Control Of Heart Rate Changes With Esmolol During Tracheal Intubation In Normotensive And Hypertensive Patients

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This is a prospective study of 75 patients conducted at Mayo Hospital, Lahore between 1994-95. Of these patients 37 were male and 38 female. They were divided into three groups of 25 patients each. First group comprised of control group, second normotensive and third hypertensive patients. Response of these patients to tracheal intubation in terms of heart rate was determined and that after Esmolol 100mg I.V bolus 2 minutes before intubation. Response was evaluated immediately, 5 minutes and 15 minutes after intubation. Mean basal heart rate in all three groups showed no significance difference. At 5 minutes control group had highest heart rate among three groups. And this was statistically significant (P=0.01). Difference in mean 5 minutes heart rate between normotensive and hypertensive was not significant. Fifteen minutes recording showed a higher heart rate for control group compared to normotensive. However, difference between control and hypertensive and normotensive versus hypertensive was not significant. Mean basal heart rate in control group increased by 16 beats per minutes at 5 minutes (P<0.01). At 15 minutes heart dropped by 12 beats below 5 minutes rate (P<.05). Difference between basal and 15 minutes was not significant (P=.49). Basal heart rate increased by 2 beats per minute in 0-5 minutes, between 5-15 heart rate decreased by 8 beats per minute which were significant (P-0.01), while difference in basal and 15 minutes was not significant. In hypertensive group difference in basal 5 and 15 minute was not significant. Therefore while control group showed increased heart rate at 5 minutes, no such significant rise was seen in other two groups. Both the control and hypertensive groups had significant reduction in heart rate at 5 and 15 minutes which was not the case with hypertensive group which showed no significant heart rate response over basal readings.
Key Words: Heart rate,Endotracheal intubation, esmolol

Tracheal intubation is the most common procedure which anaesthetists encounter in day-to-day practice. The haemodynamic responses to craniotomy, sternotomy, electro-convulsive therapy, laryngoscopy and intubation is currently an established problem for Anaesthesiologist. This haemodynamic response which is usually sympathetic in nature appears in the form of rise in heart rate and arterial blood pressure[1]. It is generally agreed that such a response may become harmful for the patient specially having raised intracranial pressure or any cardiac disease[2]. In an attempt to suppress these responses to laryngoscopy and intubation many techniques and pharmacological agents have been used with variable degree of success. No single technique has been universally accepted. To suppress this response Esmolol was used which is short acting β-antagonist which is cardioselective in nature. It has very rapid onset and offset of action. Its distribution half life is only two minutes, whereas, elimination half life is about nine minutes.[3] Bolus dosing is becoming popular among the Anaesthetists, although, it has not yet been approved[4]. Kovac et al (1990) studied the effects of infusion of esmolol in suppressing the haemodynamic responses to electroconvulsive therapy. He found that the number of patients having esmolol showed significant control over heart rate but there was no significant difference between seizure duration[5]. Sheppard et al (1990) studied the esmolol in 100 and 200mg bolus doses for laryngoscopy and intubation. The difference in heart rate between control and both esmolol was significant before intubation but after intubation only 200mg group was found[6]. They suggest that there is no advantage in using 200mg esmolol to attenuate the laryngoscopic response[6]. Same doses (100, 200mg) were used by Ebert et al (1990) and Parnass et al (1990) to attenuate the laryngoscopic response and both studies showed that both doses were collectively effective in controlling the heart rate[7,8]. We used Esmolol (Brevibloc), as a bolus dose to save the time and additional equipment.

This study was carried out to see the suppression of sympathomimetic effects (heart rate).

Material and Methods

Study was conducted at Mayo Hospital, Lahore. Proper approval of the study was taken from the Hospital Ethical Committee, Seventy five patients of either sex age 15 to45 years and of both sexes weight 40-90Kg from different surgical departments of the hospital having ASA status I and II undergoing elective surgery were included in the study. Written consent of the patients was taken. Patients having heart rate less than 70/m; systolic BP less than 100mm Hg, heart block of any agree, myocardial infarction in the previous three months; history of bronchospastic disease or asthma; age less than 15 years; pregnancy,ingestion of β-blocking drugs in past 24 hours, thyrotoxicosis, congestive cardiac failure, diabetes and peripheral vascular disease were excluded from the study. No drug as premedication was used. To allay the anxiety, only reassurance of the patient was done in the preoperative visit. No anticholinergic drug was given prior to the surgery.

Variables monitored were heart rate, systolic, diastolic and mean blood pressure and ECG. After stabilising the patient for 5 minutes,limb lead II of ECG monitor (Datascope MD_4) was used to have a base line heart rate as well as for continuous monitoring ECG strip was taken before and during anaesthesia if any arrhythemia occurred. Baseline measurements of systolic, diastolic and mean blood pressure were taken by using non-invasive automated (Dinamap) sphygmomanometer B.P.

Group I
Patients in this group received 20ml of 5% Dextrose water i/v bolus.

Group II:
Patients in this group received 20ml of i/v bolus solution containing 100mg of esmolol.

Group III

Patients in this group received 20ml IV bolus solution containing 100mg of esmolol (hypertensive).

After having baseline readings, patient received the respective dose of esmolol (or placebo) at time zero by hand held bolus over 15 seconds. Immediately, after thiopentone sodium 5mg Kg^{-1} was given as inducing agent and suxamethonium 1.5 $mgKg^{-1}$ for laryngeal inlet relaxation. Laryngoscopy and orotracheal intubation was done exactly two minutes after bolus of esmolol (or placebo) by using standard Macintosh laryngoscopic blade. Surgical incision, position making or draping the patient were not allowed upto ten minutes after induction. Monitoring of heart rate was obtained after 0, 5 and 15 minutes.

Results

Twenty five patients were included in each of the three groups. There were no significant differences in age, weight, sex, ASA physical status and base line haemodynamic variables between the esmolol 100mg, and placebo groups. No difficulties were encountered during tracheal intubation and the duration of laryngoscopy never exceeded 15 seconds.

Analysis of study group-I, II and III is shown in the following tables

Group I.

Variables	Mean± S.D.	Range	Min.	Max.
Age	36.89±11.45	40.00	16	56
Weight	60.42±9.28	35.00	40	75
HR0	101.95±16.01	55.00	70	125
HR5	118.85±17.33	69.00	80	149
HR15	106.53±23.38	118.00	57	175

Group II

Variables	Mean± S.D.	Range	Min.	Max.
Age	32.40±10.38	32.00	18	50
Weight	63.90±6.89	25.00	50	75
HR0	89.10±17.12	62.00	59	121
HR5	91.40±12.41	48.00	73	121
HR15	83.10±13.27	44.00	64	108

Group III

Variables	Mean± S.D.	Range	Min.	Max.
Age	40.80±5.03	15.00	35	50
Weight	65.60±10.49	34.00	48	82
HR0	95.20±13.71	42.00	72	114
HR5	96.40±14.44	45.00	71	116
HR15	90.00±9.82	26.00	78	104

The differnece in basal heart rate between control and normotensive and hypotensive was not significant. At 5 minute there was significant difference between control and hypertensive and normotensive. At 15 minutes there was significant difference between control and normotensive.

Discussion

Mean basal heart rate readings showed no difference between the three groups. At 5 minutes control group had the highest heart rate amongst the three groups and this difference was statistically significant (P=0.01). The difference in mean 5 minute heart rate between the normotensive and hypertensive groups was not significant. Recording of 15 minutes showed a higher heart rate for control group compared to the normotensive group. However, the difference between control and hypertensive and normotensive versus hypertensive patients was not significant.

Mean basal heart rate in the control group increased by 16 beats per minute at 5 minutes (P<0.01), At 15 minutes the mean heart rate dropped by 12 beats below the 5 minutes rate (P< 0.05). The difference between the basal and 15 minute rate was not significant (P=0.49).

Basal heart rate in the normotensive group increased by only 2 beats per minute between 0 and 5 minutes (P=0.52). Between 5 and 15 minutes this group had a mean reduction in pulse rate of 8 beats per minute which was significant (P<0.01) while the difference in mean basal and 15 minute pulse rate was not significant.

Analysis of the heart rate response in the hypertensive group showed that the difference in the basal, 5 minute and 15 minute heart rates was not statistically significant. Thus while the control group showed an increase in pulse rate at 5 minutes, no such significant rise was seen in the other two groups. Both control and normotensive groups had a significant reduction in heart rate between 5 and 15 minutes while this was not the case with hypertensive group which showed no significant heart rate response over the basal readings.

Conclusion

In our view the present study showed that normotensive patients responded well to 100mg esmolol but hypertensive patients responded even better than normotensive patient.

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