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Comparison of Intravenous Versus Nebulised Lignocaine in Attenuation of Presser Response to Laryngoscope and Intubation

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Abstract
Laryngoscopy and endotracheal intubation are often associated with hypertension as well as tachycardia as a result of temporary sympathoadrenal activation. Sudden hemodynamic response can have detrimental effects on patients suffering from cardiovascular and cerebrovascular illnesses, including arrhythmias, cardiac failure, elevated ICP and cerebral hemorrhage. Therefore, one of the essential steps in the effective induction of general anesthesia is to eliminate such responses. Due of this, a variety of adjuvants have been used, with differing degrees of success, including opioids, lignocaine, nitroglycerine, beta-blockers and magnesium sulphate. To compare the hemodynamic changes to direct laryngoscopy and tracheal intubation between intravenous and nebulized forms of lignocaine. The present study was a prospective study conducted in 64 patients ASA Grade I and II patients between the ages of 20 and 60 of either gender scheduled for elective procedures under general anaesthesia were divided into two groups, Group A and Group B, with a sample size of 32 each. Patients in Group A received nebulization with 2% lignocaine 2 mg/kg for 10 minutes, while Group B received 2% lignocaine 2 mg/kg intravenously 90 seconds before induction. Heart rate (HR), blood pressure (BP) at both systolic and diastolic levels, mean arterial pressure (MAP) and basal values were measured, as well as at the 1, 3, 5, 7 and 10 minute following intubation. SPSS 20.0 was used for data analysis and the t test and Chi square were used to examine the relationship. The HR, SBP, DBP and MBP in the current study increased one minute after laryngoscopy and intubation, indicating a rise over the baseline value. In Group B, it was seen that the high hemodynamic values began to decrease by 10 minutes to the base line value. However, at 1,3 and 5 minutes, the HR, SBP, DBP and MBP in group A were significantly lower and statistically significant ($p<0.05$). Nebulized lignocaine performed somewhat better than intravenous lignocaine in terms of reducing the presser response to laryngoscopy and endotracheal intubation without causing severe adverse effects.

INTRODUCTION

Maintaining the airway to ensure the patient receives enough ventilation while under general anesthesia is the primary duty of an anesthesiologist[1]. Securing the airway with endotracheal intubation is the gold standard. The peri-operative phase must have the fewest hemodynamic disruptions possible thanks to balanced anesthesia procedures[2]. However, reflex sympathetic excitation brought on by laryngo pharyngeal stimulation is virtually always linked to a hemodynamic spike following the use of a laryngoscope and tracheal intubation following the induction of anesthesia. Catecholamines are released as a result of this elevated sympathoadrenal venture, which causes hypertension, tachycardia and arrhythmias[3].

The cardiovascular reaction is a reflexive phenomenon. This is facilitated by the vagus as well as glossopharyngeal cranial nerves. They transmit the afferent stimulus from the infraepiglottic region and the epiglottis, which activates the vasomotor center and triggers the peripheral sympathetic adrenal response, which leads to arrhythmias, tachycardia and hypertension. Pulmonary edema, myocardial ischemia and cerebrovascular accidents might result in patients who already have suboptimal cardiovascular and cerebrovascular conditions. Therefore, it is essential to prevent any unwelcome reaction that can raise the morbidity and fatality rates after surgery[4,5].

Both non-pharmacological and pharmacological techniques have been used to reduce the stress reaction during laryngoscopy and intubation. The installation of a Laryngeal Mask Airway (LMA) or advanced airways, a gentle and smooth intubation with a shorter laryngoscopy duration and blockage of the glossopharyngeal and superior laryngeal nerves are the non-pharmacological techniques used. Opioid receptor blockers, calcium channel antagonists like diltiazem and verapamil, vasodilators like nitroglycerine, a and ß adrenergic blockers and α2 agonists like clonidine and dexmedetomidine are a few examples of pharmacological techniques that are employed[6].

Lignocaine is a synthetic, amide-based local anesthetic. Its function stabilizes the heart. To reduce the stress reaction, topical anesthesia with lignocaine in the form of viscous gargles, lignocaine aerosols, or oropharyngeal sprays is still a common technique, either used alone or in conjunction with other techniques[7].

Intravenous lignocaine has been used to treat laryngospasm, suppress cough during extubation and suppress cough during tracheal intubation. Additionally, it has been utilized to lessen broncho constriction and decrease airway hyperactivity. Comparing intravenous lignocaine to other types of lignocaine, it is determined that the latter is a more appropriate substitute for reducing the stress response due to its well-established centrally depressive and anti-arrhythmic effects[8].

Various studies have examined the impact of lignocaine on the hemodynamic responses of intubated patients. However, the majority of these studies try to find out the manner in which nebulized and intravenous (IV) lignocaine works in relation to other medications or control groups. According to available research, the benefits of lignocaine for enhancing the hemodynamic responses of intubation patients are not entirely known. This study compared the hemodynamic effects of direct laryngoscopy and tracheal intubation with intravenous and nebulized lignocaine administration in patients scheduled for general anesthesia procedures involving endotracheal intubation.

Aims and Objectives: To compare the hemodynamic changes to direct laryngoscopy and tracheal intubation between intravenous and nebulized forms of lignocaine.

MATERIALS AND METHODS

This randomised double blinded study was carried out in Sree Mookambika Institute of Medical Sciences, Kulasekharam from June 2023 to December 2023. The study comprised 64 patients with ASA grades I and II aged 20 to 60 years of either gender who had been scheduled for elective surgery under general anaesthesia and were willing to participate in the study. The following patients were excluded from the study: those with a body mass index (BMI) of greater than 30 kg/m2, a history of lignocaine allergies, a basal heart rate of less than 50 bpm, patients at risk of regurgitation and pulmonary aspiration (due to inadequate fasting or pregnancy) and patients who were unwilling to participate in the current investigation.

The patients were divided into two groups randomly as:

Group A: received Lignocaine (2%) nebulization 2 mg/kg 10 minutes prior to induction, (n = 32).

Group B: received IV Lignocaine (2%) 2mg/kg 90 seconds prior to induction, (n = 32).

A detailed pre-anaesthetic assessment was conducted, which included a history of prior medical conditions and procedures, a general physical examination and a systemic examination. There were baseline studies done. A detailed explanation of the anesthetic technique was given before a written, informed and valid consent was obtained. As per the recommended fasting requirements, all patients were

kept at nil per oral. Premedication included 150 mg of ranitidine at night and 2 hours before surgery, as well as 10 mg of diazepam 2 hours before surgery.

On the day of the procedure, baseline blood pressure and heart rate readings were taken 15 minutes prior to the patient being moved to the operating room. Patients in Group A were given 5 mL of 2% lignocaine nebulization, while patients in Group B were given normal saline nebulization. Using a Philips Nebulizer, nebulization was administered in the propped-up preoperative holding room.

After that, the patient was moved to the operating room, where they were observed by non-invasive blood pressure and pulse oximetry, as well as a 5-electrode echocardiography that monitored leads II and V5. Anaesthesia was induced with IV fentanyl (2 µg/kg) and IV propofol (2 mg/kg) following preoxygenation. Vecuronium 0.1 mg/kg was used to paralyze patients once it was determined that mask breathing was sufficient. those in Group B received 5 mL of 2% lignocaine intravenously and those in Group A received 5 mL of saline intravenously after 90 seconds.

An appropriate-sized cuffed endotracheal tube was used during intubation and the cuff was inflated with the right amount of air. Both auscultation for bilateral air entrance and capnographic observation allowed for the confirmation of the tube location. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were measured and recorded at various intervals: baseline, 1 minute, 2 minutes, 3 minutes, 5 minutes, 7 minutes and 10 minutes.

A combination of 50% nitrous oxide, 50% oxygen and 1% sevoflurane was used to maintain anesthesia. In both groups, minimal monitoring in accordance with ASA criteria was employed. After regaining sufficient muscle power and consciousness, patients were extubated and given Neostigmine (0.05 mg/kg IV) and Glycopyrrolate (0.01 mg/kg IV) at the conclusion of the surgery.

The data collected was organized into an Excel sheet and a master sheet was created. The SPSS 20.0 version was utilized for doing statistical analysis. Qualitative data was expressed as percentages and values. For qualitative data, the chi-square test was employed. The unpaired t-test was employed to compare the quantitative variables between the two groups. A statistically significant result was defined as a p value of less than 0.05.

RESULTS AND DISCUSSIONS

The age distribution in group A and group B ranged from 24-58 years. There was no significant difference in age, gender, weight and height distribution in the two groups. (Table 1).

Statistically significant reduction in heart rate was seen (p value <0.05) at 1, 3 and 5 minutes after endotracheal intubation in group A compared to group B with p = 0.029, 0.019, 0.014 respectively. (Table 2).

Statistically significant reduction in systolic blood pressure occurred in group A as compared with B group at 3 and 5 minutes after endotracheal intubation with p = 0.032, 0.046 respectively. (Table 3).

The statistically significant reduction in DBP was observed in patients with group A as compared with group B at 3,5 and 7 minutes after endotracheal intubation with p value = 0.043, 0.021, 0.019 respectively. (Table 4).

The statistically significant reduction in MBP was observed in patients with group A as compared with group B at 1, 3 and 5 minutes after endotracheal intubation with p = 0.026, 0.012 and 0.034 respectively. (Table 5).

Tracheal intubation and laryngoscopy cause a strong sympathoadrenal reaction. Such modifications may be harmful in some patient groups, such as those who are susceptible to arterial hypertension or myocardial ischemia. Although the exact cause of this sympathoadrenal reaction is unknown, it is most likely the result of strong upper respiratory tract stimulation. Preventing hypertension after intubation is a crucial requirement for a safe and effective general anesthetic procedure[9].

The most popular medication for reducing the hemodynamic reactions to laryngoscopy and tracheal intubation has been a local anesthetic, such as lignocaine. The following methods have been utilized to soften the hemodynamic reactions to intubation when lignocaine is administered: As a topical spray, as lignocaine aerosol for intratracheal analgesia, as a gargle for oropharyngeal analgesia and as an intravenous infusion for analgesia[10].

The inhalation of lignocaine aerosol is a widely recognized, easy, safe and efficient approach. Small children, stubborn patients, patients who pose a risk of regurgitation or vomiting and a lack of time are obvious limits[11]. With all of the benefits and convenience of administration of lignocaine, as well as the low risk of side effects, the current study was conducted to assess the efficiency of lignocaine in blunting the hemodynamic response to laryngoscopy and endotracheal intubation via two separate routes. The HR, SBP, DBP and MBP in the current study increased one minute after laryngoscopy and intubation, indicating a rise over the baseline value. In Group B, it was seen that the high hemodynamic values began to decrease by 10 minutes to the base line value. In group A, however, there was a statistically significant decrease in HR, SBP, DBP and MBP at 1, 3 and 5 minutes. When compared to the IV lignocaine group, this showed a statistically significant

Table 1: Demographic Data among both groups

	Group A	Group B	p value
Age (mean +/- SD)	34.65±5.67	39.45±7.64	0.784
Weight	68.47±11.31	70.26±13.70	0.459
Height (Mean+/- SD)	164.29± 6.45	172.13±9.62	0.376
Gender M/F	19/13	18/14	0.182

Table 2: Comparison of Heart Rate Variation among both groups

	Group A	Group B	p value
Baseline	86.34±5.487	90.72±5.216	0.516
1 min	90.33±5.142	96.18±4.766	0.029
3 min	80.02±3.195	88.12±4.143	0.019
5 min	72.19±2.513	75.23±4.223	0.014
7 min	70.42±3.312	71.19±4.398	0.354
10 min	68.86±2.266	70.80±3.072	0.422

Table 3: Comparison of Systolic Blood Pressure Variation among both groups

	Group A	Group B	p value
Baseline	128.23±3.76	128.08±4.12	0.244
1 min	113.0±5.33	130.22±5.82	0.572
3 min	100.6±6.18	122.24±4.14	0.032
5 min	103.80±7.74	114.56±5.26	0.046
7 min	110.98±7.18	110.53±5.27	0.186
10 min	113.87±5.69	114.24±8.36	0.596

Table 4: Comparison of Diastolic Blood Pressure Variation among both groups

	Group A	Group B	p value
Baseline	84.36±3.92	85.13±2.01	0.618
1 min	68.39±6.18	88.07±3.39	0.843
3 min	62.82±5.32	76.30±6.76	0.043
5 min	67.66±5.94	71.33±7.03	0.021
7 min	65.78±6.45	66.10±8.34	0.019
10 min	66.44±7.01	63.73±7.98	0.392

Table 5: Comparison of Mean Arterial Pressure Variation between among both groups

	Group A	Group B	p value
Baseline	96.34±3.24	96.89±2.52	0.234
1 min	83.67±3.14	98.13±3.47	0.026
3 min	76.17±4.57	84.11±3.18	0.012
5 min	74.12±3.89	79.42±4.51	0.034
7 min	75.86±4.56	77.89±3.96	0.262
10 min	70.42±3.62	75.76±3.21	0.623

lowering of blood pressure responses (SBP, DBP and MAP) following intubation with nebulized lignocaine. While both groups showed an increase in HR at laryngoscopy compared to the baseline, the IV lignocaine group showed a substantially greater rise in HR than the nebulization group.

Ganesan P[12] examined nebulized versus IV lignocaine for attenuating the pressor response to laryngoscopy and intubation, which was similar to the current study. The study found that both the laryngoscopy and intubation groups had a rise in HR and BP from baseline, however, the increase in Nebulized lignocaine was considerably less ($p<0.05$). By the third minute after intubation, the parameters in both groups had returned to baseline levels.

Study done by Baloch AA[13] observed that while the mean heart rate was statistically significant between the groups at 2 and 9 minutes, it was not significant at baseline, 1 minute, 3 minutes, or 8 minutes. Between groups, mean atrial blood pressure was statistically significant from 2-6 and then 8 minutes. In terms of immediate side effects, the intravenous and nebulization groups noticed fewer side effects than the control group. In comparison to the other two groups, the control group exhibited a considerably higher rate of sleepiness, tremors and hypoxia.

Bhaskar V[14] in their study found that, as compared to the IV lignocaine group, there was a statistically significant suppression of the blood pressure responses (SBP, DBP and MAP) following intubation with nebulized lignocaine. While both groups showed an increase in HR at laryngoscopy compared to the baseline, the IV lignocaine group showed a substantially greater rise in HR than the nebulization group ($p = 0.009$).

Jokar A[15] The MAP of Group 1 (inhaled nebulized lignocaine) was lower than that of Group 2 (IV lignocaine), but there was no statistically significant difference between the two groups. The MAPs of the two groups differed from the control group in a substantial way. The Mean HR showed a significant difference between the inhaled and IV lignocaine groups, thus, the mean HR in Group 1 (inhalation) was lower than that in Group 2 (IV injection).

In contrast to the present study, study carried out by Puntambekar Shweta S[16] Group A (nebulized lignocaine) noticed increase in HR, SBP, DBP, and MAP after one minute after intubation of 24.86 bpm, 9.6 mm Hg, 20.44 mm Hg and 22.30 mm Hg, respectively.

The rise in HR, SBP, DBP and MAP in Group B (IV) was determined to be 11.7 bpm, 3 mm Hg, 2.61 mm Hg and 4.77mm Hg, respectively. The study concluded that IV lignocaine has better suppressing property than nebulization of lignocaine.

In addition, Gavale S[17] and Asokumar N[18] found that while both intravenous and nebulized lignocaine are useful in reducing the pressor response, nebulized lignocaine demonstrated marginally superior outcomes than intravenous lignocaine while posing negligible adverse effects.

CONCLUSIONS

Nebulization of lignocaine is an easy, economical, and safe process. In the field of anesthesia, it has been used to complement airway blocks and reduce coughing. It is a fresh and feasible notion to use this strategy to decrease hemodynamic reactions to intubation. Given that the IV lignocaine group showed much higher increases in hemodynamic variables than the nebulization group, the study suggests that nebulization of lignocaine is a more effective method of reducing hemodynamic responses than IV lignocaine.

REFERENCES

1. Hews, J., K. El-Boghdadly and I. Ahmad, 2019. Difficult airway management for the anaesthetist. Br. J. Hosp. Med., 80: 432-440.
2. Maguire, S., P.R. Schmitt, E. Sternlicht and C.M. Kofron, 2023. Endotracheal intubation of difficult airways in emergency settings: A guide for innovators. Med. Devices: Evidence Res., 16: 183-199.
3. Berkow, L., 2024. Complications of airway management. Curr. Anesthesiol. Reports, Vol. 6.
4. Komisaruk, B.R. and E. Frangos, 2022. Vagus nerve afferent stimulation: Projection into the brain, reflexive physiological, perceptual and behavioral responses and clinical relevance. Autonomic Neurosci., Vol. 237.10.1016/j. autneu.2021.102908.
5. Karemaker, J.M., 2022. The multibranched nerve: Vagal function beyond heart rate variability. Bio. Psychol., Vol. 172 .10.1016/j. biopsycho.2022.108378.
6. Bhardwaj, N., A. Thakur and A. Sharma, 2020. A review of various methods for prevention of pressor response to intubation. Int. J. Res. Rev., 7: 360-364.
7. Mundiya, J. and E. Woodbine, 2022. Updates on topical and local anesthesia agents. Oral Maxillofacial Surg. Clin. North Am., 34: 147-155.
8. Udupi, S., K. Asranna, S. ThimmaiahKanakalakshmi and S. Mathew, 2020. Hemodynamic response of lignocaine in laryngoscopy and intubation. Trends Anaesth. Crit. Care, 32: 33-38.
9. Cusack, B. and D.J. Buggy, 2020. Anaesthesia, analgesia and the surgical stress response. BJA Educ., 20: 321-328.
10. Kramer, K.J., C.J. Riley and J.W. Brady, 2020. Overview of local anesthesia. In: Applied Head and Neck Anatomy for the Facial Cosmetic Surgeon, Ferneini, E.M., M.T. Goupil, M.A. McNulty and C.E. Niekrash, (Eds.)., Springer International Publishing, Cham, ISBN-27: 9783030579302,9783030579319, Applied Head Neck Anat. Facial Cosmet. Surgeon, pp: 3-15.
11. Yu, J., L. Ren, S. Min, Y. Yang and F. Lv, 2020. Nebulized pharmacological agents for preventing postoperative sore throat: A systematic review and network meta-analysis. PLOS ONE, Vol. 15 .10.1371/journal.pone.0237174.
12. Ganesan, P., H. Balachander and L. Elakkumanan, 2020. Evaluation of nebulized lignocaine versus intravenous lignocaine for attenuation of pressor response to laryngoscopy and intubation. Curr. Med. Issues, 18: 184-188.
13. Baloch, A.A., N. Kalim, A. Hassan, V. Kumar, Z. Ahmad and N. Shafqat, 2023. Comparative study on the effects of lignocaine nebulization with I/V lignocaine on stress response to laryngoscopy and tracheal intubation. Pak. J. Med. Health Sci., 17: 6-8.
14. Rajaram, P., V. Bhaskar, S. Shetty and M. Varmudy, 2021. Comparison of intravenous versus nebulised lignocaine for suppression of haemodynamic responses to tracheal intubation. Airway, 4: 175-178.
15. Jokar, A., A. Yazdanbakhsh, M. Babaei, S. Pourmatin, M. Taheri and A. Almasi-Hashiani, 2018. Effects of intravenous and inhaled nebulized lignocaine on the hemodynamic response of endotracheal intubation patients: A randomized clinical trial. Anesthesia Essays Res., 12: 159-164.
16. Shweta, P.S. and V.V. Deshpande, 2019. A comparative study of lignocaine nebulization with intravenous lignocaine in attenuation of pressor response to laryngoscopy and intubation. Indian. J. Anesth. Analg., 6: 1030-1036.
17. Gavale, D.S., D.N. Singh and D.B. Pawar, 2021. Evaluation of nebulized lignocaine versus intravenous lignocaine for attenuation of pressor response to laryngoscopy and intubation in controlled hypertensive patients. Int. J. Med. Anesthesiol., 4: 16-20.
18. Asokumar, N., S. Amrutha, S. Achinthalu, L.K. Dash and S.S. Naik, 2024. Comparative study of lignocaine 10% spray after induction versus 2% intravenous lignocaine (preservative free) to attenuate the intubation response. International Journal of Medicine and Public He Int. J. Med. Public Health, 14: 50-54.