

Comparision of Intubating Conditions at 60 Seconds with Different Doses of Rocuronium Using the Train of Four Monitoring

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Abstract

Objective: To evaluate the intubating conditions with rocuronium at 0.6mg/kg (2*ED95) and 0.9mg/kg (3*ED95) at 60 seconds using the timing principle. *Methods:* 60 patients were divided into 2 groups of 30 each. Group A received 0.9mg/kg and group B received 0.6mg/kg of rocuronium. Intubation was done at 60 s. The Train of four monitoring was done at the adductor pollicis muscle. The TOF count at intubation and time to loss of TOF were noted and compared. *Results:* Intubating conditions were excellent 13 (65%) in group A compared to 9 (45%) in group B and was statistically significant. The TOF count at intubation was not statistically significant (p=0.677) between the groups where as time to loss of TOF (p=0.03) were significant between the groups. *Conclusion:* Intubating conditions were better in group A in comparision with group B but both the groups provided clinically acceptable conditions for intubation. The use of train of four count at the adductor pollicis as a guide for laryngeal muscle paralysis is questionable.

Keywords: Rocuronium; Train of Four; Intubating Conditions.

Introduction

A rapid sequence induction of anaesthesia and endotracheal intubation are indicated in emergency situations in the presence of full stomach or conditions with increased risk of aspiration.

The ease with which endotracheal intubation is performed depends upon degree of muscle relaxation, depth of anaesthesia and skill of anaesthesiologists.

Succinyl choline has been for a long time the NMBD (Neuro muscular blocking drug) of choice for RSII (Rapid sequence induction and intubation), because of the quick onset along with excellent intubating conditions. However it is desirable to look for an alternative due to its side effect profile.

Rocuronium bromide, a non depolarising neuromuscular blocking drug has a faster onset of

action with a stable hemodynamic profile. The TOF(Train of Four) pattern of twitch stimulation was developed in 1970 by Ali [1] and colleagues, in an attempt to provide a clinical tool to assess neuromuscular block in the anaesthetized patient. The pattern involved stimulating the ulnar nerve with a TOF supramaximal twitch stimuli, with a frequency of 2 Hz, that is, four stimuli each separated by 0.5 s. The TOF was then repeated every 10 s [2].

When a non-depolarizing agent is given, a typical pattern is observed. The number of twitches (TOF count) correlates with the degree of neuromuscular block.

With this basic knowledge in our study we evaluate the intubating conditions with rocuronium at 0.6mg/kg (2*ED95) and 0.9mg/kg (3*ED95) at 60 seconds using train of four monitoring.

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Received on 30.04.2018, Accepted on 10.05.2018

Materials and Methods

Study Area

Department of Anaesthesiology, SSIMS-RC, Davangere.

Study Population

Adult general anaesthesia cases in ENT OT.

Study Duration: 2 months (June-July 2017)

Sample Size

Based on the proportions taken from the previous study [3] sample size was estimated using appropriate formula and power of the study to be 80% and 95% significance level. And the total calculated sample size was 20 in each group.

Randomisation

Cases were randomly allocated to 2 groups by using block randomisation method, in which all the odd numbers were categorised to group A and even numbers to group B.

Group A: Patients receive rocuronium 0.9 mg/kg as a bolus dose

Group B: Patients receive rocuronium 0.6mg/kg as a bolus dose.

Methodology

After the approval from the institutional ethical committee, written informed consent were taken from the patient. Exclusion criteria included ASA 3 and 4, Mallampati grade 3 and 4, Anticipated difficult airway, Neuro muscular disorders and Allergy to the drugs.

After the pre anaesthetic evaluation, the patients were fasted overnight. On the day of surgery, antacid prophylaxis was given in the morning. The patient was shifted to OT (operation theatre), an appropriate size cannula secured. Basic monitors such as ECG, Pulse oximeter, NIBP (Non invasive blood pressure) were attached and the baseline reading noted. The nerve stimulator applied to ulnar border of the forearm and its monitor is also attached.

Patients were premedicated with glycopyrrolate 0.01mg/kg and fentanyl 2mcg/kg. Preoxygenated for 3 minutes.

Variables	Intubating Conditions		
	Excellent	Acceptable	Unacceptable
Ease of laryngoscopy	Easy	Good	Difficult
Vocal cord position	Abducted	Intermediate	Closed
Vocal cord movement	None	Moving	Closing
Airway reaction	None	Diaphragm	Sustained
Movement of limbs	None	Slight	Vigorous

Patients were induced with propofol 2mg/kg. After loss of eye lash reflex a baseline TOF (Train of Four) count is taken and rocuronium was administered.

Neuromuscular monitoring using the train of four at the adductor pollicis muscle is commenced. At 60 s a TOF count is recorded and tracheal intubation is done by an experienced anaesthesiologists. The time to loss of TOF will be noted.

Intubating conditions will be assessed as excellent, good and poor according to the grading scale based on criteria of good clinical practice [4].

SBP (Systolic blood pressure), DBP (Diastolic blood pressure), HR (Heart rate), and SpO₂ (oxygen saturation) were recorded at intubation, 1, 3 and 5 minutes following intubation.

Statistical Analysis

Statistical tests used were descriptive statistics (mean age, weight) chi square test (Yates correction wherever required) and software used was SPSS version 20.

Results

The intubating conditions were excellent in 13 (65%) in group A and 9 (45%) in group B. And they were good in 7(35%) in group A and 11(55%) in group B. (Table 1,2 and Graph 1).

There was no statistically significant difference in TOF at intubation between the groups whereas time to the loss of TOF was significantly different. (Table 3).

Table 1: Table showing the comparison of assessment of intubating conditions

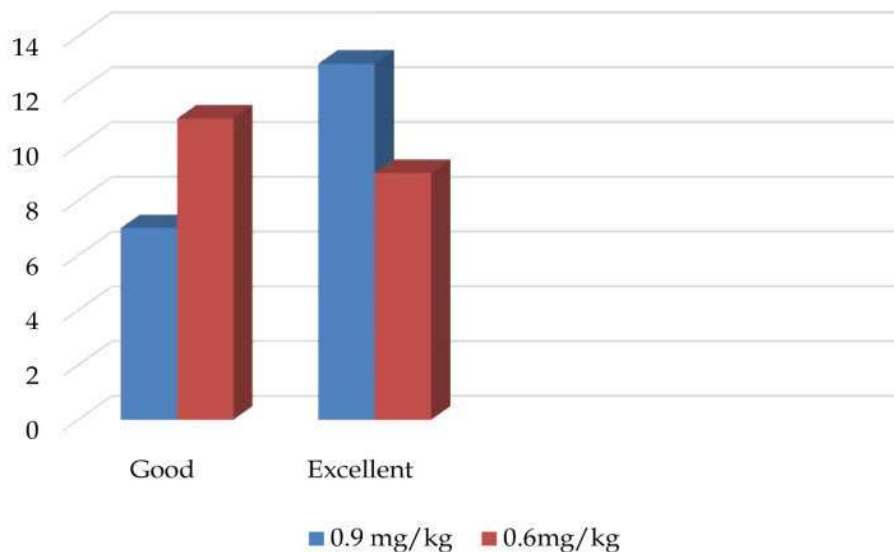
Variables		0.9mg/kg N (%)	0.6mg/kg N (%)	Total	P value
Ease of laryngoscopy	Easy	16(80)	18(90)	20(100)	0.331
	Fair	4(20)	2(10)	20(100)	
Vocal cord position	Abducted	17(85)	12(60)	20(100)	0.078
	Intermediate	3(15)	8(40)	20(100)	
Airway reaction	None	20(100)	12(60)	20(100)	0.007
	Diaphragm	0(0)	6(30)	20(100)	
	Sustained	0(0)	2(10)	20(100)	
Movement of limbs	None	20(100)	14(70)	20(100)	0.02
	Slight	0(0)	6(30)	20(100)	

Table 2: Table showing the comparison of intubating conditions

Variables	0.9MG/KG n (%)	0.6MG/KG n (%)	Total	P value
Excellent	13(65)	9(45)	20(100)	0.036
Good	7(35)	11(55)	20(100)	

Table 3: Table showing the TOF at intubation and time to loss of TOF

Variables		Rocuronium dose		Total	P value
		0.9MG/KG N (%)	0.6MG/KG N (%)		
TOF at intubation	1	4(20)	3(15)	20(100)	0.677
	2	16(80)	17(85)	20(100)	
Time to loss of TOF	<120s	15(75)	7(35)	20(100)	0.039
	<180s	4(20)	11(55)	20(100)	
	<240s	1(5)	2(10)	20(100)	

**Graph 1:** Bar Graph Showing Intubating conditions

Discussion

The ideal neuromuscular blocking agent is one which has brief duration of action, provides profound relaxation and is free from hemodynamic changes.

Succinylcholine is the commonly used muscle relaxant for RSII due to its fast onset, excellent intubating conditions and short time course of action. However, it may have adverse effects which can limit or even contraindicate its use at times.

An alternative drug suggested and used in recent times for rapid sequence induction is rocuronium in the dose of 0.6 to 1.2mg/kg. Rocuronium bromide is a steroidal non depolarising muscle relaxant that is useful to produce a rapid onset of action [5].

Onset time of a neuromuscular blocker is considered important because it serves as a predictive parameter for the rate of development of ideal intubating conditions [6].

Hence in our study we decided to compare the intubating conditions between 0.6 and 0.9mg/kg of rocuronium along with the train of four count at intubation and time to loss of train of four count and we found that the intubating conditions were better with 0.9mg/kg when compared with 0.6mg/kg and the results were statistically significant.

But the intubating conditions were clinically acceptable in both the groups.

A similar study by Usha devi et al. [7] in cesarean sections also concluded that conditions after 0.9mg/kg are better than those offered by 0.6mg/kg of rocuronium. Cheng et al. [8] did a similar study with thiopentone and alfentanil induction and concluded that intubating conditions were adequate after 0.9 mg/kg of rocuronium but found 0.6mg/kg dose inadequate.

Heggeri M et al. [9] concluded that 3xED95 dose of Rocuronium achieves more intense NMB and better conditions for intubation at 60 seconds than 2ED 95 dose. Similar observations were done by Bunburaphong P et al. [10].

When a non-depolarizing agent is given, a typical pattern is observed. There is a reduction in the amplitude of the evoked responses, with T4 affected first, then T3, followed by T2, and finally T1. Adequate relaxation for intubation is obtained when TOF responses are 2 or 1 when NMB is 80% [11].

The TOF value at intubation were either 3/ 4 or 4/4 in majority of the cases in both the groups and the values are also not statistically significant between the two groups. This implicates that monitoring the TOF at adductor pollicis is not correlating with the intubating conditions.

This finding of ours is substantiated as Meistelman et al. [12] concluded that monitoring the adductor pollicis for onset of blockade might be misleading, further Donati et al. [13] also concluded from his study that neuromuscular block at adductor pollicis lags behind that of laryngeal muscles.

But Haller G et al. [14] concluded from his study that Monitoring neuro-muscular activity of the AP

using TOF to determine the appropriate tracheal intubation time and conditions in patients paralysed with rocuronium is more clinically relevant than monitoring the Orbicularis Occuli muscle.

The mean time to the loss of TOF is 115 seconds with 0.9mg and 132 seconds with 0.6mg which is statistically significant. Similar results were seen in the study by Mathias sluga et al. [15] where the median time for loss of TOF was 130 seconds with 0.6 mg/kg dose of rocuronium and by Veena chathrath et al had the median time for loss of TOF at 110 seconds with 0.6mg /kg of drug.

Conclusion

Intubating conditions were better in group A in comparision with group B but both the groups provided clinically acceptable conditions for intubation.

The use of train of four count at the adductor pollicis as a guide for laryngeal muscle paralysis is questionable.

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