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Original Research Article

Comparative study between ketamine versus betamethasone gargles in attenuating post-operative sore throat after endotracheal intubation

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ABSTRACT

Introduction: Postoperative sore throat (POST) is a commonly encountered side effect which causes patient discomfort after airway instrumentation during general anesthesia (GA). This study was conducted to investigate the efficacy of preoperative gargling with Ketamine, a NMDA receptor antagonist and Betamethasone gargles, a steroidal anti inflammatory drug in reducing POST in patients being intubated for surgery under GA.

Materials and Methods: This was a randomized, single blinded, prospective study conducted after obtaining the Institutional Ethics Committee approval. 90 patients undergoing surgery under GA with endotracheal intubation were enrolled in the study after obtaining written informed consent from all. They were further divided into 3 groups; group B, group K and group C who received Betamethasone gargles, Ketamine gargles and Dextrose Saline gargles respectively, 5 minutes before GA.

Results: Results obtained were compared statistically by using Kruskal-Wallis test, which showed significant difference between median POST grading. The Mann-Whitney U test was used for the statistical intergroup analysis. There was no statistical difference among groups as far as age, height, weight by using ANOVA test; p value > 0.05. Age of patients varied between 16-60 years in three groups. The severity of sore throat were noticeably reduced after Ketamine, Betamethasone gargles in group K and group B ($p < 0.05$) as compared to group C when statistically analysed by Mann-Whitney U test. But Betamethasone gargles in group B patients more efficiently reduced the incidence, severity of sore throat compared to Ketamine gargles ($p<0.05$) during postoperative period.

Conclusion: The incidence & severity of POST decreased with use of pre-operative Ketamine gargles or Betamethasone gargles during post-operative period in patients with tracheal intubation. The Betamethasone gargles were more effective than Ketamine gargles in reducing the incidence, severity of POST.

1. Introduction

Postoperative sore throat (POST) a commonly encountered side effect after airway instrumentation during GA leading to patient discomfort. In comparison with other post-operative complications (e.g. postoperative nausea vomiting) sore throat is a minor side effect with no long term complications but adds to patient discomfort & dissatisfaction. Many factors can contribute to POST and the incidence varies with the method of airway management. POST was ranked by American anaesthesiologists as the eighth most important problem of current clinical anaesthesiology.[1] Sore throat can be accompanied by cough, laryngitis, tracheitis, dysphagia or hoarseness. It is assumed that the symptoms are in association with mucosal inflammation & trauma to the airway mucosa following

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trachea manipulation by means of laryngeal mask airway, intubation or oral airway.

The reported incidence of POST varies from 20 to 74%.[2,3] Variety of pharmacological medications as well as non – pharmacological interventions have been used for decreasing the incidence, gravity of POST with variable success.[4] This great variability is due to countless factors implicated in POST such as variation in airway device, technique of insertion, kind of lubricant used, cuff pressure, length of procedure, anaesthesia administered, evaluation techniques, and multitude of patient factors. POST is generally considered a minor consequence and is most often relieved within 24 hours.

Intubation with smaller size tube, lubricating the tube any medicated jelly, careful airway handling and suctioning technique, intubating the patient after full relaxation and extubation after completely deflating the endotracheal tube are some effective non-pharmacological measures to reduce the incidence of postoperative hoarseness and sore throat.[5] Gargling with sodium azulene sulfonate, inhaled fluticasone propionate; oral inhalation with beclomethasone and intravenous steroids like dexamethasone injection etc. were all recommended as pharmaceutical measures to attenuate the POST.[6–8]

Ketamine a N-methyl-D-aspartate (NMDA) receptor antagonist, is an anti-inflammatory, anti-nociceptive, pre-emptive analgesic and have been proved effective as gargle for reducing the severity of POST.[9] Betamethasone gel a anti-inflammatory agent is effective in reducing POST, cough, and hoarseness after laryngo-tracheal intubation.[10]

2. Objectives

This study was conducted to determine the effectiveness of Ketamine gargles and Betamethasone gargles in comparison to placebo and also Ketamine gargles in comparison to Betamethasone gargles for reducing the severity of POST in patients being intubated for surgery under GA.

3. Methods

This was a randomized, single blinded, prospective study conducted after approval of Institutional Ethics Committee. We enrolled 30 patients in each group after obtaining the written & informed consent from all the patients. Sample size was determined by taking the following assumption; the proportion of postoperative sore throat was 74%, Confidence interval of 95% and margin of error 0.05. The sample size was determined using the following formula-: $n= Z^2(P)(1-P)/d^2$.

90 patients, ASA physical status I–II, aged 16- 60 years of either sex, undergoing surgery under general anesthesia with endotracheal intubation in supine position were studied. We excluded patients if they refused to participate or had sore throat, Mallampati grade >2, difficult airway, history of oral surgeries, patients with obstructive airway disease on medication, head and neck surgeries, allergies to study drug, recent pain alleviating medication like non-steroidal anti-inflammatory drugs.

Pre-anaesthetic evaluation for all patients was done prior to surgery. After thorough general & systemic examination they were appropriately investigated. All patients were randomly divided into 3 groups.

1. Group B (n=30):– Were given Betamethasone Gargles with Betamethasone dispersible tablets 1 mg in 30 ml Dextrose Saline.
2. Group C (n=30):– Were given Saline Gargles with 30 ml Dextrose saline
3. Group K (n=30):– Were given preservative free Ketamine gargles 50 mg in 29 ml Dextrose saline.

Patients gargled with the preparation, sweetened by Dextrose saline for 30 seconds in the operating room, 5 min before induction of Anaesthesia.[4,8] The similar taste of the three sweetened preparations helped for blinding the patients.

Intra-operative patients were monitored using continuous electrocardiography, non-invasive blood pressure, and pulse oximetry. Patients were pre medicated with IM Glycopyrrolate, IV Ondansetron, IV Midazolam & IV Pentazocine. GA was induced with IV Thiopentone 5 – 7 mg/kg and IV vecuronium bromide 0.08 mg/kg and the trachea was intubated. Cuffed (high-volume, low-pressure cuff), sterile endotracheal tube of polyvinyl chloride material with an internal diameter of 7–7.5 mm for women and 8–8.5 mm for men without any lubricating medication were used in our study. Incidence of POST alters by application of lubricating jellies like lidocaine gel, betamethasone gel, benydamine hydrochloride (steroid) etc on the cuff of ETT. The endotracheal tube cuff was inflated until no air leakage. Endotracheal intubation procedure was done by an experienced anaesthesiologist and those patients with more than one attempt at intubation were excluded in our study. Controllable risk factors like type & size of airway device, concurrent use of nasogastric tube, aggressive oropharyngeal suctioning and long variation in duration of surgery were identified and avoided. Due to non availability of pressure manometer in our institute intra-cuff pressure was not monitored in our study.

Oxygen & nitrous oxide with Isoflurane, Inj Vecuronium IV were used for maintenance of GA. Gentle suctioning of the oropharynx under direct laryngoscopic vision was done at the end of surgical procedure without causing inadvertent trauma. Reversal of neuromuscular block with IV Neostigmine 50 μg/kg and Glycopyrrolate 10 μg/kg was obtained and patients were extubated after adequate recovery from neuromuscular block. Patients with more than one attempt of intubation and more than 20 seconds duration of laryngoscopy were excluded from study. For

post operative analgesia Inj Tramadol 1mg/kg IV and Inj Diclofenac 75 mg IM was given. Post operative patient was shifted to recovery room for observation.

On arrival in the Surgical recovery room, sore throat/pain and haemodynamic parameter were noted at 0 hrs. Similarly scores were obtained at 1, 4, 8, 16 and 24, 48 hours and thereafter.

POST grading was done based on four-point scale (0-3)[4,8] asfollows

0 = no evidence of sore throat;

1 = evidence of mild sore throat (sore throat complain only on asking);

2 = evidence of moderate sore throat (sore throat complain on his/her own); and

3 = evidence of severe sore throat (change of voice, hoarseness, throat pain)}.

Other side-effects, if any were noted.

4. Results

There was no statistical difference among groups as far as age, height, weight by using ANOVA test; p value > 0.05 (Table 1). Age of patients varied between 16-60 years in three groups (Diagram 1). Other parameters monitored were Pulse, BP, ECG, SPo2. Though no significant difference was found.

Patients in all the groups remained haemodynamically stable with no stridor, laryngospasm, dissociative symptoms or any other adverse effect during the entire postoperative study period. Pre-procedure and post-procedure the vitals of the patient didn't have significant difference.

In our study, POST was assessed at 0, 1, 4, 8, 16, 24, and 48 hours after extubation in all three groups: Gr B-Betamethasone gargles, Gr K- Ketamine gargles and Gr C-control group. The data was compared statistically by using Kruskal-Wallis test; p-value obtained at 0, 1, 4, 8,16, 24 and 48 hrs were <0.05(Table 2). According to p- value obtained a significant difference between median POST grading in group B, group K and group C was obtained.

POST in Group B, Betamethasone gargles was compared with Group C who gargled with Dextrose saline. In our study the incidence, severity of POST in the control group at 0, 1, 4, 8, 16, 24 and 48 hours after surgery was comparatively more than Betamethasone group (B). The statistical analysis was done by Mann-Whitney U test and p values acquired were lower than 0.001 at all point of time, which proved statistically significant difference between the two groups. The incidence and severity of POST was significantly higher (p<0.05) in control group (Table 3). From the above results it can be said that Betamethasone gargles are more effective in reducing the incidence and severity of POST.

Similarly Ketamine gargles group when compared with control group who gargled with Dextrose saline at 0, 1, 4, 8, 16, 24 and 48 hours after surgery revealed significantly lower incidence and severity of POST. The statistical analysis was done by Mann-Whitney U test (Table 3) and p values obtained were less than 0.001 at all point of time, which proved statistically significant difference between the two groups (Table 3). The gravity of POST was significantly greater in Control group when compared with Ketamine group.

POST after Betamethasone gargles was compared with Ketamine gargles group. In the Ketamine group, the incidence of POST at 0, 1, 4, 8 hours after surgery was considerably more than Betamethasone group. The statistical analysis was done by Mann-Whitney U test and P values obtained at 0, 1, 4, 8, 16, 24 and 48 hours were 0.043, 0.011, 0.017, 0.040, 0.999, 0.999, 0.999, which proved statistically significant difference between the above two groups at 0, 1, 4, and 8 hours (Table 3). The incidence and severity of POST was significantly more with Ketamine gargles. Betamethasone gargles had a better control in POST compared to Ketamine gargles in our study (Figure 1, Table 2).

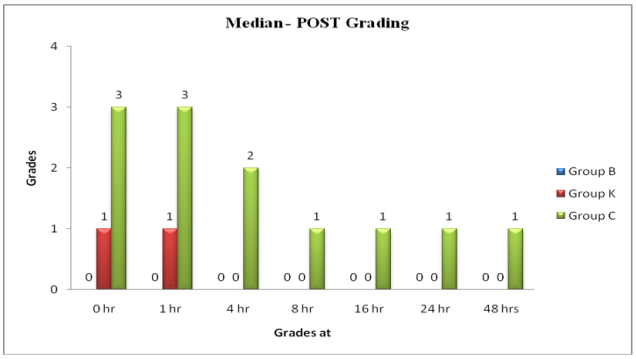

Fig. 1: Comparison between Betamethasone Group, Ketamine group and Control group

5. Discussion

The incidence of POST in this study was 13-67%. No correlation was observed between age, gender, weight, duration of surgery and POST in this study. Hemodynamic parameters (heart rate, mean arterial pressure) were comparable in all three groups. There were no adverse reactions reported in any group.

We found that the gravity of POST was significantly reduced after preoperative gargling with Ketamine compared with Dextrose saline gargles. Similar studies by Canabay et al,[11] Rajkumar et al[12] found that gargling with Ketamine decreases the incidence and severity of POST following endotracheal intubation.

Sore throat due to endotracheal tube result from local injury causing tissue oedema, congestion, pain and aseptic inflammation. An experimental study shows that NMDA receptors are found in the central nervous

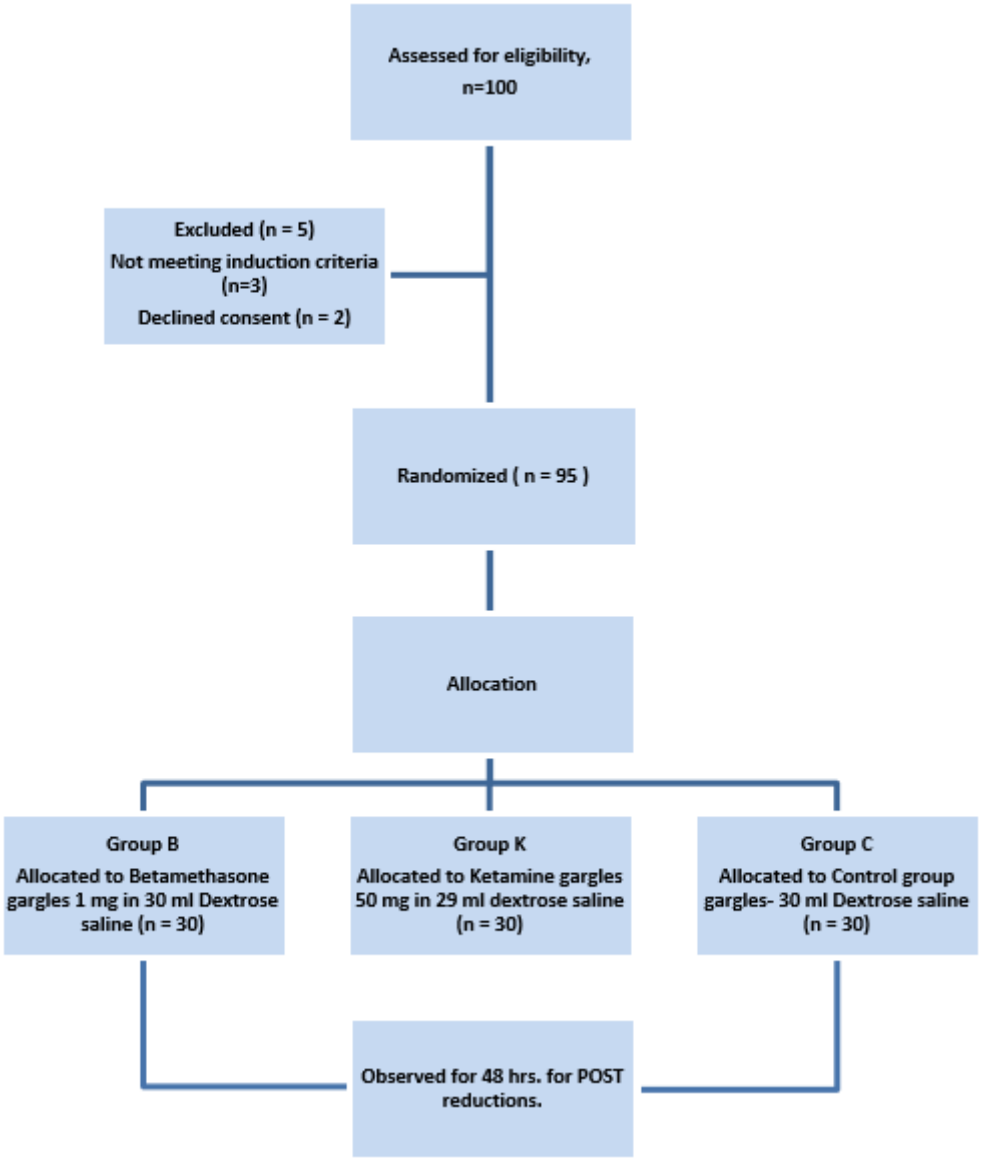

Diagram 1: Consolidated standards of reporting trails flow diagram

Table 1: Demographic data.(Data are presented as number of patients or mean ± SD)

	Group B (n=30)	Group K (n=30)	Group C (n=30)	P-Value
Gender (Male/Female)	16/14	17/13	17/13	0.999
Age (yrs)	38.63/10.74	37.20/10.44	38.70/10.02	0.820
Height (cm)	152.33/4.84	153.80/4.94	153.37/4.87	0.596
Weight (kg)	59.20/7.10	63.23/10.15	59.53/14.57	0.596
Duration of Surgery	2.07/0.54	1.87/0.41	1.81/0.43	0.074

Table 2: Comparison between studied groups by using Kruskal-Wallis test

Grades at	Group B (n=30)			Group K (n=30)			Group C (n=30)			P-value
	Min	Max	Median	Min	Max	Median	Min	Max	Median	
0 hr	0	1	0	0	2	1	1	3	3	0.043
1 hr	0	1	0	0	2	1	2	3	3	0.011
4 hr	0	1	0	0	2	0	1	3	2	0.017
8 hr	0	0	0	0	1	0	0	2	1	0.04
16 hr	0	0	0	0	0	0	0	2	1	< 0.001
24 hr	0	0	0	0	0	0	0	2	1	< 0.001
48 hrs	0	0	0	0	0	0	0	2	1	< 0.001

Table 3: Comparison between studied groups by using Mann-Whitney U test

P-value for	Sore throat grade at						
	0 hr	1 hr	4 hr	8 hr	16 hr	24 hr	48 hrs
Group B vs. Group C	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Group K vs. Group C	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*	< 0.001*
Group B vs. Group K	0.043*	0.011*	0.017*	0.040*	0.999	0.999	0.999

system as well as the peripheral nerves. Activation of these NMDA receptors leads to inflammatory pain and nociceptive behaviours. Ketamine an NMDA antagonist when administered peripherally acts as antinociceptive and anti-inflammatory drug.[4,11,12] Reduction of inflammation by ketamine gargles due to its pre-emptive analgesic and anti-inflammatory action appears to be the cause for decrease in the incidence of POST.

We found that the gravity of POST were significantly lower after preoperative gargling with Betamethasone compared with Dextrose saline gargles. Tabari et al[13] showed that the application of betamethasone gel lessens the incidence of postoperative sore throat. They compared betamethasone gel group with the control & IV dexamethasone groups. Significantly lower incidence of sore throat in the Betamethasone gel group when compared with the IV dexamethasone group was seen. Kiran et al[14] in their study lubricated the cuff of PLMA with 0.05% of betamethasone gel & found it effective in reducing the incidence of POST. Many studies were conducted with Betamethasone gel, in present study we noted efficacy of gargling dispersible Betamethasone tablets.

Betamethasone is a potent, long acting Glucocorticoid without any mineralocorticoid action. The anti-inflammatory effect of 0.75 mg is equivalent to that of 20 mg of Hydrocortisone. Multiple mechanisms are involved in the suppression of inflammation but most important mechanism appears to be limitation of recruitment of inflammatory cells at local site and proinflammatory mediators.[15]

In our study we found that the incidence and severity of POST was significantly low after preoperative gargling with Betamethasone (Betamethasone dispersible tablets 1 mg in 30 ml Dextrose Saline) compared to Ketamine gargles (50 mg in 29 ml Dextrose saline). Safavi et al[8] prophylactically used 0.2 mg/kg of IV dexamethasone plus ketamine gargle and proved significantly reduced incidence and severity of POST when compared with using each of these drugs alone or using placebo. Shaaban et al[16] used application of 0.5% Betamethasone gel over endotracheal tube and compared with Ketamine gargles given prior to induction of anesthesia. They found similar incidence and severity of POST between the two groups but reduced incidence of postoperative cough and hoarseness of voice.

6. Limitation of Study

Ours was a single centred study with limited patients.

7. Conclusion

In conclusion**,** both Ketamine and Betamethasone Gargling reduced the incidence and severity of POST, but we found Betamethasone was more effective during early post-operative period in patients receiving general anesthesia with tracheal intubation.

8. Source of Funding

None.

9. Conflict of Interest

No conflict of interest.

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