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Attenuation of Pressor Response:a Comparison of Diltiazem and Esmolol.

KEYWORDS: Pressor response, Esmolol, Diltiazem

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ABSTRACT *Laryngoscopy during general anaesthesia results in stimulation of the larynx, pharynx, epipharynx and trachea leading to sympathetic system activation leading to various cardiovascular changes like increase in heart rate, blood pressure, intracranial tension, intraocular pressure, dysrrhythmias, cardiac asystole and even sudden death. The recent reports of effectiveness of various calcium channel blockers like diltiazem and Esmolol a beta-antagonist with short half-life and easy availability of both promoted us to study their efficacy in preventing pressor response to laryngoscopy and endotracheal intubation. The results showed that Diltiazem attenuates the haemodynamics pressor responses during laryngoscopy and intubation better than Esmolol although attenuation in both the groups is comparable*

INTRODUCTION

Laryngoscopy during general anaesthesia stimulates the pharynx, larynx and trachea, activating sympathetic system leading to increase in heart rate, blood pressure, intracranial tension, intraocular pressure, dysrrhythmias, cardiac asystole and even sudden death[1,5,6,7]. These may be hazardous in patients with poor coronary reserve, open eye injury, increased intracranial pressure and trauma to thoracic aorta. These can be reduced by deeper planes of anaesthesia, which may be poorly tolerated. Hence various methods/drugs have been advocated to reduce/prevent these responses like opioids, topical and intravenous lidocaine, Beta-antagonists, Calcium channel blockers, etc. The recent reports of effectiveness of various calcium channel blockers like Diltiazem and Esmolol a newer beta-antagonist with short half-life and easy availability of both promoted us to study their efficacy in preventing pressor response to laryngoscopy and endotracheal intubation. [2,3,4,8,9,10,11] Our aim was to compare the relative efficacy of Esmolol and Diltiazem for attenuation of pressor responses during laryngoscopy and tracheal intubation.

MATERIALS and METHODS

Total of 100 normotensive patients undergoing planned elective surgery under general anaesthesia were selected. Pre- operatively, a detailed clinical history, physical examination and relevant investigations were evaluated. Patients between age group 15 to 45 years and ASA grade I and II were included in the study. Patients with anticipated difficult intubation, hypertension, heart disease, IHD, COPD, diabetes mellitus, old age, cerebrovascular disease were excluded.

These were randomly divided into two groups:

Group I : - (n=50)- Inj. Ditiazem HCl i.v. 0.2 mg/kg before thiopentone induction.

Group II : - (n=50)- Inj. Esmolol HCl i.v. 2 mg/kg before thiopentone induction.

The study was explained to the patient and their informed written consent was taken. All patients were premedicated with inj, Glycopyrrolate 5 µg/kg i.m. half an hour prior to induction. Pre operative baseline parameters like heart rate, blood pressure were recorded. An intravenous access was established and 500ml of Ringer's Lactate was started. All patients were preoxygenated with 100 % oxygen for 3 minutes.

Then according to the two groups

Group I : - Patients received Ditiazem 0.2 mg/kg i.v.

Group II : - Patients received Esmolol 2mg/kg i.v.

This was followed by induction with Inj. Thiopentone sodium (2.5%) 4-5 mg/kg i.v. till loss of eyelash reflex followed by Inj. Succinylcholine 2 mg/kg to facilitate endotracheal intubation. Patient was ventilated with 100 % oxygen and upon full relaxation laryngoscopy and intubation was carried out. All intubations were smooth and gentle and done within 30 seconds. Immediately, after intubation pulse and blood pressure were recorded at one-minute, two minute, five minute and ten minute intervals. The patients were maintained on oxygen, nitrous oxide and Isoflurane (started five minutes after intubation (0.8 -1.2%)). The heart rate and blood pressure were recorded after succinylcholine and 1 min, 2 min, 5 min and 10 min after intubation. Paired and unpaired 't' test was applied to compare the changes in pulse rate, arterial pressure and rate pressure product(Heart Rate*Systolic BP- Indicates Myocardial Oxygen Demand) between the two groups.

OBSERVATIONS AND RESULTS

The data obtained from the study were organized and analysed statistically by student's 't' test (Paired within groups and unpaired between groups) was applied to find out significance and a 'P' value of less than 0.05 was considered significant.

The age, body weight and height distribution between two groups were comparable.

TABLE I:-CHANGES IN HEART RATE IN GROUP-I AND II

Reading	Diltiazem	Esmolol
Preoperative	88.6±10.9	89.94±12.3
Induction	99.7±12.0	101±9.4
1 M	100.9±11.8	100.1±10.3
2 M	100.8±12.2	99.1±11.0
5 M	100.1±11.6	99±9.9
10 M	96.2±17.1	97.5±10.4

- Rise in pulse rate in Group I and II during laryngoscopy and intubation is statistically significant. (P<0.05)
- Rise in pulse rate between two groups is comparable with the difference being marginal.

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TABLE II:-CHANGES IN SYSTOLIC BLOOD PRESSURE IN GROUP I AND II

Reading	Diltiazem	Esmolol
Preoperative	118.2±9.4	118.7±9.2
Induction	108.3±16.8	114±18.6
1 M	117.5±13.7	121.8±15.2
2 M	119.9±12.0	122.3±12.6
5 M	117.3±10.5	121.9±12.2
10 M	114.8±8.2	119.1±11.2

The rise in systolic blood pressure during laryngoscopy and intubation in Group-I and II is statistically significant. The rise in Group-II was more than Group-I.

TABLE III:-CHANGES IN DIASTOLIC BLOOD PRESSURE IN GROUP I AND II

Reading	Diltiazem	Esmolol
Preoperative	82.9±3.8	82.5±4.6
Induction	79.4±6.4	82.3±7.8
1 M	85.2±5.4	86±7.6
2 M	84.7±5.7	86±6.9
5 M	84±5.5	85.8±6.5
10 M	83.4±5.2	85.4±6.1

The rise in diastolic blood pressure during laryngoscopy and intubation in Group-I and II is statistically significant. The rise in Group II was greater than in Group I.

TABLE IV:-CHANGES IN RATE-PRESSURE PRODUCT IN GROUPI AND II

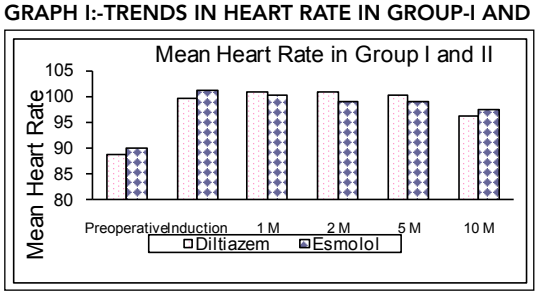
Reading	Diltiazem	Esmolol
Preoperative	10472.52	10675.88
Induction	10797.51	11514
1M	11855.75	12192.18
2M	12085.92	12119.93
5M	11741.73	12068.1
10M	11043.76	11612.25

The rise in rate-pressure product during laryngoscopy and intubation in Group-I and II is statistically significant. The rise in group II is greater than in Group I.

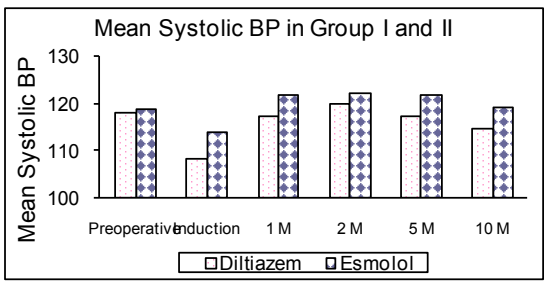
TABLE V:-ELECTROCARDIOGRAPHIC CHANGES IN GROUP I AND GROUP II

Group	Heart Rate/min			Arrhythmias
	<60	60-120	>120	
Diltiazem	0	47	3	0
Esmolol	1	49	0	1

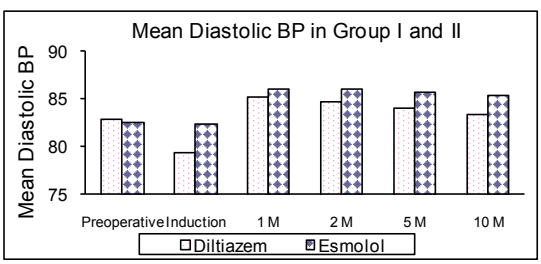
GRAPH I:-TRENDS IN HEART RATE IN GROUP-I AND II



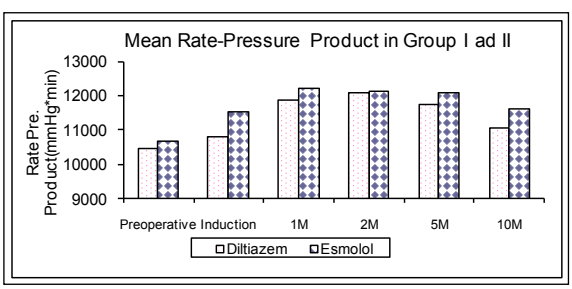
GRAPH II :-TRENDS IN SYSTOLIC BLOOD PRESSURE IN GROUP I AND II



GRAPH III:- TRENDS IN DIASTOLIC BLOOD PRESSURE IN GROUP I AND II



GRAPH IV :-TRENDS IN RATE-PRESSURE PRODUCT IN GROUP I AND II



Discussion

There was a general tendency towards tachycardia(13% rise) during induction and laryngoscopy possibly due to the vasodilatation produced by thiopentone, and augmented by diltiazem as found by Mikawa et al(1990)[47][4]. The fall in systolic and diastolic blood pressure following induction may indicate changes secondary to administration of thiopentone, as per James et al (1989).[13] The subsequent rise with peak at 1 min is probably due to catecholamine response to laryngoscopy and intubation. This was in concurrence with the findings of Stoelting R.K. (1997).[17]

Esmolol was found to control rise in pulse rate better than Diltiazem although the effect was comparable with no statistical significance. (Table I and Graph I)

Diltiazem caused greater fall in systolic blood pressure post-induction than Esmolol and blunted pressor response better than Esmolol. (Table II and Graph II)

Mikawa et al (1990) reported attenuation by diltiazem 0.3 mg/kg,[4] and Hasegawa et al (1992)[16] with 0.2 mg/kg. A continuous infusion of diltiazem is also known to suppress this pressor response as swown by Shimada et al (1991).[14] Vuceric G.M. Purdy et al[12] found that Esmolol causes a less rise in systolic blood pressure than the control group.

Diltiazem caused greater fall in diastolic blood pressure post-induction than Esmolol and blunted pressor response better than Esmolol. (Table III and Graph III)

The rise in rate-pressure product with Esmolol was greater

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than in diltiazem group, thus showing that diltiazem controls myocardial oxygen demand better than Esmolol. (Table IV and Graph IV)

Mikawa et al (1990)[4] have reported similar significant attenuation of rise in RPP.

Hasegawa et al (1992)[16] had also reported attenuation of RPP by 0.2 mg/kg diltiazem.

No significant hypotension, bradycardia or conduction disturbances wre noted following administration of bolus dose o diltiazem. While one case of badycardia was observed in Esmolol group for 45-50 seconds and which required administration of Inj. Atropine 0.6 g i.v. returning heart rate to normal. But no conduction defects were observed.

Thus, in conclusion, Esmolol 2 mg/kg can be used in anxious, ischaemic heart disease patients who are at risk during laryngoscopy and intubation. Ditiazem 0.2 mg/kg definitely has a cardio protective action and can be safely used in high-risk patients who have hypertension and ischaemic heart disease with low ejection fraction.

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