Original Research Paper

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STUDY OF HAEMODYNAMIC PARAMETERS AFTER AIRWAY NEBULIZATION WITH LIGNOCAINE 2% VERSUS ROPIVACAINE 0.5% ON INTUBATION RESPONSE IN PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA

Dr.Syeda Saniya* Junior resident.*Corresponding Author

Dr. KavyashreeNG Professor and HOD

ABSTRACT **Introduction:** Intubation and extubation during anaesthesia can cause haemodynamic changes due to the sympatho-adrenal response due to stimulation of epipharynx and laryngopharynx. The study aims to compare haemodynamic stability between lignocaine 2% and ropivacaine 0.5% among patients undergoing surgery under general anaesthesia. **Methods:** A randomized controlled study was conducted among patients undergoing elective surgeries under general anesthesia. 40 patients were randomized into two groups of 20 each. One group received nebulization with lignocaine 2% and the other group with ropivacaine 0.5%. The heamodynamic parameters (heart rate, systolic and diastolic blood pressure and mean arterial pressure) were measured at various time intervals. **Results:** The baseline characteristic (age, sex and BMI) of both the groups were similar. The baseline haemodynamic parameter of both the groups was also similar. The heart rate at 3, 4 and 10 minutes after intubation was more among the lignocaine than ropivacaine group and this was found to be statistically significant ($p<0.05$). The mean arterial pressure was similar among both groups except at 4 minutes after intubation which was more among the lignocaine than ropivacaine group ($p<0.05$).**Conclusion:** Patients on ropivacaine were found to have lesser heamodynamic fluctuation at all stages of examination when compared to lignocaine.

KEYWORDS :

INTRODUCTION

Following induction of anesthesia when laryngoscopy or tracheal intubation results in symapatho –adrenal responses due to activation of somato-visceral reflexes caused by stimulation of epipharynx and laryngopharynx.(1) These reflexes are generated within 5 seconds of intubation and reaches maximum in next 1 to 2 minutes and returns to baseline within 5 minutes (2). This leads to increase in circulatory catecholamines, heart rate, blood pressure, dysrhythmia and also myocardial oxygen demand. Though these changes are transient in nature is can vary among individual making it difficult to predict which patient can be affected. (3). This unpredictable response can be life threatening among patients with cerebrovascular or coronary artery disease. (4)

Commonly used techniques to overcome the adverse effects of intubation are use of heavy premedication, potent narcotics and inhalational anesthetic drugs to increase the depth of anesthesia but none is ideal. (5, 6) Lignocaine is the most widely used local anesthetic for intubation and extubation. (7, 8) Due to its short duration of action it requires repeat dose administration, hence the need for a long acting local anesthetic with minimal hemodynamic changes. Ropivacaine is a long-acting anesthetic drug which has been widely used through various routes. The present study aims to compare the hemodynamic stability of ropivacaine with lignocaine.

OBJECTIVE

To compare haemodynamic parameters (Baseline heart rate, systolic and diastolic blood pressure and mean arterial pressure, just before intubation, immediately after intubation and at 1, 2, 3, 4, 5 and 10 minutes between lignocaine 2% and ropivacaine 0.5% among patients undergoing surgery under general anaesthesia.

METHODOLOGY

STUDY DESIGN: Randomized controlled trial
DURATION OF THE STUDY: 2 months

SOURCE OF DATA: Patients scheduled for elective surgeries under general anesthesia admitted in Shridevi institute of medical sciences and research hospital.

INCLUSION CRITERIA:

1. Patients of either sex , aged between 18 - 65 years .
2. ASA physical status grade I and II
3. BMI more than 18kg/m2 - less than 35kg/m2

EXCLUSION CRITERIA:

1. History of respiratory diseases, gastroesophageal reflux, neurological, cardiovascular, cerebrovascular, hepatic or renal diseases

SAMPLING METHOD: Simple random sampling of all patients undergoing elective surgeries under general anesthesia during the study period and fulfilling the inclusion and exclusion criteria will be randomly allocated into two groups using computer generated randomization sequence till the required sample size is reached.

SAMPLE SIZE: The sample size was estimated using the following formula

$$N = \frac{2\,(Z_\alpha + Z_\beta)\sigma^2}{d^2}$$

Where,
$Z\alpha = 1.645$ for 90% confidence interval
$Z\beta = 0.84$ for 80% statistical power
σ = pooled Standard deviation of 8.05
Mean in group 1 ($\mu 1$) =7.64
Mean in group 2 ($\mu 2$) = 11.3
d = acceptable margin of error =| 7.64- 11.3| = 3.66
Therefore the estimate sample size in each group is 20
(i.e, 20+20=40, Total sample size of 40 assuming equal group sizes)

A total of 40 adult patients of either sex, in the age group 18 to 65 years posted for elective surgeries under general anaesthesia in Sridevi institute of medical sciences , satisfying the inclusion and exclusion criteria were included in the study. Patients were allocated into two groups after obtaining valid written informed consent.

Group A : 20 patients recieved Lignocaine 2% nebulization [5ml]
Group B : 20 patients recieved Ropivacaine 0.5% nebulization [5ml]

Thorough pre-anaesthetic check -up with detailed clinical history general and systemic examination was done. All the patients were kept nil per oral for 6 hours and preloaded with Ringer lactate solution 10ml/kg followed by maintenance. Baseline heart rates, systolic blood pressures, diastolic blood pressure, mean arterial blood pressure were recorded. Nebulization was done 30 minutes before shifting to OT for 10- 15minutes. All parameters (heart rate, systolic and diastolic BP and MAP) were observed at baseline, before intubation, immediately after intubation and at 1, 2, 3, 4, 5 and 10 min after intubation and results were documented in standardized protocol. Double blinding was done in which the patients and the investigator assessing the outcome were blinded to the assigned group to reduce bias.

ETHICAL CONSIDERATION: The study was started only after obtaining institutional ethics clearance from the institutional review board. Participants were recruited only after obtaining oral and written informed consent.

STATISTICAL ANALYSIS: Data entry was done in MS excel and analyzed using SPSS version 25. Mann Whitney U test was used to

compare the hemodynamic parameters of both the groups with p value of <0.05 to be considered statistically significant.

RESULTS

The baseline characteristics of group A (lignocaine) and group B (ropivacaine) were similar with statistical difference. (Table 1)

Table 1: Comparison of demographic data between the groups

Variable	Lignocaine	Ropivacaine	p value
Age (years) (mean ± SD)	47. 0 ± 7.9	45.9 ± 6.8	0.64
Sex			
Male (n,%)	14 (70)	9 (45)	0.10
Female (n,%)	6 (30)	11 (55)	
BMI (kg/m2) (mean ± SD)	28.8 ± 3.5	28.3 ± 3.6	0.53

The heart rates of both the groups were compared at the various time points as shown in Table 2. There was significant difference in the groups at T6, T7 nad T9 with the mean heart being more in group A (lignocaine) than B (ropivacaine).

Table 2: Comparison of heart rate between the groups with lignocaine and ropivacine nebulization at various time points

Time points	Heart rate (/min) mean ± SD		p value
	Lignocaine	Ropivacaine	
T1	77.1 ± 5.4	77.0 ± 6.3	0.93
T2	77.1 ± 5.3	76.1 ± 5.9	0.57
T3	78.1 ± 6.6	75.3 ± 6.0	0.16
T4	77.5 ± 5.9	76.1 ± 5.8	0.44
T5	77.8 ± 5.8	76.3 ± 5.7	0.40
T6	89.4 ± 4.7	83.7 ± 6.7	0.00*
T7	83.0 ± 2.6	76.2 ± 6.4	0.00*
T8	78.0 ± 6.5	76.9 ± 3.9	0.59
T9	91.7 ± 6.7	77.1 ± 6.6	0.00*

T1-Baseline, T2- Before intubation, T3- Immediate after intubation, T4- at 1 minute after intubation, T5- at 2 minutes after intubation, T6- at 3 minutes after intubation, T7- at 4 minutes after intubation, T8- at 5 minutes after intubation, T9- at 10 minutes after intubation.

The systolic blood pressures of both the groups were compared and there was significant increase at T7 interval among the lignocaine group. (Table 3)

Table 3: Comparison of systolic blood between the groups with lignocaine and ropivacine nebulization at various time points

Time points	Systolic BP (mmHg) mean ± SD		p value
	Lignocaine	Ropivacaine	
T1	122.7 ± 7.2	125.4 ± 11.2	0.36
T2	123.5 ± 7.7	123.7 ± 8.8	0.70
T3	120.8 ± 7.5	122.3 ± 9.1	0.59
T4	122.7 ± 7.2	122.1 ± 8.2	0.70
T5	122.5 ± 6.8	118.5 ± 4.3	0.94
T6	126.7 ± 6.7	119.2 ± 3.4	0.81
T7	128.2 ± 5.3	119.4 ± 3.2	0.03*
T8	124.5 ± 7.1	119.2 ± 4.1	0.41
T9	135.4 ± 6.1	117.7 ± 3.6	0.70

T1-Baseline, T2- Before intubation, T3- Immediate after intubation, T4- at 1 minute after intubation, T5- at 2 minutes after intubation, T6- at 3 minutes after intubation, T7- at 4 minutes after intubation, T8- at 5 minutes after intubation, T9- at 10 minutes after intubation.

The diastolic blood pressures of both the groups were compared and there was significant increase at T7 interval among the lignocaine group. (Table 4)

Table 4: Comparison of diastolic blood pressure between the groups with lignocaine and ropivacine nebulization at various time points

Time points	Diastolic BP (mmHg) mean ± SD		p value
	Lignocaine	Ropivacaine	
T1	80.1 ± 4.7	81.5 ± 6.3	0.36
T2	81.2 ± 5.3	82.1 ± 1.0	0.70
T3	80.5 ± 4.7	82.1 ± 5.7	0.59
T4	80.6 ± 4.9	82.1 ± 5.7	0.70
T5	80.7 ± 4.9	82.1 ± 5.7	0.94
T6	80.4 ± 4.5	80.1 ± 4.4	0.81
T7	84.6 ± 4.7	81.2 ± 6.4	0.03*
T8	81.4 ± 4.7	80.4 ± 4.3	0.41
T9	82.3 ± 5.8	80.6 ± 4.4	0.70

T1-Baseline, T2- Before intubation, T3- Immediate after intubation, T4- at 1 minute after intubation, T5- at 2 minutes after intubation, T6- at 3 minutes after intubation, T7- at 4 minutes after intubation, T8- at 5 minutes after intubation, T9- at 10 minutes after intubation.

On comparing the MAP value between the two groups, at T7 interval the value was more among the lignocaine group than ropivacaine group (Table 5)

Table 5: Comparison of mean arterial pressure (MAP) between the groups with lignocaine and ropivacine nebulization at various time points

Time points	MAP (mmHg) mean ± SD		p value
	Lignocaine	Ropivacaine	
T1	79.4 ± 3.9	80.8 ± 5.4	0.36
T2	79.7 ± 4.3	80.3 ± 5.5	0.70
T3	79.1 ± 4.0	79.9 ± 5.3	0.59
T4	79.8 ± 4.2	80.4 ± 5.4	0.70
T5	79.7 ± 3.9	79.8 ± 4.4	0.94
T6	79.4 ± 3.8	79.7 ± 4.1	0.81
T7	82.8 ± 2.8	80.0 ± 4.7	0.03*
T8	79.3 ± 3.9	80.6 ± 5.8	0.41
T9	80.4 ± 4.3	80.8 ± 4.8	0.70

T1-Baseline, T2- Before intubation, T3- Immediate after intubation, T4- at 1 minute after intubation, T5- at 2 minutes after intubation, T6- at 3 minutes after intubation, T7- at 4 minutes after intubation, T8- at 5 minutes after intubation, T9- at 10 minutes after intubation.

DISCUSSION

The present study compared the haemodynamic parameter following intubation between lignocaine (2%) and ropivacine (0.5%) nebulization with better stability was among the group receiving ropicaine.

Thangavelu et. al. (9) conducted a double blinded study comparing the effect of normal saline, ropivacaine (0.25%) and lignocaine (2%). Their study found ropivacaine to be effective in decreasing the haemodynamic response when compared to normal saline but showed similar efficacy as lignocaine. The strength of ropivacaine used in this study was only 0.25% while we used 0.5% which could possibly be a reason for no significant association in their study.

Singam Geetha et. al. (10) compared the pre-induction nebulization between 0.75% ropivacaine and 2% lignocaine. The study proved significant stable haemodynamics (heart rate and MAP) among the ropivacaine group in comparison to lignocaine. Even the severity of cough reflex was also lesser among the ropivacaine group.

Verma et. al .(11) in their study documented the effect of 4% lignocaine nebulization before induction on the cardiovascular response due to intubation and found significant surge heart rate, systolic and diastolic BP and MAP value at 3 and 5 minutes after intubation which decreased at 10 minutes. Similar findings were obtained in our study also.

There are very limited studies that have compared the effect of ropivacine nebulization prior to intubation. Our study found ropivacaine to be more effective than lignocaine. There is a need for further study among larger samples to confirm our study findings.

CONCLUSION

In the present study ropivacine 0.5% was proved to provide better haemodynamic stability in terms of heart rate, blood pressure and MAP when compared to lignocaine 2% among patients undergoing surgery under general anaesthesia.

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