Original Research Paper

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A COMPARATIVE STUDY TO STUDY THE DIFFERENCE IN EFFECT BETWEEN INTRACUFF SALINE, LIGNOCAINE AND ALKALINIZED LIGNOCAINE ON EMERGENCE COUGH, SORE THROAT AND HOARSENESS

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ABSTRACT Postoperative sore throat is the most common complaint after tracheal intubation. Mucosal injury or inflammation due to airway instrumentation or endotracheal tube is aggravated by diffusion of nitrous oxide into the cuff. Alkalinized Lignocaine or lignocaine, when administered as a cuff inflation medium , it diffuses across the cuff and desensitizes the laryngeal mucosa, and prevents diffusion of nitrous oxide into the cuff, this decreases the incidence of multiple laryngeal morbidities. In this study 60 patients were randomized into 3 groups of 20 each. Group- AL: received Alkalinized 2%lignocaine, Group-PL: received 2% lignocaine & Group-S: received normal saline as cuff inflating medium. Hemodynamic parameters, the severity of cough, post-operative sore throat and hoarseness of voice were compared. Increase of mean heart rate, systolic BP and diastolic BP from baseline is more in Group S than Group AL & PL at the time of extubation,10min & 30min after extubation with P value <0.05. There was significant difference in Cough severity,post-operative sore throat, hoarseness of voice after extubation with P value ≤0.05, the severity is less in Group AL than Group PL and less in Group PL than Group S. We observed that use of intracuff alkalinised lignocaine is very effective in reducing the laryngotracheal morbidity like sore throat, hoarseness of voice and cough in the immediate postoperative period when compared to plain lignocaine and saline.

KEYWORDS : cough , sore throat, hoaseness , alkalinized lignocaine

INTRODUCTION

Coughing induced by an ETT can complicate emergence from general anaesthesia.Use of Nitrous oxide during General anaesthesia tends to diffuse into the cuff and increases the cuff pressure. The increased cuff pressure is transmitted to tracheal mucosa and jeopardizes the mucosal blood supply which leads to ischemia of mucosa that results in complications like post-operative sore throat, hoarseness of voice and tracheal stenosis. Irritant or stretch stimuli in the trachea caused by the tube and its cuff are presumed mechanisms. Rapidly adapting stretch receptors (RAR) in the tracheal mucosa are believed to be irritant receptors involved in the cough reflex. Topically applied local anesthetics block the receptors. Lignocaine can diffuse across the ETT cuff. ETT cuffs are commonly made from polyvinyl chloride (PVC), which is a hydrophobic chemical substance. The rate of lignocaine diffusion is slow. Mechanism of lignocaine diffusion across an ETT cuff is similar to that found in epidural space. Lignocaine exists in two forms, non-ionized freebase and ionized cation. An increase in non-ionized fraction of lignocaine results in improved penetration and better diffusion across the cuff. Increasing the pH of the solution can predictably increase the percentage of the non- ionized form.

Use of an alternative method of cuff inflation could be a simple and effective way in decreasing the complications of endotracheal intubation both in the perioperative period as well as in ICU setting. This study was done to compare the effects of ETT cuff inflation with saline, lignocaine or alkalinised lignocaine on postoperative airway morbidity.

The aim of this clinical study is to compare and evaluate the effect of intracuff saline,lignocaine and alkalinized lignocaine to attenuate the incidence of post-operative airway complications.

MATERIALS & METHODS

60 patients divided into three groups of 20 each.Preoperative evaluation done on the day before surgery.

Patients were randomly allocated into following 3 groups :
Group S intracuff saline
Group PL intracuff lignocaine
Group AL intracuff alkalinized lignocaine

At operation theatre, iv access was established with 18/20G cannula. Standard monitoring was applied and baseline pulse rate, systolic blood pressure(SBP), diastolic blood pressure(DBP), mean arterial blood pressure(MAP) and Spo2 was recorded.

Premedication-Inj.Glycopyrrolate 0.004mg/kg IV ,Inj.Ondansetron 0.15 mg/kg IV & Inj. Fentanyl 1-2 microgram/kg IV given.

Pre-oxygenation-Air sealed face mask of correct size was held close to the patient's face with 100% oxygen of 6-8 litter for 3-5 minutes using bain circuit.

Induction-Inj.Propofol2-3mg/kgIV,Inj. Suxamethonium 2mg/kg IV
Intubation : Appropriate size ET Tube mm ID, Pretex, Cuffed inserted & inflated with
Group S intracuff saline
Group PL intracuff lignocaine
Group AL intracuff alkalinized lignocaine

The volume was decided by the minimum occlusion volumn technique when no audible leak from cuff when IPPV given.Bilateral air entry checked, cuff inflated and tube fixed.

Maintenance of anaesthesia- 50% O2+ Sevoflurane / Isoflurane + Inj. Atracurium 0.5mg/kg loading dose + 0.1mg/kg maintenance dose
Reversal of anaesthesia- Inj. Glycopyrrolate 0.008mg/kg IV + Inj. Neostigmine 0.05 mg/kg IV

Endotracheal tube cuff deflated & removed when the patient had established protective reflexes with adequate tidal volume and muscle tone/power and hemodynamic stability and patient started following verbal commands.

Post operatively after extubation, following parameters were noted. Incidence of sore throat, coughing ,hoarseness assessed over immediate after extubation, 10 minutes, 30 minutes, 1 hour, 6 hour, 12 hours, 24 hours.

Severity of Cough:
Grade 0: No Cough
Grade 1: Cough Lasting For Less Than 15 Second
Grade 2:Cough Lasting For More Than 15 Second

Score of Sore Throat:
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/ her own (moderate sore throat)
Score 3: The patient is in obvious distress (severe sore throat)

Score of Hoarseness:
Score 0: no complaint of hoarseness at any time since the operation
Score 1: minimal changes in quality of speech. Patient answers in the

affirmative only when asked (minimal hoarseness)
Score 2: moderate changes in quality of speech of which the Patient complaints on his/her own (moderate hoarseness)
Score 3: gross changes in the quality of voice perceived by the observer (severe hoarseness)

DATA ANALYSIS METHODS

According to Navarro et al study, considering the incidence of POST (Post Operative Sore Throat) in air as 59% and incidence of POST in lignocaine as 32% at 95% confidence interval with 80% power, the sample size calculated as

$$N= (Z_{1-\alpha/2} + Z_{1-\beta})2^* 2^* P^* (1-P) / (P_1-P_2)^2$$

$Z_{1-\alpha/2}$ -two tailed probability for 95% confidence interval
$Z_{1-\beta}$- two tailed probability for 80% power
P_1 **(%)**-Prevalence of POST in air
P_2**(%)** Prevalence of POST in lignocaine
P-average Prevalence of POST in air and POST in lignocaine

The sample size was calculated to be 60. Patients were divided into 3 groups of 20 each.

All data entry was coded and entered in MS excel worksheet 2017 and analysis was done in SPSS SOFTWARE 22.0 Version.The continuous data was expressed as mean ±standard deviation(SD).The comparison of continuous data was done using chi square test or Fisher's exact test and the comparison of continuous data was done using independent sample 't' test and one way ANNOVA test. Probabilityvalue('p'value)of less than or equal to 0.05 at 95% confidence interval was considered as statistically significant.

RESULTS

The mean age in Group S was 41.15 ± 9.46 years, in Group PL 41.65 ± 11.59 years and in Group AL 42.20 ± 11.77 years.

The sex distribution was equal in all 3 groups 13 (65%)male & 07 (35%)female in Group S,12 (60%)male & 08 (40%)female in Group PL and 14 (70%)male & 06 (30%)female in Group AL.

ASA distribution was equal in all 3 groups
GroupS:01(05%)ASA1,09(45%)ASA2,10(50%)ASA3
GroupPL:02(10%)ASA1,08(40%)ASA2,10(50%)ASA3 GoupAL:01 (05%)ASA1,08 (40%)ASA2,11 (55%)ASA3

All 3 groups were comparable on basis of age ,sex
And ASA grade with Pvalue>0.05.

The mean heart rate was higher at the time of extubation and subsequently lower at 10 minutes, 30 minutes, after extubation in all 3 groups. But Increase of heart rate from baseline is more in group S than Group PL and AL. No significant difference was observed after 30 mins of extubation in all groups.

The mean SBP and mean DBP was higher at the time of extubation & gradually lower at 10 minutes, 30 minutes, after extubation in all 3 groups. But Increase of SBP & DBP from baseline is more in group S than Group PL and AL. No significant difference was observed after 30 mins of extubation in all groups.

Group AL & PL showed a significant difference in attenuating the rise in heart rate, SBP,DBP during emergence at all intervals of assessmentwith Pvalue<0.05.

Cough severity showed significant difference at the time of extubation, at 10 minutes, 30 minutes, 1hour & upto 6hour after extubation in all 3 groups with Pvalue<0.05. No significant difference was observed in all groups after 6 hours of extubation.[table-1]

Cough was observed in 65% of patients in group S,45% in group PL and 25% in group AL after extubation

The severity of sore throat is significant upto 12 hours after extubation with Pvalue<0.05. No significant difference was observed in all groups after 12 hours of extubation.[table-2]

Sore throat was observed in 65% of group S patients,55% of group PL and 20% of group AL patients after extubation.

The severity of hoarseness is significant upto 12 hours post-extubation with Pvalue<0.05. No significant difference was observed in all groups after 12 hours of extubation.[table-3]

Hoarseness was observed in 65% of group S patients,55% of group PL and 20% of group AL patients after extubation.

DISCUSSION

The highest incidence of sore throat and other airway related symptoms tends to occur in patients who have undergone tracheal intubation. When lidocaine is injected into the ETT cuff, it spreads through the semipermeable membrane wall and induces anesthetic action in the trachea. This increases tolerance to the placement of tracheal and tracheotomy tubes. Hemodynamic alterations after tracheal extubation are thereby minimized, and the incidence of coughing is reduced. Only the non-ionized base form of the drug diffuses across the hydrophobic polyvinyl chloride walls of the ETT cuff. Increasing the pH of the solution can predictably increase the percentage of the non-ionized fraction of the drug. Addition of bicarbonate resulted in a 63-fold increase in the diffusion of lidocaine across the ETT cuff, allowing to use lower doses of lidocaine (without exceeding the toxic limits). Inflation of the ETT cuff with alkalinized 2% lidocaine is superior to saline in decreasing the incidence of emergence coughing and preventing sore throat during the postoperative period .

We compared Saline, lidocaine and alkalinized lidocaine for determining rise in intracuff pressure and thereby incidence and signs of tracheal morbidity like emergence coughing, post-operative sore throat and hoarseness of voice.

In our study, all patients were extubated without any complications, and no evidence of cuff damage was observed.

APPENDICES:

Table 1: Cough Score Wise Distribution

Cough score				P Value			
	Group S	Group PL	Group AL	S-AL-PL	S-PL	AL-PL	S-AL
After extubation	13 (65%)	9 (45%)	5 (25%)	**0.0394**	0.203	0.184	**0.011**
10 min	13 (65%)	9 (45%)	5 (25%)	**0.0394**	0.203	0.184	**0.011**
30 min	12 (60%)	9 (45%)	4 (20%)	**0.0347**	0.342	0.091	**0.009**
1 hour	12 (60%)	8 (40%)	4 (20%)	**0.0356**	0.205	0.167	**0.009**
6 hours	09 (45%)	6 (30%)	2 (10%)	**0.0479**	0.327	0.113	**0.013**
12 hours	06 (30%)	5 (25%)	1 (5%)	0.112	0.723	0.076	0.377
24 hours	03 (15%)	2 (10%)	0	0.217	0.632	0.632	0.071

Table 2: Sore Throat Wise Distribution

Sore throat				P Value			
	Group S	Group PL	Group AL	S-AL-PL	S-PL	AL-PL	S-AL
After extubation	13 (65%)	9 (55%)	4 (20%)	**0.0159**	0.203	0.091	**0.003**
10 min	13 (65%)	9 (45%)	4 (20%)	**0.0159**	0.203	0.091	**0.003**
30 min	12 (60%)	9 (45%)	4 (20%)	**0.0347**	0.342	0.091	**0.009**
1 hour	12 (60%)	8 (40%)	3 (15%)	**0.0135**	0.205	0.076	**0.003**
6 hours	10 (50%)	6 (35%)	2 (10%)	**0.0221**	0.196	0.113	**0.005**
12 hours	07 (35%)	3 (15%)	1 (5%)	**0.0442**	0.144	0.291	**0.017**
24 hours	03 (15%)	1 (5%)	0	0.1533	0.291	0.311	0.071

Table 3: Hoarseness Wise Distribution

Hoarseness				P Value			
	Group S	Group PL	Group AL	S-AL-PL	S-PL	AL-PL	S-AL
After extubation	13 (65%)	9 (55%)	4 (20%)	**0.0159**	0.203	0.091	**0.003**
10 min	13 (65%)	9 (45%)	4 (20%)	**0.0159**	0.203	0.091	**0.003**
30 min	12 (60%)	9 (45%)	4 (20%)	**0.0347**	0.342	0.091	**0.009**
1 hour	12 (60%)	8 (40%)	3 (15%)	**0.0135**	0.205	0.076	**0.003**
6 hours	10 (50%)	5 (25%)	2 (10%)	**0.0179**	0.102	0.211	**0.005**

12 hours	07 (35%)	2 (10%)	1 (5%)	**0.0242**	0.058	0.548	**0.017**
24 hours	03 (15%)	1 (5%)	0	0.1533	0.291	0.311	0.071

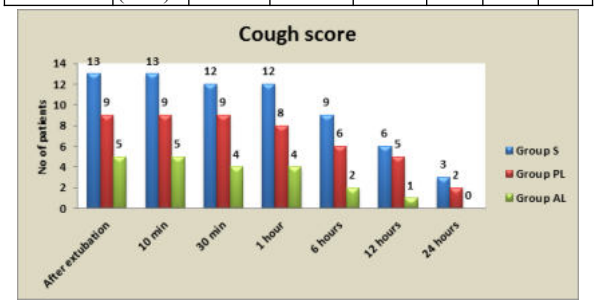

Chart 1 : Cough Score Wise Distribution

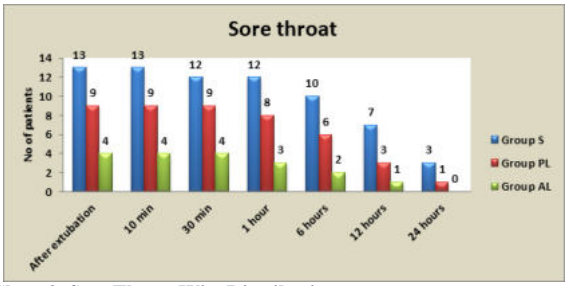

Chart 2: Sore Throat Wise Distribution

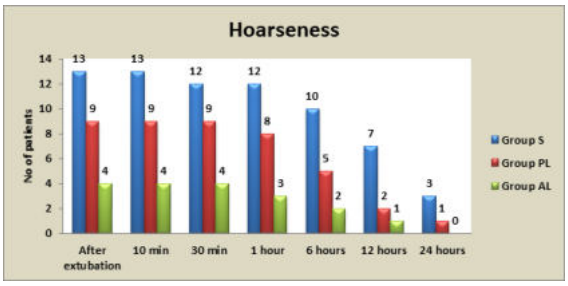

Chart 3: Hoarseness Wise Distribution

CONCLUSIONS

Use of intracuff alkalinised lignocaine is very effective in reducing the laryngotracheal morbidity like sore throat, hoarseness of voice and cough in the immediate postoperative period when compared to plain lignocaine and saline. It also helps in smoother extubation by decreasing haemodynamic response and bucking over the tube. It is a safe and effective method of improving extubation and recovery from endotracheal intubation for patients undergoing surgeries under general anaesthesia.

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