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Original Research Article

A HOSPITAL BASED OBSERVATIONAL STUDY TO COMPARE INTUBATING CONDITIONS OF ROCURONIUM WITH PRIMING AND WITHOUT PRIMING AT TERTIARY CARE CENTRE

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ABSTRACT

Background: Priming principle is a divided dose technique of neuromuscular blocking drug which produces a rapid onset of neuromuscular block and suitable intubation conditions. This randomized, double blind, comparative study was designed to study and compare the efficacy of rocuronium with different priming intervals on the time of intubation and intubating conditions. **Materials and Methods:** Sixty patients of ASA physical status I and II, aged between 20-50years, of both sexes were divided into 3 groups of 20 each. Group A received priming dose of 0.06mg/kg of rocuronium followed by 0.54mg/kg rocuronium 3 min later. Group B received 0.06mg/kg followed by 0.54mg/kg rocuronium 2 min later and Group C received saline as placebo followed by 0.6mg/kg rocuronium 3 min later. Time of intubation was assessed using a Train of Four stimuli and the intubating conditions were compared by the Cooper scoring system. **Result:** Patients in all the three groups were comparable in age, gender and ASA physical status distribution. The time of intubation in group A was 58.63±15.29 sec, group B was 105.92±11.56 sec and in group C was 124.71±13.94 sec. The intergroup comparison showed a P value of <0.001 which was statistically significant. Thus, the group A with priming of rocuronium and a priming interval of 3 min showed the least time for intubation when compared to other groups. Clinically acceptable intubating conditions were obtained in all three groups without any adverse effects. **Conclusion:** Priming with rocuronium provides excellent intubating conditions in less than 60 sec and can be used as a safe alternative for succinylcholine in RSI.

INTRODUCTION

Priming principle is a divided dose technique of neuromuscular blocking drug which produces a rapid onset of neuromuscular block and suitable intubation conditions. A priming dose (10% of intubating dose), small enough to cause any unpleasant side effects and large enough to cause moderate inhibition of neuromuscular transmission is used. After 2-4 min, rest of the intubating dose of drug is administered to produce neuromuscular blockade for rapid sequence induction.[1]

Rapid sequence induction using succinyl choline is an established technique in patients at risk of gastric aspiration. But succinyl choline is associated with a number of undesirable side effects like muscle fasciculations, myalgia, hyperkalaemia,[2] bradyarrhythmias,[3] increased intraocular pressure, raised intracranial pressure,[4] increased intragastric pressure, anaphylaxis, malignant hyperthermia and masseter spasm. Hence it cannot be used in several situations.

This has prompted the use of non-depolarizing muscle relaxants for Rapid sequence induction. The onset of action of non-depolarizing neuromuscular blocking drugs can be accelerated by various techniques like use of high doses of an individual agent, combination of relaxants, timing principle or priming technique.[5]

Rocuronium bromide has faster onset time compared with other non-depolarizing muscle relaxants.[6] Its low potency requires administration of more molecules of rocuronium. This action allows effective buffered diffusion and more rapid occupancy of large number of receptors and sensitization of receptors to the subsequently administered bolus.[7] Thus, this study was taken up to study the comparison of intubating conditions between rocuronium with priming and without priming on intubation with rocuronium at tertiary care centre.

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MATERIALS AND METHODS

This is a hospital based randomized double-blind clinical study was conducted in 60 patients, those were coming for abdominal and peripheral limb surgeries under general anaesthesia at a tertiary care hospital during one-year period.

Inclusion Criteria

- Age between 20- 50 years
- ASA physical status 1 and 2
- Weight between 50- 100kgs

Those coming for abdominal and peripheral limb surgeries

Exclusion Criteria

- Patient refusal
- Pregnant females
- Patients with significant hepatic, renal, metabolic disorder, neuromuscular disease
- Those receiving medications known to influence neuromuscular function
- Those with known allergy to rocuronium
- Those with anticipated difficult airway (obesity, thyromental distance < 6 cm, Mallampati grade 3 or 4)

Method of Study

Patients selected for study were briefed about the procedure and written informed consent was taken. Patients were assigned to one of the 3 groups A, B and C randomly by computer generated numbers.

Group A: priming with 0.06mg/kg of rocuronium followed by 0.54mg/kg of rocuronium after 3 min of priming interval.

Group B: priming with 0.06mg/kg of rocuronium followed by 0.54mg/kg of rocuronium after 2 min of priming interval.

Group C: Control group with saline followed by 0.6mg/kg rocuronium after3 min.

In the operation theatre intravenous cannula was secured in the hand opposite to neuromuscular monitoring and balanced salt solution was started. All patients were monitored with electrocardiogram, non-invasive blood pressure monitoring and oxygen saturation with pulse oximetry and baseline values were noted. After explaining about the nerve stimulation technique, supramaximal stimulus was set with a peripheral nerve stimulator.

After pre oxygenation, the priming dose of rocuronium of 0.06mg/kg to group A and B, normal saline to Group C was given. A standard anaesthesia protocol was followed. The patients were enquired about the ptosis, double vision, difficulty in swallowing and difficulty in breathing. They were induced with fentanyl 2mcg/kg and propofol 2mg/k.

Intubating dose of rocuronium of 0.54mg/kg was given to group A after 3 min, 0.54mg/kg of rocuronium to group B after 2 min and 0.6mg/kg to group C after 3 min of priming dose. A supramaximally set Train of four (TOF)stimuli of frequency 1Hz was applied over ulnar nerve at the wrist through surface electrodes every 10 sec and the time for disappearance of T1 of TOF stimuli is noted. Time interval between intubating dose and loss of T1 of TOF stimuli was considered as time of intubation. Intubating conditions were graded as excellent, good or poor based on Cooper scoring system.

The time of intubation and intubating conditions were noted in the 3 groups. Vitals were monitored every 1 min for first 5 mins. Anaesthesia was maintained with isoflurane, nitrous oxide 60% in oxygen and intermittent positive pressure ventilation.

Statistical Analysis: Continuous measurements were presented as mean±SD and categorical measurements were presented in number (%). One-way Analysis of variance (ANOVA) test was used to measure the time of intubation between the three groups and for comparing intubating conditions among the groups. Significance was assessed at 5% level of significance; Statistical analysis was performed using SSPS software version 21.0. Differences yielding P value<0.05 were considered statistically significant.

RESULTS

The gender distribution between the three groups was statistically insignificant (P>0.05). Mean age in group A was 37.6±9.34, in group B was 38.12±8.96 and in group C 40.07±9.44 yrs. With p value of >0.05 the groups are comparable with respect to age. There was no statistically significant difference in the weight between the three groups [Table 1].

The time of intubation in group A was 58.63±15.29 sec, group B was 105.92±11.56 sec and in group C was 124.71±13.94 sec. The intergroup comparison showed a P value of <0.001 which was statistically significant. Thus, the group A with priming of rocuronium and a priming interval of 3 min showed the least time for intubation when compared to other groups [Table 2].

Intubating condition was excellent in 90% of the patients in group A, 85%in group B and 80% in group C. Overall excellent to good intubating conditions were obtained in all patients in the three groups. Inter group comparison of intubation condition showed no statistically significant difference [Table 3].

Table 1: Demographic variables in between three groups

Variables		Group A (N=20)	Group B (N=20)	Group C (N=20)	P value
Sex	Male	9	13	11	>0.05
	Female	11	7	9	
ASA	PS I	14	11	15	>0.05
	PS II	6	9	5	
Age (yrs) (Mean±SD)		37.6±9.34	38.12±8.96	40.07±9.44	>0.05
Weight (kg)		60.42±8.21	61.86±8.78	63.35±8.12	>0.05

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Table 2: Time of Intubation (time interval between intubating dose and loss of T1 of TOF stimuli):

	N	Mean	Std. Deviation	p-value
A	20	58.63	15.29	<0.001
B	20	105.92	11.56	
C	20	124.71	13.94	
Total	60	96.38	30.32	

Table 3: Intubating Conditions.

Group		Intubating Condition		Total	p-value
		Excellent	Good		
A	Count	18	2	20	>0.05
	% within Group alloted to patient	90.0%	10.0%	100.0%	
B	Count	17	3	20	
	% within Group alloted to patient	85%	15%	100.0%	
C	Count	16	4	20	
	% within Group alloted to patient	80.0%	20.0%	100.0%	

DISCUSSION

Succinylcholine has an established role in rapid sequence intubation, but can be associated with many untoward effects. Rocuronium bromide, a steroidal non-depolarising muscle relaxant is useful to produce a rapid onset of action. But the onset time and intubating conditions comparable to succinylcholine can be achieved only by administration of 0.9-1.2mg/kg of rocuronium which can significantly increase its duration of action.[7] However, priming principle can be advocated to shorten the onset time of non-depolarizing muscle relaxant.

Cooper et al,[8] found that clinically acceptable intubating conditions were produced in 95% of patients at 60sec and in all patients at 90sec with rocuronium. Intubating conditions were excellent with succinylcholine at both the time intervals.

A priming dose of 10% of the standard intubating dose (2*ED95),[9] and a priming interval of 3-4 minutes has been recommended as a safe and effective technique. This study was conducted to determine the efficacy of priming on intubation with rocuronium. Singh et al,[10] had shown that with 0.6mg/kg rocuronium and 1.5mg/kg succinylcholine, the time to achieve maximum blockade was 87.94 and 65.59 sec respectively. Comparable intubating conditions were obtained in the two groups at 60 sec. Hanumantha Rao et al,[6] used a priming dose of 0.06mg/kg rocuronium in one group followed by 0.54mg/kg of rocuronium 3 mins later. The control group received saline followed by 0.6mg/kg after 3 mins. The onset time of intubation was 50.6±7.4s in the priming group and 94.0±11.62s in the control group, with excellent intubating conditions in both the group. In accordance with the results of the above two studies, dose of 0.6mg/kg,[11] rocuronium with a priming dose of 0.06mg/kg,[12] (10% of intubating dose) was chosen for our study.

Griffith et al,[7] compared priming and non-priming by giving a priming dose of 0.06mg/kg rocuronium followed 2 min later by 0.54mg/kg rocuronium and another group given directly 0.6mg/kg rocuronium. Onset times were 34±6s with priming and 59±14s without priming. Based on the results of the above study, we had compared two priming intervals of 3 min and 2 min against a control group with no priming in our study. We found that the onset time of intubation (loss of T1 of TOF) was 58.63±15.29 sec in priming group with 3 min and 105.92±11.56 sec in priming group with 2 min priming interval. The onset time was 124.71±13.94 sec in the control group. The primed group with priming interval of 3 min showed statistically significant decrease in the onset time of intubation with rocuronium.

A study was conducted by Naguib et al,[13] found that their onset time after priming with rocuronium was 73 sec which was higher when compared to our study. One of the major drawbacks of priming dose is the occurrence of adverse effects such as weakness, diplopia, dysphagia, generalized discomfort and breathing difficulties.[6]

A study done by Aziz et al,[14] found that priming doses of vecuronium and rocuronium produced greater decreases in oxygen saturation and PFT in elderly (aged 65-73 yrs) than their younger (25-35yrs) counterparts. None of the patients in our study had evidence of such adverse effects. The absence of subtle symptoms of muscle weakness following priming may be attributed to smaller priming dose used and administration of fentanyl 1 min after the priming dose.

Claude Meistelman,[15] concluded that rocuronium onset and recovery was faster at the laryngeal adductor muscles, but blockade is less intense than at the adductor pollicis. We chose adductor pollicis muscle for monitoring neuromuscular blockade in our study for the ease of monitoring. Hanumantharao et al,[6] found no increase in heart rate or blood pressure following rocuronium administration. They observed slight increase in HR and MAP 1 min post intubation, which was attributed to stress response to intubation. Shorten compared elderly patients given rocuronium 0.9mg/kg with patients given vecuronium 0.12mg/kg and found no significant change in heart rate, arterial blood pressure or plasma epinephrine concentrations in either group.

In our study the hemodynamic variables measured every min for 5 min following intubation showed no statistically significant variations among the three groups. Jaw relaxation, position of vocal cords, response to intubation (coughing, bucking or

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muscular movements) and absence of twitches to train of four stimuli were assessed just before intubation and intubating conditions were graded as excellent, good and poor depending upon the score. All the patients in our study had excellent to good intubating conditions which was clinically acceptable. This was similar to the results of studies by Naguib et al,[5] Hanumantha rao,[6] and Karl Griffith.[7] Thus, we found a shorter onset time of intubation of 58.63±15.29secin the priming group with 3 min priming interval. The intubating conditions were excellent too good in all the groups in our study.

CONCLUSION

We conclude that the onset time of intubation after priming with 10% (0.06mg/kg) of an intubating dose (0.6mg/kg) of rocuronium and a priming interval of 3 min was 58.63±15.29 sec. This was significantly lower than the other groups with 2 min priming interval (105.92±11.56sec) and without priming (124.71±13.94sec). Thus, rocuronium with priming can be used as a safe alternative to succinylcholine in rapid sequence induction.

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