



ALKALINIZATION OF INTRACUFF LIDOCAINE IMPROVES POST EXTUBATION EMERGENCE PHENOMENON.

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ABSTRACT **Aim:** The aim of study was to evaluate the effect of alkalinized lidocaine in endotracheal tube cuff on post extubation emergence phenomenon. **Method:** Patients were randomly allocated to two groups: Total 28 Patients were randomly allocated in two groups: GROUP A (Air group=14): ETT cuff was filled with air & GROUP AL (Alkalinized lidocaine=14): ETT cuff was filled with 2ML of 2% lidocaine +7.5% NaHCO₃ until there is no air leak. Coughing incidence at emergence, sore throat and hoarseness at 1st hr and then 24hr were studied post extubation. **Result:** The incidence of coughing was decreased in alkalinized lidocaine group (p<0.05). There was significant reduction in sore throat and hoarseness in group AL immediately and 24 hrs post operatively (p<0.05). **Conclusion:** Our results indicate that alkalinized intracuff lidocaine may prevent and alleviate POST and postintubation-related emergence phenomena.

KEYWORDS : Alkalinized lidocaine, Air, General Anaesthesia, Postintubation-related emergence phenomenon.

INTRODUCTION

Tracheal intubation with an endotracheal tube is often necessary during General anaesthesia. After intubation, the endotracheal tube cuff is inflated to maintain a seal, which leads to Coughing, sore throat, and hoarseness in postoperative period.¹³ Coughing during emergence can result in hypertension, tachycardia, increased intraocular and intracranial pressure, myocardial ischemia, bronchospasm, and surgical bleeding. Postoperative sore throat (POST) being the most undesirable symptom occurs in more than 50% of surgical patients.¹¹

Multiple factors affecting ETT cuff pressure like N₂O- causes rise in intracuff pressure with the progression of surgery. Different manoeuvres are used to reduce coughing during extubation and POST such as IV or topically applied local anaesthetics like lidocaine gel, lidocaine spray; IV narcotics or tracheal extubation in a deep plane of anaesthesia. Multiple studies have shown that cuff lubrication in form of jelly or topical spray is associated with undesirable side effects. The lidocaine spray contains additives such as L-methanol and ethanol which are more associated in causing POST and hoarseness. The effect of topically applied local anesthetic agent last for shorter period of time. The intravenous form of lidocaine is more associated with sedation and deepening plane of anaesthesia during extubation may lead to complication.¹³

Another method to reduce post operative emergence is to inflate the endotracheal cuff with lignocaine, first described in 1990.¹² As ETT cuff membrane allows diffusion of lidocaine across the cuff membrane and subsequently anaesthetise the underlying mucosa. Alkalinization of lidocaine with sodium bicarbonate (NaHCO₃) increases the nonionized form of lidocaine which considerably increases the diffusion of lidocaine through polyvinyl cuff walls, so lesser amount of lidocaine is required.¹¹

In our study, we have studied the effect and safety of use of intracuff alkalinized lidocaine over conventional air. Post-operative sore throat(POST), coughing and hoarseness of voice following tracheal extubation were observed.

MATERIAL & METHODS

Prospective observational study was conducted among indoor patients admitted to our tertiary care hospital. Sample size (n=28 cases) is calculated by using Open EPI software. Sample size was calculated based on an incidence of coughing on extubation of 96%, as seen in the control group in the study by *Jean Pierre Estebe* et al. [CI-95%, Margin of error-10%]

We enrolled 28 patients with age group 18–65 years with American Society of Anesthesiologists (ASA) Class I and II, Mallam Patti classification 1 or 2 being posted for surgeries under general anaesthesia lasting for 2 hours or more. Total 28 Patients were randomly allocated in two groups: GROUP A (Air group=14): ETT cuff was filled with air & GROUP AL (Alkalinized lidocaine=14): ETT cuff was filled with 2ML of 2% lidocaine +7.5% NaHCO₃ until

there is no air leak. Exclusion criteria included increased intracranial pressure, active upper respiratory tract infection, history of laryngeal or tracheal surgery or pathology, risk of aspiration of gastric contents, asthma or any airway condition.

PRE-OPERATIVE ASSESSMENT

Preoperative evaluation of patient was done before the surgery by taking history, general and systemic examination, vitals and necessary investigations and fitness for anaesthesia was decided according to ASA standard. Written informed consent was taken. NBM status of patient was noted. Patient's heart rate, blood pressure and spo₂ on air were recorded preoperatively. IV line was secured with 18/20-gauge iv cannula. Patients were premedicated 30-35 minutes prior to induction of anaesthesia with Inj. Midazolam 0.007-0.05mg/kg Intramuscularly.

IN OPERATION THEATRE

Patient's heart rate, blood pressure and spo₂ on air were recorded. Premedication was with Inj. Glycopyrrolate 0.005mg/kg IV & Inj. fentanyl 1µg/kg IV given. At the induction of anaesthesia, patients breathed 100% oxygen via a face mask and then, were anesthetized according to a standard protocol. The endotracheal tube cuff was inflated with AIR or ALKALINIZED LIDOCAINE, until there was no air leak around the tube when positive pressure was administered. Anaesthesia was maintained with isoflurane 1.2% to 1.5%, and nitrous oxide/ oxygen (65:35 ratio) and longer acting muscle relaxant like Vecuronium. At the end of surgery, Neuromuscular blockade was antagonized with neostigmine 0.04 mg/kg and glycopyrrolate 0.007 mg/kg and the pharynx was gently suctioned under direct vision and patient was extubated after spontaneous ventilation and the ability to follow verbal commands (eye opening or hand grip).

ASSESSMENT DURING EMERGENCE

A cough was recorded as either having occurred or not during emergence in each group.

POST-OPERATIVE ASSESSMENT

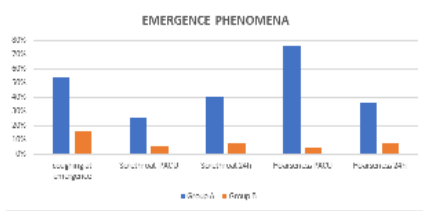
Group	Coughing at emergence	Sore throat PACU	Sore throat 24hour	Hoarseness PACU	Hoarseness 24hour
Group A	54%	36%	40%	76%	40%
Group B	16%	3%	8%	16%	6%
P value	0.0385	0.0305	0.05	0.0018	0.0358

Occurrence of post-operative sore throat and hoarseness were recorded at 1st hour and 24 hours in postoperative care unit.

RESULT

VARIABLE	CONTROL(n=14)	ALKALINIZED LIGNOCAINE(n=14)
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Group size	14	14
Age (yr.)	46±12	46±12
Weight (kg)	71±12	75±12
Sex ratio M/F	5/8	8/6
Surgery (min)	141±56	130±70



The incidence of coughing during the time of emergence was 54% and 16% for air and alkalized lidocaine, respectively, ($p=0.0385$). There was significant reduction in sore throat at 1st hr (33%) and then 24 hrs (32%) in Alkalized lidocaine group as compared to Air group ($p < 0.05$). We also observed reduction in hoarseness of voice was 60% at 1st hour and 34% at 24hr post-operatively in alkalized lidocaine group as compared to Air group ($p < 0.05$).

DISCUSSION

This study was done to evaluate efficacy and safety of alkalized lidocaine in ETT cuff during emergence from general anaesthesia. We compared air with alkalized lidocaine as inflation media in ETT cuff and evaluated signs of tracheal morbidity such as coughing at emergence, sore throat and hoarseness at 1st hr and then 24 hrs postoperatively.

Elevated ETT cuff pressure compromises the blood supply of tracheal mucosa followed by serious complications such as ciliary loss, inflammation, ulceration, haemorrhage, tracheal stenosis, and trachea-oesophageal fistula so maintenance of ideal ETT cuff pressure during whole surgery is also very important. In our study, lidocaine injected into cuff act as a reservoir of local anesthetic which prevents the diffusion of N₂O intracuff and permits through semipermeable membrane of polyvinyl chloride cuff to provide soothing effect on tracheal mucosa thus it helps to reduce incidence of coughing and POST (post-operative sore throat).¹³

We found that small amount of alkalized Lidocaine (2ml=40 mg) improves the ETT-induced emergence phenomena from general anaesthesia. ETT cuff is made up of polyvinyl chloride which allows simple diffusion of drug across it. Thickness of ETT cuff will be remained standard for all ETT so limiting factors for drug diffusion will be lidocaine concentration and time. Carl Fegan et al used 4% lidocaine to inflate the ETT cuff. They used mean volume of 6.1 ml ± 0.9 ml (244mg ± 36mg) per ETT cuff. The study of Estebe et al. and Pappunath et al reported that alkalization of intracuff lidocaine increases the diffusion of its nonionized neutral base across cuff membrane from 1% to 65% within 6 hours.^{12, 13} They studied both in vitro and in vivo effect of alkalized lidocaine across tracheal mucosa and showed significant decrease in dose requirement of lidocaine to as low as 20–40 mg as compared to non-alkalinized lidocaine dose of 200–500 mg. In study of *Papunath et al*, they stated that 30–180 min are necessary for diffusion of alkalized lidocaine across PVC cuff material.¹² We included surgery that lasted for more than 2 hours in our study so that lidocaine can diffuse across the membrane and provide local anaesthesia at point of contact with trachea. The risk of systemic toxicity will be lesser in our study as compared to direct topical application of local anaesthetic established by *Pregnel et al* who instilled lidocaine 2mg per kg via ETT. The reason behind it is Plasma level will be rise more slowly as it is time dependent.

The incidence of coughing during emergence was 54% and 16% for air and alkalized lidocaine respectively, in our study ($p=0.0385$). Significant reduction in sore throat and hoarseness of voice at PACU in alkalized lidocaine group as compared to air group ($p < 0.05$). There was reduction in sore throat and hoarseness of voice in AL group as compared to Air group at 24 hours post operatively ($p < 0.05$). These findings are supported by the study of Carl Fegan et al, Papu Nath et al and Jean Pierre Estebe et al.^{11,12}

CONCLUSION

The incidence of coughing, early and late POST (postoperative sore throat) and hoarseness were significantly lower in alkalized

lidocaine group, so we concluded that use of alkalized lidocaine instead of air in ETT cuff is a relatively easy and safe practice to reduce post operative emergence.

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