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Comparison Between IV Lignocaine and IV Labetalol on Hemodynamic Changes during Extubation of Endotracheal Tube

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ABSTRACT

Introduction: Laryngoscopy and endotracheal intubation produce pressor and sympathoadrenal reactions. Certain medications, such as Lignocaine and Labetalol, can be given to prevent these haemodynamic alterations before intubation. **Objective:** The aim of this study was to compare the hemodynamic changes of IV lignocaine and antihypertensive drug during extubation. **Materials and Methods:** 60 patients of ASA grade I, scheduled for various surgeries under general anesthesia were divided into 2 Groups. Group A was administered I.V plain lignocaine 1.5 mg/kg. Group B was administered IV labetalol 0.5 mg/kg 2 minutes prior to extubation. HR, SBP, DBP was recorded at baseline and 5 min after tracheal extubation. **Results:** The mean age of patients was 38.07±11.69 years in the Labetalol group and 34.53±6.68 years in the Lignocaine group. Before induction, hemodynamic parameters were comparable. Pre-induction heart rate (HR) was 85.90±9.51 beats/min in the Labetalol group and 87.40±9.12 beats/min in the Lignocaine group. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 118.67±11.05 mmHg and 73.87±4.87 mmHg in the Labetalol group, and 122.00±10.30 mmHg and 75.53±4.63 mmHg in the Lignocaine group. Five minutes post-extubation, HR was 90.80±0.99 beats/min in the Labetalol group and 102.50±11.04 beats/min in the Lignocaine group. SBP/DBP were 103.33±7.58 mmHg/71.33±5.76 mmHg in the Labetalol group and 107.67±11.65 mmHg/73.87±5.98 mmHg in the Lignocaine group. These findings align with previous studies, where HR at five minutes post-intubation was significantly lower in the Labetalol group (78.43±6.41 vs. 88.37±6.73 beats/min, $p<0.001$). **Conclusion:** Labetalol is a more effective drug in attenuation of hemodynamic response to laryngoscopy and endotracheal intubation in comparison to Lignocaine.

INTRODUCTION

Endotracheal intubation is a critical component of general anaesthesia treatments for major surgeries. Both intubation and extubation are linked with diverse cardiovascular and airway reactions leading to tachycardia, hypertension, arrhythmias, myocardial ischaemia, coughing, bronchospasm, increased bleeding, elevated intracranial and intraocular pressure[1]. Tracheal extubation is the removal of an artificial airway when the reasons for its implantation, such as general anaesthesia, airway blockage, airway protection, suctioning, ventilatory failure, and hypoxaemia, are no longer met. Many researchers have established that tracheal extubation induces a temporary rise in blood pressure and heart rate[2]. These broad alterations can have a negative impact on sensitive individuals, perhaps leading to abrupt heart failure, arrhythmias, and cerebrovascular damage[3]. In order to ensure a smooth extubation, the anaesthetist must manage the challenging task of stabilising haemodynamic parameters since coughing, breath holding, and movements can exacerbate intracranial pressures, intraocular pressures, and post-operative haematomas or haemorrhage[4]. Several methods and antihypertensive medications, such as high dosages of opioids, local anaesthetics like lignocaine, alpha- and beta-adrenergic blockers, and vasodilating medications like nitroglycerine, are available to reduce airway and circulatory reflexes during extubation, but none of them have proven entirely effective[5].

Before extubation, lignocaine is a beneficial medication to establish haemodynamic stability, particularly in circumstances where the patient is conscious. Research

revealed that lignocaine significantly reduced MAP and HR when compared to the control group[6]. HR was 123.71± 9.22 at baseline and 111.73± 8.37 five minutes after extubation in research including IV lignocaine. The mean SBP was 147.34 ± 12.45 at baseline, 135.48 ± 8.24 five minutes after extubation, and 98.33 ± 8.3 at baseline, and 87.49 ± 8.1 at five minutes[6]. In another study using Labetalol the mean HR at baseline was 109.02 ± 6.91 and at and at 5 minutes after extubation it was 83.40 ± 10.92, change in HR was 24.11±0.12. Mean DBP at baseline was 88.34 ± 7.3 at 5 minutes after extubation was 78.85 ± 9.35 in IV Labetalol group[7]. Another study using Labetalol showed SBP at baseline was 125.50±6.9 and at and at 5 minutes after extubation was 114.6±8.5[8]. The aim of this study was to compare the hemodynamic changes of IV lignocaine and antihypertensive drug during extubation of endotracheal tube to recommend better drug for future surgeries.

MATERIALS AND METHODS

This randomized controlled trial was conducted in department of Anesthesia, Allied Hospital Faisalabad from 10 August 2024 to 1 Feb 2025. Study was started after the approval from hospital ethical review committee. 60 patients aged 18-60 years, ASA grade I undergoing Elective procedures were selected. Sample Size of 60 was obtained using open EPI calculator at 90 % power of study, 5%, significance level, mean SBP at T1 (P1) in Lignocaine group= 111.73±8.37[6] and mean SBP at T1 (P2) in Labetalol group = 83.40 ± 10.92[7]. Patients having emergency surgery, requiring difficult protracted intubation timings or numerous intubation attempts, or with a history of uncontrolled hypertension, diabetes mellitus, or known allergies to study medicines were excluded. Pre-medication included I.V nalbuphine 0.1 mg/kg, IV metoclopramide 10 mg stat, and induction with I.V propofol 2 mg/kg and I.V Atracurium 0.5 mg/kg. Patients were intubated using a cuffed endotracheal tube (IDD: 5-8mm). Following intubation, isoflurane (MAC 1.5-2%) was used to maintain anaesthesia. Extubation was performed when a spontaneous breathing effort began. Group A received 1.5 mg/kg of I.V. ordinary lignocaine. Group B received 0.5 mg/kg IV labetalol two minutes before extubation. HR, SBP, and DBP were measured at baseline (during extubation) and 5 minutes after extubation. All of the collected data was analysed using SPSS version.

RESULTS

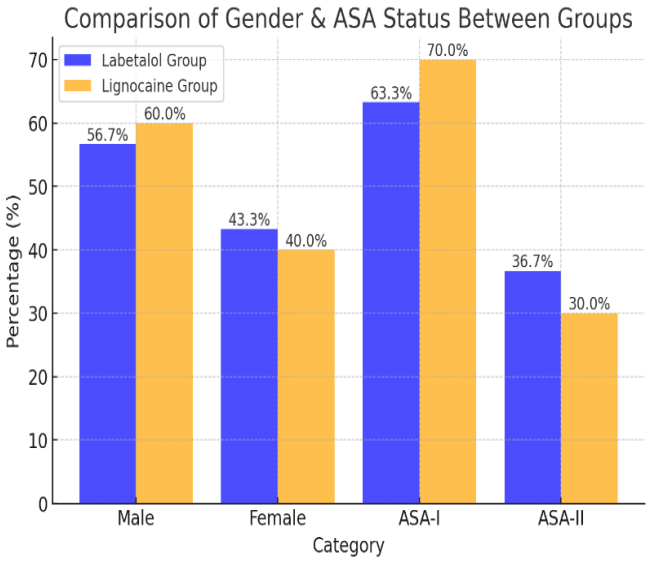
Each group comprised 30 patients. The proportion of male and female patients in each group was similar. In the labetalol group, there were 13 (43.3%) girls and 17 (56.7%) men. Twelve girls (40%) and eighteen guys (60%) made up the Lignocaine group. The groups did not vary statistically significantly (p 0.793). Patients in the labetalol group had an average age of 38.07±11.69, whereas those in the lignocaine group had an average age of 34.53±6.68, with no statistically significant difference between the groups (p 0.156). Patients in the labetalol group had a mean BMI of 28.18±2.01, whereas those in the lignocaine group had a mean BMI of 28.29±2.20. There was no statistically significant difference between the groups (p 0.838). In the labetalol group, there were 19 (63.3%) ASA-I and 11 (36.7%) ASA-II. There were 21 (70.0%) ASA-I and 9 (30.0%) ASA-II in the lignocaine group, although there was no statistically significant difference between the groups (p 0.392).

Table 1

Basic Demographic Features of patients

Variables		Group		P Value
		Labetalol Group	Lignocaine Group	
Gender	Male	17(56.7%)	18(60.0%)	0.793
	Female	13 (43.3%)	12(40.0%)	
Age		38.07±11.69	34.53±6.68	0.156
BMI		28.18±2.01	28.29±2.20	0.838
ASA	ASA-I	19(63.3%)	21(70.0%)	0.392
	ASA-II	11(36.7%)	9(30.0%)	
Total		30(100%)	30(100%)	60(100%)

Figure 1



Before induction, the hemodynamic parameters in the two groups were comparable. The heart rate (beats/min) pre induction was 85.90±9.51 in Labetalol group, while it was 87.40±9.12 beats/min in Lignocaine group. SBP and DBP in Labetalol group before induction was 118.67±11.05 mmHg and 73.87±4.87 mmHg respectively, while in Lignocaine group, it was 122.00±10.30 mmHg and 75.53±4.63 mmHg respectively. After 5 minutes tracheal extubation, the hemodynamic parameters in the two groups were comparable. The HR (beats/min) pre induction was 90.80±0.99 in Labetalol group, while it was 102.50±11.04 beats/min in Lignocaine group. SBP and DBP in Labetalol group before induction was

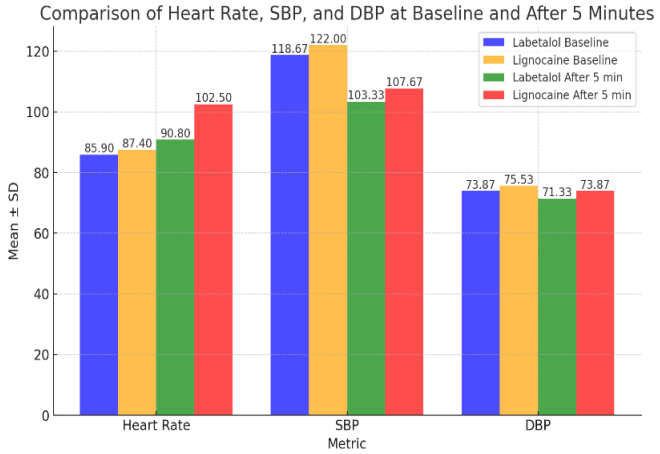
103.33±7.581 mmHg and 71.33± 5.76 mmHg respectively, while in Lignocaine group, it was 107.67±11.65 mmHg and 73.87± 5.98 mmHg respectively.

Table 2

Baseline Hemodynamic parameters of patients

	At Baseline			After 5 min		
	Labetalol Group	Lignocaine Group	P Value	Labetalol Group	Lignocaine Group	P Value
	Mean± SD	Mean± SD		Mean±SD	Mean± SD	
Heart	85.90 ± 9.51	87.40 ± 9.12	0.535	90.80 ± 0.99	102.50 ± 11.04	0.000
SBP	118.67 ± 11.05	122.00 ± 10.30	0.232	103.33 ± 7.581	107.67 ± 11.65	0.093
DBP	73.87 ± 4.87	75.53 ± 4.63	0.179	71.33 ± 5.76	73.87 ± 5.98	0.100

Figure 2



DISCUSSION

Anaesthesia induction, laryngoscopy, and tracheal intubation are all conducted in a certain order and are associated with considerable haemodynamic variations and autonomic reflex activation, which may be a cause of concern during the induction of general anaesthesia[9]. Laryngoscopy and intubation are associated with an increase in heart rate and blood pressure, as well as the development of cardiac arrhythmias. Within 5 minutes of beginning the laryngoscopy treatment, these potentially hazardous anomalies were eliminated[10].

When used before endotracheal intubation, lignocaine given intravenously should be chosen over laryngotracheal administration11. New drugs are now being investigated for their potential to lessen the adrenergic response in intubation and laryngoscopy. A combined α and non-selective beta-adrenergic blocking drug, labetalol has demonstrated enhanced haemodynamic stability and a better safety profile. The effects are 7:1 greater than the side effects when given intravenously (IV). lessens reflex tachycardia and systemic vascular resistance. The IV injection has a 5-minute onset time, a 5- to 15-minute peak effect, and a 4-6-hour half-life. decreases tachycardia reflexes. It has a minimal placental transfer and is not associated with rebound hypertension due to the high degree of ionization at physiological pH[12].

The purpose of this study was to compare how Labetalol and Lignocaine attenuate haemodynamic response during laryngoscopy and endotracheal intubation. Each group comprised 30 patients. The proportion of male and female patients in each group was similar. Patients in the labetalol group were 38.07±11.69 years old, whereas those in the lignocaine group were 34.53±6.68 years old (p = 0.156). Patients in the labetalol group had a mean BMI of 28.18±2.01, whereas those in the lignocaine group had a mean BMI of 28.29±2.20. There was no statistically significant difference between the groups (p 0.838). These findings are consistent with previous research[12,13].

The haemodynamic parameters in the two groups were similar prior to induction. Before induction, the Labetalol group's heart rate was 85.90±9.51, whereas the Lignocaine groups was 87.40±9.12 beats per minute. Prior to induction, SBP and DBP were 118.67±11.05 mmHg and 73.87±4.87 mmHg in the Labetalol group and 122.00±10.30 mmHg and 75.53±4.63 mmHg in the Lignocaine group, respectively. The haemodynamic values in the two groups were similar following a 5-minute tracheal extubation. Prior to induction, the Labetalol group's heart rate (beats per minute) was 90.80±0.99, whereas the Lignocaine group's was 102.50±11.04 beats per minute. Prior to induction, SBP and DBP were 103.33±7.581 mmHg and 71.33± 5.76 mmHg in the Labetalol group and 107.67±11.65 mmHg and 73.87± 5.98 mmHg in the Lignocaine group, respectively. These results are in accordance with other studies. In a study Heart rate at 5 minutes post intubation in patients with labetalol group was 78.43±6.41 beats/min versus 88.37±6.73 beats/min in patients in lignocaine group (p-value <0.001)[13].

In another research, HR, SBP, and DBP were considerably lower in the Labetalol group as compared to the Lignocaine group, with the mean arterial pressure and heart rate reaching the basal value in the Labetalol group within 5 minutes of intubation, while it was still higher in the Lignocaine group[14].

Intraoperatively, the labetalol group had more stable haemodynamic parameters than the esmolol and lignocaine groups. This corroborates our findings. A research by Kiran Kumar et al indicated that Labetalol was more efficient in attenuating the heart rate and blood pressure than Esmolol and Lignocaine[15]. In another study by Prasad SR, et al has showed that mean heart rate at intubation was 82.54±9.84 /min and after 5 minutes post intubation it was 96.50±9.80 /min while mean arterial pressure 90.8±10.80 mm of Hg and after 5 minutes post intubation it was 94.60±10.10 mm of Hg with low dose Lignocain[16]. In a research revealed that in IV lidocaine, the mean change in HR was 22.60±9.09, SBP was 20.96±10.53, DBP was 12.81±7.24, and MAP

was 14.44±7.14. In IV Labetalol, the mean change in HR was 24.11±0.12, SBP was 20.95±9.87, and DBP was 12.13±5.31. Both groups demonstrated a substantial decrease in mean haemodynamic parameters within groups[12].

Consistent with our findings, Attari et al. compared the efficacy of morphine and labetalol in controlling blood pressure and pulse during the emergence from anesthesia in brain tumor craniotomy and discovered that patients receiving labetalol had lower systolic and diastolic pressure at the time of extubation. Patients taking labetalol demonstrated improved haemodynamic stability, however in the morphine group, some changes in blood pressure and heart rate were seen[17].

CONCLUSION

Labetalol is more effective than Lignocaine in reducing the haemodynamic response to laryngoscopy and endotracheal intubation. Its half-life is 5.5 hours; therefore, it avoids unpleasant effects even during extubation. Labetalol is generally accessible, cost-effective, and easily administered with little side effects, making it a better alternative than lignocaine for usage during general anaesthesia.

REFERENCES

1. Younes MM, Mahareak AA, Salem EA, Nooreldin T. Attenuation of cardiovascular responses to tracheal extubation with labetalol. Al-Azhar Assiut Med J. 2017; 15(4):216-22. https://doi.org/10.4103/azmj.azmj_14_18
2. Pradhan K, Vaidya PR. Efficacy of dexmedetomidine in attenuating hemodynamic and airway responses during extubation: a randomized double-blind study. J Soc anesthesiol. Nepal. 2019; 6(1):e273. https://doi.org/10.3126/jsan.v6i1.25065
3. Khalawe N, Abbass HF, Ali AS. Comparative study between lidocaine and Metoprolol on hemodynamic attenuation during laryngoscope and endotracheal intubation. Global Sci J. 2018; 6(10): 330-44.
4. Kucukosman G, Aydin BG. A comparative analysis of the effects of esmolol, lidocaine, nitroglycerin and placebo on hemodynamic response to extubation and extubation quality and postoperative pain. Ann Med Res. 2020; 27(10):2617-24. https://doi.org/10.5455/annalsmedres.2020.05.514
5. Roy S, Gharami BB, Pandit P, Biswas A, Bhattacharya D, Sen S. A study on oral clonidine vis a vis intravenous lignocaine for attenuation of hemodynamic response to laryngoscopy and endotracheal intubation. Asian J M Sci. 2021; 12(3):33-7. https://doi.org/10.3126/ajms.v12i3.31995
6. Ramya K, Banerjee PB. Comparison of iv lignocane and iv labetalol for the attenuation of hemodynamic response to laryngoscopy and endotracheal intubation. Eur J Mol Clin Med. 2022; 9(2); 3043-49. https://doi.org/10.21088/ijaa.2349.8471.7420.2
7. Malik S, Muzaffar M, Munir N, Raza S, Rehman L. Comparison of hemodynamic responses by IV labetalol and IV lidocaine at the time of tracheal extubation: A randomized controlled trial. Pak J Surg. 2022; 38(1):35-40.
8. Prajwal Patel HS, Shashank MR, Shivaramu BT. Attenuation of hemodynamic response to tracheal extubation: A comparative study between esmolol and labetalol. Anesth Essays Res. 2018; 12:180-5. https://doi.org/10.4103/aer.aer_130_17
9. Nikhila T, Talikoti DG, Shivanand LK. A Randomized Comparative Study between Dexmedetomidine and Fentanyl on Attenuating Stress Response and Airway Response to Tracheal Extubation. J Krishna Inst Med Sci Univ. 2021; 10(1):84-92.
10. Kucukosman G, Aydin BG. A comparative analysis of the effects of esmolol, lidocaine, nitroglycerin and placebo on hemodynamic response to extubation, and extubation quality and postoperative pain. Ann Med Res 2020;27(10):2617-24. https://doi.org/10.5455/annalsmedres.2020.05.514
11. Gelineau AM, King MR, Ladha KS, et al. Intraoperative Esmolol as an Adjunct for Perioperative Opioid and Postoperative Pain Reduction: A Systematic Review, Meta-analysis, and Meta-regression. Anesth Analg. 2018; 126:1035-49. https://doi.org/10.1213/ane.0000000000002469
12. Malik S, Muzaffar M, Munir N, Raza S, Rehman L. Comparison of hemodynamic responses by IV labetalol and IV lidocaine at the time of tracheal extubation: A randomized controlled trial. Pakistan Journal of Surgery. 2022 ;38(1): 35-40.
13. Sharif M, Muhammad AB, Ahmed N, Zafarullah YR. Comparison of Low dose Labetalol Versus Low dose Lignocaine for Attenuation of Pressure Response During Intubation Under General Anaesthesia. Pak J Med Health Sci. 2021: 15(12): 3703-05. https://doi.org/10.53350/pjmhs2115123703
14. Ramya K, Banerjee PB. Comparison of iv lignocane and iv labetalol for the attenuation of hemodynamic response to laryngoscopy and endotracheal intubation. European Journal of Molecular & Clinical Medicine. 2022;9(2): 3043-49.

15. Kiran Kumar H. Comparison of Esmolol, Labetalol and Lignocaine for the attenuation of Sympathomimetic responses to laryngoscopy and endotracheal intubation. Int J Med Biomed Sci. 2019;3(7):211-15. https://doi.org/10.32553/ijmbs.v3i2.606
16. Prasad SR, Matam UM, Ojili GP. Comparison of intravenous lignocaine and intravenous dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation. Journal of Dr. NTR University of Health Sciences. 2015 Apr 1;4(2):86-90. https://doi.org/10.4103/2277-8632.158579
17. Attari MA, Tayyari F, Narimani N. Comparing the effect of labetalol versus morphine on controlling blood pressure and pulse rate during emergence from anesthesia after craniotomy. Adv Biomed Res 2017; 6:127. https://doi.org/10.4103/2277-9175.216781