

## COMPARATIVE STUDY OF INTUBATING CONDITIONS WITH SUXAMETHONIUM AND ROCURONIUM IN CHILDREN

K. Chandra Sekhar<sup>1</sup>, D. Vijayakumar Rao<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Anaesthesiology, Gitam Institute of Medical Sciences and Research, Rushikonda, Visakhapatnam.

<sup>2</sup>Professor, Department of Anaesthesiology, Gitam Institute of Medical Sciences and Research, Rushikonda, Visakhapatnam.

### ABSTRACT

#### BACKGROUND

Suxamethonium is routinely used for intubation from long time in spite of its side effects, as there is no alternate drug till recently. Present study is focused on rocuronium rapidly acting as non-depolariser, which behaves like vecuronium in all other aspects. The study is focused on finding attractive and safe alternative drug to suxamethonium using rocuronium, which behaves like Vecuronium in all aspects.

Aims and Objectives- To search for a safe alternative drug to suxamethonium using rocuronium for intubation in children.

#### MATERIALS AND METHODS

This non-randomised controlled trial was conducted on 50 children for convenience of either sex, of ASA physical status I or II, belonging to age between 8 and 15 years, posted for elective surgery under general anaesthesia. Informed consent was taken. These patients were non-randomly divided into two groups of 25 patients each for convenience according to the neuromuscular blocking drug used.

Group I- Suxamethonium 1 mg/ kg.

Group II- Rocuronium 0.6 mg/ kg.

#### RESULTS

Grading of intubating conditions were 96% with suxamethonium and 80% with Rocuronium. Immobility of vocal cords was better and diaphragmatic response was less pronounced with Suxamethonium. Cardiovascular changes in heart rate and mean arterial pressure were less than 10% of basal level.

#### CONCLUSION

There was no significant difference between intubating dose of 0.6 mg/kg of rocuronium and 1 mg/kg of suxamethonium. Rocuronium may be a safe alternative when suxamethonium is contraindicated or is to be avoided for its side effects, especially in children.

#### KEYWORDS

Suxamethonium, Rocuronium.

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#### BACKGROUND

Rapid and safe endotracheal intubation is of paramount importance with minimal side effects. Ease with which intubation is achieved depends on muscular relaxation, immobile vocal cords, deep anaesthesia and skill of the Anaesthetist.

Suxamethonium is still considered the agent of choice, but because of disadvantages like potassium release, rise in intragastric and intraocular pressures, muscle pains, myoglobinuria and myotonic reactions, dire search for alternate drug has been continuing. The introduction of new aminosteroid relaxant Rocuronium bromide has now provided anaesthetists with rapid onset with a dose of 0.6mg/ kg. Suxamethonium acts by depolarising the end plate and the initial action is like acetylcholine, which is responsible for undesired side effects.<sup>1</sup>

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*Corresponding Author:*

*Dr. K. Chandra Sekhar,*

*Associate Professor, Department of Anaesthesiology,*

*Gitam Institute of Medical Sciences and Research,*

*Rushikonda, Visakhapatnam.*

*E-mail: doctorkota123@gmail.com*

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Acts by desensitisation of postsynaptic receptors and presence of agonist for prolonged periods increases the threshold for triggering action potential and neuromuscular blockade follows. Suxamethonium is not hydrolysed by acetylcholinesterase in synaptic cleft, but by plasma cholinesterase. It acts repeatedly at postsynaptic receptors and produces persistent depolarisation. Side effects include hyperkalaemia, vagotonic effects, fasciculations, muscle pains, raise of intragastric, intracranial and intraocular pressures, masseter spasm, malignant hyperthermia, prolonged paralysis in patients with atypical cholinesterase activity, phase II block with large doses. ED95 dose of suxamethonium 0.5 mg/ kg and half-life is 2 - 4 minutes.<sup>2,3</sup>

Rocuronium non-depolarising agent, mono-quaternary aminosteroid with intermediate duration of action non-depolarising drugs compete with acetylcholine and bind one or two alpha subunits of acetylcholine receptor at postsynaptic membrane and the block is reversed by anticholinesterase drugs. Faster onset than vecuronium, eight times less potent than vecuronium. Rocuronium has a hydroxyl group at 3-carbon position, whereas vecuronium has hydroxyl group. Rocuronium is not metabolised and 30% to 40% is excreted in bile unchanged.<sup>4,5</sup> Vecuronium is metabolised to 3-hydroxy vecuronium with 50% activity. Maintenance dose rocuronium is 0.15 mg/ kg, best given when twitch height has recovered to

25% of control. Risk of anaphylaxis is same as with other neuromuscular agents and precautions should be taken to recognise the signs and symptoms. Careful titration against twitch response to avoid prolonged action in hepatobiliary disorders and renal failure, hypothermia, obesity and in patients receiving magnesium sulphate. ED95 dose means the dose required to produce 95% depression of twitch response of thumb. ED95 dose of rocuronium is 0.3 mg/ kg and the intubation dose is 0.6 mg/ kg (twice of ED95 dose). Most common cardiovascular changes are increase in heart rate up to 9% and increase in mean arterial pressure by 16%. Drug is stored at 2 to 8 degrees temperature and concentration is 50 mg in 5 mL.<sup>6,7</sup>

Side effects of non-depolarising drugs include ganglion blockade (Hypotension), muscarinic blockade (Tachycardia), vagolytic (Tachycardia), histamine release (Anaphylaxis), arrhythmias and bradycardia (Vecuronium). In this study, comparison of intubating conditions was done as a whole (Jaw relaxation, vocal cord relaxation and reaction to intubation) in paediatric age group with rocuronium and suxamethonium.<sup>8,9,10</sup>

**MATERIALS AND METHODS**

This non-randomized controlled trial was conducted on 50 children for convenience, of either sex, of ASA physical status I or II, belonging to age between 8 and 15 years, posted for elective surgery under general anaesthesia. Informed consent was taken. These patients were non-randomly divided into two groups of 25 patients each, was taken for convenience according to the neuromuscular blocking drug used-  
 Group I- Suxamethonium 1 mg/kg.  
 Group II- Rocuronium 0.6 mg/kg.

Patients with history of allergy to neuromuscular blocking drugs or previous history of difficult intubation or airway problems or patients with disorders of CNS and neuromuscular junction were excluded from the study.<sup>11,12</sup>

After thorough pre-anaesthetic check-up, all the patients were pre-medicated with Midazolam and Glycopyrrolate forty five minutes before induction of anaesthesia.

Induction was done in an identical manner with Propofol 2 mg/ kg IV, following which respective muscle relaxant was given to facilitate the intubation. Time of onset of apnoea was noted and oral endotracheal intubation was attempted at fixed time interval according to onset of apnoea, at 60 seconds for suxamethonium and at 90 seconds for Rocuronium. Jaw relaxation, vocal cord relaxation, motor response to intubation and overall intubation conditions were assessed according to the criteria proposed by Lund and Stovner (1962) and was graded as excellent or satisfactory or poor or impossible.

**Proforma**

- Name.
- Age.
- Sex.
- Weight.
- Premedication.
- Glycopyrrolate 20 µ gm/ kg.
- Midazolam 0.5 mg/ kg.
- Induction Propofol 2 mg/ kg.
- Relaxant Rocuronium 0.6 mg/ kg.

(or)

- Suxamethonium 1 mg/ kg.
- Duration of First Dose.
- Score of intubating conditions.

**Statistical Analysis**

Descriptive statistics for continuous variables such as age and weight were presented as mean and standard deviation, while the inferential statistics for hypothesis testing were performed with the unpaired “t” test. Categorical data were compared using the Chi-square test. Estimation of sample size was based on the results of a previous study, in which 80% of patients receiving rocuronium and 96% of patients receiving suxamethonium showed excellent intubating conditions.

**Scoring of Endotracheal Intubating Conditions**

(Lund and Stovner, 1962)

Score	Intubating Conditions	Jaw Relaxation	Vocal Cords	Diaphragmatic Reaction to Intubation
3	Excellent	Complete opening	Wide abduction	None
2	Good	Partial opening	Gentle pressure is required to pass tube	Slight bucking
1	Fair	Slight opening	Closing (adducted)	Marked bucking
0	Poor	No opening	Cords opposed	Severe bucking or coughing or limb movements

**Excellent  
Total Score (8 - 9)**

Cords well abducted, not moving, easy passage of tube without bucking.

**Good  
Total Score (6 - 7)**

Slight movements of cords when touched. Passage of tube with slight bucking or coughing or both.

**Fair  
Total Score (3 - 5)**

Passage of tube with moderate coughing or bucking or both.

**Poor  
Total Score (0 - 2)**

Intubation not possible.

	No. of Patients	Age Median ± S.D	Weight Mean ± S.D
Group-I (Suxamethonium )	25	11.6 ± 2.11	28 ± 4.9
Group-II (Rocuronium)	25	11.4 ± 2.12	29 ± 4.5
<b>Mean age and Mean Weight of Patients</b>			

**RESULTS**

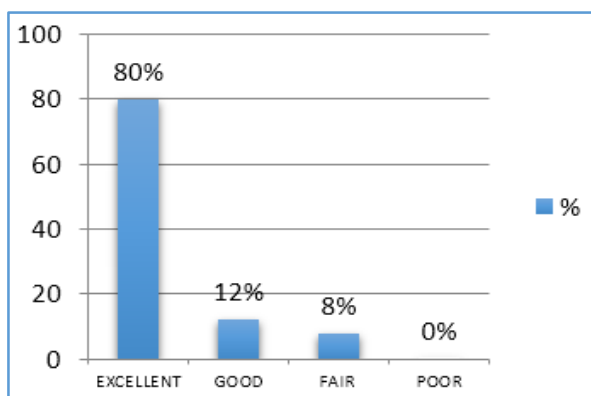
Group	I	II
Drug	Suxamethonium	Rocuronium
No. of Patients	25	25
Excellent	24 (96%)	20 (80%)
Good	---	2 (8%)
Fair	1 (4%)	3 (12%)
Poor	---	---

**Distribution and Overall Grading of Intubating Conditions**

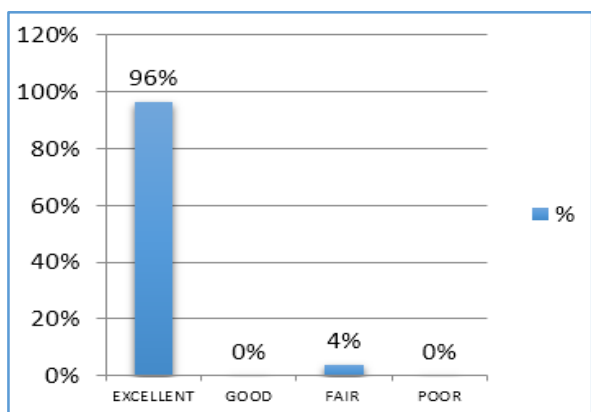
After intubation, anaesthesia was maintained with oxygen and nitrous oxide (50:50) and sevoflurane % with supplementary doses of respective neuromuscular blocking agent.

At the completion of surgery, all patients were reversed with inj. neostigmine 0.007 mg/ kg and glycopyrrolate 0.02 mg/ kg. After complete reversal, child was extubated and sent to recovery room.<sup>13,14</sup>

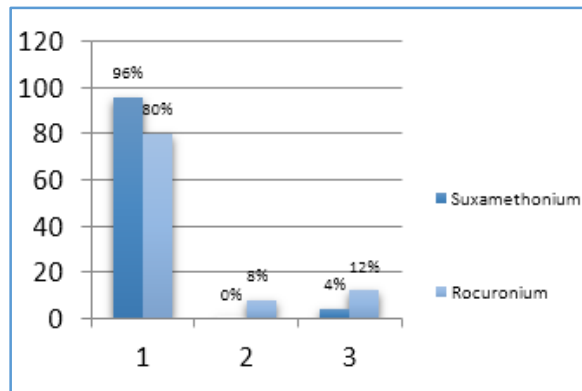
Reviewing the whole area of clinical applications, rocuronium has the same safety features and advantages as vecuronium, but adds some extra benefits which are the result of short onset of action and its mild vagolytic effects. Replacement of suxamethonium by a non-depolarising relaxant like rocuronium for routine induction and intubation is now appropriate. Also, in comparison to vecuronium, rocuronium adds such distinct improvements during induction and the course of surgery that integral replacement is acceptable and logical. It is clearly a step forward towards the near ideal muscle relaxant.



**Figure 1. Intubating Conditions at Ninety seconds after 0.6 mg/ kg of Rocuronium**



**Figure 2. Intubating Conditions at One Minute after 1 mg/ kg of Suxamethonium**



**Figure 3. Distribution of Overall Grading of Intubating Conditions**

**DISCUSSION**

In the present study, suxamethonium dominated over rocuronium by providing ideal excellent intubating conditions for intubation.

Intubating conditions were clinically acceptable (Excellent) in 96% of patients, who received suxamethonium and in 80% with rocuronium group.

However, the condition of vocal cords (immobile with wide abduction) was better and diaphragmatic response to intubation was less pronounced with suxamethonium group.

Changes in the heart rate and blood pressure were same (<10% of basal level) in both groups.

In the rocuronium group, five patients developed slight-to-moderate diaphragmatic reaction (Bucking). Though intubation was successfully completed, it was not as smooth as with suxamethonium.<sup>15</sup>

Intubation was not attempted until the stipulated time (60 seconds for suxamethonium and 90 seconds for rocuronium), even though apnoea was detected earlier.

The duration of apnoea lasted 8 - 12 minutes with suxamethonium and 24 - 30 minutes with rocuronium.

Children are chosen for the study with this new drug rocuronium as airway problems, obesity and mask ventilation problems are less common in this age group.

Intubating conditions study was done in elective surgery patients like tonsillectomy, hernia repair and orthopaedic procedures of moderate duration.

**CONCLUSION**

There was no significant difference between intubating dose of 0.6 mg of rocuronium and 1 mg/ kg of suxamethonium in children. Rocuronium may be a safe alternative to suxamethonium when it is contraindicated or to be avoided for its side effects.

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