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Hemodynamic Effects of Vecuronium at Time of Induction

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Abstract

Objective: The aim of the study to evaluate the influence of vecuronium on heart rate, systolic & diastolic arterial blood pressure (hemodynamic stress response) during nitrous oxide – halothane anesthesia.A double-blind study was done in Aljamhori teaching hospital, Mosul city, Iraq from (February 2011 – May2013); All the patients were in the age of 16-47 years, and ASA1. In this study 60 patients males & females prepared for elective surgery; Vecuronium was administered to 30 patients named (Group A) & normal saline was administered to another 30 patients (Group B); Heart rate & arterial blood pressure were monitored immediately before induction, at time of induction & (0, 3, 4, 5) minutes after induction of anesthesia. There were no significant differences in sex, weight & age of patients also there was no significant differences statistically between the two groups (P > 0.05) in heart rate & arterial blood pressure in pre induction, after induction & maintenance of anesthesia. In conclusion; Vecuronium had no effect on hemodynamic stress response during general anesthesia.

Keywords: Vecuronium; hemodynamic stress response.

1. Introduction

Disturbances of heart rate & rhythm are common during anesthesia. They occur more frequently during induction & intubation, & less frequently during stable anesthesia. Most are caused by pharmacological or physiological changes in autonomic tone & are potentially avoided by using certain agents [1].

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Laryngoscopy and intubation incur hemodynamic changes like increase in heart rate, arterial blood pressure, pulmonary artery pressure, wedge capillary pressure and arrhythmias [2] Thus, anesthesiologists have always been seeking ways to avoid these complications. Numerous pharmacological methods have been suggested to diminish these side effects including use of adrenergic receptor blockers, calcium channel blockers, opioids, and vasodilators [2], in addition to that these effects can decreases by using certain muscle relaxant & one of these is Vecuronium.Vecuronium is a muscle relaxant agent belonged to non-depolarizing group, of these groups there are three major subdivisions which includes: long acting, intermediate acting & short acting. The intermediate-acting muscle relaxants include atracurium, *cis*-atracurium, vecuronium and rocuronium. The aim of this study is to evaluate & monitor the hemodynamic effect of Vecuronium at intubation time.

Vecuronium bromide

Vecuronium bromide is non-depolarizing muscle blocking agent, it`s the 16-monoquaternary derivative of pancuronium which produced by demethylation of pancuronium [3].

The (3- acetyl group) is also stereo-isometricaly altered in position resulting in a virtual absence of vagolytic & other cardiovascular effects [4].

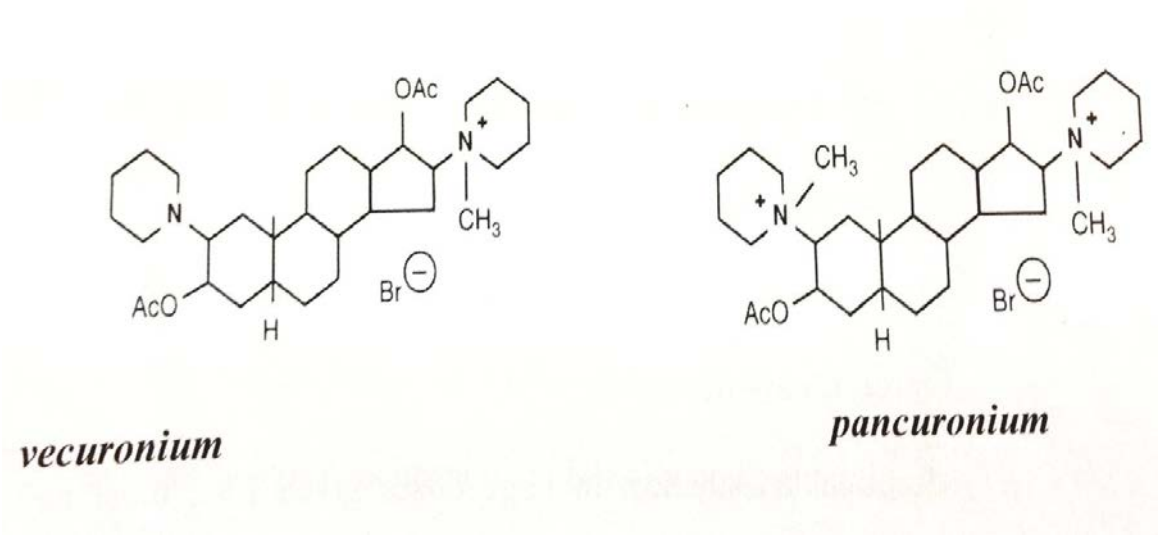

Figure 1: vecuronium vs pancuronium structure.

The demethylation decreases Ach- like activity, reducing the cardiovascular effects & increasing lipophilicity which increased plasma clearance by the liver compared with pancuronium [3]. The ED90 (dose required to produce 90% suppression of muscle twitch response under balanced anesthesia).is (0.04-0.05 mg/kg). A dose of 0.1-0.15mg/kg) provide acceptable intubating condition with (90-120 seconds) & surgical relaxation for (24-40 minutes) [3]. The initial Vecuronium dose of (0.08-0.1 mg/kg) generally produces first depression of twitch in approximately one minute [4].

Table 1: Clinical dosage of vecuronium.

Administration	Dosage mg/kg	Clinical duration
Intubation	0.1 – 0.2	40-90 min.
Relaxation (N2O/O2)	0.05	25 – 40 min.
Relaxation (Vapour)	0.03 – 0.04	25 – 40 min.
Maintenance	0.01 – 0.02	15- 30 min.
Infusion	0.8 – 2 microgm/kg/min.	

2. Patients & methods

Sixty adults (ASA-1) patients (male:39) & (females:21), undergone elective surgery were admitted to this open study. All patients received diazepam 5 mg I.V. as premedication (15 min. before induction) & they are pre oxygenated with 100% oxygen for 3-5 min., induction done by thiopentone (4-6mg/kg) & anesthesia was maintained by nitrous oxide (O2/N2O, 1:2) & halothane 1.5%. All patients were monitored by pulse oximeter, electrocardiograph lead II & noninvasive blood pressure. The patients allocated randomly & divided into two groups (group A) in which vecuronium given immediately after induction in dose (0.1mg/kg) & (group B) in which normal saline was given at same time of Vecuronium. The ventilation of the lungs was maintained by face mask & the trachea was not intubated until study was completed in order to avoid effect of intubation on the cardiovascular system. (Table 2). Heart rate (HR), systolic (SABP)& diastolic (DABP) arterial blood pressure were measured immediately before induction, at time of induction,0,3rd,4th,5th minutes, the parameter was measured by using automatic noninvasive monitors. Vecuronium was given immediately following post induction measurement of heart rate & arterial blood pressure.

Table 2

Groups	A	B
Premedication: Diazepam: 5mg I.V.	+	+
Induction Thiopentone 4-6mg/kg	+	+
Maintenance: O2/N2O Halothane 1.5%	+	+
Vecuronium 0.1mg/kg	+	_
Normal saline	_	+

3. Results

Group – A have a range age (16-47 y.) with a mean age (31.43) & Group-B have a range age (16-42y) with a mean age (28.73). There was no significant difference in the sex, weight or age distribution. In all patients, heart rate increased above the pre induction value immediately following induction of general anesthesia (table 3), were as systolic & diastolic arterial blood pressure decreased following induction of anesthesia in both groups. (table 4&5). Both parameters in both groups starts to decline with repeated measurement as the anesthesia progress.

Table 3: mean heart rate (beat/min.) (Mean)

Group	Pre induction	0	3	4	5
A	94.8	101.06	97.9	94.6	90.4
B	93.97	101.23	98.50	95.80	92.9

Table 4: systolic arterial blood pressure (mmHg) (mean)

Group	Pre induction	0	3	4	5
A	132.4	128.7	126.8	124.0	120.5
B	128.07	125.5	123.3	120.8	118.3

Table 5: Diastolic arterial blood pressure (mmHg)(Mean)

Group	Pre induction	0	3	4	5
A	92.54	81.70	74.97	68.72	63.72
B	87.15	76.00	69.15	62.84	57.43

After administration of Vecuronium, the magnitude of the decrease in heart rate, systolic & diastolic arterial blood pressure was of the same order as that occurring in patients not receiving Vecuronium.

Table 6: Heart rate (beat/min.) (Mean) $P > 0.05$

HR	Vecuronium	Saline	P –value
Pre induction	94.83	93.97	0.809
0	101.07	101.23	0.964
3	97.90	98.50	0.871
4	94.83	95.80	0.784
5	90.33	92.90	0.454

Table 7: systolic arterial pressure (mmHg) (Mean) P > 0.05

SABP	Vecuronium	Saline	P –value
Pre induction	132.43	128.07	0.108
0	128.90	125.50	0.208
3	126.67	123.40	0.218
4	124.00	120.80	0.226
5	120.57	118.30	0.393

Table 8: diastolic arterial pressure (mmHg) (Mean) P > 0.05

DABP	Vecuronium	Saline	P –value
Pre induction	92.54	89.77	0.244
0	86.22	82.68	0.0598
3	73.61	77.79	0.206
4	68.72	65.43	0.315
5	63.72	61.61	0.322

4. Discussion

Many neuromuscular blocking agents exert cardiovascular side effects but these are thought to be infrequent following Vecuronium bromide administration [5]. This study shows no significant difference in the reduction of heart rate, systolic & diastolic arterial blood pressure which occurs following administration of Vecuronium or normal saline. Many studies & researches are done for Vecuronium alone or in comparison with other neuromuscular blocking agents. Morris and his colleagues (1983) [6] and Roervik and his colleagues (1988) [7] showed that Vecuronium has a large margin of safety between the neuromuscular and vagal blocking effects and shows cardiovascular stability even when used in higher doses. M. Somani & his colleagues observed insignificant fall in heart rate following induction with use of vecuronium. The value was 83.4 as compared to the basal value of 84.2 beats/min. (8) N. Girish Babu and his colleagues (9), Shashi Chaturvedi and his colleagues (9) show that both vecuronium and rocuronium were associated with clinically unimportant hemodynamic changes. (9). M.Naguib & his colleagues show in his study that the rocuronium & Vecuronium had no Significant changes in either plasma histamine concentration or hemodynamic variable (10).

5. Conclusion

This study demonstrated that Vecuronium did not influence heart rate or systolic or diastolic arterial blood pressure during nitrous oxide-halothane anesthesia. As heart rate play important role in myocardial oxygen supply & in oxygen demands, so Vecuronium will reduce the possibilities of oxygen supply- demand imbalance in highly risky patients. The same results of Vecuronium on arterial blood pressure can reduce the hazard of increase blood pressure during anesthesia.

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