

COMPARATIVE STUDY OF 3*ED95 ROCURONIUM VERSUS SUCCINYLCHOLINE A INTUBATING AGENT IN A PEDIATRIC PATIENT

DR.SHRUTI DESAI(Resident in anaesthesia, VS GH,NHLM Medical college, Ahmedabad)

DR MANISHA S.KAPDI(Associate professor in Anaesthesia, VSGH,NHLM Medical college ,Ahmedabad)

Corresponding author: Dr.Manisha kapdi :manisha_ kapdi@yahoo.com

Key words : neuromuscular relaxant, succinylcholine, pediatric patients, rocuronium TOF guard
TOF : TRAIN OF FOUR, IOP : INTRAOPTIC PRESSURE

Abstract

Background: succinylcholine is routine muscle relaxant for paediatric patients. Rocuronium is newer non depolarising muscle relaxant.

Aims & objectives: To assess time, course and duration of both relaxants as well as intubation conditions.

Material & Methods:

The randomized blind study was carried out to evaluate the intubating condition with two different muscle relaxants in 50 ASA grade I and II pediatric patients with age group of 2-6 years, having duration of surgery less than 30 minutes. 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. Neuromuscular blockade was assessed by twitch response of adductor pollicis longus after supra- maximal stimulation of ulnar nerve. Tracheal intubating conditions were assessed by blinded anaesthetist after 60 seconds and then after every 15 seconds, till patient got intubated. Along with this, time of onset and percentage of neuromuscular blockage was also assessed.

Observations and results:

Time course and duration of action were more in case of rocuronium group as compared to succinylcholine group. Intubating conditions are comparable in both groups

key words: 3*ED95 Rocur IIM, succinylcholine, paediatric patients, TOF guard

Introduction

The randomized blind study was carried out to evaluate the intubating condition with two different muscle relaxants in 50 ASA grade I and II pediatric patients with age group of 2-6 years, having duration of surgery less than 30 minutes. 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. Neuromuscular blockade was assessed by twitch

response of adductor pollicis longus after supra- maximal stimulation of ulnar nerve. Tracheal intubating conditions were assessed by blinded anaesthetist after 60 seconds and then after every 15 seconds, till patient got intubated. Along with this, time of onset and percentage of neuromuscular blockage was also assessed. Onset of time and duration of action were more in case of rocuronium group as compared to succinylcholine group.

TOF : TRAIN OF FOUR, IOP : INTRAOPTIC PRESSURE

Succinylcholine is a depolarising muscle relaxant for rapid endotracheal intubation used since decades, but its use is associated with a number of complications, eg. Bradycardia, asystole, malignant hyperthermia, raised IOP etc., so need of depolarizing neuromuscular relaxants with which the onset of action is rapid is there. 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 . 7-8. Hophkins 8 has indicated that there would be good reason not to use 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.

Objective of the study was to evaluate in blinded fashion the intubating condition with rocuronium after administration of 3 *ED 95 0.9 mg/kg, in comparison to succinylcholine 1.5 mg/kg.

Present study was done in ASA grade I and II children 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

After approval of ethical committee and informed consent of parents, this randomized double blind study was carried out in ASA grade I and II patients of age 1-5 years. This study was carried out with 50 patients. Patients with airway problems, neuromuscular disorders or receiving medication known to interact with neuromuscular blocking agents were excluded. IV lines secured, & 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. Vitals of patient evaluated. 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.

Patients were preoxygenated with 100% oxygen. 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 anaesthetist assessed intubating conditions by using Goldberg scale. Maintenance of anaesthesia 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 non invasive 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 through out the operation. Normocapnia and normal body temperature maintained through out operation.

Results

Demographic characteristics

	R (n = 2 5)	S (n = 2 5)	P value
A g e (y r s)	4 . 1 5 +/- 1 . 2 8	4 + / - 1 . 2 9	> 0 . 0 5
W e i g h t (k g)	1 2 . 2 0 +/- 2 . 2 8	1 2 . 1 5 +/- 2 . 6	> 0 . 0 5
S e x (M / F)	1 6 / 9	1 8 / 7	> 0 . 0 5

Statistical significance of different variables were determined by TURKEY'S TEST or STUDENT' TEST for paired and unpaired variables as indicated. $P < 0.05$ was considered significant.

Time, course and action(in minutes)

	R (n = 2 5)	S (n = 2 5)	P value
O n s e t t i m e	9 0 +/- 3 0 . 4 7	6 2 . 8 +/- 1 1 . 2	< 0 . 0 0 1
Clinical duration	2 8 + / - 6	9 + / - 3	< 0 . 0 0 1

In rocuronium group, 18patients had 100% suppression of supramaximal stimulus and 7 had 95 % suppression. While in scoline group, 20patients had 100% suppression and 5 had 94% suppression. With intubating dose of rocuronium, 20patients were intubated in 60 seconds and 5 patients in 90 seconds. In scoline group all the 25 patients were 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.

Scoring of intubating conditions

s c o r e	j a w r e l a x a t i o n	v o c a l c o r d s	Response to intubation
0	p o o r	c l o s e d	severe coughing
1	M i n i m a l	C l o s i n g	Mild coughing
2	M o d e r a t e	M o v i n g	Slight diaphragmatic movement
3	g o o d	O p e n e d	n o n e

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

The aim of our study was to compare the intubating condition by using 0.9 mg/kg rocuronium or with scoline 1.5 mg/kg to confirm that rocuronium could provide good intubation condition as compared to scoline,& be the ideal choice in case scoline is contraindicated. MALIGNANT HYPERTHEMIA association of US and Germany, strongly advises discontinuation of scoline because of its side effects like intractable cardiac arrest, hyperkalemia, rhabdomyolysis, acidosis and even death in apparently healthy children.

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 pollicis 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) an 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 opioid 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 0.6 mg/kg. Stoddart observed 24.2 +/- 6.6 minutes. In our study duration of action was 28 minutes, which was with dose of 0.9 mg/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 special 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 results support the hypothesis that onset of motor blockage of vocal cords and diaphragm after rocuronium does not significantly differ from succinylcholine. 21.

Pre induction administration of opioids significantly improved condition of intubation with rocuronium.

In nutshell, we conclude that injection rocuronium 3*ED95(0.9 mg/kg) can be used as an alternative to scoline in pediatric patients where scoline is contraindicated.

References

1. Dolphin E, Jackson D. Use of succinylcholine during elective pediatric anaesthesia. *Anesth analg* 1987, 66.. 1190 to 1192
2. Meakin G, Walker R W. Myotonic and neuromuscular blocking effect of increase dose of succinylcholine in infant and children. *British journal of anaesthesia* 1990, 65.. 816 to 818.
3. Rosenberg H. intractable cardiac arrest in children with succinylcholine. *Anaesthesiology* 1992, 77.. 1054
4. Sullivan M Thompson WK Hill GD. Succinylcholine induced cardiac arrest in children with undiagnosed myopathy. *Canadian journal of anaesthesia* 1994.. 41 497 to 501.
5. Badgwell JM Hall SC, Lockhan C. revised label regarding use of succinylcholine in children adolescent anaesthesiology 1994, 80.. 243 to 245.
6. Goudsouzaian NG. Recent changes in package insert for succinylcholine should the drug be contraindicated in routine use in children and adolescent. *Anaesthesia and analgesia*. 1995, 80.. 207 to 208.
7. Bevan DR Succinylcholine *Canadian journal of anaesthesia* 1994 41.. 465 to 468.
8. Hopkins PM. Use of succinylcholine in children. *British journal of anaesthesia*. 1995, 75.. 675 to 677
9. Fuchs Budder T. Tassonyi E. intubating condition and time course of rocuronium induced neuromuscular block in children. *British journal of anaesthesia* 1996, 77.. 335 to 338.

10. Kali I. Effect of surface electrode positioning on the compound action potential evoked by ulnar nerve stimulation in anaesthetized infant and children. *British journal of anaesthesia*. 1988, 62.. 188 to 193.
11. J F Curl, V. vanbellegham. Rocuronium with alfentanil and propofol allows intubation within 45 seconds. *European journal of anaesthesia* 1995, 82.. 111 to 112.
12. Okelly B Frosad J. Neuromuscular blockage following rocuronium ORG 9426 in children during N2O halothane anesthesia. *Anaesthesiology* 75 : A787 1991.
13. Sussan Woelfel K. Brandom BW, Cook R. effect of bolus administration of ORG 9426 in children during N2O halothane anaesthesia. *Anaesthesiology* 1992, 76.. 939 to 942.
14. Wright PM, Caldwell JE, Miller RD. Onset and duration of rocuronium and succinylcholine at the adductor pollicis and laryngeal muscles in anaesthetized human. *Anaesthesiology* 1994, 81.. 1110 to 1115.
15. Comparison of intubating conditions after rocuronium and vecuronium when the timing of intubation is judged by clinical criteria.
Smith I ; Saad Rs, *British journal of anaesthesia*, feb 1998.
16. Tracheal intubation with rocuronium using the "timing principle "
Seiber TJ; Zbinden AM ; Curatolo M; Shorten GD.
Anesth analg (united states) may 1998.
17. Clinical pharmacokinetics of rocuronium bromide.
Khuenl Brady Ks; Sparr H.
Clin pharmacokinetic (New Zealand) sep 1996
18. Comparison of intubating conditions after rocuronium and suxamethonium following rapid sequence induction with thiopentone in elective cases.
Sparr HJ; Luger Tj; Heidegger T.
Acta Anaesthesiology Scand (Denmark) Apr 1996.
19. 1 * ED 90 dose of rocuronium bromide; tracheal intubation conditions and time course of action. Prein T; Zahn P; Menges M;
Eur J Anaesthgesiology suppl (ENGLAND)
SEP 1995.
20. Pharmacodynamics of rocuronium with and without prior administration of succinylcholine.
Dubois MY; Lea DE; Kataria B; Gadde PL.
J- clin Anaesthesia United States, Feb 1995.
Eur J Anaesthesia suppl (ENGLAND) 1994
21. Mielstelman C. Plaud B. rocuronium neuromuscular blockage at the adductor pollicis in human. *Canadian journal of Anaesthesia* 1992, 39.. 665 to 669.