Original Article

ISSN (O): 2456-7388; ISSN (P): 2617-5479

Prospective Study of Efficacy of Intracuff Dexamethasone, Lignocaine and Normal Saline on Post Extubation Response

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Abstract

Background: Post-surgical throat pain is the most common symptom after endotracheal intubation and is seen in up to 90 percent of patients. It can be considered along with the appearance of the endotracheal tube with laryngeal edema and ischemia. Chemical and mechanical tracheal mucosal inflammation affects the occurrence of cough from general anesthesia at the time of emergence, possibly leading to severe postoperative complications. During the emergence of a sore throat in a lighter plane of anesthesia, adverse hemodynamic changes can result. These changes are especially undesirable in patients undergoing neurosurgery, ophthalmic surgery or those with an increased risk of adverse cardiovascular incidents. The aims is to the purpose of this research is to determine and compare the effectiveness of intra-cuff dexamethasone and lignocaine in reducing the adverse effects of the post-extubation airway as a control group with normal saline. **Subjects and Methods**: Prospective study was performed on 90 patients admitted to general anaesthesia for separate operations. After having received approval from the institutional ethics committee and written informed consent, they were randomly divided into 3 groups of 30 patients each. **Results**: Among the three classes of surgical, anaesthetic, and baseline characteristics, there were no statistically significant differences. In terms of cough, the three groups differed significantly ($p = 0.02$). In other words, while lignocaine was more beneficial for the occurrence of cough after extubation, dexamethasone affected the severity of post-extubation cough more than the other 2 medications. In comparison with the dexamethasone and standard saline groups, spontaneous ventilation time and time to extubation (increase in endotracheal tolerance) were also extended in the lignocaine community. The three classes did not vary substantially in terms of patient satisfaction after 24 hours. **Conclusions**: When Dexamethasone is inflated with the endotracheal tube cuff, the incidence of postoperative sore throat and cough, but not speech hoarseness, is decreased.

Keywords: Dexamethasone, Lignocaine, Endotracheal tube

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Received: 20 September 2020 **Revised: 30 October 2020** **Accepted: 07 November 2020** **Published: 16 December 2020**

Introduction

The main causes of postoperative respiratory problems are general anaesthesia and surgery, and increased benefits are likely to be offered by an increasing understanding of the root causes of respiratory complications and improved methods of early care. It is a general anaesthesia standard to use cuffed endotracheal tubing. In the tracheal mucosa, however, tracheal tube cuff pressure can cause a number of problems. General anaesthesia is common and problematic following postoperative sore throat and other airway morbidities following endotracheal tube intubation. [1,2] About 30 percent and 70 percent of patients are stated to have a sore throat following tracheal intubation. The risk of a sore throat varies according to the endotracheal tube's shape, diameter, and cuff pressure used. Providing prophylactic drugs to relieve postoperative throat pain can be helpful if intubation is required. [3]

As the ETT cuff is semi-permeable, diffusion of lignocaine was feasible, making it a possible drug reservoir. In trials using topically administered steroids, intravenous dexamethasone, and inhaled fluticasone propionate to relieve postoperative throat pain, positive results have been shown. The cuff pressure manometer for the endotracheal tube fills monitors and alters the cuff pressure of the endotracheal, endobronchial, and tracheostomy tubes at low pressure. Therefore the objective of this study was to assess and compare the efficacy of intra-cuff dexamethasone and lignocaine as a control group with normal saline in reducing adverse effects associated with post-extubation airways, such as incidence of cough, sore throat, and hoarseness, when used to regulate cuff pressure to

help minimise tracheal wall mucous membrane injury.

Subjects and Methods

The prospective research was performed on 90 patients admitted to undergoing general anaesthesia for various operations. After having received approval from the institutional ethics committee and written informed consent, they were randomly divided into 3 groups of 30 patients each.

Inclusion criteria:

Patients of either sex, aged between 18 and 60 years, with surgery lasting between 30 and 360 minutes, were given consideration. ASA class I and II who underwent general anesthesia with controlled ventilation with endotracheal intubation posted for elective surgeries of two to three hours duration.

Exclusion criteria:

Patients with a history of allergy to dexamethasone, predictors of difficult intubation, smokers, history of asthma or COPD and with preexisting sore throat or hoarseness of voice.

A comprehensive pre-anesthetic assessment, including history and general examination, was conducted. Tab 0.5 mg Alprazolam was administered to all patients the night before bedtime, and Nill was retained orally at 12 a.m. onward. They transferred the patients to OT. An intravenous line was secured with an 18 gauge cannula and a gradual infusion of Lactated Ringer's solution was started. The airway cart was kept ready. In the OT, non-invasive blood pressure monitoring, pulse oximetry, electrocardiogram, and capnography were included as normal monitoring. Monitors were attached to patients and reported pre-induction systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), and oxygen saturation (SpO2). Pre-medication was given to all the patients with Inj. Glycopyrrolate 0.01 mg / kg, Inj. Midazolam 0.02mg / kg, Inj. Ondansetron 4 mg. After 3 minutes of preoxygenation with 100 percent oxygen, anesthesia was caused by Inj. 1.5mcg / kg opioid, and Inj. 2mg Propofol / lb. A bolus dose of 1.5 mg/kg of succinylcholine was then administered following lack of verbal contact; ensuring ventilation of the face mask was possible. For single-use, polyvinyl chloride ETTs (Portex ® Profile tracheal tube) with low-pressure high-volume cuffs with an internal diameter of 7.0-7.5 mm for females and 8.0-8.5 mm for males are used. A direct laryngoscopy, followed by intubation, was then performed using either a Macintosh 3 or 4 laryngoscope needles.

According to the randomised process, the ETT cuffs are then inflated. In the first, second and third classes, the ETT cuffs were filled with normal saline, dexamethasone, and 2% lidocaine, respectively. At a peak airway pressure of 20 cm H_2O, the tracheal tube cuff was injected with fluid, until no leak could be heard. Using a cuff pressure gauge, the initial cuff pressure was measured and recorded. Patients that had unsuccessful intubation during the first attempt were removed. Anesthesia was then preserved with a combination of 50 percent -50 percent oxygen-nitrous oxide, isoflurane, and 0.05 mg/kg vecuronium. In order to maintain one to two twitches on the train-of-four ulnar nerve stimulation, the Inj. vecuronium bromide bolus was repeated intermittently. The cuff pressure was measured again at the end of the surgery and reported. Isoflurane was discontinued, 100 percent oxygen was administered, and 0.01 mg/kg glycopyrrolate and 0.05 mg/kg Neostigmine were given to antagonize residual neuromuscular blockade. The patient was extubated and when extubation criteria were satisfied, 100 percent oxygen was delivered via the face mask.

Results

Total number of 90 men were recruited for the study

There were no statistically significant differences between the three groups about surgical, anaesthetic, and baseline characteristics.

There were no tracheal intubation problems or cuff inflation. No major variations in the occurrence of sore throat, hoarseness, and post-extubation laryngospasm were found between the three groups. The results of dexamethasone are thus the same as the other two medications in managing symptoms such as sore throat, hoarseness, and laryngospasm following surgery.

In terms of cough, however, the three groups were significantly different ($p = 0.02$). In other words, while lignoocaine was more effective in the occurrence of cough post-extubation, dexamethasone affected the severity of post-extubation cough more than the other 2 medications. In comparison with the dexamethasone and standard saline groups, spontaneous ventilation time and time to extubation (increase in endotracheal tolerance) was also extended in the lignocaine community.

The three groups did not vary substantially in terms of patient satisfaction after 24 hours.

Discussion

All anesthesiologists aim for smooth extubation without coughing and bucking. Several procedures are used to attenuate the emergence phenomenon, such as the use of opioids, anesthesia extubation in a deeper plane, and lignocaine use. It has been shown that lignocaine in the ETT's cuff is effective in reducing throat pain. Intense stimulation caused by laryngoscopy or tube movement can excite the sensory C fibres of the airway and produce secondary neuroplasticity associated with pain and cough in the postoperative throat. Lignocaine stops this excitation of sensory C fibres. Lignocaine also decreases damage to

Table 1: Characteristics of patients in the three groups

Variables	Dexamethsone	Lidocaine	Normal saline	P-Value
Age	41.02±10.21	38.8±10.39	41.17±11.1	0.1
Weight	65.6±5.11	66.3±5.4	67.7 ± 4.87	0.09
Duration of intubation(sec)	11±3	10±4	11±5	0.1
Duration of surgery(min)	65±7	67±5	66±6	0.12
Time of extubation(min)	19±4	21±5	18±3	0.08, 0.07 0.6
Spontanous ventilation time(min)	11±4	15±4	8±4	0.08 0.09, 0.6

Table 2: Comparison of post-extubation variables and severity of cough between the three groups

Post-extubation variables	Dexamethsone	Lidocaine	Normal saline	P-Value
SBP(mm Hg)	141±15	138±10	146±45	0.07
DBP(mm Hg)	74±8	71±9	87±10	0.06
HR(bpm)	93±20	81±15	93±12	0.08
Cough	0.13±0.32	0.3±0.45	0.35±0.47	0.02
Sore throat	0.18±0.4	0.9±0.27	0.25±0.43	0.08
Hoarsness	0.08±0.3	0.02±0.13	0.1±0.3	0.17
Laryngospasm	0.02±0.1	0.02±0.13	0.02±0.1	0.9
Mild cough	17(56.6%)	5(16.7%)	14(46.7%)	0.03
Moderate cough	8(26.7%)	3(10%)	8(26.7%)	
sever cough	0	2(6.7%)	6(20%)	

Table 3: Comparison of patient satisfaction after 24 hours between the three groups according to the Kruskal-Wallis test.

	Patient satisfaction		
	Low	Medium	High
Lignocaine	8 (26.7%)	7 (23.4%)	15 (50%)
Dexamethasone	7 (23.4%)	9 (30%)	14 (46.7%)
Normal saline	9 (30%)	8 (26.7%)	13 (43.4%)

the tracheal mucosa during extubation. It is probable that the mechanism of intracuffic dexamethasone is based on its anti-inflammatory role, which involves leukocyte migration inhibition, cell membrane integrity protection, lysosome release attenuation, and fibroblast proliferation reduction.

Rafiei et al, have compared the effects of intracuff dexamethasone, lignocaine and regular saline on the reduction of post-extubation reactions. [4] In combination with water-soluble gel lubrication, Estebe et al. showed the advantages of ETT cuff-filled alkalinized lignocaine to prevent pain in the throat during intubation. [5] In a meta-analysis by Lam et al., it was shown that the emergence phenomena associated with postintubation were minimized by both alkalinized and non-alkalinized lignocaine. [2] Dexamethasone was inserted into the cuff of the tracheal tube in this study. In order to remove the age and sex influencing variables identified in previous research, [6] all our participants were men, underwent a similar procedure (i.e. hernia), and were in the same age range.

Our findings showed no major variations between the three groups in the prevalence of sore throat, hoarseness, and laryngospasm post-extubation [Table 2]. It can thus be concluded that dexamethasone and the two other drugs similarly affect the sore throat, hoarseness, and laryngospasm. On the other hand, while lignocaine's preventive effect on cough incidence was more than the other two drugs, dexamethasone seemed to better prevent cough severity [Table

2]. It is therefore not surprising that patient satisfaction did not vary significantly between the three groups after 24 hours [Table 3].

The incidence of postoperative sore throat after intubation and cuff filled with air and without any drug administration was 73 percent in a study by Saleem S et al., and Athar J et al.[7] The frequency of postoperative throat pain with dexamethasone was 8 percent and regular saline was 54 percent in the present report.

In the Rafiei M et al.[4] clinical trials, patients demonstrated three drugs that were not significantly different in attenuating post-extubation reactions, such as hoarseness, sore throat, and laryngospasm. This is in contrast to the present study which showed dexamethasone to be better than normal saline in reducing sore throat. Authors could conclude that dexamethasone and normal saline does not differ in reducing hoarseness of voice ($p>0.05$) while dexamethasone is better than normal saline in reducing the incidence of postoperative cough ($p<0.05$).

Research conducted by Lee AR et al. shows that gargle is effective in minimising the severity of 0.05 percent dexamethasone solution for postoperative sore throat and 0.05 percent dexamethasone solution for endotracheal tube soaking.[8] Corticosteroids such as dexamethasone minimise oedema through the blocking of leukocyte migration. Furthermore these drugs inhibit hydrolysis around cells, impede the release of granulocyte and phagocyte lysozymes, and also obstruct fibrosis by preventing fibroblast proliferation. The local action of dexamethasone has been concluded to be effective in reducing postoperative throat pain. The same inference could be drawn from the present study that when the cuff is filled with dexamethasone and the authors give time for the membrane to become saturated with the drug, local inflammation can decrease due to cuff pressure on the tracheal mucosa.

Studies have been performed to alleviate postoperative throat pain by using intravenous dexamethasone. In a study by Bagchi D et al., 0.2 mg/kg dexamethasone intravenous injection reduced the incidence of a postoperative sore throat from 44 percent to 14 percent.[9] Current research has shown that dexamethasone can minimize the rate of a post-operative sore throat to 8% in the cuff.

Research by Thomas S et al.[10] concluded that dexamethasone is given intravenously before intubation decreases postoperative sore throat. Similar findings were obtained in their trial by Haider HS et al.[11] The main benefit of the use of liquid to inflate the cuff is to maintain the endotracheal cuff pressure low during the procedure by preventing further inflation of the cuff due to the diffusion of nitrous oxide. Not only does dexamethasone inhibit nitrous oxide diffusion, but it also lowers inflammatory mediator levels such as prostaglandins and leukotrienes by being a potent corticosteroid, thus reducing oedema and inflammation.[12] Dexamethasone diffuses, working via the endotracheal tube cuff on the tracheal mucosa in contact with it, thus decreasing the inflammatory process in the tracheal mucosa.

Conclusion

It is noteworthy to note that when the endotracheal tube cuff is inflated with dexamethasone, the incidence of postoperative sore throat and cough is reduced, but not speech hoarseness. Further studies are required in this direction until this is standardised and recognised as normal.

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How to cite this article: Rajeswar P, Esampalli SK. Prospective Study of Efficacy of Intracuff Dexamethasone, Lignocaine and Normal Saline on Post Extubation Response. Acad. Anesthesiol. Int. 2020;5(2):84-88.

DOI: dx.doi.org/10.21276/aan.2020.5.2.18

Source of Support: Nil, **Conflict of Interest:** None declared.