

# Comparative Study of Rocuronium, Vecuronium & Atracurium as non Depolarising Muscle Relaxant in Paediatric Patients

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## ABSTRACT

**Introduction:** Comparison of 2 different Nondepolarising muscle relaxant is utmost important in this time due to posed side effects of both. Study aimed to compare jaw relaxation, ease of intubation, haemodynamic stability of all NDMR agents.

**Material and methods:** This randomised comparative observation study was conducted in VS General hospital, NHLM Medical college Ahmedabad Gujarat, from February 2017 to February 2019. All patients were nil by mouth according to standard starvation protocol. IV line secured and prophylactic antibiotic given. All patients premeditated with inj. Fentanyl 2 µg/kg and inj. Midazolam 0.01 mg/kg. Pulse oxy-meter ECG attached and vitals evaluated. After induction, inj. Rocuronium 0.9 mg/kg or Inj. vecuronium 0.1 mg/kg or Inj. Atracurium 0.5 mg/kg given.

**Results:** Rocuronium provide early intubation condition then Vecuronium (90+/-30.6 in R group, 174+/-20.6 in V group, 180 +/-10.2sec). Cooperman scale for intubation condition was 8/9 (Excellent) in all groups. At 3 min all agents provide clinical acceptable conditions, at 90 sec only rocuronium provide clinical acceptable conditions All NDMR agents are providing Haemodynamic stability through out the study.

**Conclusion:** Rocuronium is good alternative to Vecuronium, & Atracurium for early intubation in paediatric patients.

**Keywords:** Rocuronium, Vecuronium, Atracurium, Intubation Agents, Paediatric Patients, TOF (Train of Four) Guard, NDMR (Nondepolarising Muscle Relaxant)

## MATERIAL AND METHODS

Study was done in VS General hospital, NHLM Medical college Ahmedabad Gujarat, from February 2017 to February 2019. Sample was estimated according to pilot study of 5 patients in each group, sample size calculation done as 25 patients in each group & total 75 patients

**Inclusion criteria:** Paediatric patients of age group 2-10 years, ASA grade I/II, duration of surgery more than half hour

**Exclusion Criteria:** Children less than age of 2 years, & more than 10 years, ASA grade III/IV, Duration of surgery less than or equal to half hour.

### Group Allocation

#### Group Allocation

Group Allocation was done by randomised sealed opaque envelope method.

Randomisation was done by Randomisation table on line Execution of group allocation by sealed opaque envelope at time of General Anaesthesia.

Group R (n=25)- Inj. Rocuronium 0.9 mg/kg

Group V (n=25)- Inj. Vecuronium 0.1 mg/kg

Group A (n=25)- Inj. Atracurium 0.5 mg/kg

Starvation Protocol: All patients were starved in standard manner.<sup>2,5</sup>

All patients were evaluated day before surgery thoroughly and optimized medically. After approval of institutional committee & informed consent of patients, this randomized controlled double blinded study was carried out in 75 elective paediatric patients of ASA grade I/II, age of 2 to 10 years for

## INTRODUCTION

Succinylcholine is short acting depolarising muscle relaxant used commonly since decades.<sup>1,2</sup> There are some contraindications for its usage as, hyperkalemia, muscular dystrophy, malignant hyperthermia etc. So there is need of short acting non depolarising muscle relaxant. we have compared 3 different Non Depolarising muscle relaxant (NDMR).<sup>3,4,5</sup> Rocuronium steroidal Non depolarization Muscle Relaxant having Rapid onset of action & intermediate duration of action & good hemodynamic stability. Rocuronium is ORG 9426, 2 Morpholino-16 allyl Pyrrolidino derivative of 3-Hydroxy analog of vecuronium with NM potency of 1/5 of Vecuronium.<sup>6,7</sup>

Main objective of study was to evaluate intubation condition with Rocuronium. After administration of 3\*ED<sub>95</sub> 0.9 mg/kg with Vecuronium 0.1 mg/kg & Atracurium 0.5 mg/kg in paediatric cases as it has excellent hemodynamic stability. We have used TOF guard as main parameter to assess NMDA.

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different surgeries who required General Anaesthesia were randomly enrolled for study.

All patients nil by mouth according to standard starvation protocol. IV line secured and prophylactic antibiotic given. All patients premeditated with inj. Fentanyl 2 µg/kg and inj. Midazolam 0.01 mg/kg. Pulse oxy-meter ECG attached and vitals evaluated.

Nerve stimulator TOF guard of INMED applied to forearm to stimulate ulna Nerve. Reference electrode place on palmar surface of base of index finger. Active electrode between thumb and index finger. Test hand was immobilized in supine position by arm board. Free movement during thumb adduction was allowed by fixation of extended ulnar side fingers by adhering tapes.<sup>8</sup>

Patients were pre-O<sub>2</sub> by 100% O<sub>2</sub> Anesthesia was given with Inj. Ketamine 2mg/kg & Inj. Rocuronium 0.9mg/kg or Inj. Vecuronium 0.1mg/kg<sup>8,9,10,11</sup>, & inj. Atracurium 0.5 mg/kg according to group Allocation. Before administration of any relaxants, supra maximal stimulus was determined by help of TOF guard by contraction of Adductor pollicis & Flexor digitorum muscles. Thumb adduction was quantified via force displacement transducer. Injection time of of Muscle relaxant was noted. Every one sec. Single twitch was given till 100% suppression of control of twitch response. Same blinded anesthetist assessed intubation condition by Cooper scale.<sup>9</sup>

#### Cooper et al Scale (Scoring of intubation condition)<sup>9</sup>

Score	Jaw relaxation	Vocal Cord Movement	Response to intubation
0	Poor (impossible)	Closed	Severe Coughing or bucking
1	Minimal (difficult)	Closing	Mild Coughing
2	Moderate (fair)	Moving	Slight Diaphragmatic movement

total Score : 8-9 =Excellent 6-7 =Good

3-5 =Fair 0-2 =Poor

Score of 6 or more is clinical accepted intubation condition. core less than or equal to 5 is clinically unaccepted intubation condition.

After intubation ET Tube was fixed by checking equal bilateral air entry. after intubation nasal infant feeding tube was introduced. Patient was put on ventilator (Pressure

mode).ETCO<sub>2</sub> & Spo<sub>2</sub> were monitored through out operation.

#### STATISTICAL ANALYSIS

It was done with SPSS software version, 16 (IBM, Armonk, NY, USA) & ANOVA test of. Variance

P>0.05 was considered not significant.

P<0.05 was considered significant.

P<0.001 was considered Highly significant.

#### RESULTS

Table 1 shows comparable Demographic parameters in each group. Table 2 shows onset & duration of action of each relaxant. It shows that Rocuronium provides statistical significant early clinical acceptable intubating conditions as well as longer duration of action.(p<0.001). Table 3 (A) & (B) shows that there were stable comparable Haemodynamic changes during study in each group.

#### DISCUSSION

Our result support that onset of motor blockage and vocal cord and diaphragm is earlier with rocuronium than vecuronium & Atracurium. (P<0.05)

Okelly et al. Studied pharmacokinetics of rocuronium in pediatric patient and concluded that weight Rather than surface area is more useful for calculation of dosage in pediatric patients depending on this. We choose bolus dose of rocuronium 0.9 mg/kg (3\*ED<sub>95</sub>)<sup>12</sup>

In all groups good clinical acceptable intubating conditions achieved.<sup>13,14,15</sup>

W.M sahramn, K. strasser and C.K. Spiss studied that onset time in their study for rocuronium (0.6mg/kg) onset was 142 second and for vecuronium 192 second.<sup>10</sup> In our study rocuronium (0.9mg/kg) was used and onset was early.

TOF at intubation was comparable in each group.(p>0.05)

In R group 22 patients have 100% suppression of supramaximal stimulus and 3 have 95% suppression. In V group 21 patients have 100% suppression and 4 have 90% suppression of supramaximal stimulus. With intubation dose in group A 22 patient intubated within 60 sec. And 3 patients within 90 sec. With V group 21 patients within 2.4 min. And 4 patients within 3 min. Onset time is shorter with R group (90±30.4 sec.) than with V group (174±20.6)sec & A group (180 +/-10.2)sec.(p<0.001).

Parameters	Group R (n=25)	Group V (n=25)	Group A (n=25)	P value	Inference
Mean Age (Years)	7±1	6±1	6±2	>0.05	NS
Mean Wt. (Kg)	10±3	11±2	10±2	>0.05	NS
Sex (Male:Female)	19:6	20:5	18:7	>0.05	NS

**Table-1:** Demographic data

Parameter	Group R	Group V	Group A	P value	Inference
Onset Time of Relaxation (Seconds)	90±30.4	174±20.6	180±10.2	P<0.001	HS
Duration of Action (minutes)	18±6	20±5	15±3	P<0.001	HS
TOF at intubation	2±0.2	2±0.1	2±0.1	P>0.05	NS

**Table-2:** Onset and duration of relaxation

(A)Heart Rate/Min					
HR(/min)	Resting	After induction.	1 min After intubation	3 min After intubation	5min AfterIntubation
Group R	110±8	112±10	118±9	113±8	108±8
Group V	106±7	108±8	110±5	108±5	106±5
Group A	105±4	108±5	110±4	107±6	105±3
P value	>0.05	>0.05	>0.05	>0.05	>0.05
(B)Mean arterial Pressure (mmHg)					
MAP (mm of Hg)	Resting	After induction.	After intubation at 1 Min.	3 Min.	5 Min.
Group R	55±5	56±4	58±3	59±2	60±4
Group V	54±6	55±2	58±5	60±5	59±3
Group A	52±8	54±4	55±3	60±2	60±3
P value	>0.05	>0.05	>0.05	>0.05	>0.05

**Table-3:** Haemodynamic parameters

W.M sahramn,K.strasser and C.K. Spiss studied that there are no changes in HR and MAP in neurosurgical patients.<sup>10</sup> M.Naguib, A.H Samarkandi and associates have studied histamine release haemodynamic changes produced by rocuronium, vecuronium, mivacurium and tubocurarine. they found no significant change in HR and in MAP in all groups.<sup>11</sup>

All 3 groups R, V, A Groups score was 8-9. Quality of neuromuscular junction block was comparable by intubating conditions. Early blockage of laryngeal muscle rather than adductor pollicis by Rocuronium and ease of intubation can not be judge by depression of single twitch. All the patients in R group. Have no diaphragmatic movement.

J. F. Curl and colleagues observe good intubation condition even with 0.6 mg/kg of Rocuronium at 45 sec. With propofol and Fentanyl. Fentanyl is short acting opioid as hypnotic as well as analgesic effect. Curl also used propofol which relaxes laryngeal muscles so that they could intubate in shorter duration with less dose.<sup>13</sup> Fuchs Buder and Tassongi demonstrated increase dose of 0.6 to 0.9 mg/kg of rocuronium in children significantly decrease onset of action and prolong duration of action.<sup>14</sup>

Susan Woelfel found clinical duration 26.7±1.9 min. Stoddart observed 24.2±6.6 min. In our study it was 28 min. Which is due to 2 ED95 dose as well as summative effect of rocuronium and Fentanyl.<sup>15,16,17</sup>

## CONCLUSION

In nutshell we conclude that Rocuronium is a better alternative to vecuronium & Atracurium as a intubation as it provides better hemodynamic stability and early clinical acceptable intubating conditions.

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