

Original Article

To analyze the efficacy of iv labetalol 0.25/mg/kg in attenuation of haemodynamic response to extubation.

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Abstract

Background: The surgeries performed with securement of airway with endotracheal tube placement will be followed by extubation at the end of surgical procedure. Extubation may be associated with upper airway obstruction, laryngospasm, bronchospasm, tachycardia, hypertension and dysrhythmias. Extubation evokes various haemodynamic stress response in the form of tachycardia, raised blood pressure, changes in the heart rhythm which is detrimental to susceptible patients. Hence a study is needed to find a pharmacological drug to attenuate the stress response to extubation.

Aims and Objectives: To analyze the efficacy of iv labetalol 0.25/mg/kg in attenuation of haemodynamic response to extubation.

Materials & Methods: 64 participants belonging to ASA 1 or 2 of age group 18 – 55yrs were randomly divided into groups of 2. Group Lt received injection Labetalol iv 0.25mg/kg and group Ct received normal saline. Heart rate, systolic and diastolic blood pressure were recorded at baseline, 2,5,8 minutes after drug infusion, at extubation, and 1,3,5,8,10 and 15 minutes post extubation.

Results and Observations: Group Lt showed lowered heart rate, systolic and diastolic blood pressure at extubation and 15 minutes post extubation compared to group CT.

Conclusion: Injection Labetalol iv 0.25mg/kg effectively attenuated the haemodynamic stress response to extubation.

Keywords: Haemodynamic Response, Labetalol iv, haemodynamic, extubation.

Introduction:

The surgeries performed with securement of airway with endotracheal tube placement will be followed by extubation at the end of surgical procedure. Extubation may be associated with upper airway obstruction, laryngospasm, bronchospasm, tachycardia, hypertension and dysrhythmias. Thus a smooth extubation is essential to avoid the consequences that arise due to rise in plasma

concentration of catecholamines. Different methods had experimented with aiming for smooth extubation such as extubation in deep planes of anaesthesia and usage of pharmacological modes such as lidocaine, opioids, calcium channel blockers, magnesium sulphate and propofol but none of them were fully efficacious.¹ Labetalol is a combined alpha and betaadrenoceptor antagonist. It is a salicylamide derivative.² Securement of airway by General anaesthesia with endotracheal intubation is the gold standard practice, this is followed by endotracheal extubation which is associated with autonomic disturbances such as hypertension, tachycardia, arrhythmias due to epipharyngeal and laryngopharyngeal stimulation. Extubation is also associated with coughing, straining and bronchospasm³⁻⁴ Many methods had been tried such as avoiding lighter planes of anaesthesia during extubation ,usage of lidocaine, calcium channel blockers, opioids have been tried for attenuation of sympathoadrenal response to extubation but not associated with 100% efficacy.⁵ Labetalol is an adrenergic receptor blocking agent with mild alpha-1 and predominant beta-adrenergic receptor blocking actions. It is an oral and parenteral antihypertensive drug that is alpha-1 and nonselective beta-1 and beta-2 adrenergic antagonist.⁶ Labetalol lowers the systemic vascular resistance (alpha-1 blockade) and there by decreases the blood pressure, whereas the response of tachycardia caused by vasodilatation is attenuated by simultaneous beta blockade. There is no effect on cardiac output⁷ Hence a study is needed to evaluate the efficacy of 0.25mg/kg of iv labetalol in the attenuation of haemodynamic response to extubation

Materials and Methods:

After obtaining informed risk consent from all the participants and ethical committee clearance, the 64 participants of age group 18-55 yrs belonging to ASA class 1 or 2 were allocated into two groups of 32 each based on shuffled opaque sealed envelopes containing the name of the group. Patients with cardiac, renal and hepatic impairment, cerebral disease, difficult airway, heart blocks, bradycardia(heart rate <60bpm) were excluded from the study.

Group Ct received 10ml of normal saline intravenously over 10minutes using a syringe pump before extubation.

Group Lt received injection Labetalol 0.25mg/kg diluted upto 10ml with normal saline given over 10minutes before extubation.

All the subjects were premedicated with injection Midazolam 0.05mg/kg body weight and injection ondansetron 0.1mg/kg body weight and induced with injection thiopentone 5mg/kg and injection vecuronium 0.1 mg/kg.

Anaesthesia was maintained with oxygen,nitrous oxide, isoflurane with intermittent dose of injection vecuronium.

Group Lt received injection Labetalol 0.25mg/kg diluted upto 10ml with normal saline given over 10 minutes before extubation and Group Ct - received 10ml of normal saline intravenously over 10minutes before extubation.

At the end of the procedure, neuromuscular blockade was reversed with Inj neostigmine 0.05mg/kg body weight and Inj glycopyrrolate 0.01mg/kg body weight. Haemodynamic parameters such as heart rate, systolic and diastolic blood pressure were recorded at baseline,2,5,8 minutes after drug infusion, at the time of extubation and at 1,3,5,8,10 and 15 minutes postextubation.

Statistical Analysis

The calculation of sample size was done after discussion with the statistician, on the basis of pilot study observations. The observation conducted showed approximately each group should have 25 patients for ensuring a power of study 0.80 for detecting clinically meaningful difference by 15% in

haemodynamic parameters. With assumption of 5% patients would drop out, the final study sample size was fixed at 32 patients in each group, allowing a type 1 alpha error =0.05 and a type 2 error of beta=0.2 and power of 0.8. All the statistical methods were carried out through Microsoft excel SPSS for Windows (version 20.0)

Results and Observations:

There was no statistically significant difference in correspondence to demographic variables such as age, sex and weight.

Heart Rate:

The difference in baseline heart rate was statistically insignificant in between the two groups.

Group Lt showed a decrease in mean heart rate at 1,3,5,8,10 and 15 minutes post extubation compared to group Ct which was statistically significant. The mean heart rate remained below the baseline even at 15minute postextubation in group Lt which was statistically significant compared to group Ct as shown in Table 1 and Figure 1.

At extubation the mean heart rate was increased by 6 bpm in labetalol group whereas in control group the mean heart rate was increased by 41 bpm which was statistically significant.

Table 1: Mean Heart Rate in the patients

Groups		N	Mean
Baselin e	Group Lt	32	92
	Group Ct	32	85
2min AD	Group Lt	32	90
	Group Ct	32	90
5 Mins AD	Group Lt	32	88
	Group Ct	32	92
8 Mins AD	Group Lt	32	80
	Group Ct	32	93
Extubati on	Group Lt	32	95
	Group Ct	32	125
1minA E	Group Lt	32	92
	Group Ct	32	120
3Min AE	Group Lt	32	90
	Group Ct	32	115
5Min AE	Group Lt	32	88
	Group Ct	32	112
8min AE	Group Lt	32	85
	Group Ct	32	110
10 min AE	Group Lt	32	80
	Group Ct	32	105
15 Min AE	Group Lt	32	80
	Group Ct	32	100

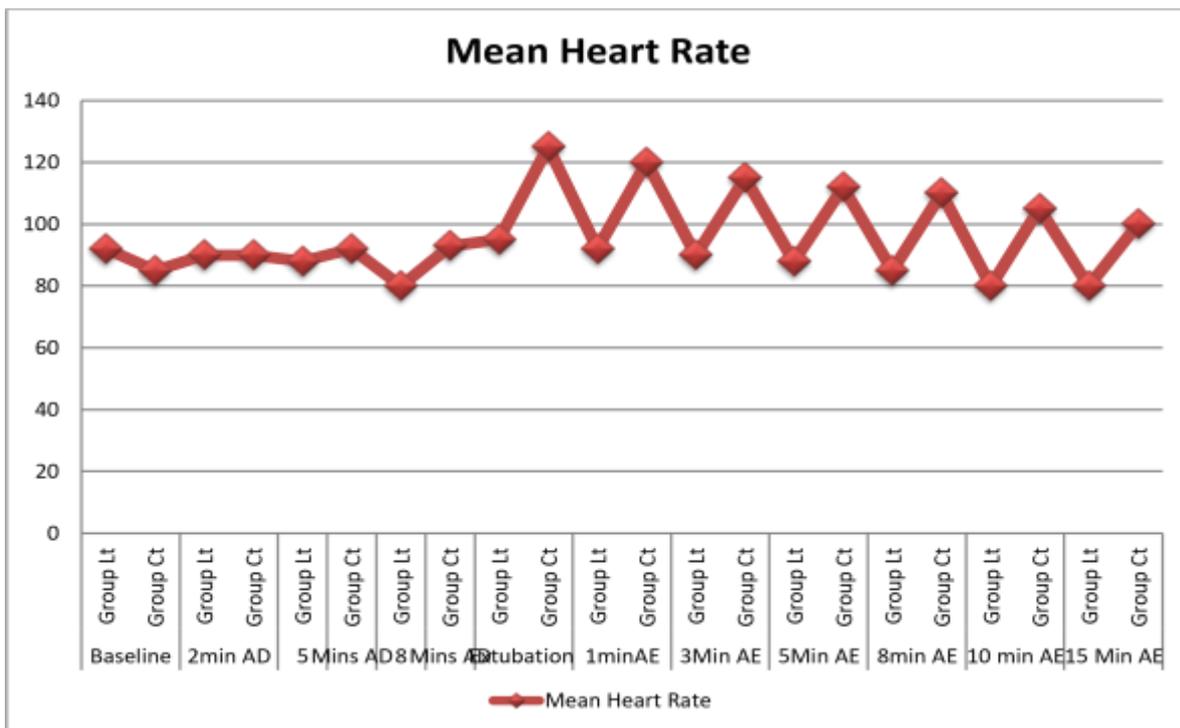


Figure 1: Mean Heart Rate Table 2: Mean Systolic BP in the patients

Groups	N	Mean	
Baselin e	Group Lt	32	130
	Group Ct	32	130
2min AD	Group Lt	32	129
	Group Ct	32	132
5 Mins AD	Group Lt	32	125
	Group Ct	32	135
8 Mins AD	Group Lt	32	122
	Group Ct	32	140
Extubati on	Group Lt	32	125
	Group Ct	32	150
1minAE	Group Lt	32	122
	Group Ct	32	149
3Min AE	Group Lt	32	118
	Group Ct	32	145
5Min AE	Group Lt	32	110
	Group Ct	32	140
8min AE	Group Lt	32	100
	Group Ct	32	135
10 min AE	Group Lt	32	100
	Group Ct	32	132
15 Min AE	Group Lt	32	100
	Group Ct	32	130

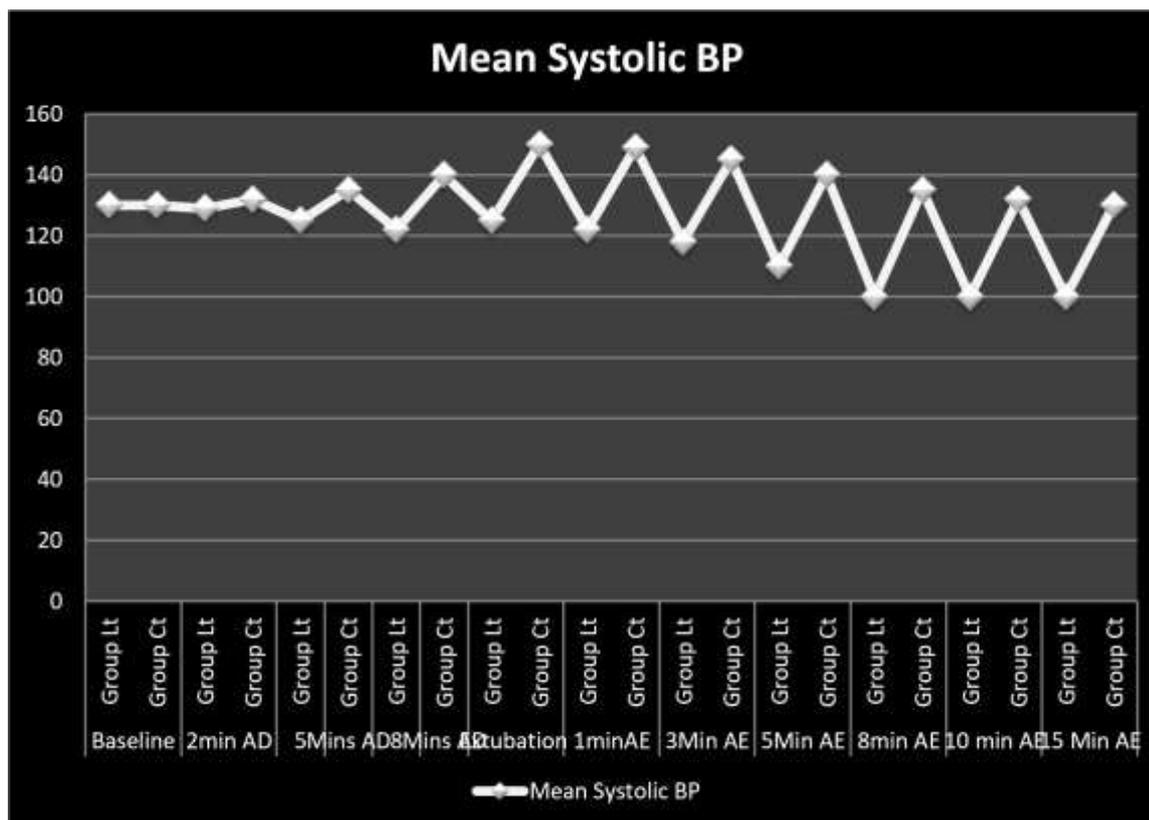


Figure 2: Mean Systolic BP

Systolic And Diastolic Blood Pressure

The baseline systolic and diastolic blood pressure were statistically insignificant between the two groups. Group Lt showed a decrease in mean systolic and diastolic blood pressure at extubation, 1, 3, 5, 8, 10 and 15 minutes postextubation which was statistically significant compared to group Ct. The mean systolic and diastolic blood pressure remained below the baseline even at 15th minute postextubation which was statistically significant. At extubation, the mean systolic and diastolic blood pressure was decreased by 7mmhg and 6mmhg respectively in labetalol group whereas in control group, the mean systolic and diastolic blood pressure was increased by 25mmhg and 19mmhg respectively which was statistically significant as shown in Table 2, 3 and Figure 2, 3.

Table 3: Mean Diastolic BP in the patients

Groups	N	Mean	
Baseline	Group Lt	32	80
	Group Ct	32	80
2min AD	Group Lt	32	78
	Group Ct	32	82
5 Mins AD	Group Lt	32	75
	Group Ct	32	88
8 Mins AD	Group Lt	32	75
	Group Ct	32	92
Extubation	Group Lt	32	76
	Group Ct	32	100
1minAE	Group Lt	32	75

	Group Ct	32	100
3Min AE	Group Lt	32	73
	Group Ct	32	100
5Min AE	Group Lt	32	72
	Group Ct	32	98
8min AE	Group Lt	32	72
	Group Ct	32	93
10 min AE	Group Lt	32	70
	Group Ct	32	90
15 Min AE	Group Lt	32	70
	Group Ct	32	85

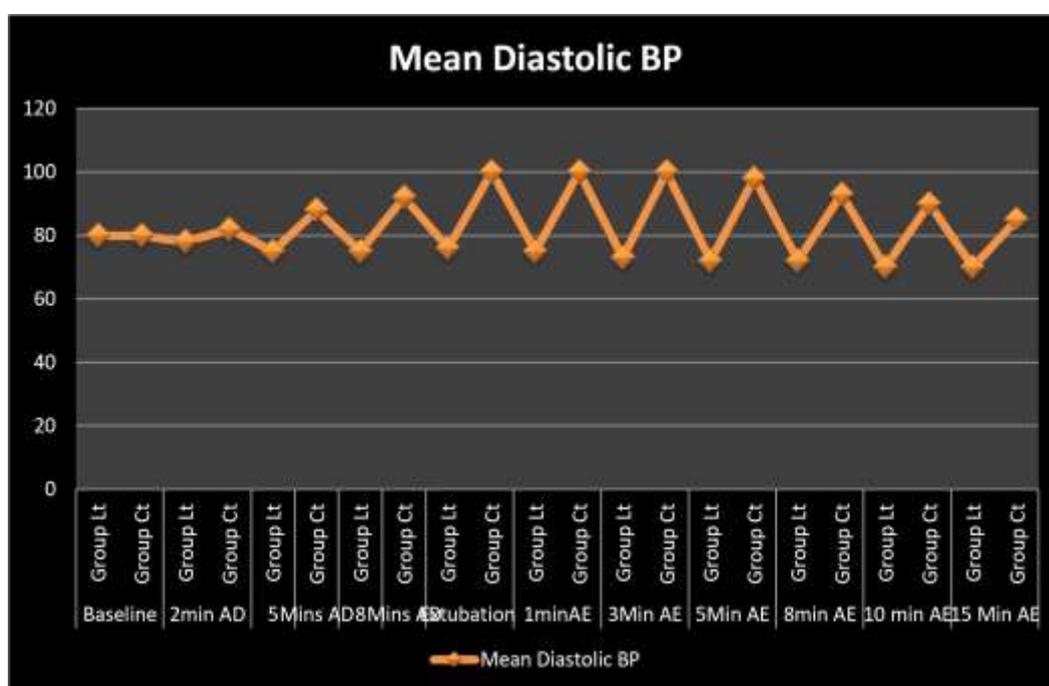


Figure 3: Mean diastolic BP.

Discussion:

The Extubation process evokes haemodynamic stress response due epipharyngeal and laryngopharyngeal stimulation. The stress response manifests in the form of autonomic disturbances such as hypertension, tachycardia, arrhythmias and also associated with coughing, straining and bronchospasm. Extubation process in general anaesthesia is associated with autonomic disturbances in the form of increased heart rate and blood pressure due to raised catecholamines levels, anxiety, pain which is detrimental in cardiovascular and cerebrovascular patients.⁸ Therefore attenuation of extubation response is necessary. Labetalol is a salicylamide derivative. It has alpha: beta blockade ratio of 1:7 for iv and 1:3 for PO administration⁹. Labetalol exhibits equilibrium-competitive antagonism at beta and alpha receptors. The intrinsic activity or partial agonism action at beta-2 receptors in the vasculature and by causing blockade of alpha receptors is responsible for vasodilator effect of the drug¹⁰. In our study, after infusion of 0.25mg/kg of labetalol group showed statistically significant decrease in mean heart rate and systolic and diastolic blood pressure after drug infusion and 15 minutes postextubation compared to control group. At extubation we noticed an increase of mean heart rate by 6bpm and decrease in systolic and diastolic blood pressure by

7mmhg and 6mmhg in Labetalol group. Our study results reveals that labetalol group showed a better control over haemodynamic parameters. In the study conducted by Younes M M *et al*¹¹, the mean heart rate was decreased by 10bpm at extubation and mean arterial pressure was decreased by 25mmhg. Thus labetalol was effective in controlling haemodynamic response to extubaion. In the study conducted by patel H S *et al*¹² at extubation the mean heart rate was decreased by 7mmhg, systolic blood pressure was decreased by 1mmhg and diastolic blood pressure was decreased by 3mmhg in labetalol group. Labetalol was more efficient in controlling Heart rate at 5th and 15th min postextubation having statistical significance in comparing with esmolol. This is probably because the difference in timing of administration of drug. In the study conducted by Babita *et al*.⁶ labetalol showed a effective attenuation of intubation response compared to fentanyl group. Various studies such as kunakeri SB *et al*¹³, Singh SP *et al*¹⁴, Kumar A *et al*¹⁵ labetalol effectively attenuated the sympathoadrenal response to intubation. In the study conducted by Attari *et al*.¹⁶ patients who were administered labetalol had a better haemodynamic control compared to morphine group. Labetalol has two optical centres with four isomers. The R, R isomer is about four times more potent as a β receptor antagonist than racemic Labetalol but it is less than 20% potent as an alpha 1 antagonist compared to racemic mixture.¹⁷

Limitations: Our Study More accurate results will be obtained if invasive blood pressure monitoring is done.

Conclusion

From our study we concluded that administration of 0.25mg/kg of iv labetalol 10 minutes before extubation effectively attenuated the haemodynamic response to extubtion.

Conflict of interests: None

Source of funding: None

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