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## A comparative study on different doses of suxamethonium, rocuronium and vecuronium with respect to onset time action and side effects

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### Abstract

The ease with which endotracheal intubation is performed depends upon degree of muscle relaxation, depth of anaesthesia and skill of anaesthesiologist. This is prospective, randomised observational study conducted at Deccan academy of Medical Sciences and Research Centre, Hyderabad. The aim of this study is to compare the effect of suxamethonium, vecuronium and rocuronium on intubation time and intubating conditions when used along with rocuronium. 75 patients aged between 30 to 50 year of both genders, weighing from 40 to 70kg coming for elective surgeries under general anaesthesia included. They are divided in three groups, Group I received 0.6 mg/kg rocuronium, and Group II received Suxamethonium 1.5 mg/kg. And group III vecuronium 0.1 mg/kg. Intubating conditions were assessed by cooper scoring system. In Group I, 15 patients showed excellent, 10 patients good and no patients showed poor intubation conditions and in group II all patients (25) showed excellent, and group III all patients showed good intubation conditions respectively. The onset time of intubating condition of three groups were  $82.95 \pm 20.34$  in Group I compared with  $60.25 \pm 9.41$  in Group II whereas in group III  $154.5 \pm 6.47$ . These timings were significantly reduced in Group II compared to Group I and Group III. Vecuronium 0.1 mg/kg produces good intubation conditions at 60 sec when compared with Vecuronium 0.8 mg/kg provides excellent intubating conditions within 60–66 secs without any adverse effects in elective surgeries in patients with stable haemodynamics.

**Keywords:** Intubation, vecuronium, rocuronium, cooper score

### Introduction

A perfect setting for tracheal intubation include a rapid onset, profound paralysis of all muscles and short duration of action so that the patient's own respiratory function can be restored. These requirements are best met by succinylcholine, an ultra-short acting depolarizing muscle relaxant. However its many unwanted side effects have necessitated a search for an alternative drug or technique to facilitate tracheal intubation. Rocuronium bromide is a steroid, non-depolarizing neuromuscular blocking agent with a rapid onset and an intermediate duration of action. It may be a suitable alternative to succinylcholine [1].

Succinylcholine (also known as suxamethonium chloride – introduced by Thesleff and Foldes in 1952) with its ultra-rapid onset and short duration of action has been drug of choice to obtain excellent intubating conditions in less than 60 s for both elective and emergency surgeries. However, the undesired side effects of succinylcholine led to a search for ideal neuromuscular blocking agent among the non-depolarizing type. Rocuronium bromide introduced into clinical practice by Dr. Sleight and late Dr. Savage in 1990 was the first drug to challenge the onset time of succinylcholine facilitating rapid and safe ET intubation devoid of its side effects.

In this context, the present study was undertaken to compare the intubating conditions of rocuronium, vecuronium with that of succinylcholine along with the clinical duration of action, the hemodynamic changes, and the occurrence of any untoward side effects with either drug.

### Aim of Study

To study and compare the efficacy of Suxamethonium, Rocuronium and Vecuronium in patients with respect to:

1. Intubating conditions at one minute
2. Adverse effects

## Materials and Methods

### Study Design

The proposed study entitled Intubating conditions with the use of suxamethonium chloride, vecuronium bromide and rocuronium bromide in paediatric patients

### Type of study

A comparative observational study

### Place of study

The study was carried out in the Department of Anaesthesiology, Princes Esra Hospital, Deccan college of Medical Science.

### Study Population

75 patients of either sex aged between 1 to 9 years of ASA grade 1/II, scheduled to undergo various surgical procedures were chosen as subjects of this study with informed consent.

### Inclusion criteria

Pre anaesthetic assessment of each patient was done by taking a detailed history along with a careful and complete general examination one day prior and again on the morning of surgery.

### Exclusion criteria

Rule out the presence of any undetected systemic disorders such as haematological and biochemical profile, as well as routine urological investigations etc.

### Study Design

The proposed study entitled intubating conditions with the use of suxamethonium chloride, vecuronium bromide and rocuronium bromide in paediatric patients.

After ensuring a fasting status of minimum four hours, the patients were premeditated with midazolam 0.5 mg/kg oral. Grouping was done into three lots of 25 each, and patients were randomly allocated to any one of the following

**Group I:** Intubation accomplished with IV Rocuronium 0.6 mg/kg.

**Group II:** Intubation accomplished with IV Suxamethonium 1.5 mg/kg.

**Group III:** Intubation accomplished with IV Vecuronium 0.1 mg/kg.

### Cooper scoring system

Scoring of intubating conditions based on four criteria's was used to rate the degree of relaxation achieved in the three groups.

Criteria	Score		
	1	2	3
<b>Jaw relaxation (Ease of laryngoscopy)</b>	<b>Minimal (Impossible)</b>	<b>Moderate (Difficult)</b>	<b>Complete (easy)</b>
Vocal cords	closed	Intermediate	abducted
Diaphragmatic	Coughing	Bucking	None
Limb movement	Vigorous	Slight	None

Total score:

12: Excellent

8-11: Good

4-7: Poor

**Anaesthetic technique:** An intravenous route was secured upon the patient's arrival in the operation theatre and Inj Atropine 0.01 mg/kg I.V was administered. Monitoring equipment was then attached and pre induction heart rate, pulse oximetry and non-invasive blood pressure reading were taken.

The ulnar nerve at wrist was selected for neuromuscular monitoring, using surface (ball) electrodes attached to the Organon Teknika neuromuscular monitor. A base line single twitch response was noted.

Preoxygenation was done for five minutes on 100% oxygen. Patients were induced using Thiopentone sodium 5 mg/kg body weight followed by the muscle relaxant preselected for study.

Assessment of quality of intubating conditions was performed using a scoring system based on 4 criteria's i.e. jaw relaxation, vocal cord position, diaphragmatic response and limb movement.

Laryngoscopy was first attempted at 60 sec. In case laryngoscopy was not possible attempts were repeated at subsequent intervals of 30 sec up to 150 sec, when intubation was to be considered as a failure for the purpose of study.

Neuromuscular monitor was used to observe the correlation between the intubating conditions and the adductor pollicis response to single twitch ulnar nerve stimulation.

Following the intubation IV pethidine 1 mg/kg body weight and IV Ondansterone 0.1 mg/kg b.w were administered. Anaesthesia was maintained on mixture with controlled ventilation using the Boyle's anaesthesia machine. Muscle relaxation was maintained as necessary, using ¼ initial dose of relaxant administered. The patients in Gp II (I.E Intubation using suxamethonium 1.5 mg/kg) were subsequently administered IV vecuronium as necessary.

### Parameters monitored

Haemodynamic parameters, heart rate, pulse oximetry, non-invasive blood pressure (Systolic, diastolic, mean).

Neuromuscular monitoring was accomplished using the Organon Teknika and the response to single twitch nerve stimulation was virtually assessed.

Onset of action of intubating dose of the muscle relaxant was taken as the time from administration of drug to the time of intubation n with good to excellent intubating condition as per the scoring system based on 4 criteria.

At the end of surgical procedure, spontaneous recovery was attempted. Reversal of residual neuromuscular block was carried out. If necessary using IV atropine 0.02 mg/kg and neostigmine 0.05 mg/kg. Patient was extubated after adequate Oropharyngeal toilet.

## Results

**Table 1:** Total scoring of Intubation conditions in the three groups

Total score	Score	Group I				Group II				Group III			
		Time in seconds											
		60	90	120	150	60	90	120	150	60	90	120	150
Excellent	1	-	-	-	-	-	-	-	-	-	-	-	-
Good	2	5	-	-	-	-	-	-	-	-	-	12	08
Poor	3	20	-	-	-	25	-	-	-	-	-	3	2

The above table depicts the distribution of total scoring in the three groups. An excellent score seen in all cases of Group II within 60 sec. In Group I 60% had excellent and 40% had good intubation condition within 60 sec. All the

patients in group III had only good intubating conditions that were achieved at 120 sec in 60% and at 10 sec in 40% of the patients.

**Table 2:** Incidence of Grades of intubating conditions

Grade	Score	Group I		Group II		Group III	
		No	%	No	%	No	%
Excellent	12	15	60	25	100	-	-
Good	8-11	10	40	-	-	25	100
Poor	4-7	-	-	-	-	-	-

The above tables shows the grades of intubating conditions in the three groups

**Table 3:** Onset time of intubating doses in the three groups

Intubating dose of Drugs (mg/kg b w)	Group I		Group II		Group III	
	(Rocu 0.6 mg/kg b. w)		(Suxamet 1.5mg/kg b. w)		(Vecuro 0.1 mg/kg b. w)	
Onset of time (In Sec)	82.95±20.34		60.25±9.41		154.5±6.47	

The above table depicts the Onset time of intubating dose in the three groups (mean ± SD).

## Discussion

Muscle relaxation is used to serve two purposes: one to facilitate endotracheal intubation and other to provide surgical relaxation [1]. The ideal neuromuscular blocking agent is one which has brief duration of action, provides profound relaxation and is free from haemodynamic changes. Rocuronium reliably produces muscle relaxation within 60 seconds of its administration with fewer side effects. Rocuronium is amino steroid no depolarizing muscle relaxant with rapid onset and intermediate duration of action. It has a faster neuromuscular blockade onset time compared to other NDMRs [3].

Intubating conditions were graded as excellent when intubating scores were between 8 and 9, good with 6–7, fair with 3–5 and poor with 0–2. Excellent and good intubating conditions were considered clinically acceptable as per Cooper *et al.* [2]. Data noted included loss of thumb adduction, onset time of intubation, conditions at the time of intubation (Using Cooper's scoring system), heart rate, mean arterial pressure, oxygen saturation (using pulse oximetry) at baseline, post-induction, at intubation, immediately after intubation, 1 min, 3min and 5 min after intubation. Various haemodynamic parameters like heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were evaluated. All these parameters increased following laryngoscopy and intubation [4]. The increase was maximum at 1 minute after intubation. All the parameters decreased thereafter towards resting values in all the three groups. These changes were not statistically significant.

## Untoward side effects

In the present study, no adverse effects were found with

either 0.6 mg /kg b. w of vecuronium and rocuronium who were given Suxamethonium 1 mg/ kg b. w which are similar to the studies done by other authors.

## Conclusion

We conclude that Rocuronium is a suitable alternative to Succinylcholine for intubation in paediatric patients in a dose of 0.9mg/kg or 1.2mg/kg. The dosing of Rocuronium can be fixed depending on the duration of surgery owing to slight difference in duration of action of the two doses.

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## Conflict of interest

There is no conflict of interest

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