Original Research Paper

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ATTENUATION OF POSTOPERATIVE SORE THROAT WITH INTRACUFF ALKALINIZED LIGNOCAINE.

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ABSTRACT **Background and objectives:** Airway pressure is maintained by endotracheal tube cuff during mechanical ventilation while also preventing aspiration of secretions. Postoperative sore throat occurs in 90 % intubated patients due to deleterious effects of inflated cuff on tracheal mucosa. Lignocaine is one of the commonly used drugs for preventing postoperative sore throat. Objective of this study is designed to make a hypothesis that alkalinized intracuff lignocaine attenuates the postoperative sore throat and hemodynamic changes associated with endotracheal intubation. **Methods:** In this prospective comparative single blind randomized control study of interventional type with 132 adult patients of age 18 years to 65 years of either sex belonging to ASA I, II, III undergoing elective surgeries under GA were divided into two groups: Group A and Group L -one cuff inflated with Air and other with alkalinized Lignocaine maintaining intracuff pressure around 25cmH2O in both groups. Hemodynamics, cough, sore throat and hoarseness of voice parameters were studied. Data analysis was done using chi square test and unpaired t test. Severity of cough, postoperative sore throat, hoarseness and hemodynamic changes were less with use of alkalinized Lignocaine to inflate the cuff than Air. **Conclusion:** The incidence of side effects of tracheal intubation such as hemodynamic changes, hoarseness and cough were less when inflating medium of endotracheal tube cuff was alkalinized Lignocaine rather than Air.

KEYWORDS : Cuff pressure, Lignocaine, postoperative sore throat

INTRODUCTION:

Airway pressure is maintained by Endotracheal tube cuffs during mechanical ventilation, also preventing aspiration of pharyngeal and gastric secretions. Pressure generated by endotracheal tube cuffs is transmitted to tracheal mucosa when elevated above 30cmH2O causing ischemia of tracheal mucosa which leads to ciliary loss, inflammation, ulceration, hemorrhage and after sometime tracheal stenosis and tracheoesophageal fistula[6,7]. The occurrence of tracheal ischemia is directly related to the cuff pressure and duration of exposure. Chemical and mechanical irritation of the tracheal mucosa influences the incidence of cough at emergence from general anesthesia, potentially leading to significant postoperative complications[5]. Hyperinflation of the cuff causes tracheal mucosal lesions leading to sore throat, coughing, hoarseness which results in discomfort after extubation[6,7]. Various prophylactic interventions such as anti-inflammatory drugs, opioids, steroids, and local anesthetics have been employed extensively.

Lignocaine is one of the most commonly used drugs for preventing postoperative sore throat[1,4]. To reduce this complication several methods are suggested like gel lubrication of cuff before insertion, intracuff saline, intracuff lignocaine and intracuff alkalinized lignocaine[13]. Endotracheal tube cuff has a semipermeable membrane allowing diffusion of lignocaine through it that exerts local anesthetic effect on surrounding tracheal mucosa. Plain lignocaine requires high dosage (200-500mg) diffusing slowly through the membrane, which can be dangerous if cuff ruptures[12,13]. It has been reported that alkalinization of lignocaine with soda bicarbonate 8.4% lowers the dose (40mg) and increases the diffusion rate across the ET cuff leading to attenuation of sore throat and other side effects of intubation such as hemodynamic changes, restlessness, dysphonia and propensity to cause systemic toxicity because of the lower dose[18,19,20].

Materials And Methods:

In our study 132 adult patients Age between 18 years to 65 years of either sex belonging to ASA grade I, II, III were selected. They were posted for elective surgery under general anesthesia. All the patients with a history of hypersensitivity to Local anesthetic drugs, hemodynamic instability, unconscious patients, emergency surgery, and patients with Acid-Base imbalance were excluded.

All patients were visited on the day prior to surgery and explained about the anesthetic technique and perioperative course. Each patient had a pre anesthetic checkup which included any significant present and past medical/surgical history, physical examination, vital parameters like BP, pulse, temperature & respiratory rate. All routine and specific investigations (ECG, CBC, chest-x-ray, RFT, LFT, serum electrolytes).The procedure explained and written informed consent of the patients for the study was taken.

***Study design*:** Prospective, comparative single blind randomized controlled study of interventional type.

Study groups - *Group A:* cuff inflated with air and intra-cuff pressure maintained around 25cmH20. *Group L*: cuff inflated with alkalinized lignocaine (2% lignocaine and Sterile Solution of Sodium bicarbonate 8.4% in 19:1 ratio with 0.9% NS), with cuff pressure around 25cmH2O.

***Study sampling*:** 132 patients were screened for eligibility to participate in the study. Written informed consent was obtained from 132 patients of either sex, ASA-I, II and III in the age group of 18-65 years. Patients were divided into two groups with 66 patients in each group by computer based random sampling.

Upon entering the operation theatre, all ASA standard monitors (Electrocardiogram, Noninvasive blood pressure and Saturation probe) were applied and the baseline systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood Pressure (MAP), pulse rate, oxygen saturation (spO2) and respiratory rate were recorded. Intravenous access with 18G/20G cannula was secured. In the pre-medication Inj. Glycopyrrolate 0.004 mg/kg iv, Inj. Ondansetron 0.15 mg/kg iv, Inj. Fentanyl 2 mcg/kg iv were given. Pre oxygenation was done with 100% oxygen for 3 minutes using Bain's or closed circuit as per convenience of anesthetist. In the induction Inj. Propofol 2-2.5 mg/kg IV (or) Inj. Thiopentone 4-6 mg/kg IV (or) Inj. Etomidate 0.3-0.6 mg/kg IV and Inj. Succinylcholine 2 mg/kg IV for facilitating intubation were given. Intubation was done with polyvinyl chloride high volume low pressure cuffed ETT of proper size i.e., in adult female- 7/7.5 ID and in adult male-8/ 8.5 ID. In group -L: ETT

cuff was inflated with 2% Lignocaine and and Sterile Solution of Sodium bicarbonate 8.4% in 19:1 ratio with 0.9% NS., the volume was decided by the pressure monitor to keep intra cuff pressure below 25cmH2O. In group- A ETT cuff was inflated with Air, the volume was decided by the pressure monitor to keep intra cuff pressure below 25cmH2O.In maintenance O2+N2O+Sevoflurane/ Isoflurane/ Desflurane with Inj. Vecuronium 0.08-0.12mg/kg IV was given followed by 0.01-0.015 mg/kg IV (or) Inj.Atracurium 0.4-0.5 mg/kg IV followed by 0.08-0.1mg/kg IV (or) Inj.Cis atracurium 0.15-0.2 mg/kg IV followed by 0.03 mg/kg IV. In Analgesia Inj. Paracetamol 15mg/kg IV was given. With the return of spontaneous respiration, the neuromuscular block was reversed with Inj. glycopyrrolate 0.008 mg/kg IV, Inj. neostigmine 0.03-0.07 mg/kg IV. When the patient was fully awake and had adequate tone and power present, thorough oral suction was done and the cuff was deflated and ETT was removed.

Following parameters were observed and compared:

- **Hemodynamics:** HR, SBP, DBP, during induction, intubation, 30 min after induction and during extubation.
- **Severity of cough:** 15 min, 1hour, 6 hour, 12 hour, 24 hours after extubation.

Grade-0	No cough
Grade-1	Cough lasting for<15 seconds
Grade-2	Cough lasting for>15 seconds

- Sore throat: 15 min, 1hour, 6 hour, 12 hour, 24 hours after extubation.

Score-0	No sore throat at any time since the operation
Score-1	The patient answered in the affirmative when asked about sore throat(minimal sore throat)
Score-2	The patient complains of sore throat on his own(moderate sore throat)
Score-3	The patient is in obvious distress(severe sore throat)

- Hoarseness of voice: 15 min, 1hour, 6 hour, 12 hour, 24 hours after extubation.

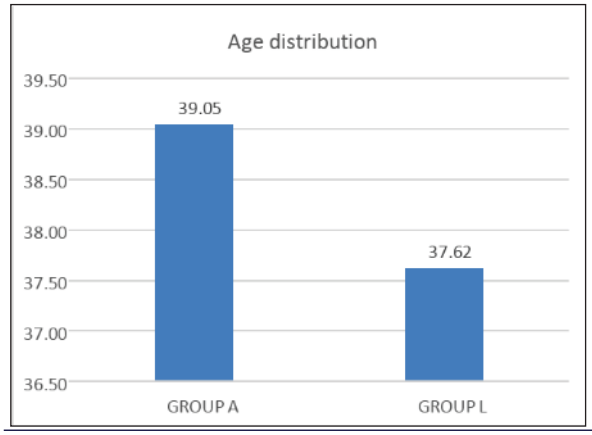
Score-0	No complaint of hoarseness at any time since the Operation
Score-1	Minimal change in quality of speech, patient answers in affirmative only when enquired about (minimal hoarseness)
Score-2	Moderate change in quality of speech of which the patient complains on his/her own(moderate hoarseness)
Score-3	Gross change in quality of voice perceived by the observer(severe hoarseness)

The end point of the study was 24 hours after the completion of the surgery where the patient was observed and scored.

All data entry was entered in MS excel and analysis was also done in MS excel. Continuous variable was expressed as median with standard deviation. For qualitative data chi-square test was applied and for quantitative data unpaired t test was applied to determine the statistical difference between two groups.

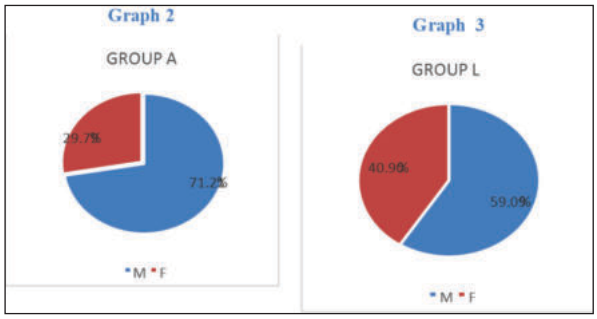
Observations and results:

1. Age distribution
Graph-1



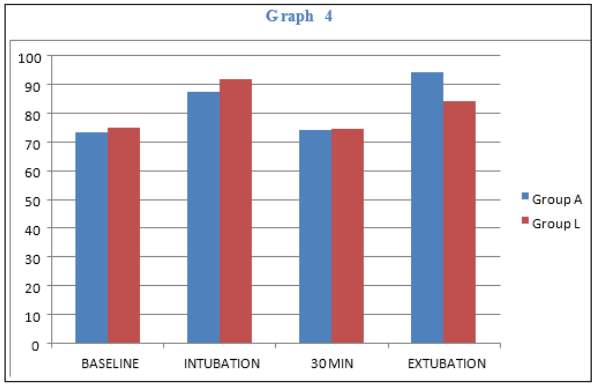
With respect to age, both groups were comparable.

2. Sex distribution



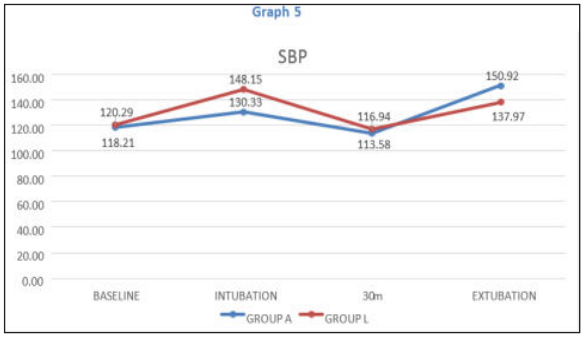
There was no statistically significant difference between both sexes.

3. Changes in heart rate



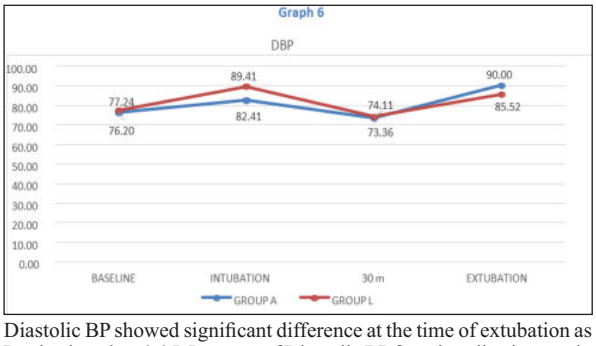
There was a significant difference between heart rates of two groups at extubation, the alkalinized lignocaine group being lesser as P value was <0.05.

4. Changes of systolic blood pressure:



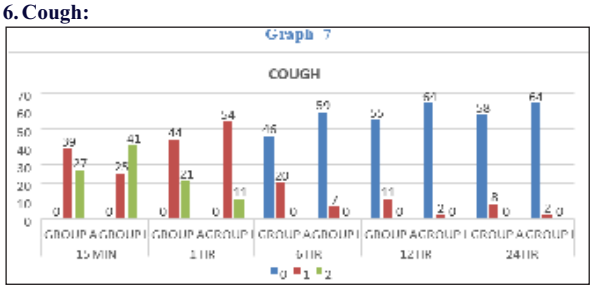
Systolic BP showed significant difference during extubation as P value < 0.05. Increase of Systolic BP from baseline is more in Group A than Group L during extubation.

5. Changes in diastolic pressure:



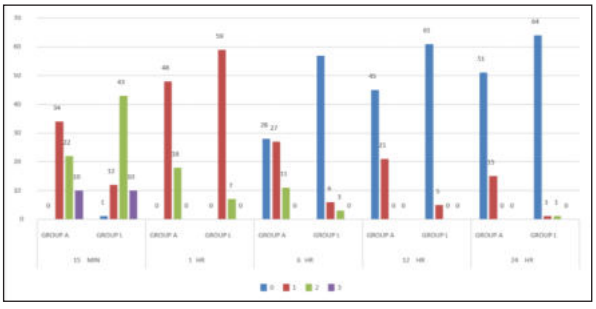
Diastolic BP showed significant difference at the time of extubation as P value less than 0.05. Increase of Diastolic BP from baseline is more in Group A than Group L at the time of extubation.

6. Cough:



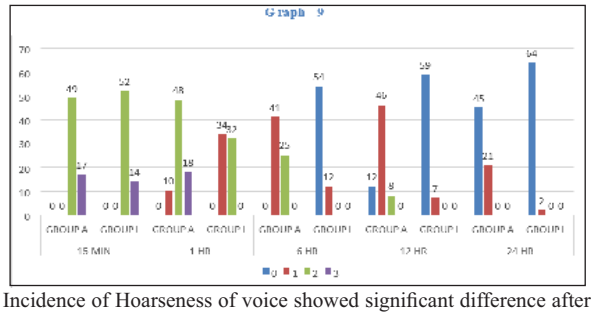
Cough severity showed significant difference after extubation at 15 min, 1hr, 6hr, 12hr and 24hr intervals in between groups with P≤0.05. Severity of cough is less in Group L than Group A.

7. Sore throat:
Graph 8



Sore throat severity showed significant difference after extubation at 15 min, 1hr, 6hr, 12hr and 24hr intervals between groups with P≤0.05. Severity of Sore throat is less in Group L than Group A.

8. Hoarseness of Voice:



Incidence of Hoarseness of voice showed significant difference after extubation at 1hr, 6hr, 12hr and 24hr intervals in between groups with P≤0.05. It showed no significant difference at 15 min intervals. Incidence of Hoarseness of voice is less in Group L than Group A.

DISCUSSION

Post-operative sore throat occurs in 90% of intubated patients and is the most common complaint after tracheal intubation. The insertion of tracheal tube can damage the upper respiratory tract resulting in hematoma, laceration or granuloma of the mucosa, or arytenoids cartilage damage[1,3]. The tube may also damage the anterior branch of recurrent laryngeal nerve within the larynx causing cord paralysis.[4] These factors may result in hoarseness, postoperative sore throat and coughing on emergence. Sore throat is also attributed to factors like tube size, tube design, lateral wall pressure, intra cuff pressure, tube lubricants, local infection, use of steroids, and duration of intubation, but one of the most important factors seems to be cuff pressure and contact area of tube with the tracheal mucosa.

Previous studies have shown that increased cuff pressure and volume have occurred over time after air inflation. During anaesthesia with the use of Nitrous oxide, cuff pressure increases as nitrous oxide diffuses into it more rapidly than it leaves[7] .This over inflation of the ETT has been associated with damage to pharyngeal mucosa and recurrent laryngeal nerve palsy[8].This complication was decreased by filling the ETT cuff with liquid[9,10]. In our clinical study, the cuff pressure was recorded at the start of the surgery and was maintained below 25cmH_2O in both groups to remove the confounding factor.

It has been reported that lignocaine alone has a low diffusion rate across an ETT cuff (1% release during a 6 hours period[8] . Only high doses of lignocaine (200-500mg) produce a clinical effect when used to inflate the cuff [12,13] and this could be dangerous if the ETT cuff ruptures. In vitro studies have shown that alkalinization of lignocaine greatly enhances (63-fold) the diffusion of lignocaine[16] and in vivo studies have shown that low dose (40mg) reduced postoperative side effects [11]. It also has been shown that the amount of lignocaine diffusing across the ETT cuff in the presence of sodium bicarbonate is proportional to the dose of lignocaine used between 20 and 40mg [3].

The main findings in this study were a decrease in the incidence of coughing, sore throat, hoarseness of voice and changes in hemodynamics at emergence from general anaesthesia when alkalinized lidocaine was used to inflate the ETT-cuff instead of the usual medium that is air. This finding is similar to those in other studies conducted in other parts of the world[18,19,20], though few variations in the intensity and duration of responses existed. This could be attributed to various types of anaesthetic agent and adjuncts used.

CONCLUSION

In conclusion our study showed that there is a decrease in the incidence of sore throat during the postoperative period when the cuff of an endotracheal tube was filled with alkalinized lignocaine rather than air. The incidence of side effects of tracheal intubation such as hemodynamic changes, hoarseness of voice and coughing were less when inflating medium of ETT cuff was alkalinized lignocaine rather than air.

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