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ASSESSMENT OF ROCURONIUM EFFECTIVENESS FOR PAITENTS

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ABSTRACT

The study is based on succinylcholine which is a routine muscle relaxant for pediatric patients. Rocuronium is newer non depolarizing muscle relaxant. The objective of this study was to assess time, course and duration of both relaxants as well as intubation conditions. This study was blind and randomized in nature and conducted to test the intubating conditions with two separate kind of muscle relaxants in 50 ASA grade I and II pediatric patients who fall in age category of 2 to 6 years who undergone surgery of less than half an hour. Patients were anaesthetized with injection rocuronium 0.9 mg/kg i.v. or with injection succinylcholine 1.5 mg/kg after injection fentanyl 1ug/kg and injection thiopentone 5 mg/kg. The assessment of Neuromuscular blockade was conducted with twitch response of adductor pollicis longus after supra-maximal stimulation of ulnar nerve. We assessed Tracheal intubating conditions using the blinded anesthetist after 1 month and every 15 seconds till patient got intubated. The time of onset and percentage of neuromuscular blockage was also assessed.

Keywords: Neuromuscular Relaxant, Pediatric Patients, Succinylcholine, Rocuronium TOF Guard, Intrapotic Pressure.

INTRODUCTION

The nature of this study is randomized blind study and it was conducted to assess the intubating conditions with two separate muscle relaxants in 50 ASA grade I and II pediatric patients who were in age group of 2 years to 6 years age group who undergone surgery of less than half an hour. Rocuronium 0.9 mg/kg i.v. or injection succinylcholine 1.5 mg/kg after injection fentanyl 1ug/kg and injection thiopentone 5 mg/kg was used for anaesthetizing the patients. We assessed Neuromuscular blockage using the twitch response of adductor pollicis longus after supra-maximal stimulation of ulnar nerve. Tracheal intubating conditions were judged by blinded anaesthetist after 60 seconds and then after every 15 seconds until patient got intubated. We also assessed percentage of neuromuscular blockage and time of onset after this. Onset of time and duration of action were more in case of rocuronium group as compared to succinylcholine group. Succinylcholine is a depolarising muscle relaxant used for speedy endotracheal intubation. It is in use for last several decades. However, number of complications are reported such as raised IOP, malignant hyperthermia, asystole, and bradycardia. Because of danger of hyperkalemic cardiac arrest after succinylcholine in children with unrecognized muscular dystrophy 1-4 there have now seen moves to limit the use of succinylcholine in children [1,2,3,4,5,6, 7, 8]. It is also argued that there is good reason for not using the succinylcholine if another drug had the same advantage with fewer side effect.

Rocuronium is a steroidal, non-depolarizing neuromuscular blocking agent having rapid onset of action and intermediate duration of action and good hemodynamic stability, having neuromuscular potency about 1/5th of vecuronium.

In this study, our focus was to assess the blinded fashion the intubating conditions with rocuronium after 3 *ED 95 0.9 mg/kg was administered while making comparison with succinylcholine 1.5 mg/kg.

ASA grade I and II children were part of this study and focus was to assess the onset of action and intubating conditions with rocuronium, so that whether we could use it when succinylcholine is relatively contraindicated. We have used TOF guard as main parameter to assess the neuromuscular blockage.

METHODS

We took approval of the ethics committee and later took informed consents of parents for administering this study. The study was related to ASA grade I and II patients who were in the age group of 2 years to 6 years. There were total of 50 patients whom we studied as part of this study. Those patients who were having some problems such as neuromuscular disorder, airway problems, or some who receiving some medication related to neuromuscular blocking agent were not included in this study.

IV lines secured and all patients premedicated with injection atropine 0.01 mg/kg and injection fentanyl 1 ug/kg. After premedication, pulse oximeter and noninvasive BP monitor were attached. Evaluation of vital organs were conducted. Electrodes of nerve stimulator TOF guard were applied to forearm to stimulate the ulnar nerve. Active electrode on the palm at apex of interphalangeal space between thumb and index finger. Reference electrode placed on palmar

surface of base of index finger. Test hand was immobilized in supine position using arm board. Free movement during evoked thumb adduction was allowed by fixation of the extended ulnar fingers by adhesive tape.

100% oxygen was used for preoxygenated to patients. Anaesthesia was given with injection thiopentone sodium 5 mg/kg and injection rocuronium 0.9 mg/kg or injection scoline 1.5 mg/kg . Before administration of any relaxants, supramaximal stimulus was determined with the help of TOF guard by contraction of adductor pollicis and flexor digitorum. The thumb adduction was quantified via force displacement transducer. Time of injection of relaxant was noted. Every one second single twitch was given till 100% suppression of control of twitch response. Same blinded anesthetist assessed intubating conditions by using Goldberg scale. Maintenance of anesthesia was carried out with 40% oxygen and 60% nitrous oxide and 0.5% to 0.8% intermittent sevoflurane. After the surgery, in R group neuromuscular blockade was reversed with injection atropine 0.02 mg/kg IV and injection neostigmine 0.05 mg/kg IV. Significance of difference between two groups was determined by Chi square test. Significance assessed by <0.05 .

During operation heart rate and noninvasive blood pressure were determined by cardio cap monitor at one-minute interval during the first 30 minute of operation, and then 3 minutes thereafter. Oxygen saturation and expiratory carbon dioxide monitoring done throughout the operation. Normocapnia and normal body temperature maintained throughout operation.

RESULTS

Results are as follows.

Table 1: Demographic Characteristics

	R (n=25)	S (n=25)	P value
Age (Years)	3.45 +/- 0.98	3.67 +/- 1.11	>0.05
Weight (Kg)	11.56 +/- 1.23	10.67 +/- 1.87	>0.05
Sex (M/F)	15/10	14/11	>0.05

Turkey test was used to determine the significant statistical differences between both pairs. Results shows that the results for both pairs on variables of age, weight, and gender were insignificant.

Table 2: Time, Course and Action (in minutes)

	R (n=25)	S (n=25)	P value
Onset time	88 +/- 34.33	67.4 +/- 10.98	<0.001
Clinical duration	31 +/- 7	10 +/- 4	<0.001

In rocuronium group, 100% suppression of supramaximal stimuli was found among 18 patients; and 95% suppression was found among 7 patients. In scoline group, 100% suppression was found among 20 patients, and 94% suppression was found among 5 patients. 5 patients intubated

in 90 seconds, and 20 patient intubated in 60 seconds after administering dose of rocuronium. In scoline group, all 25 patients intubated within 60 seconds. Onset time was shorter with scoline (5.325 +/- 10.25 seconds) than with rocuronium (101.2 +/- 27.98 seconds). $P < 0.001$.

Table 3: SCORING OF INTUBATING CONDITIONS

Score	Jaw Relaxation	Vocal Cords	Response to itubation
0	Poor	Closed	Severe Coughing
1	Minimal	Closing	Mild Cough
2	Moderate	Moving	Slight diaphragmatic movement
3	Good	Opened	None

Total score of 8-9 excellent, 6-7 good, 3-5 fair, 0-2 poor. In both R and S group, total score of 8-9 was observed. ($P > 0.05$).

DISCUSSION

Our objective of study was to make comparison of intubating conditions by utilizing 0.9 mg/kg rocuronium or with scoline 1.5 mg/kg to establish whether rocuronium could provide good intubation conditions in comparison to scoline and be the ideal choice in case scoline is contraindicated. Malignant Hyperthermia association of US and Germany strongly advice discontinuation of scoline due to its negative side effects such as acidosis, rhabdomyolysis, hyperkalemia, and cardiac arrest [9,10,11].

O' Kelly B et al [12] studied pharmacokinetics of rocuronium in pediatrics patients and concluded that weight rather than surface area is more useful for calculations of doses in pediatric patients. Depending on these, we choose the bolus dose of rocuronium 0.9 mg/kg (3*ED95). Quality of neuromuscular block at larynx was comparable by intubating score.

Earlier blockage of laryngeal muscles rather than adductor policies by rocuronium and ease of intubation could not be judged by depression of single twitch. All the patients in rocuronium group had excellent or good intubating conditions when no diaphragmatic activity. It is very useful when scoline is relatively contraindicated.

J.F.Curl [11,12,13] and colleagues observed good intubating conditions with rocuronium at 45 sec with 0.6 ug/kg with propofol and fentanyl with 2ug/kg. Here we used fentanyl as analgesic agent.

Fentanyl is short acting opiod and has hypnotic effect on patients. Curl and associates also used propofol, which relaxes laryngeal muscles, so they could intubate in 45 seconds as we were in 60 seconds. Fuch's budder and Tassonyi [9] documented that increased dose of rocuronium 0.6 to 0.9 mg/kg in children significantly decreased onset of action and prolonged duration of action.

Susan woelfel [13] found clinical duration of 26.7 +/- 1.9 minutes with 0.6mg/kg. stoddart observed 24.2 +/- 6.6 minutes. In our study duration of action was 28 minutes, which was with

dose of 0.9mg/kg rocuronium. Effect could be prolonged due to more doses and also due to summative effect of rocuronium and fentanyl.

Considering the longer duration of onset with rocuronium our study seems surprisingly specially if one considers that succinylcholine was administered with a dose of 4.5*ED95. While rocuronium was administered with a dose of 2 * ED95. 17.

Our result support the hypothesis that onset of motor blockage of vocal cords and diaphragm after rocuronium does not significantly differ from succinylcholine.

CONCLUSION

Pre induction administration of opioids significantly improved condition of intubation with rocuronium. In summary, our conclusion is that injection rocuronium 3*ED95(0.9 mg/kg) can be used as an alternative to scoline in pediatric patients where scoline is contraindicated.

Conflict of Interest

Author declare no conflict of interest

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