4. History of allergy to Ketamine and Dexmedetomidine.
5. The anticipated and the unanticipated difficult airway.
6. Undergoing head and neck procedures.
7. Sheared airway surgery.
8. Any surgery requires an abnormal position.
9. Traumatic suctioning in form of blood in the oropharynx OR the catheter.
10. High risk surgeries or patients who developed any operative complication as disturbed conscious level (DCL) need mechanical ventilation.
11. Pregnant women.

2.3 Group allocation

Patients were allocated random into three groups each group consist of 20 patients:

- Group 1 (n=20); (D group): patients received preoperative dexmedetomidine 50µg (0.5mL) with saline (4.5mL) nebulization 15 minutes before operation.
- Group 2 (n=20); (K group): patients received preoperative ketamine 50mg (1mL) with saline (4mL) nebulization 15 minutes before operation.
- Group 3 (n=20); (C group): control group patients received preoperative saline 0.9% (5 mL) nebulization 15 minutes before operation.

2.4 Drugs used in the study:

- Dexametomidine hydrochloride (DEXTOMID 100 microgram (1ml) & 200 microgram (2ml), ampoule, Neon–India) ampoule.
- Ketamine Vial.

2.4.1 Technique

2.4.1.1 Preoperative

The medications were made up to 5ml volume with sterile saline and the medications was distributed by a nebulization mask for 15 min, with the fixed oxygen driven source (8L, 50psi). During nebulization, patients were inclined at 45 degree and encouraged to simultaneously breathe through the mouth and nose

2.4.1.2 Intraoperative.

General Anesthesia was started 15 minutes after the final nebulization with IV fentanyl 1 g/kg and IV propofol 2 mg/kg. Cis-tracurium 0.5 mg/kg IV was given to ensure little trauma. Three minutes after the cis-tracurium was administered, a smooth laryngoscopy was performed by a professional anesthesiologist, lasting less than 60 seconds and utilizing a blade size 3 to 4. Tracheal intubation was performed using a single lumen with an inner diameter of 7-7.5mm and an outer diameter of 9.3-10 mm in females and 8-8.5mm and an outer diameter of 10.7-11.3 mm in males. Then, the handcuff of endotracheal tube was overstated with room air until no appreciable air leak was discovered. Anesthesia was kept at 75% oxygen and 30% air and isoflurane (1-1.2 MAC). During surgery, 1g IV paracetamol was delivered; no opioids were recommended. If opioids were required during surgery and/or in the recovery room, and the hemodynamics (HR and BP) were elevated by one-third above the baseline, the prescription values were recorded.

2.4.1.3 Postoperative

After the surgery, the oropharynx was smoothly suctioned under visualization using a suction tube with antagonism of the neuromuscular blocker by neostigmine 50 µg/kg IV and atropine 0.01 mg/kg IV. After fulfillment of extubation measures, the patient was extubated.

Four-point scale (0-3):

- 0 intended to absence of sore throat.
- 1 intended to mild sore throat.
- 2 intended to moderate sore throat.
- 3intended to severe sore throat.
  - If the four-point scale was 2 to 3, IV diclofenac 1.5 mg/kg.
  - Afterward 12 hours, if patients continued to complain of moderate or severe POST, they would be given a warm saline rinse as well as decongestants.
  - If the manifestations still persist, an otorhinolaryngology referral would be warranted.

2.5 Statistical analysis

The sample size was calculated using the mean SPO2 of the Dexmedetomidine and Ketamine groups from prior research 5. Using G*power version 3.0.10 to determine sample size, the overall estimated sample size will be 24 based on an effect size of 1.22, a 2-tailed test, an error of 0.05, and a power of 80.0% (12 in each group).

3. Results

As shown in table 1 and fig 1 we conducted this study on sixty participants with the age ranging from 20 to 65 years with ASA 1or2, scheduled for elective operation under GA , they were assigned randomly to three groups, group D (dexmetomidine group) Patients received dexmetomidine 50 µg plus 4.5 ml of normal saline for nebulization, K (ketamine group) Patients took ketamine 50 mg plus 4 ml of normal saline for nebulization. C (control group) Patients took normal saline for nebulization, fifteen minutes before GA.

As shown in table 2 this revealed a statistically important rise in the frequency of sore throats in group C at 2hr, 6hr, and 12hr post-operative time frames compared to groups D and K, but no statistically significant change in the frequency of sore throat in group K in comparison to D group at 2hr, 6hr, 12hr, and 24hr post-operatively. As shown in Table .3, this revealed a statistical increase in the degree of severity of sore throat in group C at 2hr, 4hr, 6hr, and 12hr postoperatively time intervals when compared to the other studied groups. However, there was no statistically significant difference in the severity of sore throat between group D and group K at 2hr, 4hr, 6hr, 12hr, and 24hr postoperatively. This table shows no statistically significant change between the 3 studied groups.

Table 1: demographic data between different groups

	Group(D) n=20	Group (K) n=20	Group (C) n=20	Test of significance
Age (years) Mean ± SD	34.30±10.04	31.70±10.98	30.50±9.73	F=0.716 P=0.493
Sex N (%) Male Female	16(80) 4(20)	12(60) 8(40)	11(55) 9(45)	χ^2=3.08 P=0.215
Weight(kg)	74.71±7.69	76.13±7.17	75.29±7.2	F=0.225 P=0.799
Height(cm)	170.71±3.46	172.42±3.57	171.17±2.32	F=0.342 P=0.712
BMI (kg/m^2)	24.6±1.22	24.68±1.44	24.51±1.47	F=0.087 P=0.917
ASA N (%) 1 2	13(65.0) 7(35.0)	16(80) 4(20)	13(65.0) 7(35.0)	χ^2=1.43 P=0.490
Duration of surgery(minute)	95.88±14.14	88.83±16.74	85.04±15.25	F=0.84 P=0.44
Types of operation				MC=16.20 P=0.439
Reconstruction	2(10)	1(5.0)	0	
Paraumbilical hernia	0	0	1(5.0)	
Otoplasty	0	1(5.0)	1(5.0)	
ORIF	9(45)	6(30)	5(25.0)	
Lap cholecystectomy	0	3(15)	1(5.0)	
Graft	0	2(10)	3(15)	
Breast reduction	6(30)	5(25)	3(15)	
Breast augmentation	1(5.0)	1(5.0)	3(15)	
Abdominoplasty	2(10.0)	1(5.0)	3(15)	

F: One Way ANOVA test, χ^2: Chi-Square test.
No statistical important change among studied clusters rendering to their demographic data.

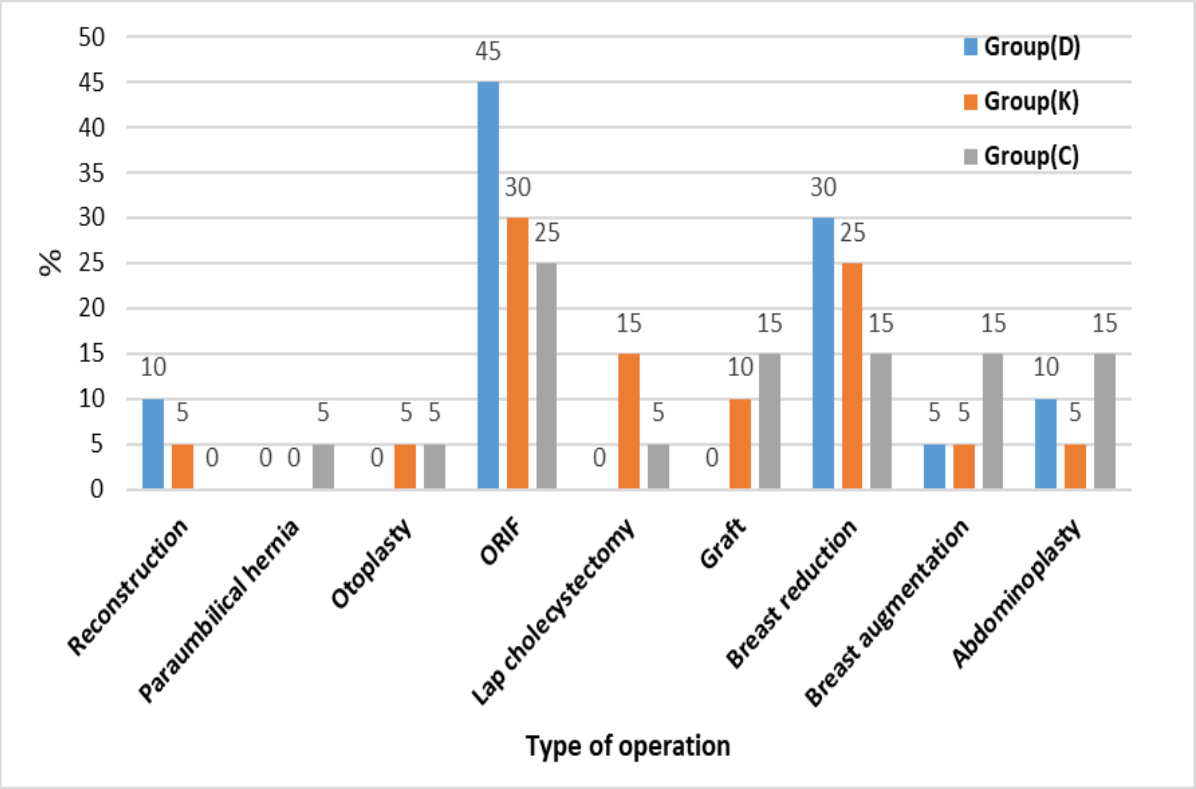

Figure 1: Type of operation distribution among 3 studied groups.

Table 2: Comparison of the frequency of postoperative sore throat among the 3 studied groups

Time	Group(D) n=20	Group (K) n=20	Group (C) n=20	Test of significance	within group significance
2 hours	3(15.0)	4(20)	16(80)	MC=22.14 P<0.001*	p1=1.0 p2<0.001* p3<0.001*
4 hours	9(45)	6(30)	15(75)	MC=8.4 p=0.015*	p1=0.327 p2=0.053 p3=0.004*
6 hours	1(5.0)	0	14(70)	MC=32.53 P<0.001*	p1=1.0 p2<0.001* p3<0.001*
12 hours	0	0	7(35.0)	MC=15.85 P<0.001*	p1=…. p2=0.004* p3=0.004*
24 hours	0	0	0		

Table 3: Comparison of mean four-point sore throat severity score change between the 3 studied groups

Four-point sore throat score	Group(D) n=20	Group (K) n=20	Group (C) n=20	Test of significance	Within group significance
2 hours 0 1 2	 17(85.0) 3(15.0) 0	 16(80) 4(20) 0	 4(20) 12(60) 4(20)	 MC=24.17 P<0.001*	 P1=1.0 P2=0.001* P3=0.001*
4 hours 0 1 2 3	 11(55.0) 9(45.0) 0 0	 14(70) 6(30) 0 0	 5(25) 5(25) 9(45) 1(5.0)	 MC=25.50 P<0.001*	 p1=0.327 p2=0.004* p3=0.002*
6 hours 0 1 2	 19(95) 1(5) 0	 20(100) 0 0	 6(30) 10(50) 4(20)	 MC=32.67 P<0.001*	 p1=0.311 p2<0.001* p3<0.001*
12 hours 0 1	 20(100) 0	 20(100) 0	 13(65.0) 7(35.0)	 MC=15.85 P<0.001*	 p1=1.0 p2<0.001* p3<0.001*
24 hours 0	 20 (100)	 20 (100)	 20 (100)		

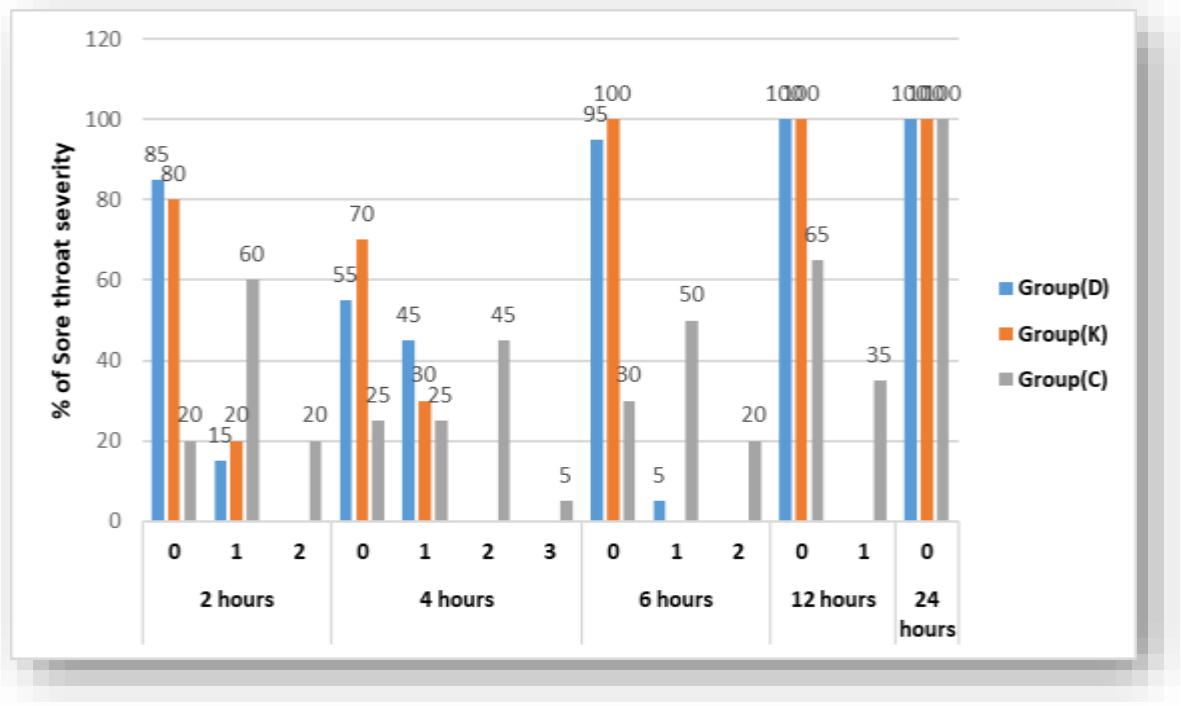

Figure 2: Comparison of mean four-point sore throat severity score change between the 3 studied groups.

Table 3 :Adverse effects distribution among the differant studied groups.

Adverse effect	Group(D) n=20	Group (K) n=20	Group (C) n=20
No	20(100)	20(100)	20(100)

4. Discussion

Postoperative sore throat (POST) after general anesthesia with an endotracheal tube is an unfavorable consequence per prevalence fluctuating from 20% to 65%. Even though the condition improves completely with no therapy, preventive intervention to reduce their frequency and intensity is nevertheless indicated to improve post-anesthesia care quality [2]. POST uttermost two to four hours after extubation and declines over the next 24 hours 6. Different approaches were used to decrease POST, including pharmacological approaches as ketamine 3. Nebulization is an effective method of medication delivery because of its simplicity of administration, ability to access distal airways [7]. Therefore, Dexmedetomidine nebulized has been demonstrated to have fast absorption through respiratory mucosa, with up to 65% solubility through nasopharynx and 82% solubility through buccal mucosa. Inhaled dexmetomidine transports the medicine to the action site with systemic effect 8. Also was highly effective in reducing sore throat [3]. Subsequently ketamine rinse and nebulizer were explored in decreasing intensity and incidence of Sore Throat (ST). Uptake of ketamine through nebulized route is faster as most of the drug is absorbed directly by the alveoli into the circulation [8].

We conducted this study on sixty patients with the age range from 21to 65 years with ASA 1or2, were scheduled for elective operation under GA, and with greater than 1 h were recruited. This surgical duration was chosen to guarantee that the patient was intubated for a long enough period of time to elicit irritation of the oropharyngeal mucosa. There were random allocated to three groups, group D (dexmetomidine group), K (ketamine group), C (control group) Patients.

As regard Hemodynamic data, in the current study, hemodynamic data was recorded and there was statistically significant increase in group K compared with Groups D and C and significant decrease in group D compared with Groups C in the SBP, DBP, MAP at the mentioned time points (post nebulization, 5min, 30min, 60min, 90min, 120min and 180min) and HR at the mentioned time points (post nebulization, 5min, 30min at 60min) between the three groups at all-time points except postoperative this in agreement with, Thomas et al. (2020), who compare the effect of nebulized dexmedetomidine versus ketamine on postoperative sore throat, the results revealed that Following nebulization with ketamine, there was an increase in pulse rate, systolic and diastolic pressure that seems to be statistically significant compared to dexmedetomidine group [5].

Regarding the Incidence of POST, our study revealed that there was statistical significant decrease in the frequency of sore throat in the dexmedetomidine group (15%) and ketamine group (20%) compared to control group (80%) at all-time point. When comparing dexmedetomidine group and ketamine group, there was no significant decrease in the frequency of sore throat in dexmedtomidine in comparison to ketamine group. (P=0.001).this in agreement with the result of our study, study done by Thomas et al. (2020), who intended to relate the outcome of nebulized dexmedetomidine versus ketamine on postoperative sore throat, The findings demonstrated that there wasn't a statistical significance in the incidence of POST among different groups at 2,4,6,12, and 24 hours postoperative, in the study was 17% with the overall frequency of POST; seven patients in the ketamine group and ten patients in the dexmedetomidine group (P = 0.424) from 50 patient in each group [5].

Another study was done by Dehkordy et al. (2020), There was no significant change between the both groups when comparing the consequence of dexmedetomidine versus ketamine as a pre-operation rinse on the frequency and extent of post-operation sore throat in acute invasive operations

(p=0.344) in the K group and in the D group, (p= 0.150). The mean severity of the postoperative sore throat score was 2.1 3. A similar study was done by Bhatta et al. (2020), who assessed sore throat in postoperative care unit, 0hr and then in the ward every 2 hrs for 8 hrs, then every 24 hrs. At 0hr many patients in saline group suffered from sore throat but only a few patients in ketamine group suffered from sore throat. The incidence increased with time the peak was at 4 hr. in saline group and 6 hr. in ketamine group. At 24 hour, patients in saline group continue to have sore throat but in ketamine group only few patient complains from sore throat [9].

Regarding the severity of POST, our study revealed that number of patients and percentage according to severity of POST using four grading scale- showing statistically difference between the studied groups at 2hr, 4hr, 6hr, 12hr, and 24hours postoperatively. There was noteworthy increase in the severity of POST between control group and both dexmedetomidine and ketamine groups at time interval 2hr, 4hr, 6hr, 12hr and 24 hours postoperatively. While the severity of sore throat was not significant difference between dexmedetomidine group compared to ketamine groups at 2hr, 4hr, 6hr, 12hr and 24hours postoperatively with no patient experienced severe sore throat (POST Score 3) in both groups.

In total agreement with these results the paper done by Thomas et al. (2020) reported that the degree of intensity of the sore throat was greatly reduced in dexmedetomidine, and ketamine groups compared to control group, with no statistically significant difference for sore throat severity between two groups at through-time intervals[5].

Also, Dehkordy et al. (2020), reported that the intensity of the sore throat was greatly reduced in dexmedetomidine and ketamine group with no statistical significant change for sore throat severity between both groups at different time intervals[3]. On the other hand, other studies done by Kumari et al. (2019), reported that when comparing for the severity of POST between the dexamethasone and ketamine groups using a 4-point scale. POST was significantly abated in dexamethasone group at 2hr, 4hr, 6hr, and 12hr postoperative when paralleled to ketamine group. At 24hr post-extubation there was insignificant difference in the severity of POST [10].

This in alien with the study of Ahuja et al. (2015). POST was significantly decreased at 2hr in ketamine group in comparison to saline group [11].

Conclusion

Our research showed that dexmedetomidine nebulization stays efficient as ketamine nebulization in reducing POST with less hemodynamic disruption. As a result, nebulized dexmedetomidine may be a suitable substitute to nebulized ketamine to lower POST.

Conflict of interest

no conflicts of interest.

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Nil

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