

## A Study of Hemodynamic Response to Intubation with Suxamethonium and Org 9426 (Rocuronium)

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**Abstract:** There is hemodynamic stress responses to tracheal intubation and can cause adverse cardiovascular events in patients with or without cardiovascular disease. The aim of the present study was to compare the intubating conditions and changes in heart rate and blood pressure achieved after using suxamethonium and rocuronium during intubation in patients undergoing elective surgical procedures. Methods: It is prospective randomized controlled study carried on 90 adult patients with age groups of 20-60 years of either sex. They were posted for elective surgery in Rajiv Gandhi Institute of Medical Sciences [RIMS], Adilabad. They were randomly divided into two groups of (n=45) each. Group I (R) patients received rocuronium at the dose of 0.9mg/Kg and Group II(S) patients received suxamethonium at the doses of 1.5mg/Kg. Results: The heart rates were measured at pre-operative, after the administration of muscle relaxant followed by HR at 0 min, 5 min, and 10 minutes. There was no significant difference in heart rates during all the intervals in both groups. The systolic blood pressure [SBP] preoperative values in Group I was  $120.78 \pm 11.74$  in Group II  $117.60 \pm 10.12$  after the administration of muscle relaxant the values in Group I were  $124.82 \pm 12.64$  and Group II were  $132.51 \pm 13.77$ , immediately after intubation the values were group I  $130.71 \pm 15.37$  and Group II were  $138.89 \pm 11.45$  after 5 minutes the values were  $117.22 \pm 13.29$  and  $122.64 \pm 11.73$  in group I and group II respectively and at 10 minutes the values were  $112.0 \pm 8.86$  and  $117.5 \pm 10.57$  all the p values were found to be significant except at the preoperative time. The DBP preoperative in group I was  $76.60 \pm 8.85$  and group II was  $74.15 \pm 8.81$  after the administration of muscle relaxant group I  $80.33 \pm 11.27$  and group II  $84.96 \pm 10.61$  immediately after intubation Group I  $86.60 \pm 13.21$  group II  $89.95 \pm 9.48$ . After 5 minutes of intubation Group I  $73.96 \pm 11.68$  and Group II  $79.35 \pm 9.44$  at the end of 10 minutes Group I  $71.84 \pm 10.18$  Group II  $74.17 \pm 9.16$  respectively. Conclusion: Rocuronium bromide is as effective as suxamethonium for rapid sequence induction it has proven to be safe and hemodynamically stable and can be considered as an alternative to suxamethonium for endotracheal intubation for patients in whom suxamethonium is contraindicated.

**Keywords:** hemodynamic stress, tracheal intubation, blood pressure, suxamethonium.

### INTRODUCTION

Patients often require tracheal intubation during emergencies and the best method is the rapid sequence induction [RSI] technique to protect against aspiration of the gastric contents, to facilitate intubation and prevent increased intracranial pressure [1 2]. During emergency treatments intubation is often required in unstable situation with potential of hemodynamic instability or a full stomach. This often requires modification of rapid sequence induction [RSI] for the patients with a goal of securing a patient airway safely and quickly as it can be done. Suxamethonium is currently the only available neuromuscular blocking drug with an onset of action that makes it useful for rapid tracheal intubation. Suxamethonium has got rapid onset, profound muscle relaxation and short duration

which made it drug of choice for tracheal intubation [3, 4]. However, it has got many side effects like hyperkalemia, bradycardia, nodal rhythm, ventricular dysrhythmias, myalgia, a rise of IOP, increased ICP and malignant hyperthermia [3, 5-8]. The other agents that are becoming increasingly popular are pancuronium, vecuronium, and atracurium [9]. Atracurium and vecuronium are associated with an onset which is relatively slow, particularly when compared with suxamethonium [3-8]. Rocuronium Org 9426 is a desacetoxy derivative of vecuronium it is a steroid compound and a non-depolarizing muscle relaxant, the duration of action is longer lasting for 37 to 72 minutes with standard doses [10]. The intubation dose of rocuronium in ED 95 X 2 onset of action is  $83 \pm 33$  sec and ED 95 X 3 dose onset is equal to that of

suxamethonium  $55 \pm 14$  sec [3, 6, 11]. Side effects of suxamethonium are not generally observed with rocuronium bromide [11, 12]. The present study was aimed at determining the cardiovascular responses to intubation using suxamethonium and rocuronium for routine endotracheal intubation in patients undergoing elective surgeries.

**MATERIALS AND METHODS**

It is prospective, randomized, a cross-sectional study which was carried out in 90 adults patients with age range from 20 – 60 years of both sexes those who were posted for elective surgery in MGM Hospital. The study was carried in the Department of Anesthesiology of Rajiv Gandhi Institute of Medical Sciences [RIMS], Adilabad, and Telangana State, India. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from the patients after explaining the study in their local language. The patients were randomly divided into two groups Group I (R) patients (n=45) received rocuronium at the dose of 0.9mg/Kg and Group II (S) patients received suxamethonium at the dose of 1.5mg/Kg. Inclusion criteria were, patients belonging to ASA grades I and II, also belonging to MPC grade I and II posted for elective surgeries. Exclusion criteria were: patients with anticipated difficult intubation, history of neuromuscular disease. Those on calcium channel blockers, morbid obesity, renal disease or hyperkalemia

or increased ICP or IOP. After pre-anesthetic evaluation, the patients were kept NBM for 6 hours prior to surgery and cap. Omeprazole 40mg night before surgery was given. On the day of surgery baseline preoperative PR, BP, SPO<sub>2</sub>, and ECG were recorded. They were premedicated with Midazolam 0.05m/Kg, Inj Pentazocin 0.5mg/Kg and Inj Glycopyrrolate 0.005 mg/Kg after which the patients were pre-oxygenated with 100% oxygen for induction Inj. Thiopentone was given at the dose of 5mg/Kg after the loss of eyelash reflexes muscle relaxants were given an IV bolus. Laryngoscopy was attempted in 60 seconds after injection of muscle relaxant. If the conditions were unsatisfactory then repeat scopy was attempted at 30 sec intervals. Bag-mask ventilation with 100% oxygen was continued till repeat scopy was attempted [2]. Maintenance of anesthesia was done with 60% oxygen 40 % Nitrous Oxide, Sevoflurane and IPPV were given with Brain's circuit. Monitoring of pulse rate O<sub>2</sub> saturation and blood pressures, ECG was recorded immediately after laryngoscopy at the end of 5 minutes and 10 minutes and after intubation. At the end of surgery, all anesthetics were stopped and 100% O<sub>2</sub> was resumed. After appearing in spontaneous respiratory efforts patients were reversed with slow IV injection of Neostigmine 0.05mg/Kg and Glycopyrrolate 0.001mg/Kg.

**RESULTS**

**Table-1: Inter group comparison of Heart Rate [HR] at various time intervals**

	Group	Mean ± SD	t-value	p-value
HR Preoperative	Group I	88.35	0.359	0.72
	Group II	87.24		
HR after muscle relaxant	Group I	103.00	0.757	0.45
	Group II	105.38		
HR at 0 minutes after intubation	Group I	110.98	0.223	0.223
	Group II	110.37		
HR at 5 minutes after intubation	Group I	100.64	0.35	0.73
	Group II	101.62		
HR at 10 minutes after intubation	Group I	94.35	0.467	0.64
	Group II	93.04		

The Heart Rates HR were measured at different time intervals between Group I (Rocuronium) and Group II (suxamethonium). The heart rates were measured at pre-operative, after the administration of muscle relaxant followed by HR at 0 min, 5 min, and 10 minutes. There was no significant difference in heart rates during all the intervals in both groups as the p values obtained at all stages were insignificant given in table 1.

The systolic blood pressure [SBP] was recorded from all the patients in group I and group II. The recording was done preoperatively to obtain the base line values followed by administration of muscle

relaxants and following intubation and then after 5 minutes of intubation and 10 minutes after intubation. The systolic blood pressure [SBP] preoperative values in Group I was  $120.78 \pm 11.74$  in Group II  $117.60 \pm 10.12$  after the administration of muscle relaxant the values in Group I were  $124.82 \pm 12.64$  and Group II were  $132.51 \pm 13.77$ , immediately after intubation the values were group I  $130.71 \pm 15.37$  and Group II were  $138.89 \pm 11.45$  after 5 minutes the values were  $117.22 \pm 13.29$  and  $122.64 \pm 11.73$  in group I and group II respectively and at 10 minutes the values were  $112.0 \pm 8.86$  and  $117.5 \pm 10.57$ . All the p values were found to be significant except at the pre-operative levels given in table 2.

**Table-2: Inter group comparison of SBP at various intervals**

	Group	Mean $\pm$ SD	t-value	p-value
SBP pre-operative	Group I	120.78 $\pm$ 11.74	1.797	0.079
	Group II	117.60 $\pm$ 10.12		
SBP after muscle relaxant	Group I	124.82 $\pm$ 12.64	2.78	0.008*
	Group II	132.51 $\pm$ 13.77		
SBP immediately after intubation	Group I	130.71 $\pm$ 15.37	3.07	0.004*
	Group II	138.89 $\pm$ 11.45		
SBP 5 min after intubation	Group I	117.22 $\pm$ 13.29	2.37	0.022*
	Group II	122.64 $\pm$ 11.73		
SBP 10 min after intubation	Group I	112.00 $\pm$ 8.86	2.74	0.009*
	Group II	117.50 $\pm$ 10.57		

\* Significant

**Table-3: Inter group comparison of DBP at various intervals**

	Group	Mean $\pm$ SD	t-value	p-value
DBP pre-operative	Group I	76.60 $\pm$ 8.85	1.90	0.072
	Group II	74.15 $\pm$ 8.81		
DBP after muscle relaxant	Group I	80.33 $\pm$ 11.27	1.95	0.057
	Group II	84.96 $\pm$ 10.61		
DBP immediately after intubation	Group I	86.60 $\pm$ 13.21	1.31	0.198
	Group II	89.95 $\pm$ 9.48		
DBP 5 min after intubation	Group I	73.96 $\pm$ 11.68	2.92	0.006*
	Group II	79.35 $\pm$ 9.44		
DBP 10 min after intubation	Group I	71.84 $\pm$ 10.18	1.27	0.208
	Group II	74.17 $\pm$ 9.16		

The diastolic blood pressure [DBP] was recorded from all the patients in group I and group II. The recording was done preoperatively to obtain the base line values followed by administration of muscle relaxants and following intubation and then after 5 minutes of intubation and 10 minutes after intubation. The DBP preoperative in group I was 76.60  $\pm$  8.85 and group II was 74.15  $\pm$  8.81 after the administration of muscle relaxant group I 80.33  $\pm$  11.27 and group II 84.96  $\pm$  10.61 immediately after intubation Group I 86.60  $\pm$  13.21 group II 89.95  $\pm$  9.48. After 5 minutes of intubation Group I 73.96  $\pm$  11.68 and Group II 79.35  $\pm$  9.44 at the end of 10 minutes Group I 71.84  $\pm$  10.18 Group II 74.17  $\pm$  9.16 respectively. All the p values were found to be insignificant except at the 5 minutes interval after intubation given in table 3.

## DISCUSSION

In the present study we determined the cardiovascular responses to intubation using suxamethonium and rocuronium. It was found that the values of Heart Rate in Group I have increased to 15 BPM from the preoperative value to just after the administration of muscle relaxant. In group II the mean HR values were increased by 17 BPM from the preoperative level to the administration of muscle relaxant. The values were not found to be significant. The values of the HR increased by 22 BPM in group I from the baseline preoperative value at 0 minute after intubation and in group II the values were increased by 23 BPM similarly the values in group I increase in mean HR by 12 BPM from baseline values at 5 minutes

after intubation. In group II the values increased by 14 BPM from the baseline values after 5 minutes of intubation. The values in group I and group II increased similarly approximately by 6 BPM in both the groups at 10 minutes of intubation. The rises in heart rates in both groups were comparable and not found to be significant. In a similar study by K Bhati *et al.* observed that the rise in mean HR from the baseline preoperative levels to just after the administration of muscle relaxant peaks at 0 minute of intubation and declines to the baseline at the 5 minute interval [7]. However in our study the values reached the baseline at the end of 10 minutes. Abhishek Kumar *et al.* found that the heart rate increased significantly after induction (maximum at 1 minute) with both Rocuronium (98.75 $\pm$ 15.53) and Succinylcholine (112.75 $\pm$ 15.89) [13]. But it gradually declined towards normal and change in heart rate with either drug was not significant at 5 minutes. In the present study the group I there was rise in mean SBP by 4mmHg from baseline preoperative values to administration of muscle relaxant. In group II the rise of SBP was by 15 mmHg from the baseline values. The differences of rise of mean SBP in both groups can be explained on the basis of stimulation of autonomic ganglia and more histamine released by suxamethonium. The Mean increase in SBP by 10 mmHg in group I from the base line was seen at 0 minute after intubation similarly the mean SBP increased by 21 mmHg in group II from the baseline. The increase in SBP is due to stress response due to stimulation of sympathetic nervous system during laryngoscopy and tracheal intubation. The mean SBP

decreased by 3 mmHg at 5 min in group I and in group II the mean SBP increased by 5 mmHg from the baseline. The decrease of SBP continued in group I and values were decreased by 10 mmHg after intubation from baseline preoperative values. In group II the SBP returned to baseline values at 10 minutes after intubation. Abhishek kumar *et al.* [13] found that the mean blood pressure increased significantly after induction (maximum at 1 minute) with both Succinylcholine (100.52±8.11) and Rocuronium (100.61±7.83) but it gradually declined towards normal in 5 minutes after induction. There was a mean rise in DBP from baseline preoperative levels after the administration of muscle relaxant at 0 min of intubation in both groups. There was decline in mean DBP to baseline preoperative values in group I at 5 minutes after intubation where as in group II at 10 minutes after intubation the rise of mean DBP in group II was slightly more than the group I these findings were similar to that of K Bhati *et al.* [7]. This suggest that the rocuronium is more hemodynamically stable compared to suxamethonium.

#### CONCLUSION

Rocuronium bromide is as effective as suxamethonium for rapid sequence induction it has proven to be safe and hemodynamically stable and can be considered as an alternative to suxamethonium for endotracheal intubation for patients in whom suxamethonium is contraindicated.

#### REFERENCES

1. Huizinga AC, Vandenbrom RH, Wierda JM, Hommes FD, Hennis PJ. Intubating conditions and onset of neuromuscular block of rocuronium (org 9426); a comparison with suxamethonium. *Acta Anaesthesiologica Scandinavica* 1992;36(5):463–8.
2. McCourt KC, Salmela L, Mirakhur RK, Carroll M, Mäkinen MT, Kansanaho M, Kerr C, Roest GJ, Olkkola KT. Comparison of rocuronium and suxamethonium for use during rapid sequence induction of anaesthesia. *Anaesthesia*. 1998 Sep 1;53(9):867-71.
3. Mohamed Najib, Cynthia A Lien. Chapter 29 Pharmacology of Muscle relaxants and their agonists. *Miller's Anesthesia*, 7<sup>th</sup> Edition. Vol 1: 859-894.
4. Mishra MN. Agarwal M. Pandey RP. Gupta AA. Comparative study of rocuronium, vecuronium, and succinylcholine for rapid sequence induction of anesthesia. *Indian J Anaesth* Dec 2005; 49(6): 469-73.
5. Aparna Shukla, KP Dubay, MSN Sharma. Comparative evaluation of hemodynamic effects and intubating conditions after the administration of ORG 9426 and succinylcholine. *Indian J Anaesth* 2004; 48(6):476-79.
6. Robert K S. Simon CH. *Pharmacology and Physiology in Anesthetic Practice*. Stoelting 4<sup>th</sup> edition. 2006; 228-241.
7. K Bhati, Vandana PS. Comparative study of intubating conditions after Rocuronium and suxamethonium. *The internet J Anaesth*. 2009; 20(1):1-14.
8. Jamshid Ali, Shawkat AG, Asaf short, Shagufta Qazi. Intubating conditions of Rocuronium bromide and succinylcholine during rapid sequence induction of Anesthesia in unpremedicated adult patients. *J Anaesth Clin Pharmacol* 2008; 24(3):337-42.
9. Mazurek AJ, Rae B, Hann S, Kim JI, Castro B, Cote CJ. Rocuronium versus succinylcholine: are they equally effective during rapidsequence induction of anesthesia?. *Anesthesia and Analgesia* 1998;87 (6):1259–62.
10. Magorian T, Flannery KB, Miller RD. Comparison of rocuronium, succinylcholine, and vecuronium for rapid-sequence induction of anesthesia in adult patients. *Anesthesiology* 1993;79(5):913– 8.
11. Verma R, Goordayal R, Jaiswal S, Sinha G. A comparative study of the intubating conditions and cardiovascular effects following succinylcholine and rocuronium in adult elective surgical patients. *The Internet Journal of Anesthesiology*. 2006;14(1).
12. Shizan Hamid Feroz, Faisal Wahid, Waqas Ahmed Kazi, Fahim Akhtar, Bourhan Eldin Al Masalmah. Comparative study of intubating conditions after rocuronium and suxamethonium (study of 50 cases). *Pak Armed force Medical journal*. 2001;61(1).
13. Kumar A, Saran J, Chandra R, Nanda HS. A comparative clinical evaluation of intubating conditions and haemodynamic effects after administration of succinyl choline & rocuronium bromide. *Journal of evolution of medical and dental sciences-jemds*. 2015 Apr 6;4(28):4769-80.