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Comparative Study of the Effect of the Endotracheal Infra Cuff Alkalinized Lidocaine and Saline in Reducing the Incidence of Emergence Coughing, Post Operative Sore Throat and Hoarseness: A Randomized Clinical Trial

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Key Words
Alkanized lidocaine, normal saline, emergence coughing, postoperative sore throat, hoarseness of voice

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ABSTRACT

The gold standard of airway management and usage of the cuffed ETT is routine in day to day practice. Adequate ventilation is provided by ETT and risk of aspiration is less. The usage of Nitrous oxide along with Oxygen during maintenance leads to elevation of cuff pressure as Nitrous oxide diffuses inside the cuff. Alkalinized Lidocaine is more permeable and has a local anaesthetic property which blocks the tracheal nociceptive receptors thereby the incidence of sore throat, emergence coughing and hoarseness. To evaluate and compare the effects of endotracheal tube cuff inflation media, with alkalinized 2% Lidocaine and Saline on emergence coughing, postoperative sore throat and hoarseness of voice during N2O maintained general anaesthesia. Seventy patients divided into 2 groups (n=35) were randomly allocated between 18-60 years of age who were posted for elective surgery under general anaesthesia with endotracheal intubation. The ETT cuff was inflated with alkalinized Lidocaine in the group I and normal Saline in group -II. Both the groups were compared regarding postoperative sore throat, emergence coughing and hoarseness at time intervals of 30, 60, 90 min and 24 hours. post-extubation, along with haemodynamic variations. The quantitative variables are compared across groups using unpaired t-test and while across follow-up comparison is done using paired t-test. Qualitative variables are expressed as frequencies/percentages and assessed using chi-square Exact test. A $p<0.05$ is considered statistically significant. The data is entered in MS Excel spread sheet and statistical analysis performed using IBM SPSS version 20.0 software. The variables are summarized using frequency distribution and mean±sd. The demographic data and duration of surgery were comparable between the 2 groups. The haemodynamic variations were less significant in the alkalinized Lidocaine group compared to the group of normal Saline. The incidence of a postoperative sore throat (POST), cough (C), hoarseness of voice (H) and coughing/bucking is significantly lesser in Group I as compared to Group II. The severity of the POST, cough and hoarseness of voice is least in Group I compared to Group II. Our study concludes that inflation of ETT cuff with alkalinized Lidocaine reduces the incidence of postoperative sore throat, emergence coughing and hoarseness of voice compared to inflation of ETT cuff with normal saline.

INTRODUCTION

Post-operative sore throat, cough, hoarseness of voice are common, uncomfortable, distressing sequelae after endotracheal intubation[1-4]. Although characteristically not incapacitating these sequelae can be very uncomfortable and annoying to patients returning home. Endotracheal tube cuff, allow pressure to be maintained in the airways during the inhalation phase of artificial breathing and prevent exhalation of regurgitated gastroesophageal contents. However, the pressure of the ETT cuff is transmitted to the tracheal mucosa. When elevated, may cause ischemia of the mucosal vessels followed by serious complications such as ciliary loss[5], inflammation, ulceration, haemorrhage, tracheal stenosis tracheoesophageal fistula. These are more when the ET cuff pressure is greater than the capillary pressure of the tracheal artery, i.e. 30 cmH2O,[6-10] which causes tracheal ischemia proportional to the pressure exerted by the cuff and to the length of exposure[11].

Various Non-pharmacological and pharmacological measures have been used for attenuating tracheal morbidity with variable success. Among the non-pharmacological methods, small-sized endotracheal tubes, lubricating the endotracheal tubes with water-soluble jelly, careful airway instrumentation, intubation after full relaxation, gentle oropharyngeal suctioning, minimizing intra-cuff pressure and extubation when the tracheal tube cuff is fully deflated. Intubation using a tracheal tube with a large residual volume and low pressure, which was deflated initially to its maximum extent and then filled with Lidocaine (2%) mixed with 7.5% Sodium bicarbonate, in the proportions of 19ml+1ml respectively, to cause a cuff pressure of 15mmHg (20cmH2O) have been reported to decrease the incidence of earlier mentioned complications.

Nitrous oxide (N_2O), a gaseous anaesthetic used in daily anaesthetic practice, easily diffuses inside ETT cuffs. Thereby raising their pressure. Overinflation of the cuff and the consequent tracheal mucosa lesions result in sore throat, hoarseness and coughing, thus causing discomfort to patients after the removal of the endotracheal tube[6,11,12].

We hypothesize that when Lidocaine is injected into the ET cuff it spreads through the semi-permeable membrane wall and induces anaesthetic action in the trachea. This increases airway tolerance to tracheal and tracheostomy tubes[13-16]. Increasing the alkalinity of the local anaesthetic, using Sodium bicarbonate also dramatically increases its diffusion through the ETT cuff; this allows the possibility of reducing the dosage of local anaesthetic[22]. After tracheal extubation, the heamodynamic alterations are reported to be minimized, thus reducing the incidence of coughing[17-21]. Alkalinized Lidocaine with Sodium bicarbonate is found to reduce the incidence of the sore throat[17,20,21] following tracheal extubation. It has been suggested that sore throats are caused by the activation of tracheal pain receptors[11]. The proposal of continuous application of local anaesthetic to block these nociceptive receptors would, therefore, seem logical, in an attempt to reduce the incidence of sore throat.

MATERIALS AND METHODS

By taking the values as reference from a prior study, the minimum required sample size with 80% power of study and 5% level of significance is 32 patients in each study group. So total sample size taken is 70 (35 patients per group) by Statistical Package for the Social Sciences (SPSS) for windows, version 20. The time period of the study was January 2018-December 2019.

The patients within age group 18-60 years posted for elective surgery requiring general endotracheal anaesthesia were randomly divided into Group I (alkalinised Lidocaine group), Group II (normal Saline group). The patients in all both the groups were comparable with respect to demographic parameters. Patients were randomised into two groups by using the numbers generated by the computer.

The observer and the patient both were kept blinded of group allocation till the end of observation period. To achieve this, a nursing officer specially trained and instructed for this purpose, was handed over the sealed envelope containing group and name of the patient. The assigned nursing staff did not take part in the subsequent anaesthetic management and postoperative observations which were entirely done by the observer and anaesthesiologist unaware of group allocation of the patient. All patients were visited a day before surgery for preanesthetic evaluation. Those patients who met the criteria were informed and explained in details about the anaesthetic evaluation. Those patients who met the criteria were informed and explained in details about the anaesthetic procedure and the study, and consent was obtained for their inclusion in the study as well as for the Anaesthesia. All patients were informed preoperatively that we would be inquiring about sore throat, emergence coughing, and hoarseness of voice in the postoperative period as per the questionnaire by Harding and McVey[23]. All Patients received Anaesthesia in the supine position. The appropriate endotracheal tube was selected (single use PVC tracheal tube [Portex™ profile tracheal tube] low pressure-high volume cuff, 7/8 mm internal diameter for female and male patients, respectively).They received a standard monitoring protocol which includes ECG, NIBP measurement and SPO2 baseline parameters were noted.

All patients received pre-anaesthetic medication of Midazolam, consisting of 0.05 mg/kg dose

intravenously one hour before Anaesthesia. After three minutes of pre-oxygenation, induction was done using Propofol (2mg/kg) i.v, Fentanyl (2mcg/kg) i.v. and intravenous Vecuronium bromide(0.1mg/kg). Tracheal intubation was performed by an experienced anaesthesiologist always after the neuromuscular blockade reached its maximum effect, which was checked by monitoring the blockade through a sequence of four thumb abductor stimulations. Before endotracheal intubation, no other lubricant was used. After tracheal intubation, the endotracheal tube cuff was filled with saline or alkalinized Lidocaine to achieve a pressure of 20 cmH_2O and the amount of this volume used to achieve this pressure was recorded.

Ventilation was controlled by adjusting the current volume and respiratory frequency, to maintain the final $_{CO2}$ exhalation pressure ($PETCO_2$) between 30 and 35 mmHg. Anaesthesia was maintained using Isoflurane (MAC: 0.5-1.0), Nitrous oxide (0.8 l/min) in oxygen (0.5 l/min), utilizing a circuit with Carbon dioxide absorption.

Data relating to the heamodynamic and respiratory characteristics and cuff pressure measurements were obtained after orotracheal intubation but before N_2O inhalation and then 30, 60, 90, 120 min (intermittently) after the start of N_2O anaesthesia and again at the end of anaesthesia, before stopping the inhalation of N_2O. At the end of the surgical procedure, the neuromuscular blockade was reversed using Neostigmine and Glyco-pylorate while careful aspiration of the oro-pharyngeal secretion was done.

Five minutes post-reversal the neuromuscular blockade, controlled or assisted ventilation was continued until signs of deglutition return and the onset of spontaneous ventilation was achieved. The tracheal tube was removed when signs of complete neuromuscular blockade reversion were seen, in response to ulnar stimulation, with fourth stimulus/first stimulus equal to one, spontaneous ventilation, with the response to verbal commands or movement demonstrating a desire to remove the tracheal tube.

At this point, the following parameters were noted: Duration of Anaesthesia, time taken for tracheal tube removal and the patient blood pressure, heart rate, emergence coughing immediately before and after tracheal extubation.

At the end of the anaesthetic surgical procedure, the patients were taken to the PACU and checked for the clinical symptoms relating to the use of the tracheal tube. We observed the occurrence of sore throat, emergence coughing and hoarseness. The intensity of the complaints was evaluated by the following scoring system as suggested by Harding and McVey[23].

RESULTS AND DISCUSSIONS

Our study conducted on 70 patients divided in to alkalinized Lidocaine (Group-I), Normal Saline group (group II) with 1:1 distribution, was completed in a prospective randomised way and results were analyzed and tested by appropriate statistical methods. The groups were comparable in terms of age, distribution, gender distribution. American Society of Anaesthesiologists (ASA) distribution [Table 2, chart 1]. The duration of laryngoscopy, distribution of number of attempts of intubation, in both groups were comparable and no statistical difference was observed ($p>0.05$). The incidence of Post operative sore throat recorded at time intervals of 30min, 60min, 90min and 24 hours. In both groups were I (2, 7, 6, 11) and II (10, 17, 21, 25) respectively. The incidence of emergence coughing at time intervals of 30min, 60min, 90min and 24 hours in group I was found to be (5, 4, 5, 7) and Group II (17, 16, 20, 23) respectively. The incidence of Hoarseness at time intervals of 30min, 60min, 90min and 24hours in group I was found to be (6, 6, 6, 6) and group II (16, 16, 18, 21) respectively. On analysis, these differences were found statistically significant ($p<0.05$) [Table 4, chart-3]. The severity of post operative sore throat, emergence coughing and Hoarseness recorded by interview based on Harding and Mc vey questionnaire[23] was analyzed. It was found that the difference between the analysis were statistically significant ($p<0.05$) [Table 5, chart-3]. The incidence of emergence coughing, post operative sore throat, hoarseness was more in Group II. The difference between these values were statistically significant as $p<0.05$.

Coughing, sore throat and hoarseness are most common postoperative complications after emergence from general anaesthesia[24] which are very distressing, unpleasant and become more upsetting than the surgery itself[29] contributing to the patients discomfort and delays discharge. Many factors including the diameter of the tracheal tube, cuff design, intubating procedure, movement of the tracheal tube during the surgery, coughing, bucking on the tube and excessive pharyngeal suctioning during extubation have been described to influence the incidence of these[1]. The endotracheal tube cuff allows pressure to be maintained in the airways during the inhalation phase of artificial breathing and prevent exhalation of regurgitated gastro-oesophageal contents. However, the pressure of the ETT cuff is transmitted to the tracheal mucosa. When elevated, may cause ischemia, of the mucosal vessels followed by serious complications such as ciliary loss, inflammation, ulceration, haemorrhage, tracheal stenosis and tracheo-oesophageal fistula[24]. These are more when ETT cuff pressure is greater than the capillary pressure of the tracheal artery pressure, i.e. 30cm H_2O[6-10],

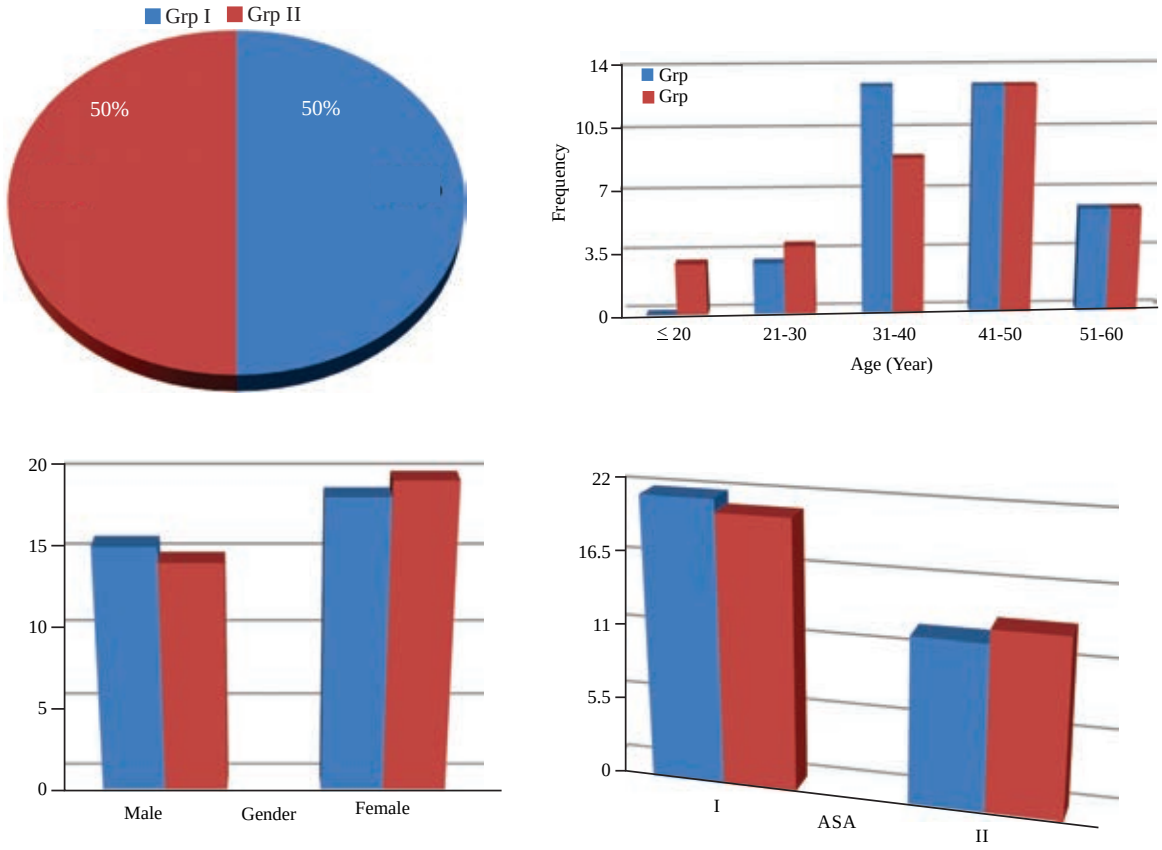

Fig. 1(a-d): Demographic Data

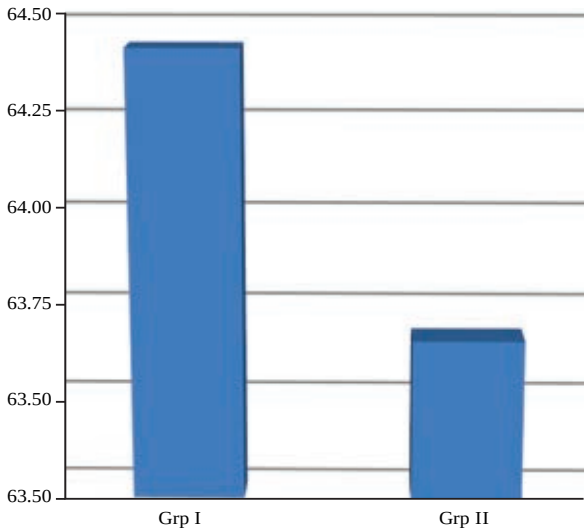

Fig. 2: Group Distribution

which causes tracheal ischemia proportional to the pressure exerted by the cuff and to the length of exposure[11]. To prevent laryngotracheal morbidity, the cuff of ETT which is hydrophobic semipermeable membrane can be used as a reservoir for drug delivery to tracheal mucosa[20]. Various alternatives like Saline, plain Lignocaine, Dexamethasone have been evaluated for cuff inflation. It has been suggested that sore throat is mainly caused by the activation of tracheal pain receptors[11]. Thus, to reduce the incidence of emergence coughing, sore throat and hoarseness of voice by blocking these nociceptive receptors by continuous application of local anaesthetic seem logical.

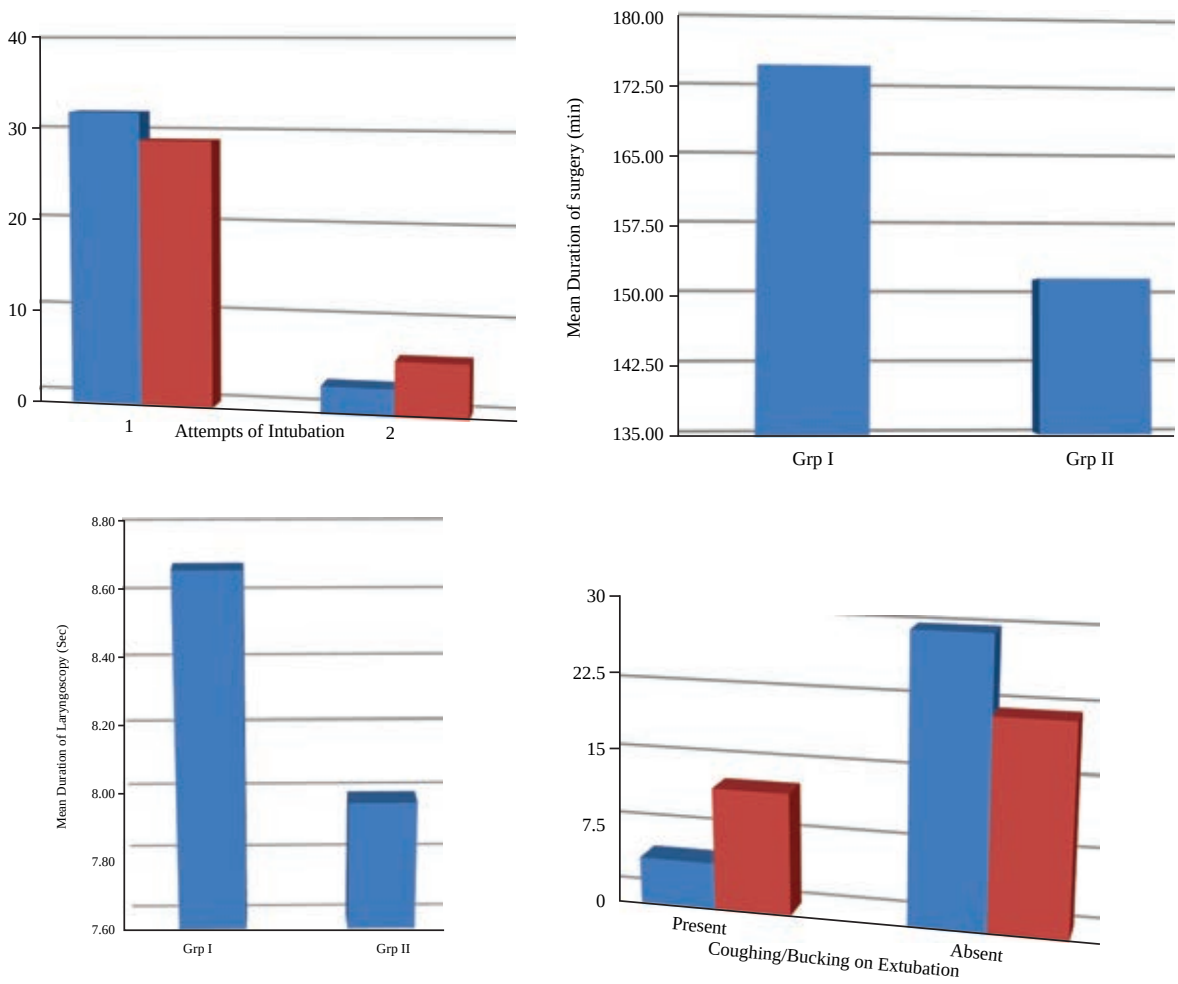

Fig. 3(a-d): Secondary parameters (Chart 1)

In our study the mean age of alkalinized Lidocaine group was (41.23±8.65 years) and in normal Saline group (40.31±10.97 years) and the difference was statistically not significant (p value=0.350), our study can be compared to Rizvanovic *et al*.[30] whose p-value was 0.471 and Abbasi *et al*.[25] whose p-value was 0.313. The gender distribution showed no statistical difference (p value=0.45). The mean weight in the two groups was comparable and showed no statistical difference was shown (p = 0.376), our findings similar to the study done by Podder *et al*.[33] whose p-value was 0.386 and Gaur *et al*.[29] whose p-value was 0.317. The ASA status of both groups was comparable, with ASA I patients preponderance in both the groups (62.86% in group I and 60.00% in group II). The distribution pattern in both the groups is the same and comparable (p = 0.403) our findings correlate with Gaur *et al*.[29] whose p-value = 0.539. Duration of laryngoscopy in both groups was comparable and showed no statistical difference (p = 0.183), the mean duration in group I was (8.69±4.05) and in group II (8.00±1.88). Number of attempts of intubation in both the groups were comparable with the preponderance of one attempt in group I is 91.43% and group II: 82.86% and no statistical significance was seen (p=0.142). The analysis of duration of surgery in both the groups was comparable and statistically significant (p=0.002). The mean duration of surgery in group I was (172±31.09) and in group II was (151.12±28.18).

The minimum duration of surgeries was 2 hr. in all our cases which allowed sufficient time for lignocaine to diffuse out of the cuff, as the diffusion of Lignocaine across the cuff membrane is a function of time[34]. In our study, we evaluated patients postoperatively (up to 24 hours) for sore throat, emergence coughing and hoarseness by using Harding and McVey scoring system[23]. We found a statistically significant to be 0.006,0.006, <0.001, <0.001 respectively. Our results are consistent with the findings of Lam., *et al*.[26] and studies were done by Rizvanovic *et al*.[30] in which p-value was found to be 0.015 at all times. Our study is also similar to studies done by Wasim *et al*.[27] in which the p-value is 0.00, Gaur *et al*.[29] p-value was 0.001 and also Podder *et al*.[33] whose p-value is (<0.001).

In our study, while comparing the incidence and severity of emergence coughing, we found there was

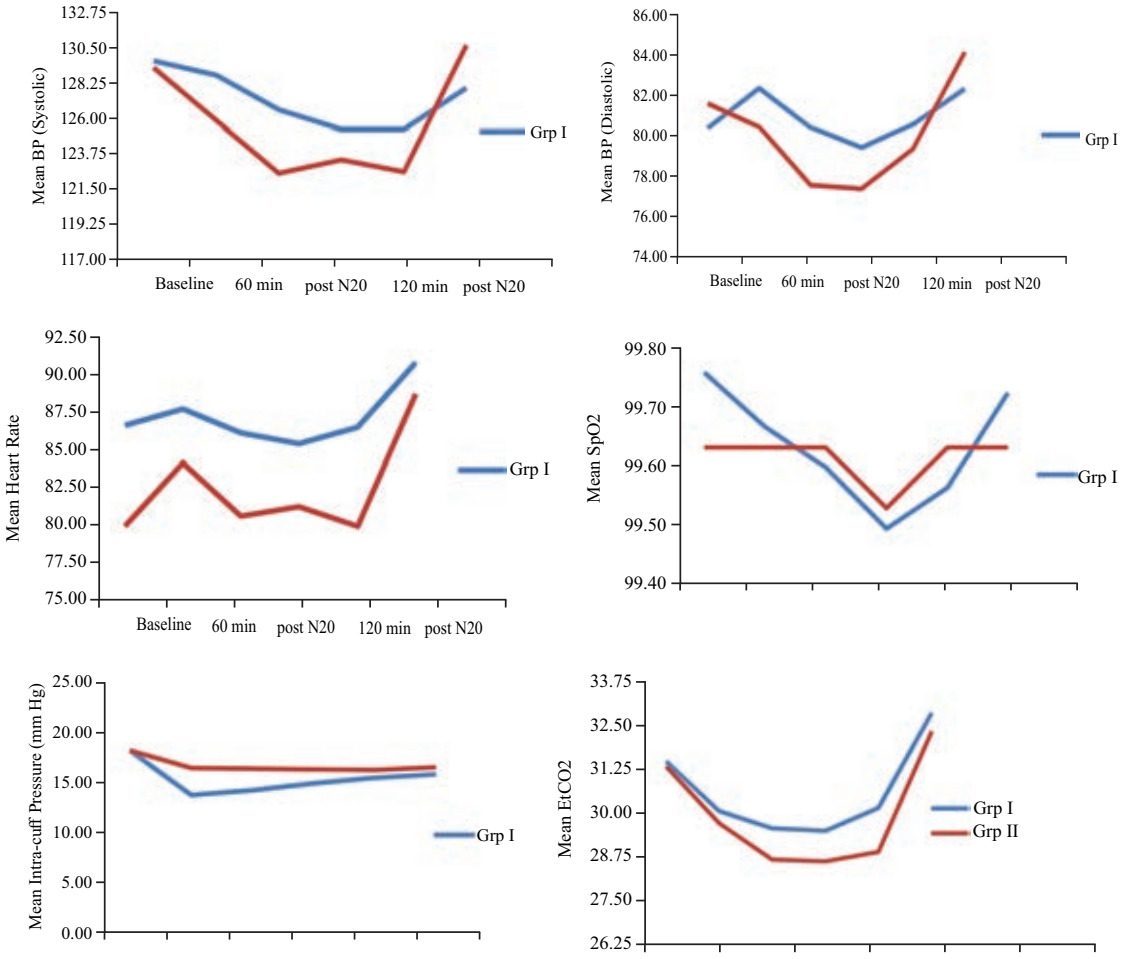

Fig. 4(a-f): Secondary parameters (Chart 2)

Table 1: Harding and McVey Questionnaire

	Scoring System for Sore Throat
0	No sore throat at any time since operation
1	Minimal sore throat, less severe than with a cold, occurring at any time since operation
2	Moderate sore throat similar to that noted with a cold occurring at any time since your operation
3	Severe sore throat, greater than noted with cold occurring at any time since your operation
	Scoring System for Cough
0	No cough or scratchy throat occurring at any time since operation
1	Minimal scratchy throat or cough, less than noted with a cold, occurring at any time since your operation
2	Moderate cough, as would be noted with cold occurring at any time since operation
3	Severe cough, greater than would be noted with a cold, occulting at any time since your operation
	Scoring System for Hoarseness
0	No evidence of hoarseness occurring at any time since operation
1	No evidence of hoarseness at time of interview but hoarseness as present previously
2	Hoarseness at the time of the interview that is noted by the patient only.
3	Hoarseness that is easily noted at the time of interview.

a statistically significant difference between the two groups. The p-value for S30, S60, S90 S24 was found to be 0.006, 0.006, <0.001, <0.001 respectively. Our study corroborates with studies by Lam., *et al*.[26], Podder *et al*.,[33] in which the p<0.001. While comparing the incidence of hoarseness of voice we found a statistically significant difference between the two groups where the hoarseness is more in the Saline group than alkalinized Lidocaine group with a significant statistical difference. The p-value for S30, S60, S90 S24 was found to be 0.005, 0.005, 0.001, <0.001 respectively. Our study correlates with the findings of the study of Podder *et al*.[33] in which the p<0.001 at all times. Our study also correlates with the study done by Jolly *et al*.[32] which showed a p-value of 0.04. In our study, the intra-cuff pressure for both groups was notably lower than the critical pressure at all times which probably is the logic for a beneficial effect of alkalinized Lidocaine on attenuating the post-operative emergence cuffing and hoarseness. However, there was a significant difference of p-value (<0.001, <0.001, 0.017, 0.015, 0.017 at 30, 60, 90,

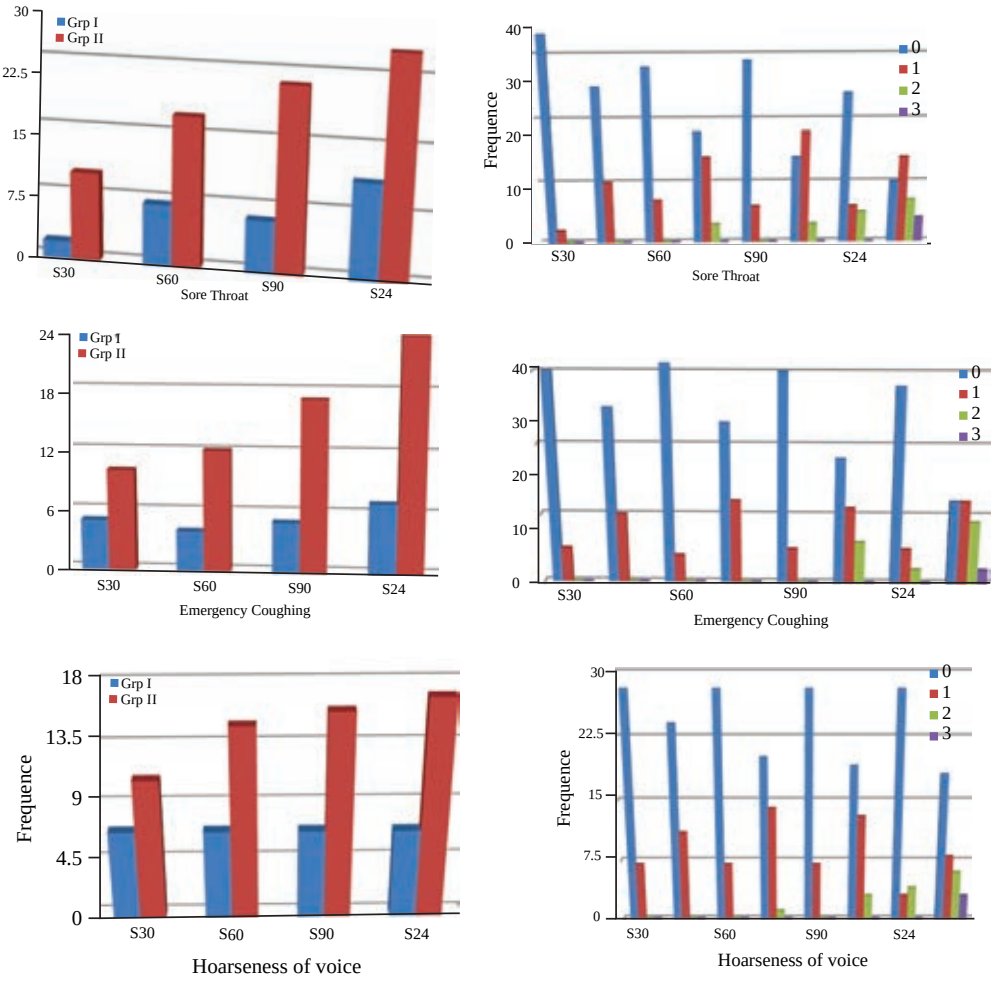

Fig. 5(a-f): Primary Parameters (Chart 3)

Table 2: Demographics

Demographics	Presentaton	P
Group distribution	**Frequency (n)**	**N/A**
I	35	
II	35	
Age(years), mean±SD		0.350
I	41.2±38.65	
II	40.31±10.97	
Gender Distribution		0.405
I		
Male	16	
Female	19	
II		
Male	15	
Female	20	
ASA distribution		0.403
I		
ASA I	22	
ASA II	13	
II		
ASA I	21	
ASA II	14	
Weight distribution, mean±sd		0.376
I	64.44± 9.85	
II	63.68 ±10.22	

120min and at extubation) respectively. Our findings correlate with Rizvanovic *et al*.[30] in which the p-value was found to be 0.001 on all occasions and Podder *et al*.[33] whose p<0.001. In our study, all the haemodynamic parameters in the preoperative period were comparable between both groups. The heart rate measured at different time intervals of procedure i.e. at baseline, 30 min, 60 min, 90 min and 120 min and extubation were all comparable and the difference was not statistically significant (p> 0.05). The variability

Table 3: Secondary parameters

Parameter	Presentation	p
Duration of Laryngoscopy mean±SD (s)		0.183
I	8.69±4.05	
II	8.00±1.88	
Attempts of intubation (%)		0.142
1		
I	91.43	
II	82.86	
2		
I	8.57	
II	17.14	
Duration of surgery Mean±SD		0.002
I	172±31.09	
II	151.12±28.18	
Variability of Systolic blood pressure (mean±sd)	**Presentation**	**p vs baseline**
I		
Base line	129.77±11.29	-
30 min(post N_2O)	128.89±12.96	0.250
60 min (post N_2O)	126.77±13.66	0.022
90Min (post N_2O)	125.54±13.68	0.008
120Min (post N_2O)	125.57±12.03	0.003
At Extubation	128.11±8.65	0.145
II		
Base line	129.37±10.74	-
30 min(post N_2O)	126±15.25	0.037
60 min (post N_2O)	122.86±14.58	<0.001
90Min (post N_2O)	123.71±12.16	0.001
120Min (post N_2O)	122.94±11.11	<0.001
At Extubation	130.74±9.52	0.196
Variability of Diastolic blood pressure (Mean±sd)	**Presentation**	**p vs baseline**
I		
Base line	80.91±10.59	-
30 min(post N_2O)	82±12.19	0.047
60 min (post N_2O)	80.94±11.55	0.491
90Min (post N_2O)	79.94±9.53	0.233
120Min (post N_2O)	81.09±9.51	0.446
At Extubation	82.86±9.28	0.080
II		
Base line	82.14±8.83	-
30 min(post N_2O)	80.97±10.87	0.173
60 min (post N_2O)	78.09±10.52	<0.001
90Min (post N_2O)	77.91±8.53	0.001
120Min (post N_2O)	79.86+-8.28	0.057
At Extubation	84.66±8.5	0.028
Variability of SPO2 (Mean+-sd)	**Presentation**	**p vs Baseline**
I		
Baseline	99.77±0.43	-
30 min(post N_2O)	99.69±0.47	0.092
60 min (post N_2O)	99.63±0.77	0.062
90Min (post N_2O)	99.54±0.98	0.037
120Min (post N_2O)	99.60±0.81	0.055
At Extubation	99.74±0.44	0.162
II		
Baseline	99.66±0.54	-
30 min(post N_2O)	99.66±0.54	-
60 min (post N_2O)	99.66±0.54	-
90Min (post N_2O)	99.57±0.81	-
120Min (post N_2O)	99.66±0.54	-
At Extubation	99.66±0.54	-
Variability of $EtCO_2$ (mean+-sd)	**Presentation**	**p-value vs baseline**
I		
Baseline	31.60±2.9	-
30 min(post N_2O)	30.26±2.82	<0.001
60 min (post N_2O)	29.80±3.12	<0.001
90Min (post N_2O)	29.74±3.17	<0.001
120Min (post N_2O)	30.34±2.75	<0.001
At Extubation	32.89±2.55	<0.001
II		
Baseline	31.46±3.23	-
30 min(post N_2O)	29.94±3.45	0.006
60 min (post N_2O)	28.97±3.71	<0.001
90Min (post N_2O)	28.91±3.28	<0.001
120Min (post N_2O)	29.17±3.29	<0.001
At Extubation	32.40±3.17	0.011
Variability of Intracuff pressure (mmHg)	**Presentation**	**p-value vs Baseline**
I		
Baseline	20.00±0	-
30 min(post N_2O)	16.54±2.39	<0.001
60 min (post N_2O)	16.89±2.01	<0.001
90Min (post N_2O)	17.43±2.1	<0.001
120Min (post N_2O)	17.86±.94	<0.001
At Extubation	18.14±1.85	<0.001

II		
Baseline	20.00±0	-
30 min(post N_2O)	18.66±1.21	<0.001
60 min (post N_2O)	18.60±1.61	<0.001
90Min (post N_2O)	18.51±2.11	<0.001
120Min (post N_2O)	18.46±1.77	
At Extubation	18.69±1.57	<0.001
Variation of heart rate	**Presentation**	**p-value vs Baseline**
I		
Baseline	86.37±13.02	-
30 min(post N_2O)	87.37±12.25	0.297
60 min (post N_2O)	85.34±12.46	0.399
90Min (post N_2O)	85.34±13.1	0.283
120Min (post N_2O)	86.29±9.85	0.476
At Extubation	89.94±11.22	0.008
II		
Baseline	80.74±13.37	-
30 min(post N_2O)	84.29±12.61	0.051
60 min (post N_2O)	81.31±12.31	0.366
90Min (post N_2O)	81.83±12.71	0.312
120Min (post N_2O)	80.74±11.85	0.500
At Extubation	88.17±12.25	<0.001
Coughing/bucking	**Frequency (n)**	**p = 0.014**
Yes		
I	5	
II	13	
No		
I	30	
II	22	

Table 4a: Incidence of sore throat in both the groups

	Grp I		Grp II		
Sore throat incidence	**No.**	**Percentage**	**No.**	**Percentage**	**p-value**
S30	2	5.71	10	28.57	0.006
S60	7	20.00	17	48.57	0.006
S90	6	17.14	21	60.00	<0.001
S24	11	31.43	25	71.43	<0.001

Table 4b: Incidence of emergence coughing in both the groups

	Grp I		Grp II		
Emergence Coughing incidence	**No.**	**Percentage**	**No.**	**Percentage**	**p-value**
S30	5	14.29	17	48.57	0.001
S60	4	11.43	16	45.71	<0.001
S90	5	14.29	20	57.14	<0.001
S24	7	20.00	23	65.71	<0.001

Table 4c: Incidence of hoarseness of voice in both the groups

	Grp I		Grp II		
Hoarseness of voice incidence	**No.**	**Percentage**	**No.**	**Percentage**	**p-value**
S30	6	17.14	16	45.71	0.005
S60	6	17.14	16	45.71	0.005
S90	6	17.14	18	51.43	0.001
S24	6	17.14	21	60.00	<0.001

Table 5a: Severity/ Grading of Sore throat

	S30		S60		S90		S24	
Sore throat Grading	**Grp I**	**Grp II**	**Grp I**	**Grp II**	**Grp I**	**Grp II**	**Grp I**	**Grp II**
0	34	25	31	18	32	14	30	10
1	1	10	4	14	3	18	3	14
2	0	0	0	3	0	3	2	7
3	0	0	0	0	0	0	0	4

Sore Throat		**S30**	**S60**	**S90**	**S24**
Grp I	mean	0.06	0.20	0.17	0.46
	+-sd	+-0.24	+-0.41	+-0.38	+-0.74
Grp II	mean	0.29	0.57	0.69	1014
	+-sd	+-46	+-0.65	+-0.63	+-0.97
p-value (I VsII)		0.005	0.003	<0.001	<0.001

5 b) Severity/grading of emergence coughing in both the groups

	S30		S60		S90		S24	
Emergence Coughing Grade	**Grp I**	**Grp II**	**Grp I**	**Grp II**	**Grp I**	**Grp II**	**Grp I**	**Grp II**
0	30	25	31	23	30	18	28	12
1	5	10	4	12	5	11	5	12
2	0	0	0	0	0	6	2	9
3	0	0	0	0	0	0	0	2

Emergence coughing		S30	S60	S90	S24
Grp I	mean	0.14	0.11	0.14	0.26
	+-sd	+-0.36	+-36	+-0.36	+-56
Grp II	mean	0.51	0.46	0.74	1.03
	+-sd	+-0.56	+-0.51	+_	+-0.92
P-value (I Vs II)		<0.001	<0.001	<0.001	<0.001

5c) Severity/grading of hoarseness of voice

	S30		S60		S90		S24	
Hoarseness of voice grading	Grp I	Grp II	Grp I	Grp II	Grp I	Grp II	Grp I	Grp II
0	29	19	29	19	29	17	29	14
1	6	14	6	14	6	14	6	11
2	0	2	0	2	0	4	0	7
3	0	0	0	0	0	0	0	3

Hoarseness of voice		S30	S60	S90	S24
Grp I	mean	0.17	0.17	0.17	0.17
	+-sd	+-0.38	+-0.38	+-0.38	+-0.38
Grp II	mean	0.51	0.51	0.63	0.97
	+-sd	+-0.61	+-0.61	+-0.61	+-0.61
p-value(I Vs II)		0.003	0.003	<0.001	<0.001

of systolic and diastolic blood pressure in group I and Group II was not statistically significant (p>0.05). The SpO2 and $EtCO_2$ values in both the groups were comparable and no statistical significance was observed (p>0.05). Our findings are consistent with the studies conducted by Navarro *et al*.[19,24], Lam., *et al*.[26] and Jolly *et al*.[32] proving that intracuff usage of alkalinized lidocaine reduces the incidence of emergence coughing, postoperative sore throat and hoarseness of voice. However, a study conducted by Navarro *et al*.[19] was only confined to smokers, whereas the study of Jolly *et al*[32] did not have better scoring and grading to study the outcomes.

We like Souissi *et al*.[28] compared alkalinized Lidocaine with normal saline. But the characteristic feature of our study is we used N_2O maintained general anaesthesia. Our study corroborates with the study done by Souissi *et al*.[28] that the incidence of postoperative sore throat, cough and hoarseness of voice was significantly less when intra cuff alkalinized Lidocaine is used. But in contrast to their study, we standardized the cuff pressure and regular monitoring was done.

The major finding of the present study is the decrease in the incidence of postoperative emergence complications from general anaesthesia when endotracheal tube cuff is inflated with alkalinized 2% Lidocaine. Further, the intracuff Lidocaine prevents the significant rise in the endotracheal tube intracuff pressure beneficial in reducing the above-mentioned complications. There are certain limitations in our study. Firstly, the results of our study are applicable only to patients of ASA I and II grade patients who are posted for surgeries of duration >2hours. Secondly, our study is confined to general anaesthesia cases in which N_2O was used.

CONCLUSION

The present study makes an important contribution towards clarifying causes to lower incidence of postoperative complications when using 2% alkalinized Lidocaine for inflating the cuff.

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