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Original Research Paper

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ATTENUATION OF HEMODYNAMIC RESPONSE TO ENDOTRACHEAL EXTUBATION AFTER GENERAL ANAESTHESIA: A PROSPECTIVE RANDOMISED CONTROLLED BLIND STUDY OF TWO DIFFERENT INTRAVENOUS DOSES OF VERAPAMIL.

Dr Neeraj Kumar Senior Resident Anesthesia, ANMMCH, Gaya.

Dr Bijay Kumar Suman* Senior Resident Pediatric Surgery. *Corresponding Author

Dr P K Sinha Associate Professor& Head of Department, ANMMCH, Gaya.

ABSTRACT

Background And Objectives: Cardiovascular stress response to extubation can result in elevated heart rate and arterial blood pressures which can be detrimental in high-risk patients. Objective of this study is to compare the effect of two different intravenous doses of Verapamil in attenuation of these responses.

Methods: 90 patients scheduled for elective surgical procedures were selected randomly and divided into three groups of 30 each. Group I-control (normal saline), group II and group III, Inj. Verapamil 0.05mg/kg and 0.1mg/kg is administered intravenously respectively 2 minutes prior to extubation after following a standard pre-operative anesthetic management. Hemodynamic parameters which included heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were recorded at the time of administration of the study drug, at time of extubation and at 1, 3, 5, and 10 minutes post extubation. Analysis of variance (ANOVA) has been used to find the significance of study parameters between groups of patients and student's t-test has been employed to find the pair wise significance.

Results: In Group I (Control), there is a significant increase in HR, SBP and DBP at the time of tracheal extubation from the baseline values (at the time of drug administration). There is significant difference in heart rate and blood pressure attenuation between patients who received Inj. Verapamil 0.05mg/kg and Inj. Verapamil 0.1mg/kg.

Conclusion: Our study concludes that Verapamil at dose of 0.1 mg/kg intravenously is superior to 0.05 mg/kg in attenuating the hemodynamic responses to tracheal extubation without any side effects.

KEYWORDS : Extubation; Verapamil.

INTRODUCTION

Extubation after general anaesthesia is associated with different cardiovascular as well as airway hyperactivity leading to tachycardia, hypertension, arrhythmia, myocardial ischemia, coughing, bronchospasm, agitation and rise in intracranial and intraocular pressure. Therefore, post-operative extubation of trachea is an important event in the course of general anaesthesia as intubation. Reid and Brace in 1940 were first to report the circulatory responses to laryngeal and endotracheal extubation in anaesthetized patient[1].The exact mechanism responsible for the above hemodynamic and respiratory instability is unknown, but considering post extubation period as stressful, it is presumed due to increased release of catecholamines[2]. Although, this period is transient but approximately 10-30% patients show moderate to severe cardiovascular and respiratory events lasting 5-15 minutes after extubation. Such responses are well tolerated by healthy subjects but may be detrimental in patients with pre-existing cardiovascular or respiratory disorders. A number of measures have been tried to attenuate these cardiovascular responses such as extubation in deeper plane of anaesthesia, avoiding or reducing duration of laryngoscopy before extubation, use of laryngeal mask airway instead of endotracheal tube. Many drugs have been also used to attenuate the cardiovascular and post extubation stress responses like tracheal instillation with local anesthetics and intracuff Lidocaine[4], intravenous lignocaine[5] small doses intravenous short acting opioids (fentanyl & remifentanyl)[6,7], pre-treatment with intravenous beta blockers (Esmolol or metoprolol)[8], intravenous calcium channel blockers(Diltiazem Nifedipine Verapamil)[9], use of vasodilators like nitrates prostaglandins[10] and magnesium sulphate[11], dexmedetomidine[9] (α-2 agonist) has also been used to attenuate this response but Verapamil a calcium channel antagonist has been studied by many workers and found to be suitable to attenuate the hemodynamic responses during post-extubation period after general anesthesia. In the present study, we have attempted to evaluate and compare the ability of intravenous Verapamil in two different doses 0.05 mg/kg and 0.1 mg/kg given two minutes prior to the extubation for attenuating the cardiovascular responses to postoperative tracheal extubation with the placebo group (normal saline) undergoing elective surgeries under general anesthesia.

MATERIAL AND METHODS

After approval from Institutional Ethical Committee, the prospective double blind, parallel randomized controlled clinical study was conducted at our institution and informed consent, 90 adult patients, age group 20-50 year, ASA I and II physical status scheduled to undergo general anaesthesia for various elective surgeries. Patients were randomly allocated into three groups of (n=30) for each group.

Group I= control group, in this group 5ml normal saline was given intravenously to the pt.
Group II= Inj. Verapamil 0.05 mg/kg intravenously, constituted to 5ml volume.
Group III= Inj. Verapamil 0.1 mg/kg intravenously, constituted to 5ml volume.

Patients were pre-oxygenated with O2 and Inj. Fentanyl 2mcg/kg given intravenously and induced with Inj. Propofol 2mg/kg IV and after confirmation adequate mask ventilation Inj. Vecuronim bromide 0.1mg/kg was given intravenously then intubated with adequate size of tracheal tube orally. The study drug was given intravenously and vitals (HR, SBP and DBP) were noted at this time as baseline.

The patient was extubated two minutes after administration of study drug with adequate oral suctioning and vitals were again noted. Pt. was then given only 100% oxygen with face mask. The vitals (HR, SBP and DBP) again measured at 1 min, 3 min, 5 min, and 10 min post-extubation respectively. Vitals were analyzed to determine cardiovascular changes associated with tracheal extubation. Values for HR, SBP and DBP noted at 1min, 3 min, 5 min, and 10 min after tracheal extubation and compared among the three groups. These values were also compared with baseline values within individual study groups. Data will be analyzed using Chi square test, student t- test, Standard deviation (SD) and

ANOVA. Statistical analysis will be performed with SPSS version 15.0 for Windows statistical software package.

RESULTS

There was no significant difference with respect to age, sex, ASA physical status and MPG Grade. **[Table1]**

Table 1: Demographic Data In Groups I, II And III (Mean ± SD)

Variable	Group I (n=30)	Group II (n=30)	Group III (n=30)	P
Age (in years)	38.2± 8.48	34.57± 8.87	34.33± 7.26	NS (p=0.412)
Sex(M/F)	13/17	12/18	14/16	NS (p=0.192)
Weight (kg)	55.5± 10.5	56.0± 13.8	56.7±12.9	P=0.56
ASA grade (I/II)	18/12	22/8	19/11	P=0.55

Data – mean ± standard deviation or number of patients SD – Standard deviation; ASA – American Society of Anesthesiologists; NS – Not significant

Table 2 showed that the attenuation of HR was more significant in group III who received inj. Verapamil 0.1mg/kg compared to group I and II. The result is statistically significant on both intra group as well as inter group in statistical analysis.

Table 3 showed that the attenuation of SBP was more significant in group III which received Inj. Verapamil 0.1mg/kg in comparison to group I and II. The result is statistically significant on both intra group as well as inter group in statistical analysis.

Table 2: Comparison Of Heart Rate (Mean ± SD)

Heart Rate (bpm)	Group I	Group II	Group III	P Value
Pre-op	88.57 ± 13.88	85.23 ± 44.22	86.13 ±2.32	0.326
Baseline (at time of drug administration)	98.80 ±10.71	95.57 ±10.31	93.14 ±8.91	0.416
At time of Extubation	117.80 ± 12.98	115.26 ± 16.95	114.57 ± 14.96	0.620
1 min	115.96 ± 15.89	107.57 ± 14.12	88.91 ± 9.58	<0.001
3 min	108.96 ± 12.25	90.67 ± 12.91	84.36 ± 8.49	<0.001
5 min	95.91 ± 9.83	84.27 ± 12.76	78.47 ± 9.61	<0.001
10 min	92.53 ± 8.73	76.67 ± 11.61	72.21 ± 8.97	<0.001

P < 0.001-Highly Significant; P < 0.05- Significant; p >0.05 not significant

Table 3: Comparison Of Systolic Blood Pressure (Mean ± SD)

SBP (mmHg)	Group I	Group II	Group III	P Value
Pre-op	124.84 ± 3.05	127.40 ± 7.39	128.67 ± 6.52	0.437
Baseline (at time of drug administration)	126.26 ± 5.18	125.57 ± 6.77	125.70±8.30	0.621
At time of Extubation	140.53 ± 7.27	142.97 ± 7.35	144.23 ± 9.28	0.320
1 min	132.23 ± 9.46	126.87 ± 7.86	120.87 ± 5.16	<0.001
3 min	122.27 ± 7012	117.73 ± 8.14	111.77 ± 6.06	<0.001
5 min	120.77 ± 8.78	109.40 ± 6.54	104.07 ± 5.01	<0.001
10 min	116.67 ± 7043	101.80 ±7.24	96.33 ± 6.18	<0.001

P < 0.001-Highly Significant; P < 0.05- Significant; p >0.05 not significant

Table 4 showed that the attenuation of DBP was more significant in group III who received Inj. Verapamil 0.1mg/kg in compared to group I and II. The result is statistically significant on both intra group as well as inter group in statistical analysis.

Table 4: Comparison Of Diastolic Blood Pressure (Mean ± SD)

DBP (mmHg)	Group I	Group II	Group III	P Value
Pre-op	83.37 ± 9.94	85.33 ± 8.24	87.33 ± 6.90	0.197
Baseline (At time of drug administration)	85.17 ± 8.90	86.33 ± 6.49	85.17 ± 5.09	0.596
At time of Extubation	93.16 ± 7.63	92.56 ± 7.83	94.25 ± 5.62	0.670
1 min	92.97 ± 7.42	88.45 ± 7.51	82.73 ± 4.30	<0.001
3 min	90.73 ± 5.05	84.93 ± 4.93	79.43 ± 3.91	<0.001
5 min	84.47 ±6.87	78.63 ± 5.77	72.03 ± 5.16	<0.001
10 min	82.66 ± 8.67	73.07 ± 6.58	65.31 ± 5.77	<0.001

P < 0.001-Highly Significant; P < 0.05- Significant; p>0.05 – not significant

Table 5 showed that incidence of cough is significantly more associated with Group I followed by Group II and nil in Group III with p<0.001.

Table 5: Comparison Of Cough In Three Groups

Cough	Group I	Group I I	Group III
No	8(26.7%)	17(56.7%)	30(100.0%)
Moderate	13(43.3%)	9(30.0%)	0
Severe	9(30.0%)	4(13.3%)	0
Total	30(100%)	30(100%)	30(100%)

DISCUSSION

An anesthesiologist quite frequently experiences problems during tracheal extubation and seems to be a benign procedure and significant increase in BP and HR which may persist till the recovery period due to high degree of sympathetic stimulation.[1-3] Several studies have advocated the use of calcium channel blockers to control tachycardia and hypertension occurring during extubation.[12]

Similarly, a study carried by **Mikawa et al** [11] to know the effect of intravenous injection of Verapamil either 0.05 mg/kg or 0.1 mg/kg on cardiovascular responses during tracheal extubation and emergence from anesthesia to compare the efficacy of the drugs with that of Diltiazem (0.2 mg/kg). This result matched with our result, in which Inj. Verapamil also attenuate cardio vascular responses statistically more significant.

A study carried by **Nishina et al** [12] to know the efficacy two different doses of Inj. Diltiazem 0.1 or 0.2mg/kg with Lidocaine 1mg/kg and control to attenuate the hemodynamic changes during tracheal extubation and emergence from anesthesia.

Verapamil has negative dromotropic and ionotropic effects, vasodilating properties, ability to increase the P-R interval and produce AV block. In fact, reflex activation of the sympathetic nervous system may be necessary during Verapamil therapy to maintain normal conduction.[13] However, in our study, none of the patients receiving Verapamil developed profound

hypotension [SBP <80 mmHg], bradycardia [HR < 50 beats/min], sinoatrial or atrioventricular block requiring sympathomimetic drugs.

CONCLUSION

In the study both group II and group III showed attenuation of HR, Mean SBP, Mean DBP, Mean MAP when compared to group I (control) at various post-extubation intervals and however, the attenuation of hemodynamic responses to extubation was statistically more significant with group III. So, to conclude, among the two doses of Verapamil used in the present study superiority of Verapamil 0.1mg/kg over 0.05 mg/kg in attenuation of hemodynamic response to tracheal extubation is evident and statistically highly significant.

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