A Comparative Study of Effectiveness of Intravenous Lignocaine versus Lignocaine Nebulization on Stress Response to Laryngoscopy and Endotracheal Intubation

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Abstract: ***<u>Background and objective</u>: To evaluate the effectiveness of intravenous Lignocaine versus lignocaine nebulization on stress response to laryngoscopy and tracheal intubation in patients undergoing surgery under general anaesthesia. <u>Methods and materials</u>: This study was conducted in 80 patients of ASA grade I of both sexes in the age group of 18 - 60 years who were scheduled for various elective surgeries under General anaesthesia. They were randomly allocated into 2 groups. Patients in group N were given nebulization with 2% Lignocaine at a dose of 2mg/kg using nebulizer mask, 10 mins before induction of anaesthesia whereas patients in group I will receive 2%Lignocaine at a dose of 2mg/kg, 90 secs before intubation. <u>Results</u>: Changes in vital parameters like HR, MAP seen after the induction of anaesthesia and blunting of pressure responses were clearly observed. In I group when lidocaine 2% concentration 2 mg\kg was used can effectively reduce the stress and pressure response to endotracheal intubation. The hemodynamic changes were effectively stabilized in the intravenous group when compared to the nebulization group. In N group when lignocaine 2% concentration 2 mg\kg used to decrease stress and pressure response was not as effective as intravenous group. <u>Conclusion</u>: Proper nebulization and the use of a higher concentration of drug could have resulted in better hemodynamic stabilization performance. By administrating lidocaine in intravenous route and nebulization route can able to reduce the stress and pressure response to laryngoscopy and endotracheal intubation. In our study, early return of hemodynamic parameters to baseline values was observed in the intravenous group compared to the nebulization group, which is a statistically significant observation.***

Keywords: Lignocaine, Nebulization, Endotracheal Intubation, Stress Response and Laryngoscopy.

1. Introduction

Endotracheal intubation is a frequent procedure done to secure the airway. It is a common procedure in anaesthesiology practice, done by passing an endotracheal tube via the nasal or oral cavity. Both parasympathetic and sympathetic responses can be elicited by endotracheal intubation. The parasympathetic response comprises hypotension and bradycardia, whereas the sympathetic response produces tachycardia and hypertension. These responses are transient and tolerated well in healthy individuals but are unpredictable in unhealthy individuals in unhealthy individuals, laryngoscopy and endotracheal intubation responses are unpredictable. Both intubation and extubating can raise catecholamine levels in the blood, causing hemodynamic changes and complications like myocardial infarction [MI], arrhythmias 2, and cerebrovascular haemorrhage (CVA). Tracheal intubation and direct laryngoscopy are linked with physiological alterations caused by the reflex sympathetic discharge.

Each method has its drawbacks, and none of them is ideal. Using Lignocaine in various routes like sprays, [14], gel[15]and nebulization effectively reduces these stress responses.1[1]Lignocaine given as a bolus to decrease stress responses is also helpful in the management of postoperative pain. During tracheal intubation, laryngospasm, and cough during extubating, intravenous Lignocaine can be administered to reduce the stress response and can prevent untoward actions. It helps decrease pressor response and mitigates bronchoconstriction after tracheal intubation. Bronchial hyperactivity can be minimized by using lidocaine in various routes of administration. Hence, the goal of this study was to study how intravenous lignocaine and lignocaine nebulization modify stress responses during laryngoscopy and tracheal intubation.

Aims and objectives:

To evaluate the effectiveness of intravenous Lignocaine versus lignocaine nebulization on stress response to laryngoscopy and tracheal intubation in patients undergoing surgery under general anaesthesia.

2. Materials and Methods

The study titled “A comparative study of the effectiveness of intravenous lignocaine versus lignocaine nebulization on stress response to laryngoscopy and endotracheal intubation” was carried out at PESIMSR, KUPPAM.

The study included 80 ASA physical status class 1 patients between the ages of 18 - 60, of either gender, who were

scheduled for elective procedures under general anaesthesia. All the Patients who gave valid written consent were randomly allotted into two groups with a sample size of 40 each.
Group I [N=40] received 2% lignocaine 2mg\kg by intravenous route
Group N [N= 40] received 2% lignocaine 2 mg\kg by nebulization.

Inclusion Criteria:
- ASA physical status 1
- The age among 18 - 60 years of either sex.
- Planned elective surgeries under general anaesthesia.

Exclusion Criteria:
- History of cerebrovascular diseases, cardiovascular diseases, psychiatric illness, and liver disorders.
- History of known allergy to Lignocaine.
- History of oropharyngeal and laryngopharyngeal abnormalities.

Pre anaesthetic evaluation:
A day before surgery, a full pre - anaestheticevaluation was performed, which included a review of previous illnesses, operations, and a general physical examination of the cardiovascular system, respiratory system, airway assessment using Mallampati grading, and other pertinent systems.
Primary investigations were done and enlisted in proforma

Investigations: -
1) Complete blood picture.
2) Serum electrolytes
3) FBS, PPBS
4) Renal functional tests
5) ECG
6) x - ray of the chest.

Premedication; -
Every one of the patients was premedicated with a Tab. Alprazolam 0.25 mg and Tab. Pantoprazole 40 mg HS before the day of surgery. On the day of surgery, NPO status was confirmed and Basal heart rates, Blood pressure, Mean arterial blood pressure were recorded. Patients in group N were given nebulization with 2% lignocaine 2mg/kg using nebulizer mask, 10 min before to induction of anaesthesia whereasPatients in group I will receive 2% lignocaine 2 mg/kg, 90 seconds before induction of anaesthesia.

Anaesthesia technique: -
Anaesthesia was produced using Inj. Thiopentone 5mg/kg 2.5% solution, With the loss of the lash reflex in the eyes and after successful trial ventilation, Inj. Vecuronium 0.1 mg\kg administered intravenously. Under vision using laryngoscope intubation was done with lubricated appropriately sized cuffed disposable oral endotracheal tube.

Monitoring:
- Heart rate in beats per minute
- MAP (Mean arterial pressure) in mm Hg
- Oxygen saturation (Spo2)

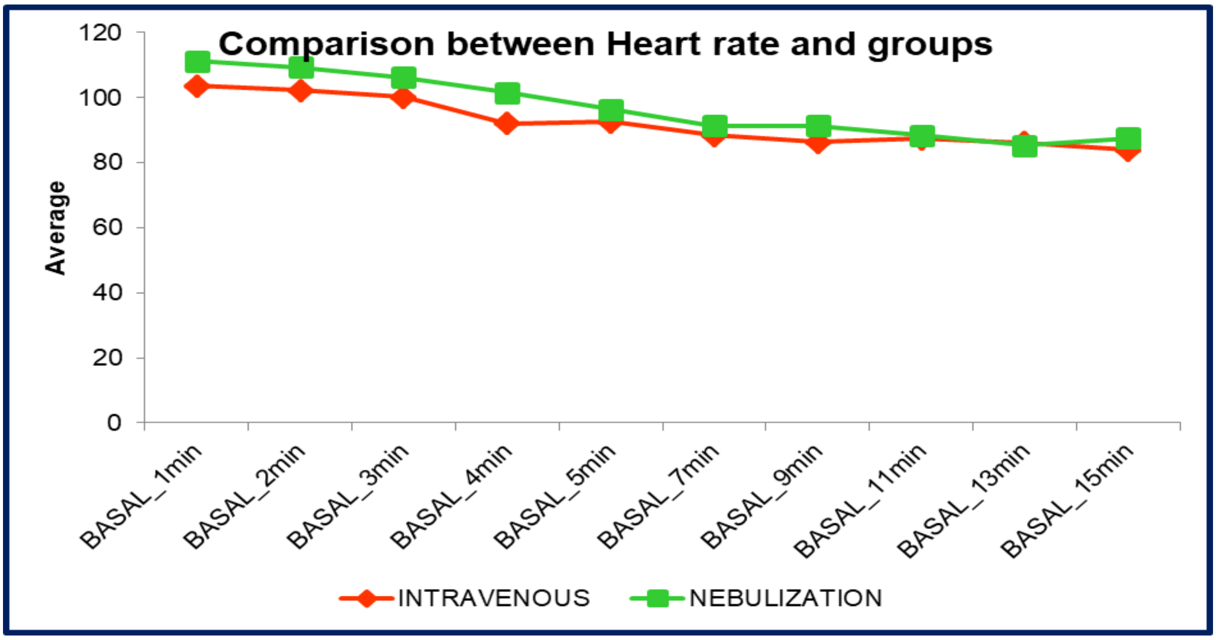
The following hemodynamic parameters were recorded as basal value before giving study - drugs and premedication in nebulization group where as in I group after shifting patients to operation theatre the basal parameters were recorded, one minute gap for 5 min after performing laryngoscopy and securing the endotracheal tube, followed by a gap of 2 min for the coming 10 min.

After the readings were recorded all patients were administered with Inj0.2 mg Glycopyrrolate and Inj. fentanyl 2 mcg\kg intravenous for analgesia. Anaesthesia was sustained with appropriate gas flows, nitrous, oxygen, Isoflurane, with top - up doses of vecuronium.

Statistical Analysis:
The information was imported into MS Excel 2007 and analysed with SPSS version 21. The following is a breakdown of descriptive statistics: The percentages are used to analyses categorical data, and the mean and standard deviation are used to analyses continuous data. The following is how inferential statistics are examined: 't' test Chi - square test Statistical significance is defined as a probability value of 0.05.

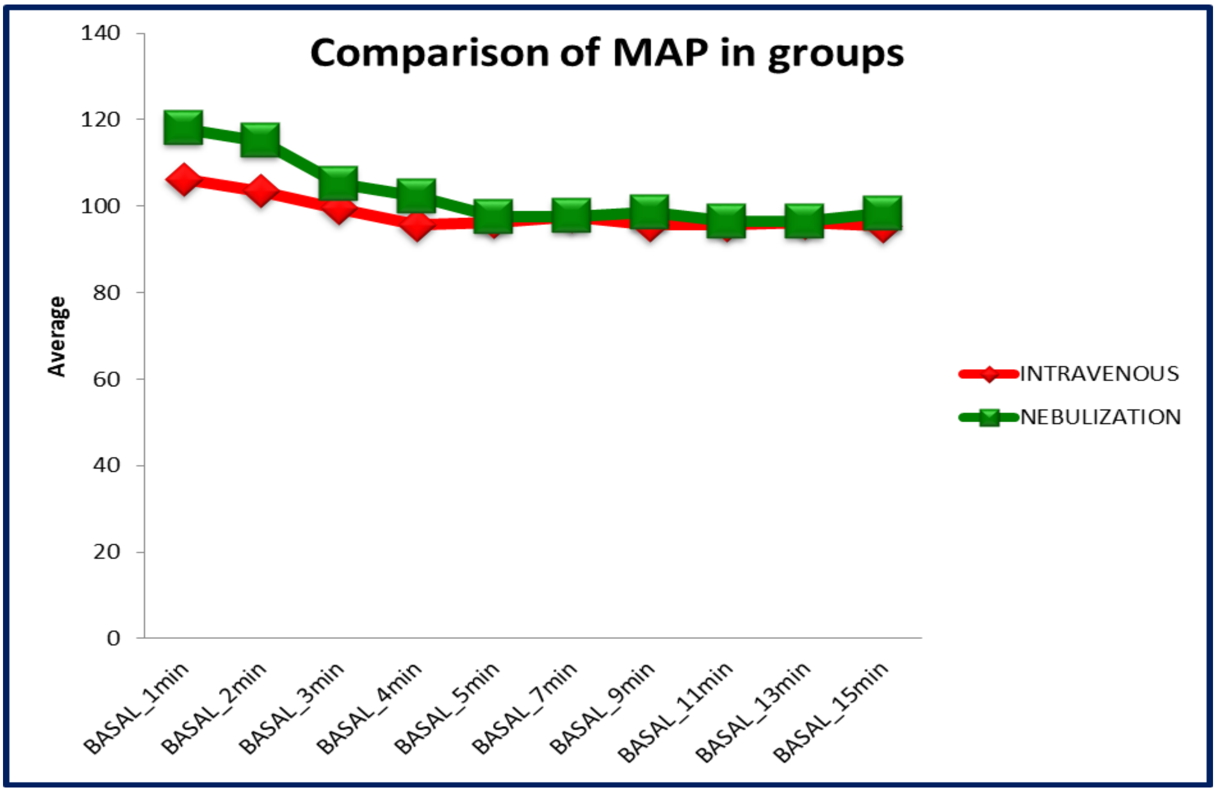
3. Results

In group I the mean basal heart rate was (87.3±10.1) beats per minute. Following intubation, the mean heart rate changes were 103.6, 102.2, and 102.4 beats per minute at the 1st, 2nd, 3rd, 4th, and 5th minutes, respectively. The increase in heart rate at 1st, 2nd, 3rd, 4th, and 5th minutes was 16.3, 14, 9, 12.8,, 4.8, 5.3 beats per minute over the basal value, respectively. The maximum increase in heart rate following intubation was observed at 1 min. A steady decrease was observed over the next 5 minutes, reaching its basal value at the 7th minute. In the 15th minute, it was at 83.9 bpm. In the N group, the mean basal heart rate was (89.2 ±11.8) beats per minute. Following intubation, the mean heart rate changes are 111.2, 109.4, 106.2, 101.6, 37 and 96.3 beats per minute in the first, second, third, fourth, and fifth minutes, respectively. The increase in heart rate that was seen at 1st, 2nd, 3rd, 4th, and 5th minutes was 22, 20.2, 17, 12.4, 7 beats per minute over the basal value. The maximum increase in heart rate following intubation was observed at the 1st minute. In the next 5 minutes, a slow decrease was observed, reaching near basal at the 11th minute. The heart rate was 87.5bpm at the 15th minute. When comparing both the I and N groups, the return of mean heart rate to near basal was earlier in the I group when compared to the N group. However, though the increase in the heart rate levels compared to the baseline value is statistically significant in both groups. The increase in heart rate was more in the nebulization group compared to the intravenous group.



The mean MAP in group I was 90.8±8.8 mmHg. Following intubation, the mean MAP was 106.2, 103.4, 99.5, 95.6, 96.3 mmHg in the first, second, third, fourth, and fifth minutes, respectively. The increase in MAP over the baseline value was 15.7, 12.6, 8.7, 5.5, 4.8 mmHg at the 1st, 2nd, 3rd, 4th, and 5th minutes. The first minute after intubation observed the maximum increase in MAP. Over the next 5 minutes, there was a steady decrease, reaching near basal at the 9th minute. At the 15th minute, the pressure was 95.4 mm Hg. The mean MAP in group N was ((94.1 ±8.2) mmHg. Following intubation, the mean MAP was 118, 115.1, 105.2, 102.3, 97.5 mmHg in the first, second, third, fourth, 46 and fifth minutes, respectively. The difference in MAP between the 1st, 2nd, 3rd, 4th, and 5th minutes was, 23.9, 21, 11.2, 8.2, 3.4 mmHg. Following intubation, the highest increase in MAP was recorded at the 1st minute. A steady drop was noted over the next 5 minutes, reaching near basal at the 11th minute. It was 98.3 mm Hg at the 15th minute. However, in both groups, the increase in mean arterial blood pressure above baseline is statistically significant. In both the I and N groups, MAP values did not reach the basal values.

The nebulization group had a higher increase in mean arterial blood pressure when compared with the intravenous group.



Comparison of mean heart rate changes in study groups

Heart rate	Group							
		Intravenous			Nebulization			
	Mean	SD	P - value	Significance	Mean	SD	P - value	Significance
Basal	87.3	10.1	<0.0001	HS	89.2	11.8	<0.0001	hs
Postintubation.1 min	103.6	13.6			111.2	15.8		
2min	87.3	10.1	<0.0001	HS	89.2	11.8	<0.0001*	HS
	102.2	11.8			109.4	14.3		
3min	87.3	10.1	<0.0001	HS	89.2	11.8	<0.001	HS
	100.1	15.2			106.2	16.2		
4min	87.3	10.1	<0.0001	HS	89.2	11.8	<0.0001	HS
	92.1	12.7			101.6	15.5		
5min	87.3	10.1	0.0450*	S	89.3	11.9	0.0016*	S
	92.6	11.9			96.3	15.3		
7min	87.3	10.1	0.634	NS	89.2	11.8	0.3852	NS
	88.4	9.9			91.4	14.7		
9min	87.3	10.1	0.6755	NS	89.2	11.8	0.3766	NS
	86.4	6.9			91.4	14.1		
11min	87.3	10.1	0.9926	NS	89.2	11.8	0.7231	NS
	87.3	13.1			88.4	12.3		
13min	87.3	10.1	0.5687	NS	89.2	11.8	0.1025	NS
	86.1	10.4			85.3	11.6		
15min	87.3	10.1			89.2	11.8	0.4681	NS
	83.9	12.5	0.1309	NS	87.5	12.7		

*P<0.05 Statistically significant

Comparison of MAP in between groups

MAP	Group							
	Intravenous			Significant	Nebulization			Significance
	Mean	SD	Pvalue		Mean	SD	Pvalue	
BASAL	90.8	8.8	<0.001*	HS*	94.1	8.2	<0.001*	HS*
Post intubation 1min	106.2	10.1			118	11.4		
2min	90.8	8.8	<0.001*	HS*	94.1	8.2	<0.001*	HS*
	103.4	14.2			115.1	13.7		
3min	90.8	8.8	<0.001*	HS*	94.1	8.2	<0.001*	HS*
	99.5	13.2			105.2	13.1		
4min	90.8	8.8	0.0376	S*	94.1	8.2	0.0013*	S*
	95.6	15.3			102.3	14.5		
5min	90.8	8.8	0.0260*	S*	94.1	8.2	0.1515	S*
	96.3	12.7			97.5	12.6		
7min	90.8	8.8	0.0012*	S*	94.1	8.2	0.0013*	S*
	97.7	11.3			102.2	11.2		
9min	90.8	8.8	0.0049*	S	94.1	8.2	0.0395*	S
	95.6	9.2			98.6	11.1		
11min	90.8	8.8	0.0065*	NS	94.1	8.2	0.2213	NS
	95.7	7.8			96.5	10.2		
13min	90.8	8.8	0.0100*	NS	94.1	8.2	0.238	NS
	96.2	12.3			96.5	10.1		
15min	90.8	8.8	0.0076*	NS	94.1	8.2	0.0174*	NS
	95.4	10.7			98.3	8.8		

*P<0.05 Statistically significant

4. Discussion

Securing the airway is critical during endotracheal intubation, which necessitates good laryngoscopy and endotracheal intubation skills, as well as good precision in performance, which is well tolerated in healthy people but can cause hemodynamic abnormalities in some patients, with cardiovascular diseases, CVA patients, and hypertensive individuals.

Performing laryngoscopy and endotracheal intubation under general anaesthesia is always linked with sympathetic activation, which causes vital parameters such as SBP, DBP, HR, and MAP to fluctuate. Following laryngoscopy, there was a rise of23 beats, a rise in blood pressure by 53\54 mmHg and a fall in left ventricular ejection fraction by approximately 20%, which is a transient response well tolerated by healthy individuals.

During laryngoscopy and intubation, hemodynamic alterations such as tachycardia and hypertension are well - known. The epiglottis and throat produce hemodynamic changes as a result of mechanoreceptor stimulation in the vocal cords. factors like drugs, age, types of surgeries, hypoxia, hypercarbia, can influence the hemodynamic changes.

5. Conclusion

Proper nebulization and the use of a higher concentration of drug could have resulted in better hemodynamic stabilization performance. By administrating lidocaine in intravenous route and nebulization route can able to reduce the stress and pressure response to laryngoscopy and endotracheal intubation.

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