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Original Article

Anaesthesia Section

Preoperative Nebulisation with Dexmedetomidine to Prevent Postoperative Sore Throat in Patients Undergoing General Anaesthesia

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ABSTRACT

Introduction: Several pharmacological and non-pharmacological ways have been used to prevent Postoperative Sore Throat (POST). Postoperative Sore Throat (POST) can be prevented with or without medical management. Dexmedetomidine is a selective alpha 2 adrenergic agonists which can be used for preoperative nebulisation to prevent POST. Dexmedetomidine absorption will be greater through transmucosal route as it is a highly lipid soluble agent. It is a highly lipid soluble agent with good systemic absorption during transmucosal administration.

Aim: To assess the efficacy of dexmedetomidine nebulisation in reducing POST in patient who require general anaesthesia with endotracheal intubation.

Materials and Methods: This randomised control study was conducted from January 2022 to March 2022. There were 60 patients separated into two groups and 30 patients in each. The patients were of age more than 18 years and belonged to American Society of Anaesthesiology (ASA) grade I and II, posted for elective surgery under general anaesthesia. Group D was given dexmedetomidine 50 mcg (1 mL) with 3 mL of saline and made it total volume of 4 mL nebulisation and Group C was given 4 mL of saline nebulisation. Sore throat was evaluated at 0, 2nd,4th,6th,12th and 24th hour after extubation, during the postoperative period. The recorded data was analysed using the Statistical Package for Social Sciences (SPSS), 21 version.

Results: Mean age (SD) of patients in group D was 33.5±12.9 years and that in group C was 36.83±14.5 years (p-value=0.23). During postoperative period, the severeness of sore throat was remarkably lesser in Group D especially from 4th hour upto 24th hour. Severeness of POST was remarkably lesser in group D compared to group C patients over the 4th-24th hours.

Conclusion: Dexmedetomidine nebulisation given prior to surgery is beneficial in reducing POST, with minimal haemodynamic disturbance. Dexmedetomidine in nebulised form is therefore a safe option for lowering POST.

Keywords: Alpha 2 adrenergic agonists, Complications, Endotracheal intubation

INTRODUCTION

Postoperative Sore Throat (POST) is a dreaded complication in patients undergoing surgery under general anaesthesia with endotracheal intubation. Female gender, young age, pre-existing lung disease and prolonged duration under anaesthesia are at greater risk. Blood-stained endotracheal tube while extubation has a higher chance for POST. Other causes for POST could be due to the use of double-lumen tubes, too much cuff pressures of endotracheal tube and general anaesthesia with tracheal intubation without adequate relaxation with neuromuscular blockade. The incidence of POST in children can be greatly reduced with the use of supra glottic airway devices and uncuffed tracheal tubes. Cuffed supra glottic airway devices should be adequately inflated to acheive a proper seal which can reduce its incidence [1-3].

Though tracheal intubation is important procedure during general anaesthesia, it can cause pressure trauma to mucosa and throat irritation. POST (Postoperative sore throat) is an unwanted complication of tracheal intubation and it can cause discomfort to the patient [1,2].

Several pharmacological ways have been used to prevent POST. Preoperative nebulisation with various drugs are now being used to prevent POST [3].

Preoperative oral gargle drugs have a bitter taste which may reduce the chance of patient compliance for oro-tracheal preparation. To avoid the chance of aspiration a reduced volume of the gargle was given as compared to the normal volume which will be requied for the adequate action. Hence, nebulisation is safer and better tolerated. Dexmedetomidine was preferred as it is a clear and odorless medicine, With it's agonistic action to selective α-2 adrenergic receptor. Transmucosal route of dexmedetomidine has a good systemic absorption as it is a highly lipid soluble agent,so nebulised form will be more effective [4].

There are not many studies available to assess the efficacy of dexmedetomidine nebulisation in controlling POST. Hence, this study was done to find out the benefit of dexmedetomidine nebulisation in decreasing POST in patients who require general anaesthesia. The hemodynamic variations was assessed as a secondary objective.

MATERIALS AND METHODS

This randomised control study was conducted in the anaesthesiology Department in a tertiary level healthcare hospital from January 2022 to March 2022. The Institutional Ethical Committee clearance was obtained on 01/12/2021.

Sample size calculation: Sample size was calculated using Winpepi software, taking the effect size of 0.8 according to Thomas D et al., with alpha error of 5% and power of 80% [4]. The calculated sample size was 52 which was inflated to 60, by including 30 patients in each group.

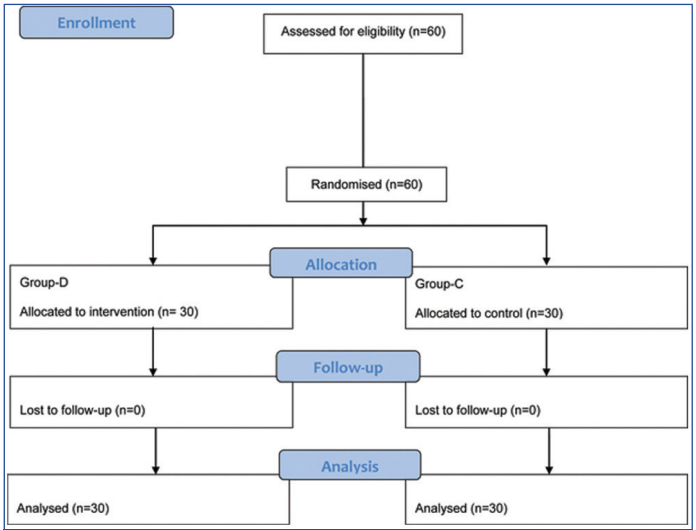
Inclusion criteria: Patients should be above 18 years, with ASA grade not more than II posted for surgery and hemodynamically stable patients.

Exclusion criteria: Patients with history of POST, upper respiratory tract infection, COPD, Mallampatti Classification (MPC) III and IV and known case of allergy to study drugs were excluded. Pregnant patients also were excluded from this study.

Preanaesthetic checkup and counseling was done on the day prior to surgery and patients were reviewed the next day. An elaborate medical history and systemic examination were done and necessary

investigations were done and optimise as needed. Patients were fasting for six to eight hours prior to surgery. Patients were divided into one of the two groups by generating randomisation codes using a simple randomisation technique [Table/Fig-1]:

- Group D: Patients were nebulised with DEXMEDETOMIDINE 50 mcg (1 mL) with 3 mL of saline, total 4 mL for 15 minutes.
- Group-C: Patients were nebulised with 4 mL saline for 15 minutes (Control group).



[Table/Fig-1]: CONSORT flow diagram.

Study Procedure

The anaesthetist assistant preparing the solution didn't participate in analysing their results. Both the study group drugs were odorless, tasteless and colourless hence the patients were also blinded. The drug delivery was via nebulisation mask for 15 minutes, attached to an oxygen driven source. After nebulisation, all patients were given medications and the patients were relaxed with injection IV succinylcholine 2 mg/kg. To reduce the soft tissue trauma, a rapid and gentle laryngoscopy was done using which lasted less than 15 seconds. A sterile endotracheal tube of adequate size were used. The cuff was inflated with air.

Anaesthesia was maintained using 35% oxygen with nitrous oxide and sevoflurane. For immediate postoperative analgesia, i.v. Paracetamol 1 gram, i.v. Tramadol 50 mg was given intraoperatively and repeated 6th hourly in the postoperative period. Prior to extubation Ondansetron 4 mg IV was given and thereafter whenever required. Before extubation, gentle oral suction was done using suction catheter. Neuromuscular reversal agents was given prior to extubation. After that patients were assessed for level of consciousness, ability to follow commands and return of adequate motor tone, we extubated the patients.

In the post-anaesthesia care unit (PACU), nursing staff assessed the sore throat, who were unaware of the allocated group of the patients and the evaluation continued in the wards at 2nd, 4th, 6th, 12th and 24th hour after extubation, during the postoperative period.

- 0- NIL
- 1- Mild sore throat (sore throat only when asked)
- 2- Moderate sore throat (sore throat even without asking)
- 3- Severe sore throat (change of voice or hoarseness with throat pain).

If moderate or severe POST persists even after 24 hours, lukewarm saline gargle and decongestants were started. Whoever had persistent symptoms, an Oto-rhino-laryngologist consultation was obtained.

STATISTICAL ANALYSIS

The recorded data was analysed using the Statistical Package for Social Sciences (SPSS), 21 version. The associations were evaluated with the use of Student's t-test for quantitative variables and $\chi 2$ tests for categorical variables. The level of significance was set at 5% for all significance tests.

RESULTS

There was no statistically significant difference between the Dexmedetomidine and control groups in terms of age, gender, weight, pulse rate, haemoglobin, total leukocyte count and platelet count [Table/Fig-2,3].

Parameters	Group-D	Group-C	p-value
Mean age in years (SD)	33.5±12.9	36.83±14.5	0.23
Gender (Female/male) [n]	15/15	14/16	0.067
Mean Weight in kg	55.8±10.4	60±15.7	0.227

[Table/Fig-2]: Demographic data.

Parameters	Group-D	Group-C	p-value
Mean Pulse Rate	89.4±14.6	86±10.5	0.305
Mean Hemoglobin	12.7±1.6	12.3±2.02	0.399
Mean TLC	7703.3±2286.3	7741.7±2874.7	0.954
Mean Platelet count	273416.7±128761.2	303500±134444.6	0.3797

[Table/Fig-3]: Baseline parameters.

From the 4th till 24th hour, the severity of POST was significantly less in Group-D [Table/Fig-4].

While considering haemodynamic parameters, there is not much difference in rise in HR, SBP and DBP but results showed that patients vitals were stable in Group-C [Table/Fig-5].

Time	Scale of POST	Group-D	Group-C	p-value
2nd hour	1	8 (26.7%)	2 (6.7%)	0.086
	2	17 (56.7%)	24 (80%)	
	3	5 (16.7%)	4 (13.3%)	
4th hour	0	1 (3.3%)	0	**0.003**
	1	19 (63.3%)	5 (16.7%)	
	2	10 (33.3%)	23 (76.7%)	
	3	0	2 (6.7%)	
6th hour	0	11 (36.7%)	1 (3.3%)	**<0.001**
	1	16 (53.3%)	8 (26.7%)	
	2	3 (10%)	21 (70%)	
12th hour	0	23 (76.7%)	5 (16.7%)	**<0.001**
	1	6 (20%)	9 (30%)	
	2	1 (3.3%)	16 (53.3%)	
24th hour	0	28 (93.3%)	8 (26.7%)	**<0.001**
	1	1 (3.3%)	16 (53.3%)	
	2	1 (3.3%)	6 (20%)	

[Table/Fig-4]: Severity of POST.

Vitals		Group-D	Group-C	p-value
Heart rate (bpm)	Preoperative	91.4±10.4	89.6±9.6	0.48
	Postoperative	88.2±7.9	83.4±11.5	0.0645
SBP (mmHg)	Preoperative	119.3±10.8	115±12.25	0.15
	Postoperative	108±8.5	110.9±12.8	0.306
DBP (mmHg)	Preoperative	73.7±6.15	73.7±6.3	1
	Postoperative	70.34±5.65	74±6.75	0.026

[Table/Fig-5]: Comparison of preoperative and postoperative vitals.

DISCUSSION

In this study, the severity of POST and the impact of preoperative nebulised Dexmedetomidine use was examined. When compared to controls, the patients on Dexmedetomidine had the lowest severity of POST. Dexmedetomidine reduces sympathetic nerve

activity and attenuates the complication of laryngoscopy and intubation by acting on a variety of brain stem and medullary nuclei, including the hypothalamus and nucleus tractus solitarus [5]. Thomas et al., has done a study based on dexmedetomidine and ketamine nebulisation and found that preoperative dexmedetomidine nebulisation is a safe alternative to nebulisation with ketamine avoid POST, with minimal effects in the haemodynamics [4].

Dexmedetomidine has been shown to have many protective effects, such as, block the generation of pro-inflammatory cytokines in various pre-clinical experiments. Zhang and Zhang conducted a study which shows reduced serum concentrations of inflammatory mediators such as TNF-α, IL-6 [6]. Salama AK et al. conducted a study based on nebulised dexamethasone and in that, the result showed that severity of POST were reduced and incidence also significantly reduced in the dexamethasone group at the time intervals, 2 hr, 4 hr, 8 hr, and 12 hr after extubation. There were no complication associated with dexamethasone nebulisation. [7].

Additionally, Li et al. performed a meta-analysis to examine the dexmedetomidine efficiency in inhibiting inflammatory mediators when taken postoperatively [8]. They concluded that dexmedetomidine, when given simultaneously with general anaesthesia (GA), produced a notable drop in IL-6, IL-8, and TNF postoperatively. Many studies are now promoting the preemptive administration of dexmedetomidine due to the anti-inflammatory properties it has demonstrated. Kang SH, et.al. conducted a study and found out, dexmedetomidine helps to reduce the release of cytokines like T1 and T2, the IL-1β, TNF-α, and IL-10, as well as reduced leukocyte count and CRP level when it was given intraoperatively [9].

Iirola T et al., found that the drug was quickly and effectively absorbed when given via intranasal route [10]. Therefore, the considerable modifications in inflammatory mediators brought on by dexmedetomidine nebulisation when given preoperatively, together with its analgesic action. So it can be utilised to lower the occurance and seriousness of POST that was observed in the dexmedetomidine group of our study.

Limitation(s)

The study did not measure the serum concentrations of the administered drugs. Cuff pressure monitoring was not done during anaesthesia, and no sedation scale was used.

CONCLUSION(S)

Dexmedetomidine nebulisation given prior to surgery is beneficial in reducing POST, with minimal haemodynamic disturbances. Dexmedetomidine in nebulised form is therefore, a safe option for lowering POST.

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