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Original Research

Comparison of effect of diltiazem and esmolol in attenuating the cardiovascular responses to tracheal extubation

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ABSTRACT:

Background: Endotracheal extubation is the translaryngeal removal of a tube from the trachea via the nose or mouth. Esmolol is used in various settings including urgent care, perioperatively, and postoperatively Diltiazem has been used extensively to maintain perioperative haemodynamic stability. Hence; under the light of above mentioned data, the present study was planned for assessing and comparing the effect of diltiazem and esmolol in attenuating the cardiovascular responses to tracheal extubation. **Materials & methods:** 60 patients with ASA physical status I or II undergoing elective surgery under general anaesthesia with endotracheal intubation were randomly divided into 2 groups using random number tables. The groups were organized as follows: Diltiazem group (Group 1, n=30): 0.1mg/kg of Diltiazem to be diluted in NS till 10 cc, and Esmolol group (Group 2, n=30): 1mg/kg of Esmolol to be diluted in NS to make 10 cc. A Performa was made and alterations in the heart rate were recorded. All the results were recorded and analyzed using SPSS software. Mann-Whitney U test was used for evaluation of level of significance. **Results:** Mean heart rate in the Group 2 was significantly lower in comparison to Group 1 at extubation, 1 minute after extubation, 3 minutes after extubation, 5 minutes after extubation, 10 minutes after extubation and 15 minutes after extubation. Hypotension was seen in 13.33 percent of the patients of the Group 1 while it was seen in 3.33 percent of the patients of the Group 2. Bradycardia was seen in 3.33 percent of the patients of group 2. **Conclusion:** In attenuating heart rate changes, esmolol is more effective than diltiazem during tracheal extubation.

Key words: Diltiazem, Esmolol

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INTRODUCTION:

Difficult airway management may be a major cause of severe perioperative morbidity and mortality related to anesthesia. Preoperatively, a lack of airway assessment, training and teaching seems to be a cause for concern. Patients who are difficult to intubate are at higher risk for airway-related complications; and reported complication rates range from 4.1% to 28% (esophageal intubation, 1.6-9%; aspiration, 2-4%; and oropharyngeal trauma, 0.5-7%).[1-3]

Endotracheal intubation in the OR and ICU are different procedures, although this is not always appreciated. The OR intubation usually involve physiologically stable patient in an optimal environment. In contrast, the ICU intubation usually occurs in an unstable patient often with a period of time (albeit sometimes brief) to allow for evaluation and planning, and in an environment not always ideally suited to airway management. A significant proportion of ICU intubations are performed by relatively junior trainees, with or without supervision.[4, 5] Esmolol is used in various settings including urgent care, perioperatively, and postoperatively Diltiazem has been used extensively to maintain perioperative haemodynamic stability.[6, 7] Hence; under the light of above mentioned data, the present study was planned for assessing and comparing the effect of diltiazem and esmolol in

attenuating the cardiovascular responses to tracheal extubation.

MATERIALS & METHODS

The present study was planned for assessing and comparing the effect of diltiazem and esmolol in attenuating the cardiovascular responses to tracheal extubation.60 patients with ASA physical status I or II undergoing elective surgery under general anaesthesia with endotracheal intubation were randomly divided into 2 groups using random number tables. The groups were organized as follows:

- Diltiazem group (Group 1, n=30): 0.1mg/kg of Diltiazem to be diluted in NS till 10 cc
- Esmolol group (Group 2, n=30): 1mg/kg of Esmolol to be diluted in NS to make 10 cc

Compete demographic details of all the patients was obtained. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. A Performa was made and alterations in the heart rate were recorded. All the results were recorded and analyzed using SPSS software. Mann-Whitney U test was used for evaluation of level of significance.

RESULTS

Among the patients of the Group 1, mean heart rate at Preoperative, Reversal, Drug administration, 1 minute after drug administration, 2 minute after drug administration, Extubation, 1 minute after extubation, 3 minutes after extubation, 5 minutes after extubation, 10 minutes after extubation and 15 minutes after extubation was found to be 82.6, 85.9, 90.4, 92.3, 91.3, 86.4, 85.4, 84.3, 83.5, 86.5 and 86.2 respectively. Among the patients of the Group 2, mean heart rate at Preoperative, Reversal, Drug administration, 1 minute after drug administration, 2 minute after drug administration, Extubation, 1 minute after extubation, 3 minutes after extubation, 5 minutes after extubation, 10 minutes after extubation and 15 minutes after extubation was found to be 83.2, 87.4, 92.6, 88.2, 90.3, 76.5, 76.1, 75.2, 74.3, 73.2 and 74.1 respectively. Mean heart rate in the Group 2 was significantly lower in comparison to Group 1 at extubation, 1 minute after extubation, 3 minutes after extubation, 5 minutes after extubation, 10 minutes after extubation and 15 minutes after extubation. Hypotension was seen in 13.33 percent of the patients of the Group 1 while it was seen in 3.33 percent of the patients of the Group 2. Bradycardia was seen in 3.33 percent of the patients of group 2.

Table 1: Age

Age (years)	Group 1	Group 2
Mean	37.12	36.44
SD	13.85	12.74

Table 2: Gender-wise distribution of patients

Gender	Group 1		Group 2	
	Number	Percentage	Number	Percentage
Males	14	46.67	15	50
Females	16	53.33	15	50
Total	30	100	30	100

Table 3: Heart rate at different time intervals

Time interval	Group 1	Group 2	p-value
Preoperative	82.6	83.2	0.33
Reversal	85.9	87.4	0.46
At the time of Drug administration	90.4	92.6	0.35
1 minute after drug administration	92.3	88.2	0.72
2 minute after drug administration	91.3	90.3	0.12
At the time of Extubation	86.4	76.5	0.02*
1 minute after extubation	85.4	76.1	0.01*
3 minutes after extubation	84.3	75.2	0.00*
5 minutes after extubation	83.5	74.3	0.00*
10 minutes after extubation	86.5	73.2	0.01*
15 minutes after extubation	86.2	74.1	0.00*

*: Significant

Table 4: Adverse events

Adverse events	Group 1		Group 2	
	Number	Percentage	Number	Percentage
Hypotension	4	13.33	1	3.33
Bradycardia	0	0	1	3.33

DISCUSSION

Endotracheal intubation is an essential part of general anesthesia techniques for major surgical procedures. Both intubation and extubation are associated with various cardiovascular and airway responses leading to tachycardia, hypertension, arrhythmias, myocardial ischemia, coughing, bronchospasm, increased bleeding, raised intracranial, and intraocular pressure.[6-9] Hence; under the light of above mentioned data, the present study was planned for assessing and comparing the effect of diltiazem and esmolol in attenuating the cardiovascular responses to tracheal extubation.

In the present study, mean age of the patients of group 1 and group 2 was 37.12 years and 36.44 years

respectively. Mean heart rate in the Group 2 was significantly lower in comparison to Group 1 at extubation, 1 minute after extubation, 3 minutes after extubation, 5 minutes after extubation, 10 minutes after extubation and 15 minutes after extubation. Our results were in concordance with the results obtained by previous authors who also reported similar findings in their respective studies. Nagrale MH et al conducted a prospective randomized study on 90 patients to evaluate haemodynamic effects of intravenous Propofol, Lignocaine, Esmolol given two minutes prior to extubation. Heart rate, Systolic, Diastolic and Mean blood pressure decreased significantly to Esmolol 1.5mg/kg and propofol 0.5 mg/kg 2 minutes prior to extubation. With lignocaine there was an initial rise in blood pressure. Lignocaine, Esmolol and Propofol were able to attenuate cough and strain of extubation in > 90% of the patients. They concluded that Esmolol IV is preferred for attenuation of haemodynamic responses when compared with IV propofol 0.5 mg/kg and IV lignocaine (2%) 1 mg/kg as the attenuation effect is elicited immediately.[10]

In the present study, Hypotension was seen in 13.33 percent of the patients of the Group 1 while it was seen in 3.33 percent of the patients of the Group 2. Bradycardia was seen in 3.33 percent of the patients of group 2. In a previous study conducted by Selvaraj V et al, authors studied the role of dexmedetomidine in attenuation of hemodynamic response to laryngoscopy and oral endotracheal intubation compared to that of esmolol hydrochloride in patients posted for elective surgery under general anesthesia. A total of 60 American Society of Anesthesiologists I patients, aged 18-60 years randomly divided into two groups; Group A patients received dexmedetomidine 1 mcg/kg diluted in 50 ml with normal saline and infused over 10 min before induction and also 20 ml of normal saline intravenous (IV) 2 min before endotracheal intubation. Group B patients received 50 ml IV infusion of normal saline over 10 min before induction and IV bolus of esmolol 0.5 mg/kg diluted in 20 ml with normal saline given 2 min before intubation. Standard induction technique followed. They concluded that Dexmedetomidine is more effective in attenuating the hemodynamic response to oral endotracheal intubation compared to that of esmolol hydrochloride.[11] Acharya N et al studied 120 patients of ASA grade I/II. The patients were randomly assigned to four groups of thirty each through a computer generated number. Group A = received 1mg/ kg of esmolol intravenously (n=30), Group B = received 1µg/kg of nitroglycerine intravenously (n=30), Group C = received 0.2mg/ kg of diltiazem intravenously (n=30) and group D received normal saline (placebo). These agents were administered one minute after reversal. HR, SBP, DBP and MAP were monitored and analyzed. The HR, SBP, SBP, MAP increased significantly during tracheal extubation in the control group ($p<0.001$). Esmolol 1 mg/kg IV bolus effectively controlled HR and mean arterial BP during extubation. NTG 1 µg/kg IV bolus effectively controlled arterial BP but not effective in controlling HR. Diltiazem 0.2 mg/kg IV bolus showed similar response like NTG. Although it attenuated rise in arterial BP significantly at extubation, it failed to control rise in HR. No significant bradycardia, hypotension, arrhythmia occurred in any of the patients. They concluded that esmolol in dose of 1 mg/kg intravenously prevented the rise in both heart rate and blood pressure effectively. Esmolol was more effective in attenuating rise in systolic blood pressure, diastolic blood pressure and mean blood pressure when compared to nitroglycerine and diltiazem.[12]

CONCLUSION

From the above results, the authors concluded that in attenuating heart rate changes, esmolol is more effective than diltiazem during tracheal extubation.

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