

# A Study on Comparative Effects of Rocuronium and Succinylcholine During Rapid Sequence Intubation

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## ABSTRACT

**Background:** Patients frequently need a rapid sequence induction (RSI) endotracheal intubation technique during emergencies or electively to protect against aspiration in conditions like pregnancy, abdominal pathologies especially obstruction or ileus, neurologic disease, or in difficult airway. Traditionally succinylcholine has been the most commonly used muscle relaxant for this purpose because of its fast onset and short duration; unfortunately, it can have serious side effects. Rocuronium has been suggested as an alternative to succinylcholine for intubation.

**Methods:** This study was done at department of anesthesia SMBT Institute of Medical Science and Research Center, Dhamangaon Tal. Igatpuri, Nashik, Maharashtra, India. The patients were systematically randomized into three groups of twenty each. Group A: Succinylcholine 1.5 mg/kg, Group B: Rocuronium bromide 0.6 mg/kg & Group C: Rocuronium bromide 0.9 mg/kg. Intubating conditions, onset of action and adverse effects were observed.

**Results:** It was observed that group A & group C patients had excellent intubation conditions with faster onset of action for group A patients. Adverse effects were not seen in any of the three groups.

**Conclusion:** Our study concludes that Succinylcholine is an ideal agent for intubation in all surgical procedures. Intubating conditions of Rocuronium bromide at a dose of 0.9mg/kg (3xED95) is comparable to Succinylcholine 1.5mg/kg at 1 minute. Rocuronium bromide 0.9mg/kg can be used safely in patients where succinylcholine is contraindicated.

**Keyword:** Succinylcholine, Intubation, Rocuronium.

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## INTRODUCTION

Preservation of a patent airway is a basic and necessary component of general anesthesia. Endotracheal intubation is one of the means of doing so in conventional anesthetic practice. Muscle relaxants are useful in providing adequate relaxation to enable laryngoscopy and intubation.<sup>1</sup> Despite its many undesirable adverse effects such as increase in serum potassium concentration, rise in intracranial, intraocular and intra gastric pressures and bradycardia, succinylcholine is still preferred over other muscle relaxants for producing rapid muscle relaxation prior to endotracheal intubation. Rapid onset of profound muscle relaxation and short apnea time are special attributes of succinylcholine that are useful in patients with high gastric volume.<sup>2</sup> Rocuronium is a newer non depolarising muscle relaxant. It is expected to have an onset time as rapid as that of

succinylcholine without its adverse effects. Rocuronium has little or no adverse cardiovascular effects, nor does it cause histamine release. For these reasons, it may be preferred to succinylcholine in compromised patients in whom hemodynamic or other changes are to be minimized.<sup>3</sup>

However, rocuronium has an intermediate duration of action of 25 to 30 minutes which is similar to that of vecuronium. Rocuronium is therefore not preferred in cases where a short apnea time is desirable. In theory, reducing the dose of a neuromuscular blocking agent should reduce its duration of action also.<sup>4</sup> The objective of our study was to evaluate whether reducing the intubating dose of rocuronium shortens its duration of action while at the same time providing clinically acceptable intubating conditions.

**METHODS**

This study entitled to compare the efficacy of rocuronium bromide in two dosage schedules – 0.6mg / kg (2 x ED95) and 0.9mg / kg(3 x ED95) IV, with succinylcholine chloride 1.5mg / kg IV, in the patients undergoing general surgical procedures was undertaken after obtaining ethical committee clearance as well as informed consent from all patients.

**Inclusion Criteria:** All ASA Physical status 1 and 2 patients aged between 20-60 years scheduled for elective surgery under general anesthesia.

**Exclusion Criteria:** Modified Mallampatti Airway Classification III, IV, Morbidly Obese, Pregnant women, Neuromuscular disease, Hepatic or renal disease,

In all the patients' age, bodyweight, preoperative blood pressure and pulse rate were recorded. A complete physical examination and airway assessment was done. Patients receiving

medication known to interact with neuromuscular blocking agents. On arrival in the operating room intravenous access was secured with 18G cannula in a vein in dorsum of hand. Ringer lactate infusion started. Following monitors are connected- Pulse oximeter, Electrocardiogram and Noninvasive blood pressure monitor. After premedication & pre oxygenation for 3 minutes, anesthesia was induced with Thiopentone sodium 5mg/kg over a period of 20 seconds. Once a control twitch height was established. The bolus of randomly assigned neuromuscular blocking agent was administered intravenously in less than 5 seconds. When injection was completed, a timer was started and at one minute, intubation was performed and scored by a blinded experienced anesthesiologist. The data was computed and all values expressed as mean ± SD. The data was analyzed using CHI-SQUARE test, ANOVA F-test; P value < 0.05 is significant.

**Table 1: Vocal Cord Position**

Group	Sample Size	Vocal Cords Score	
		2 (Moving)	3 (Open)
Group A (Sch 1.5)	20	3	17
Group B (Roc 0.6)	20	12	8
Group C (Roc 0.9)	20	1	19

**Table 2: Response to Intubation Score**

Group	Sample Size	Response to Intubation Score		
		1	2	3
Group A (Sch 1.5)	20	0	0	20
Group B (Roc 0.6)	20	11	6	3
Group C (Roc 0.9)	20	0	3	17

1: Mild cough; 2: light diaphragmatic movement; 3: none

**Table 3: Intubation Score**

Group	Sample Size	Intubation Score	
		Good	Excellent
Group A (Sch 1.5)	20	0	20 (100%)
Group B (Roc 0.6)	20	14 (70%)	6 (30%)
Group C (Roc 0.9)	20	1 (5%)	19 (95%)

P = 0.001 significant

**Table 4: Time of Onset**

Group	Sample Size	Mean	Std. Deviation	Anova F- test
Group A (Sch 1.5)	20	43.75	3.582	F = 150.93
Group B (Roc 0.6)	20	220.75	51.638	P = 0.001
Group C (Roc 0.9)	20	105.55	22.993	Significant

## OBSERVATION AND RESULTS

Our study conducted on 60 adults randomly allotted into 3 groups with twenty patients in each group.

**Group A:** Succinylcholine 1.5 mg/kg

**Group B:** Rocuronium bromide 0.6 mg/kg

**Group C:** Rocuronium bromide 0.9 mg/kg

### Tracheal Intubating Conditions at 1 Minute

The scores for jaw relaxation, vocal cord position and response to intubation and the total scores are compared between three groups at 1 minute. All patients in three groups Group A, Group B and Group C showed good jaw relaxation.

Table 1 shows vocal cord positions,  $P=0.001$  there is statistically significant difference in vocal cord position in Group A, Group B and Group C.

Table 2 shows response to intubation,  $P=0.001$  there is statistically significant difference in response to intubation in Group A, Group B and Group C.

Table 3 shows intubation score, Excellent intubating conditions was seen with Group A with 100% score. Excellent intubating conditions with Group B and Group C are 30% and 95% respectively. P value of Succinylcholine 1.5 mg/kg and Rocuronium 0.9 mg/kg is 0.466 statistically not significant.

Table 4 shows time of onset, group A onset of action was  $43.75 \pm 3.582$  seconds significantly faster than either group B and group C,  $220.75 \pm 51.638$  seconds vs  $105.55 \pm 22.993$  seconds. The difference in onset of action between the three group is statistically significant. ( $P = 0.001$ )

## DISCUSSION

In this study, intubating situation at one minute, onset of action and adverse effects were studied following administration of Succinylcholine 1.5mg/kg IV, Rocuronium 0.6 and 0.9 mg/kg IV in adults anaesthetized with Thiopentonesodium 5mg/kg IV. All the three groups were similar with regards to age, sex and weight. Brijesh Savidhan et al compared the intubating conditions by using two doses of injection rocuronium 0.6 mg/kg and 0.9 mg/kg they found that with rocuronium 0.6mg/kg 20 (66.6%) patients out of 30 patients had vocal cords in fully apart position, 8 patients vocal cords in open mid way position and 2 patients had moving vocal cords. In Group B with rocuronium 0.9mg/kg all 30 (100%) patients had vocal cords fully apart position and none of the patient in both the groups vocal cords are closed.<sup>5</sup> The findings from the studies mentioned above correlate with the findings of our study results. In our study all patients in three groups Group A injection succinylcholine 1.5mg/kg Group B injection rocuronium 0.6 mg/kg and Group C injection rocuronium 0.9 mg/kg showed good jaw relaxation. Anisha Pauline Paul et al Compared the intubation conditions using injection succinylcholine 1.5 mg/kg and two doses of injection rocuronium bromide 0.6 mg/kg and 0.8 mg/kg and found that all 30 patients with succinylcholine 1.5 mg/kg had good jaw relaxation, with rocuronium bromide 0.6 mg/kg 25(83.33%) patients out of 30 patients had Good Jaw relaxation, 5(6.67%) patients had moderate jaw relaxation and with rocuronium 0.8 mg/kg 28 (93.33%) patients out of 30 had good jaw relaxation, 2(6.67%) patients had moderate jaw relaxation The dosage of Succinylcholine was selected as per text book description and studies done by weiss et al and Bhatia Pradeep kumar et al.<sup>6</sup> They concluded that Succinylcholine 1.5 mg/kg IV provides ideal intubating conditions and quicker onset of

actions. Time taken for 100% suppression of single twitch was concluded as onset of action. After intubation and observation, anaesthesia was maintained as appropriate for surgical needs with Nitrous oxide, Oxygen and neuromuscular blocking agent Bhatia pradeep kumar et al, Mirakhur. K et al and Cooper et al have shown shorter onset time and intubating conditions at 60 seconds are excellent to good with a dose of 0.6 mg/kg IV of Rocuronium.

Weiss JH., et al Studied the intubating conditions in adult patients for elective surgery with Rocuronium 0.7mg/kg, Rocuronium 0.9 mg/kg and Succinylcholine 1.5 mg/kg. Rocuronium 0.7mg/kg displayed a significant lower score <60% and rated as poor. Rocuronium 0.9 mg/kg provides similar intubating conditions to Succinylcholine 1.5mg/kg at 60 seconds. R.K.Verma et al compared the effect on intubating condition, onset of Succinylcholine 1mg/kg and Rocuronium 0.6mg/kg and 0.9 mg/kg The study revealed a significant difference in time between the three groups.<sup>8</sup>

Fastest with Succinylcholine 1mg/kg ( $52.8 \pm 15$ ) seconds, followed by Rocuronium 0.9mg/kg ( $102 \pm 40$ ) seconds and Rocuronium 0.6mg/kg ( $163 \pm 58$ )seconds.<sup>7</sup>

Rohan Bhandari et al compared, intubation conditions using injection succinylcholine 1.5 mg/kg, with two doses of injection rocuronium bromide 0.6 mg/kg and 0.9 mg/kg. Mean onset of action of succinylcholine 1.5 mg/kg was  $47.60 \pm 3.76$  seconds, with rocuronium bromide 0.6 mg/kg  $77.40 \pm 5.32$  seconds and with rocuronium bromide 0.9 mg/kg  $58.37 \pm 4.82$  seconds. The difference in the mean onset of action of the drugs, was statistically highly significant.<sup>9</sup>

Brijesh Savidhan et al compared the intubating conditions, onset by using two doses of injection rocuronium 0.6 mg/kg and 0.9 mg/kg. The mean onset with rocuronium 0.6 mg/kg  $101.53 \pm 20.84$  s whereas with rocuronium 0.9 mg/kg  $78.27 \pm 13.04$  s. The difference in the mean onset of action of the drugs, was statistically highly significant. These findings are comparable with our study results.

## CONCLUSION

Succinylcholine is a perfect agent for intubation in all surgical procedures. Intubation from Rocuronium bromide at a dose of 0.9mg/kg is comparable to Succinylcholine 1.5mg/kg at 1 minute. Rocuronium bromide 0.9mg/kg can be used safely in patients where Succinylcholine is contraindicated.

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