ORIGINAL ARTICLE

Effect of Intracuff Lignocaine on Coughing during Emergence and Postoperative Sore Throat

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ABSTRACT

Postoperative sore throat is one of the commonest complaints after tracheal intubation. Coughing on endotracheal tube during emergence may also be another distressing aspect of patient's surgical experience.

Objectives: To compare the presence of cough at extubation and postoperative sore throat after inflating the endotracheal tube cuff with lignocaine or air.

Methods: In this study we studied in 100 patients cough during and after extubation and postoperative sore throat at one and 24 hour after anaesthesia. The cuff of the endotracheal tube was inflated with 4 % lignocaine in one group and with air in the other group.

Results: There was significantly less frequency of cough in the lignocaine group. The frequency and severity of postoperative sore throat was also decreased at one and 24 hours after anaesthesia.

Conclusion: Using lignocaine to inflate the endotracheal cuff decreases the frequency of cough at extubation and postoperative sore throat.

Key Words: anaesthesia, general, coughing, endotracheal tube cuff, postoperative sore throat.

INTRODUCTION

Inflation of the endotracheal tube cuff creates a seal that permits positive pressure ventilation and reduces the likelihood of aspiration in anaesthetized patients. Intracuff pressure may cause postoperative sore throat[1] which is the most common complaint after tracheal intubation[2].

Extubation following general anaesthesia may be associated with coughing or there may be cough while the endotracheal tube is in place. The incidence of coughing on emergence from general anaesthesia in the presence of an endotracheal tube has been estimated between 38% and 96%[3].The coughing during emergence may be a problem after ocular surgery and neurosurgery because of increased intraocular pressure and intracranial pressure. There is also increased heart rate, central venous pressure and arterial blood pressure[4]. Other possible adverse effects include high intrathoracic pressures resulting in increased venous and intra-abdominal pressures with consequent venous bleeding. It may also cause myocardial ischaemia, wound dihescence and bronchospasm in asthmatic patients[5].

There have been various methods to decrease this response during extubation. Deep extubation may be associated with precipitation of airway obstruction and possibility of aspiration. Lignocaine spray and jelly result in significant increase in the incidence of coughing and sore throat[7]. Intravenous lignocaine results in much higher plasma concentrations[8], while opioids delay recovery from the anaesthesia. Calcium channel blockers may cause hypotension and bradycardia[6] and also increase cerebral blood flow during tracheal extubation because of cerebral vasodilatation[9]. Because of these undesireable effects related to above mentioned methods, newer methods are being investigated. Use of intracuff lignocaine is one of them.

Inflating the endotracheal tube cuff with lignocaine solution rather than air, can reduce the incidence of cough during extubation and postoperative sore throat[3]. The cuff on an endotracheal tube is permeable to local anaesthetics, including lignocaine. The polyvinyl chloride cuff of endotracheal tube allows simple diffusion of lignocaine across it[10]. Continuous application of lignocaine at the contact area between the cuff and the tracheal mucosa blocks the tracheal pain receptors[11].

4% lignocaine placed in the endotracheal cuff diffuses across the cuff membrane[12]. The cuff could act as a potential reservoir for a local anaesthetic, allowing diffusion and subsequent anaesthesia of the underlying mucosa. In this technique plasma levels of lignocaine rise more slowly than they would after direct topical application, thus reducing the risk of systemic toxicity.

This study was designed to investigate the potential benefits in a clinical setting of inflating the cuff of the endotracheal tube with 4% lignocaine, rather than air.

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PATIENTS AND MATHODS

The study was approved by the anaesthesia department Mayo Hospital, Lahore. After signed informed consent 100 patients in two groups of 50 each were studied. Patients of I –II ASA status, between 18 – 50 years of age, 40 – 80 kg. weight and undergoing elective surgery under general anaesthesia with endotracheal intubation were included in the study. Patients with cardiovascular diseases, asthma, respiratory disease or recent respiratory infection, smokers, anticipated difficult intubation or with risk of aspiration of gastric contents and history of tracheal or laryngeal surgery were excluded from the study.

In this Quasi-experimental study the patients were allocated to one of the two groups preoperatively using random number table, group A (lignocaine filled endotracheal tube cuffs) and group B (air filled endotracheal to be cuffs).

Patients were premedicated with midazolam 0.03 mg/kg and nalbuphine 0.05 mg/kg intravenously about 10 minutes before induction of anaesthesia. Standard monitors including ECG, pulse oximetry, non-invasive blood pressure measurement and end-tidal carbon dioxide. Induction of anaesthesia was done with thiopentone 4–5 mg/kg. Tracheal intubation was facilitated with atracurium 0.5 mg/kg. Anaesthesia was maintained with halothane 0.5 – 1.0 % and nitrous oxide 60 % in oxygen with controlled ventilation.

Endotracheal tube (with high volume low pressure cuff) of 7.0 mm internal diameter for females and 7.5 mm internal diameter for males were used. After intubation the cuff of the endotracheal tube was inflated at the minimal occlusive volume i.e., no air leak around the tube cuff when positive pressue was administered at 20 cm. of water. The inflation of endotracheal tube cuff was performed with lignocaine 4% solution in group A patients and with air in group B patients. Mechanical ventilation was instituted with tidal volume of 8 – 10 ml/kg to maintain ET CO_2 of 30 – 35 mm. Hg.

At the time of extubation laryngoscopy was avoided and the residual neuromuscular block was antagonized by neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg. After reversal of neuromuscular blockage halothane and nitrous oxide were discontinued. When the extubation criteria were fulfilled (i.e., reversal of neuromuscular function, regular spontaneous breathing, eye opening and ability to follow the verbal command), tracheal extubation was performed immediately after gentle pharyngeal suctioning. Cough was checked during and after extubation and recorded as “yes” or “no”. To determine whether patients had suffered postoperative sore throat, each patient was asked about the presence and severity of sore throat at one hour and 24 hours after extubation. The sore throat was measured with a verbal rating scale. All data was recorded in the proforma of research protocol. Duration of intubation was also recorded after the completion of surgery. If surgery lasted for less than 40 min. the patients were excluded from further study. The volume of lignocaine solution and removal from endotracheal tube was also noted.

Data analysis: Data was analyzed in SPSS version 10.0. Both groups were compared according to age, weight and duration of intubation and presented as simple descriptive statistics, calculating mean standard deviation. Both groups were compared according to sex by using percentage.

Variables like cough during and after extubation, the presence and severity of sore throat at one and 24 hours after extubation were presented as proportions (percentages) in both groups. To detect significant differences between two groups, chi-square test was used as the data was qlualitative in nature. The statistical differences were considered significant when p-value was < 0.05.

RESULTS

In this study 104 patients were studied. Four patients were excluded due to incomplete data, multiple attempts at intubation or short duration of intubation (<40 minutes). The remaining 100 patients ASA I (94) and ASA II (6) were divided into two groups. The two groups were similar demographically with respect to age, weight and duration of intubation. In group A 19 patients (38 %) were males and 31 patients (62 %) were females, while in group B, 26 patients (52 %) were males and 24 patients (48 %) were females. No patient experienced laryngospasm or bronchospasm after extubation.

In group A, 18 patients (36 %) experienced cough at extubation as ccompared to 31 patients (62 %) in group B. So the patients in group A reported less incidence of cough at extubation than those in group B. The difference was statistically significant (P value < 0.05).

In group A, 9 patients (18 %) experienced cough after extubation as compared to 20 patients (40 %) in group B. So patients in group A reported less incidence of cough after extubation as compared to patients in group B. The difference was statistically significant (P value < 0.05).

In group A, 15 patients (30 %) suffered from sore throat one hour after extubation. Sore throat was mild in 9 patients (18 %) and moderate in 6 patients (12 %). While in group B, 28 patients (56 %) suffered

from sore throat one hour after extubation, sore throat was mild in 21 patients (42 %) and moderate in 7 patients (14 %). No patients suffered from severe throat in both groups. So the patients in group A reported less incidence of sore throat at one hour after extubation as compared to group B. The difference was statistically significant (P value moderate in 2 patients (4 %), while in group B, 19 patients (38 %) suffered from sore throat at 24 hours after < 0.05).

In group A, 8 patients (16%) suffered from sore throat at 24 hours after extubation, sore throat was mild in 6patients (12%) and extubation. Sore throat was mild in 14 patients (28%) and moderate in 5 patients (10%). No patients suffered from severe sore throat in both groups. So the patients in group A reported less incidence of sore throat at 24 hours after extubation as compared to group B patients. The difference was statistically significant (P value<0.05).

Table 1: Demographic data

	GROUP A (Lignocaine)	GROUP B (Air)
Age (Years)	33.28 ± 9.23	31.62 ± 9.21
Weight (Kg)	65.32 ± 8.76	64.82 ± 7.74
Duration of intubation. (minutes) Mean ± S.D	83.30±50.50	76.40 ± 47.38

Table 2: Frequency of cough during extubation Values given as number and percentage

	YES	NO	Total No.
Group A	18 (36%)	32 (64%)	50
Group B	31 (62%)	19 (38%)	50

Chi- Square: 6.763, P value: 0.016
P- Value < 0.05 is significant

Table 3: Frequency of cough after extubation values given as number and percentage

	YES	NO	Total
Group A	9 (18%)	41 (82%)	50
Group B	20 (40%)	30 (60%)	50
Chi- Square	5.877		
P- Value	0.027		

P- Value < 0.05 is significant

Table 4: Frequency of sore throat one hour after extubation values given as number and percentage

	Number	Mild	Moderate	Severe	Total
Group A	35 (70%)	9 (18%)	6 (12%)	0	50
Group B	22 (44%)	21 (42%)	7 (14%)	0	50
Chi- Square	7.842				
P- Value	0.018				

P- Value < 0.05 is significant

Table 5: Frequency of sore throat 24 hours after extubation values given as number and percentage

	Number	Mild	Moderate	Severe	Total
Group A	42 (70%)	6 (12%)	2 (4%)	0	50
Group B	31 (62%)	14 (28%)	5 (10%)	0	50
Chi- Square	6.143				
P- Value	0.043				

P- Value < 0.05 is significant

DISCUSSION

Coughing during emergence from anaesthesia can cause serious problems during neurosurgical, ophthalmological, and vascular procedures. Sore throat is also a common complication after surgery and anaesthesia. Any technique that would allow patients emerging from anaesthesia to tolerate an endotracheal tube, while affording airway protection with intact supraglottic reflexes would be desirable in selected groups. Intracuff lignocaine is helpful in reducing these complications.

The basis of present study was that lignocaine filled in endotracheal tube cuff might cause anaesthesia of the tracheal mucosa by diffusing across the polyvinyl chloride membrane of the cuff.

The results of the study showed a decrease in the incidence of coughing observed in patients emerging from general anaesthesia after filling the endotracheal cuff with lignocaine 4 % solution at the time of intubation as compared to air filled cuffs. This study also demonstrated a decrease in the incidence of sore throat in the postoperative period when the cuff was inflated with lignocaine rather than air. Similarly severity of postoperative sore throat was also decreased in lignocaine filled cuff group at both evaluation periods.

Previous studies reported coughing during emergence from general anaesthesia in the presence of an endotracheal tube ranging between 38 – 96%, and the postoperative sore throat in 50–60%

patients[14,15]. The findings of control group in our study are consistent with the above mentioned figures.

A study by Navarro and Baughman[11] to see effects of intracuff lignocaine on postoperative sore throat, concluded that using lignocaine to inflate endotracheal tube cuff decreases the severity of postoperative sore throat at one hour and incidence of severity at 24 hours.

Sconzo et al[12] demonstrated that lignocaine filled in the endotracheal tube cuff diffuses across the polyvinyl chloride membrane and the quantity of lignocaine diffused across the membrane is dependent on the concentration of lignocaine and time.

Hirota et al[16] studied the effects of lignocaine added to a tracheostomy tube cuff and showed that lignocaine produced approximately 50 % reduction in the discomfort.

Soltani and Aghadovoudi[7] in their study demonstrated the effects of different lignocaine application methods on postoperative cough and sore throat and showed that intracuff lignocaine group had the least frequency of postoperative coughing and sore throat as compared to other groups.

Altintes et al[8] used 10 % lignocaine in endotracheal tube cuff for the same purpose. They also studied plasma lignocaine concentration. They showed much less incidence of sore throat and reaction during extubation. The plasma lignocaine concentration did not reach the toxic levels as well. Using higher concentrations of lignocaine increases the chances of lignocaine toxicity in case of accidental cuff rupture.

In our study we used 4.5–6 ml of 4% lignocaine i.e. 180 - 240 mg (toxic dose is 4.5 mg/kg). All tube cuffs were intact postextubation and no case of lignocaine toxicity was recorded.

Estake et al[2,18,19] conducted various studies on efficacy and safety of intracuff lignocaine and demonstrated a significant decrease in cough, restlessness and postextubation sore throat when the cuff was inflated with a small dose of alkalinized lignocaine rather than with lignocaine hydrochloride or air. They concluded that use of small dose of alkalinized lignocaine (40 mg) is relatively easy and safe practice that avoids the use of large doses of lignocaine.

A limitation of our study is that endotracheal tube cuff pressure was not evaluated. During anaesthesia, increase in cuff volume of an endotracheal tube because of diffusion of nitrous oxide into the cuff is well documented[13]. Another limitation was that the study was not double blinded. Patient selection, sampling, intervention and data collection all done by the same observer. Furthermore, complaints of sore throat and its severity (mild, moderate, severe) is subjective rather than objective as in case of cough. Airway suctioning is associated with postoperative sore throat and this was not standardized except that the laryngoscopy was not performed during recovery.

CONCLUSION

When ventilation was controlled with nitrous oxide and anaesthesia time was more than 40 minutes, there was a decrease in postoperative sore throat and cough at extubation when the endotracheal tube cuff was inflated with lignocaine.

Use of intracuff lignocaine is relatively easy, effective and safe practice. Such a drug delivery system should be considered in clinical practice to improve patient's tolerance of anaesthesia, particularly in the cases like those of cardiovascular disease, intracranial or intraocular hyperpressure or hyperreactive pulmonary disease.

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