

ORIGINAL ARTICLE

## A Study on Hemodynamic Parameters Stability by Rocuronium Bromide during Anaesthesia for Elective Surgical Procedures in a Tertiary Care Hospital

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### ABSTRACT

**BACKGROUND AND OBJECTIVES:** Hemodynamic stability is an important aspect of anaesthesia care. Anaesthesia has tendency to produce significant hemodynamic changes especially during induction and intubation. Intravenous Rocuronium bromide is a relatively new steroidal intermediate acting non-depolarising neuromuscular blocking agent with a faster onset of action. **METHODS:** Fifty patients in the age group of 15-60 years of either sex who belongs to ASA physical status I or II were included in the study. Patients posted for general surgeries and ENT surgeries of intermediate duration were studied. Induction of anaesthesia was done with inj. thiopentone sodium 5-7 mg/kg iv and neuromuscular blockade was achieved immediately with inj. rocuronium bromide 0.6 mg/kg iv. Hemodynamic parameters were noted at the time of laryngoscopy and intubation. **RESULTS:** The Mean  $\pm$  SD for age is  $26.72 \pm 9.59$  years and for weight it is  $52.72 \pm 10.18$  kilograms. In our study 54% of the patients were males and 46% of the patients were females. Mean  $\pm$  SD for duration of surgery is  $74.4 \pm 23.91$  minutes. It was found that all the hemodynamic parameters were reduced from baseline till laryngoscopy than there was mild rise during intubation and after that it was again reduced. It was reducing till 45-60 minutes post intubation. **CONCLUSION:** It was concluded that there was no statistically significant increase in pulse rate, systolic and diastolic arterial blood pressure following intravenous rocuronium bromide administration. Rocuronium bromide can therefore be advocated as the drug of choice in elective as well as in emergency ENT and general surgery where rapid intubation will be beneficial without compromise of hemodynamic stability.

**Keywords:** Rocuronium bromide, elective surgery, hemodynamic stability

### INTRODUCTION

Hemodynamic stability is an important aspect of anaesthesia care. Anaesthesia has tendency to produce significant hemodynamic changes especially during induction and intubation. Also many of the factors like reflex vagal activity during surgeries like strabismus surgery, laparotomy<sup>1, 2</sup> and concurrent use of various anaesthetic agents can significantly alter hemodynamics during the course of anaesthesia. So, hemodynamic effects of the drug remain important criteria while selecting neuromuscular blocking agent during anaesthesia especially in selected cases where maintaining hemodynamic

parameters within specified range is critical. Intravenous Rocuronium bromide is a relatively new steroidal intermediate acting non-depolarising neuromuscular blocking agent with a faster onset of action.<sup>3</sup> It has proved to have minimal cardiovascular side effects in animal studies.<sup>4</sup> Some human studies have shown that Rocuronium has minimal effects on heart rate and arterial pressures with the dose of 2-3 x ED95.<sup>3</sup> Also it is argued that mild inotropic 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 and maintenance dose of 0.15 mg/kg body wt IV) in maintaining hemodynamic stability.

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**MATERIALS AND METHODS**

After getting an approval from ethical committee present study was conducted. Fifty patients in the age group of 15-60 years of either sex who belongs to ASA physical status I or II were included in the study. Patients posted for general surgeries and ENT surgeries of intermediate duration were studied. Children, pregnant females and patients with anticipated difficult airway, neuromuscular disease, and increased risk of pulmonary aspiration were excluded from the study.

Preanaesthetic examination in the form of thorough history taking, general examination, systemic examination and airway examination was done on the day before the surgery. Patients were investigated for hemoglobin, WBC count, platelet count, RBS, blood urea, serum creatinine, serum Na<sup>+</sup>, serum K<sup>+</sup>, serum bilirubin, ECG and CXR. All the patients were kept nil per oral for 8 hours before the surgery. On the day of surgery written and informed consent was taken and patients were explained about the procedure.

In the operating room iv lines were secured with 18 gauge iv cannula in the upper limbs of the patients. Monitors were applied in the form of ECG, NIBP, SPO<sub>2</sub>, EtCO<sub>2</sub> baseline parameters were noted. NMT monitor acceleromyograph was applied on the ulnar nerve with the help of two surface electrodes. Premedication was given in the form of inj. glycopyrrolate 0.04 mg kg<sup>-1</sup> iv, inj. fentanyl citrate 1-2 ug kg<sup>-1</sup> iv, inj. midazolam hydrochloride 0.02 mg kg<sup>-1</sup> iv and inj. ondansetron hydrochloride 10-15 ug kg<sup>-1</sup> iv. Ulnar nerve was stimulated by supramaximal stimulus 2Hz at every 2 seconds and baseline TOF count was noted.

Induction of anaesthesia was done with inj. thiopentone sodium 5-7 mg/kg iv and neuromuscular blockade was achieved immediately with inj. rocuronium bromide 0.6 mg/kg iv. Hemodynamic parameters were noted at the time of laryngoscopy and intubation.

**RESULTS**

In our study 50 patients of 15 to 60 years of age, weighing 30 to 75 kg of either sex, belonged to ASA physical status I or II were included. Patients posted for ENT surgeries like septoplasty, FESS, DCR, tonsillectomy and general surgeries like laproscopic appendicectomy, diagnostic laproscopy were included in the study. These surgeries were of intermediate duration.

**Table 1: Distribution of study subjects according to their demographic characteristics.**

Variables	No. of patients / Ratio	Mean ± SD / %
Age (years)	50	26.72 ± 9.59
Weight (kg)	50	52.72 ± 10.18
Sex ( M/F )	27/23	54/46
ASA status ( I/II )	35/15	70/30
Duration of surgery ( minutes )	50	74.4 ± 23.91

Table 1 Shows the Distribution of study subjects according to their demographic characteristics in which the mean ± SD for age is 26.72 ± 9.59 years and for weight it is 52.72 ± 10.18 kilograms. In our study 54% of the patients were males and 46% of the patients were females. According to ASA physical status 70% of the patients belonged to grade I and 30% to grade II. Mean ± SD for duration of surgery is 74.4 ± 23.91 minutes.

**Table 2: Distribution of study subjects according to their types of surgery done.**

Types of surgery	No. of patients	% of patients
General surgery	31	62
Lap. Appendicectomy	29	58
Diagnostic Laproscopy	02	04
ENT surgery	19	38
Septoplasty	06	12
FESS	05	10
DCR	03	06
Tonsillectomy	05	10

Table no. 2 Distribution of study subjects according to their types of surgery done which shows the Patients who underwent either general surgery or ENT surgery were included. Out of which 62% of the patients were posted for general surgery and 38% for ENT surgery. Majority of patients were from laproscopic appendicectomy i.e. 29 (58%).

**Table 3: Distribution of subjects according to their Intraoperative changes in pulse rate and blood pressure observed. ( Mean ± SD)**

Time	Pulse rate (per minute)	SBP (mmHg)	DBP (mmHg)
Baseline	87.94±13.52	122.70±11.91	78.28±8.17
Premedication	93.16±13.68	124.24±12.45	77.72±9.75
Induction	100.58±15.47	126.16±13.82	78.68±10.43
Laryngoscopy	107.06±15.40	132.58±13.84	83.18±10.60
Intubation	111.52±15.32	136.06±12.27	85.48±10.98
1 minute	109.22±16.80	130.74±12.28	83.70±9.29
3 minute	103.74±18.10	127.94±20.11	80.32±11.18
5 minute	99.82±17.18	121.80±11.93	77.02±8.63
10 minute	97.32±15.94	120.50±12.01	77.54±12.29
15 minute	95.02±13.67	120.79±12.51	76.44±11.48
30 minute	93.71±12.84	120.57±14.54	76.85±10.04
45 minute	96.00±12.99	121.46±13.88	78.85±11.35
60 minute	93.19±12.17	119.92±11.71	76.43±9.26
75 minute	93.90±10.02	120.51±8.39	78.03±6.88
90 minute	92.42±10.83	123.15±9.27	80.63±9.23
105 minute	93.63±06.31	124.45±9.58	81.72±9.46
120 minute	96.00±00.00	118.00±00.00	70.00±00.00

Table no 3 Distribution of subjects according to their Intraoperative changes in which it was observed that the distribution of pulse rate, systolic blood pressure and diastolic blood pressure. It was seen from the table that all the hemodynamic parameters were reduced from baseline till laryngoscopy than there was mild rise during intubation and after that it was again reduced. It was reducing till 45-60 minutes post intubation.

**DISCUSSION**

Neuromuscular blocking drugs can have effects on hemodynamic parameters which can be either due to autonomic effects or histamine release property of the drugs.<sup>5</sup> Intravenous Rocuronium bromide is a relatively new steroidal intermediate acting non-depolarising neuromuscular blocking agent with a faster onset of action and proved of having minimal

cardiovascular side effects in animal and human studies.<sup>3</sup> Haemodynamic stability is of utmost importance in any kind of surgery. It is important to maintain haemodynamic stability during anaesthetic induction, in patients undergoing surgery. The common practice includes, use of high dose opioids and nondepolarising muscle relaxants.<sup>6</sup> It is conceivable that Rocuronium (an analogue of Vecuronium) with mild vagolytic action leading to small increase in heart rate (HR), similar duration of action to Vecuronium but with the faster onset on action, a favourable recovery pattern and non-cumulative property may be beneficial in most cardiac lesions. Thus this study thus was carried out to evaluate the effect on haemodynamic stability with intubating dose and maintenance dose of i.v. rocuronium bromide in ENT surgeries like septoplasty, FESS, DCR, tonsillectomy and general surgeries like laproscopic appendicectomy, diagnostic laproscopy were included in the study. In the present study, it was seen that pulse rate, systolic blood pressure and diastolic blood pressure were reduced from baseline to induction level than mild increase during laryngoscopy and again reduced after intubation. In the study conducted by *Savargaonkar AP et al*<sup>5</sup> significantly more decrease in heart rate was observed after administration of loading dose of vecuronium compared to rocuronium especially at 2 and 3 minutes after administration of drug and this was observed prior to application of any stimulus like laryngoscopy or surgical incision which would affect hemodynamics. Hence the observed difference between these two drugs would be more indicative of effect of specific drug. But degree of fall was not significant from baseline in both the groups indicating that both drugs have shown good stability regarding heart rate but vecuronium having more tendencies to fall in heart rate. In the study conducted by *Priyanka Bhagade et al*<sup>6</sup> all the hemodynamic parameters were decreased during

sedation, induction, laryngoscopy and were increased after intubation with Rocuronium and vecuronium in both groups and later further decrease in the values are observed with increase in time. All the values between the two groups are non-significant when compared and our findings in the present study were in accordance with McCoy et al, Levy et al and Nitschmann et al which was found no significant alteration in haemodynamics after Rocuronium administration.<sup>7-9</sup>

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