

Comparison Of Haemodynamic Stability With Intubating Dose Of Iv Rocuronium Bromide Vs Intubating Dose Of Iv Vecuronium Bromide In Cardiac Surgery Patients

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Citation

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Abstract

Background: This study was conducted to evaluate the quality of haemodynamic stability achieved with the intubating dose (ED₉₅ x2) of IV Rocuronium bromide in comparison to that with intubating dose of IV Vecuronium bromide (ED₉₅ x 2) in patients undergoing cardiac surgery.

Methods: The study was done in 60 patients, 30 in each group, age group of 18 to 60 years, ASA grade III or IV, MPC I OR II, undergoing elective cardiac surgery. 30 patients received Rocuronium bromide (0.6mg/kg) and other 30 received Vecuronium bromide (0.1mg/kg) randomly for intubation. Intubating conditions were assessed using Goldberg criteria. Haemodynamic parameters -HR, BP (systolic, diastolic, MAP), CVP recorded at different time intervals by a blinded observer. Intra and intergroup statistical analysis done.

Results: Intubating doses of either Rocuronium or Vecuronium are not associated with any haemodynamic adverse effects. Also there were no statistically significant ($p < 0.05$) differences between both these groups, in any of the variables at any time.

Conclusions: When compared with Vecuronium bromide, Rocuronium is found to be equally good for maintaining hemodynamic stability in cardiac surgery patients.

INTRODUCTION

Hemodynamic stability is vital for successful anaesthetic management of patients undergoing various cardiac surgeries and who come under ASA grade III and ASA grade IV category. These patients have a very limited cardiovascular reserve. Any increase in myocardial oxygen demand from increased heart rate or contractility or decreased perfusion from hypotension may result in ischemia and worsen their cardiac status. Thus in these patients the choice of anaesthetic adjuvant such as neuromuscular blocking agent must be based on ability to maintain optimal hemodynamics.

Intravenous Vecuronium bromide, an intermediate acting non-depolarising muscle relaxant is widely used because of its desirable properties and is also considered as the "gold standard" among muscle relaxants for cardiovascular stability. It also has a large margin of safety between

neuromuscular and vagal blocking effects.^{1,2} Intravenous Vecuronium though being cardiostable has a slow onset and causes bradycardia when used with narcotics.^{3, 4}

Intravenous Rocuronium bromide is a relatively new steroidal intermediate acting non-depolarising neuromuscular blocking agent with a faster onset of action.⁵ It has proved to have minimal cardiovascular side effects in animal studies.⁶ Some human studies have shown that Rocuronium has minimal effects on heart rate and arterial pressures with the dose of 2-3 x ED₉₅.⁵ Also it is argued that mild ionotropic and chronotropic effect of Rocuronium is an advantage with the use of relatively higher doses of opioids.

Thus in the need of looking for a neuromuscular agent for achieving good hemodynamic stability, we undertook this study to evaluate whether Rocuronium bromide (intubating dose-0.6 mg/kg body wt) has such properties to make it an

ideal drug in cardiac anaesthesia and we compared its efficacy in maintaining hemodynamic stability with that of routinely used IV Vecuronium (intubating dose - 0.1 mg/kg body wt) in our group of patients.

MATERIALS AND METHODS

The study was performed as a randomized, prospective, double blind, clinical trial in 60 adult patients after getting approval from the hospital ethics committee. Inclusion criteria - Adult male or female patients between the age group of 18yrs to 60yrs posted for elective cardiac surgery such as intracardiac repair like valve replacement and ASD/VSD repair, ASA grade III or ASA grade IV, patients with mallampatti class I or II, those who gave written informed consent. Exclusion criteria - Those with history of difficult intubation or anticipated difficult intubation i.e mallampatti class III or IV, patients known to have or suspected to have renal, hepatic, metabolic, neuromuscular disorders, those with congestive cardiac failure, severe stenotic or regurgitant valve lesions and patients with known or suspected allergy to narcotics, neuromuscular blocking agent under study or to other medications used during general anaesthesia.

A detailed pre-anaesthetic evaluation including history of previous medical illness, previous surgeries, general examination and appropriate baseline investigations was carried out and recorded in the proforma. An informed written consent was obtained. All preoperative medications were continued until the morning of the surgery. All patients were premedicated only with IM inj. of glycopyrrolate 4microg/kg body wt, half an hour prior to surgery.

On the operation table, patients were re-examined. Intravenous access was obtained with 18 G venous cannula and a slow ringer lactate drip was started. On the other hand a radial arterial line was inserted with a 20G jelco cannula under local anaesthesia for continuous invasive blood pressure monitoring (IBP). Also, central venous catheterization using multilumen CVP line was done through the right internal jugular vein under local anaesthesia. Baseline values of heart rate, blood pressure (systolic/diastolic, mean arterial pressure) and central venous pressure were recorded by an observer who did not know which group the patient is assigned to. After baseline recordings, the patients received sedation with IV midazolam 0.03 mg/kg body wt and analgesia with IV Buprenorphine 3µg/kg body wt.

10 minutes after sedation and analgesia induction of general anaesthesia was started. All patients were pre-oxygenated with 100% oxygen by face mask for 3 minutes. Induction was done with propofol IV (1mg/kg body weight) and patients ventilated with O₂:N₂O: Sevo 50:50:1% respectively. Vital parameters were recorded at this stage and only those patients without haemodynamic compromise were involved further in the study. Thus patients (30 patients in each group) randomly received either intubating dose of Rocuronium (0.6mg/kg body wt) or intubating dose Vecuronium (0.1mg/kg body wt) intravenously.

Patients who received IV Rocuronium bromide were mask ventilated with 50% nitrous oxide and 50% oxygen and 1% Sevoflurane for 90 seconds and those who received IV Vecuronium bromide were mask ventilated with 50% nitrous oxide and 50% oxygen and Sevoflurane 1% for 4 minutes.

In patients who received the intubating dose of Rocuronium bromide, laryngoscopy was done at the end of 90 seconds and those who received Vecuronium bromide laryngoscopy was done at the end of 4 minutes as onset of action of Rocuronium is 1 to 2 minutes and that of Vecuronium is 3 to 5 minutes. All laryngoscopies and intubations were done by the same anaesthetist to avoid subjective errors. Intubating conditions in both the groups were evaluated and scored according to the four step scale proposed by Goldberg and his colleagues. As per Goldberg and colleagues intubating conditions are described as:

- Excellent: Easy passage of endotracheal tube without coughing, vocal cords relaxed.
- Good: Passage of tube with slight cough vocal cords relaxed.
- Poor: Passage of tube with moderate coughing or bucking, some vocal cord movements.
- Impossible: Vocal cords adducted or not visualised, jaw not relaxed.

Haemodynamic parameters like heart rate, systolic and diastolic blood pressure, mean arterial pressure and central venous pressure were recorded by the same blinded observer, at baseline, 10 minutes after sedation/ analgesia, at induction, laryngoscopy, intubation, then every 30 seconds for first 5 minutes, every 1 minute till 10 minutes and every 10

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minutes for total 30 minutes from the time of intubation. Any side effect if observed during intubation was noted. As study included only the intubating doses of the drugs, all recordings were done for 30 minutes from intubation. Anaesthesia was maintained with nitrous oxide (50%), oxygen (50%) and 0.5% isoflurane as an inhalational agent, with IPPV (intermittent positive pressure ventilation) in both groups. In this study patients did not receive any surgical stimulus or medication for 30 minutes after the intubation.

All the readings were subjected to statistical analysis. Pearson Chi-Square test was applied to the results of sex, types of cardiac surgeries and intubating conditions observed. To find out difference between the two groups students unpaired 't' test was used and paired 't' test was used to see the change within a group.

OBSERVATIONS AND RESULTS

Patients in both the groups were comparable with respect to demographic characters of age, weight and gender. The groups were also comparable with respect to the nature of cardiac surgeries and haemodynamic parameters of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and central venous pressure (CVP) at baseline. Intubating conditions were good to excellent in both Rocuronium and Vecuronium groups.

Figure 1

Table 1: Mean values of age and weight are given. Values in brackets are SD. All p values were >0.05

	Group	
	Rocuronium	Vecuronium
Age	32.93(11.14)	33.87(9.94)
Wt. (kg)	49.90(8.75)	51.43(7.30)
Sex (male/female)	16 / 14	21 / 9
Intubating Condition		
Excellent	27	29
Good	3	1

Figure 2

Table 2: Number of patients is in bracket. All p values were >0.05

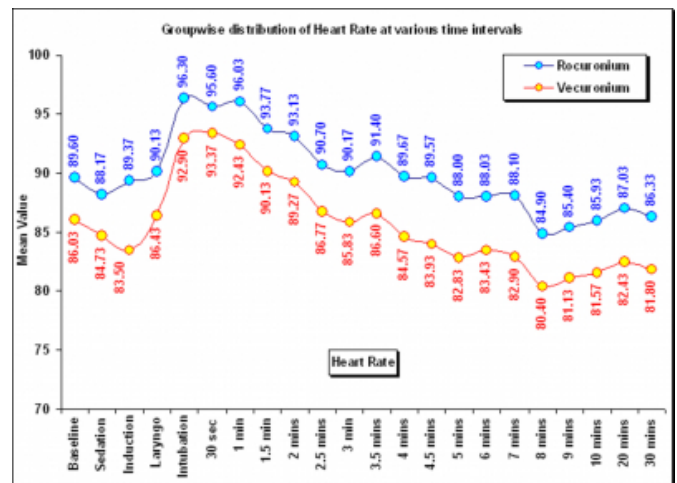
Cardiac Surgery	Group	
	Rocuronium	Vecuronium
ASD-ICR	3.30%(1)	0%(0)
AVR	16.70%(5)	20%(6)
DVR	12.30%(4)	16.70%(5)
MVR	60%(18)	56.70%(17)
OSASD-IC	3.30%(1)	3.30%(1)
VSD-ICR	3.30%(1)	3.30%(1)
Total	100%(30)	100%(30)

Figure 3

Table 3: Mean values of baseline haemodynamic parameters are given. Values in brackets are SD. All p values were >0.05

Baseline	GROUP	
	Rocuronium	Vecuronium
Heart Rate	89.60(20.98)	86.03(17.96)
Systolic BP	122.60(15.71)	123.90(14.05)
Diastolic BP	70.53(12.34)	70.30(13.20)
MAP	87.68(10.40)	88.10(8.78)
CVP	7.06(0.82)	7.09(0.72)

Figure 4



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Figure 5

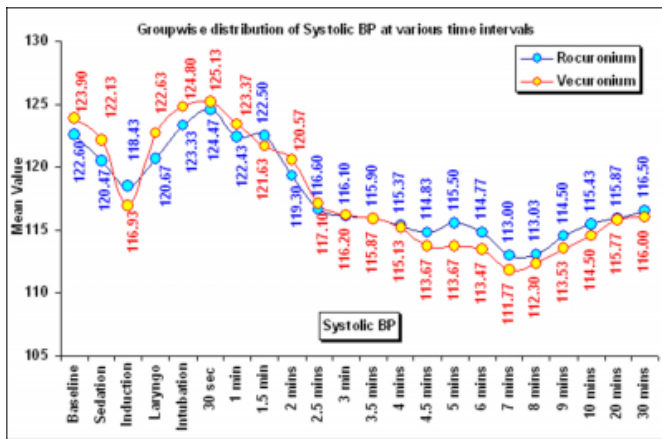


Figure 8

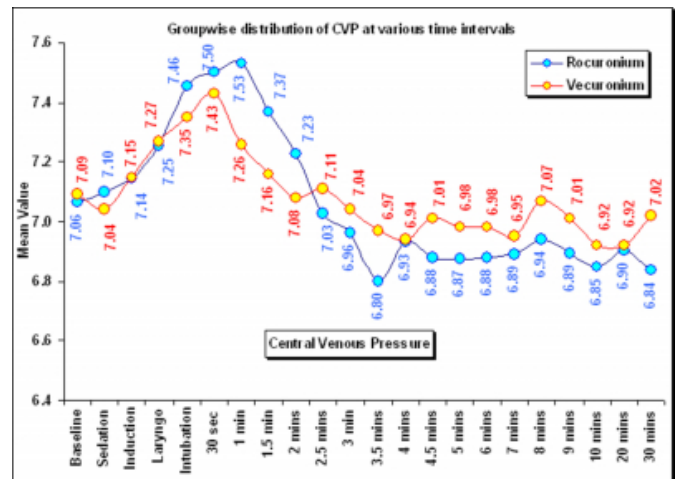
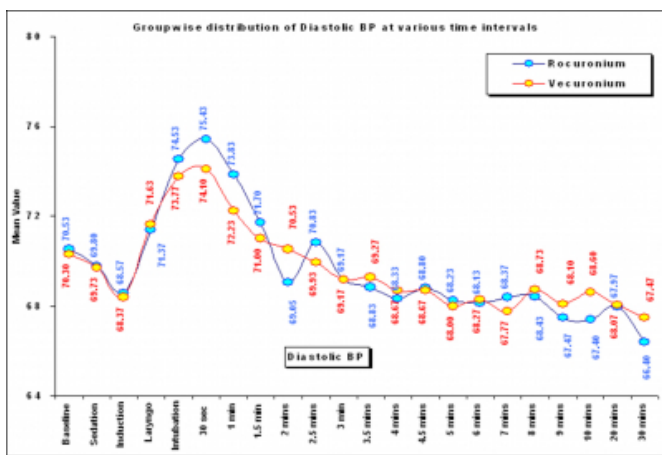


Figure 6

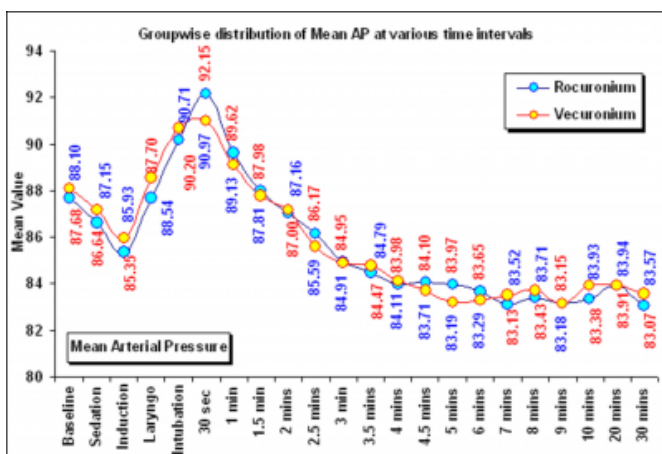


The baseline haemodynamic parameters of Systolic, diastolic, Mean Arterial Pressure (MAP), Central Venous Pressure (CVP) were compared between the two groups. There was no significant statistical difference ($p > 0.05$) in any of the above parameters between the two groups and hence the groups were comparable for study.

DISCUSSION

This study thus evaluated the effect on haemodynamic stability with intubating dose of IV Rocuronium bromide Vs intubating dose of IV Vecuronium bromide in cardiac surgery patients

Figure 7



At 10 minutes after sedation/analgesia a fall in the mean heart rate and blood pressure recordings (systolic, diastolic and mean arterial pressure) was noted in each group. This fall in the above parameters was not statistically significant between the two groups and is attributed to the effect of the sedation and analgesic agent used.

Following induction no statistically significant difference was noted in the above mentioned parameters between the two groups, so both groups were comparable at induction point which was taken as a reference level for comparing subsequent values. Patients then received intubating doses of IV Rocuronium bromide and IV Vecuronium bromide as neuro-muscular blocking agents randomly. Intubations were done in both the groups and all haemodynamic parameters recorded for 30 minutes from the time of intubation.

From the graphs it is seen that there was a rise in the mean heart rate, systolic, diastolic and MAP in both the groups following laryngoscopy and intubation. This rise observed in both groups can be attributed to pressor reflexes of

intubation stimulus. These changes though statistically significant from induction value, they were transient and without any haemodynamic instability or deterioration of patients' cardiovascular status and did not require any active intervention. These changes were clinically acceptable.

Intergroup analysis for all parameters was done and this did not show any statistically significant difference between the two groups at any time during the study.

Our findings are similar to those of P. Nitschmann et al (1994)⁷, who evaluated the comparison of hemodynamics effects of Rocuronium bromide with those of vecuronium in patients undergoing CABG surgery. He concluded that neither heart rate, mean arterial pressure nor cardiac output were altered to a clinically relevant degree following 3X ED90 of Rocuronium or Vecuronium. J. P Cornet et al (1994)⁸ evaluated the effects of Rocuronium bromide on hemodynamics and left ventricular function in patients undergoing abdominal aortic surgery. He observed that hemodynamics and LV function were not affected by Rocuronium; no significant changes in B. P., heart rate and cardiac output were noted in response to Rocuronium administration.

In contrast to our study E.N. Robertson et al (1994)⁹, when compared cardiovascular effects with 3X ED95 of Rocuronium and Vecuronium, he found that there were statistically significant increases from baseline in one or more (heart rate, BP) hemodynamic parameters in the Rocuronium group when compared to Vecuronium group. He attributed this cardiovascular changes to the vagolytic action of Rocuronium bromide, and although statistically significant they were not likely to be clinically important.

In conclusion, Rocuronium is devoid of any significant cardiovascular changes causing haemodynamic instability when compared with Vecuronium. Both the drugs are found to be equally good for maintaining hemodynamic stability in these high risk patients undergoing cardiac surgeries.

Rocuronium bromide can therefore be advocated as the drug of choice in elective as well as in emergency cardiac surgery where rapid intubation will be beneficial without compromise of haemodynamic stability.

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