Title: Hemodynamic Effects of Bolus Injection of Vecuronium in Cardiac Surgical Patients

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Introduction

Vecuronium bromide is a new intermediate acting non-depolarizing muscle relaxant. It is a monoquaternary analogue of pancuronium and 1.0 - 1.5 times as potent. The duration of action is 30-45 minutes. In laboratory animals, vecuronium has been found to be devoid of significant cardiovascular effects.[1,2] Minimal cardiovascular effects have been noted in man, utilizing a dose above the clinical range.[3] This study was undertaken to determine the cardiovascular effects of clinically useful doses of vecuronium in cardiac surgical patients.

Methods

Twelve patients scheduled for elective coronary artery bypass surgery were studied after obtaining institutionally approved informed consent. All patients received lorazepam (1-2mg PO), morphine (0.1mg/kg IM) and scopolamine (0.3-0.4mg IM) two hours prior to the induction of anesthesia. Patients were monitored utilizing a two-lead electrocardiogram, and a central venous, pulmonary artery and radial artery catheter connected to an eight channel direct writing recorder. During catheter placement additional lorazepam (1-2mg IV) was administered. Anesthesia was induced with fentanyl (100ug IV) and lorazepam (1-2mg IV). Two minutes following induction, control hemodynamic measurements were obtained and vecuronium was administered as a bolus in two doses: Group I (6 patients) - 0.1mg/kg; Group II (6 patients) - 0.2 mg/kg. Hemodynamic measurements were then repeated at 2, 5 and 10 minutes after the drug. These included heart rate (HR), systemic blood pressure (SBP), pulmonary artery pressure (PAP), central venous pressure (CVP), pulmonary capillary wedge pressure (PCWP), and cardiac output (CO). Systemic vascular resistant (SVR), pulmonary vascular resistance (PVR) and stroke volume (SV) were calculated from the above data. Analysis of the data was performed using Student's t test for unpaired and paired data.

Table 1 (Group I - 0.1 mg/kg)

	Control	2 min	5 min	10 min
HR (beats/min)	49.3±2.6+	50.5±2.2	49.2±1.8	48.3±2.1
SBP (mean/mmHg)	74.2±5.4	75.8±6.0	75.0±5.3	71.7±5.1
SVR (dynes-sec cm^{-5})	1321±86	1448±109	1354±112	1419±186
CO (liters/min)	3.91±0.23	3.76±0.19	3.98±0.2	3.68±0.16
PCWP (mmHg)	11.2±2.1	11.2±1.63	12.7±2.0	12.0±2.2

+ = means±SE, n = 6

Results

Results for Group I and Group II are shown in Tables 1 and 2 respectively. Neither group exhibited significant changes in HR, SBP, SVR, PAP, PVR, CO, PCWP or rhythm following administration of vecuronium. In addition, no significant differences were noted between the two groups of patients.

Table 2 (Group II - 0.2mg/kg)

	Control	2 min	5 min	10 min
HR (Beats/min)	53.2±3.2+	52.3±2.8	52.8±2.1	52.0±2.7
SBP (mean/mmHg)	80.0±3.7	74.2±4.7	77.5±4.6	77.5±4.2
SVR (dynes-sec cm^{-5})	1469±96	1364±68	1421±67	1448±81
CO (liters/min)	3.96±0.24	4.04±0.17	4.04±0.17	4.0±0.13
PCWP (mmHg)	11.2±1.4	10.2±0.8	11.2±1.0	11.8±1.2

+ = means±SE, n=6

Discussion

The undesirable cardiovascular effects of non-depolarizing muscle relaxants may be secondary to histamine release, ganglionic blockade, cardiac anti-muscarinic effects and/or sympathetic nervous system stimulation. Currently available non-depolarizing muscule relaxants are know to produce many of these undesirable effects.[2,4] In contrast, we found that vecuronium produced insignificant cardiovascular effects when used at doses of 1.7 times (0.1mg/kg) and 3.5 times (0.2mg/kg) the ED95 for neuromuscular blockade. In previous investigations, vecuronium has been shown not to alter serum histamine levels when used within the clinical dose range.[5] From these findings, we conclude that the use of vecuronium offers a distinct advantage over the use of other currently available muscle relaxants. This is particularly true when cardiovascular stability is critical in the anesthetic management of the patient with whom we are given charge.

References

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