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Original Research Article

Comparative Evaluation of Rocuronium Bromide and Succinylcholine for Rapid Induction Anesthesia

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Conflict of interest: Nil

Abstract

Background: Succinylcholine chloride continues to be the standard neuromuscular blocking drug for creating the best intubating circumstances during rapid sequence intubation. The only medication on the market right now with the same quick beginning of action as succinylcholine chloride is rocuronium bromide. To examine the effectiveness of rocuronium bromide and succinylcholine chloride for usage during fast sequence intubation in adult patients, the current study was conducted.

Methods: This prospective controlled study was done in the Department of Anesthesia, Prathima Institute of Medical Sciences, Naganoor, Karimnagar Based on the inclusion and exclusion criteria a total of n=60 cases were selected to be included in the study. They were randomly divided equally into two groups Group I (n=30 cases received Rocuronium Bromide 1mg/kg) and group II n=30 cases received Suxamethonium 1mg/kg.

Results: The intubating condition according to the grading system as per Viby-Mogensen et al., grading of intubating conditions, there are a greater number of patients having better intubating conditions in both groups. Group II was found to be somewhat better than group I scores although the differences were not found to be statistically significant. Comparing the changes in potassium ion concentration, the group receiving succinylcholine has a statistically significant increase whereas the group receiving rocuronium experiences essentially no change.

Conclusion: This study leads us to the conclusion that the intubating circumstances produced after rocuronium bromide 1mg/kg are almost identical to and clinically acceptable intubating conditions as those obtained by succinylcholine 1mg/kg, with a reduced incidence of adverse effects when compared to succinylcholine. Although Rocuronium bromide is a safe alternative to succinylcholine chloride for rapid sequence induction of anesthesia in situations where succinylcholine is contraindicated and in whom there is no anticipated difficult airway, succinylcholine chloride appears to be a safer agent for use in patients with anticipated difficulty in intubation.

Keywords: Anaesthesia, Rapid Sequence Intubation, Succinylcholine Chloride, Rocuronium Bromide.

Introduction

Succinylcholine has been used as the primary neuromuscular blocking drug during endotracheal intubation, with particular emphasis on rapid sequence induction and challenging intubations. [1] The succinylcholine's effect starts very quickly and lasts very briefly. [2] With these characteristics, succinylcholine continues to hold the top spot in many situations, offering perfect circumstances for endotracheal intubations. Of the nondepolarizing neuromuscular blocking medications that are currently on the market, rocuronium has the fastest start of the action. [3] Contrary to succinylcholine, its usage is not linked to postoperative myalgias, hyperkalemia, or muscular fasciculations. It does not significantly alter cardiovascular parameters [3] and has a modest potential for systemic histamine release. [4] However, the majority of patients do not have any discernible cumulative effects. In the present study, we evaluated the intubating conditions with Rocuronium Bromide 1.0 mg per kg body weight and compared the intubating conditions with that of succinylcholine chloride 1.5 mg per kg body weight, for use during rapid sequence intubation of anesthesia in adult patients. The aim was to examine the intubating circumstances, start and duration of action, and cardiovascular consequences following the administration of rocuronium and succinylcholine to adult patients having elective surgery, the current study was carried out.

Material and Methods

This prospective controlled study was done in the Department of Anesthesia, Institutional Ethical Approval was obtained for the study. Written consent was taken from all the cases of the study.

Inclusion criteria

1. ASA I and II cases
2. Elective surgeries
3. Aged 18 – 60 years.
4. Agreed to participate in the study voluntarily.

Exclusion criteria

1. Patients with anticipated difficult airway
2. Modified Mallampati class 3 or 4.
3. Pregnancy
4. Bronchial asthma
5. Ischemic heart disease
6. Presence of neuromuscular disease
7. Known allergy to study drugs.

Based on the inclusion and exclusion criteria a total of n=60 cases were selected to be included in the study. They were randomly divided equally into two groups Group I (n=30 cases received Rocuronium Bromide 1mg/kg) and group II n=30 cases received Suxamethonium 1mg/kg. All patients received the same routine anesthetic care. All patients received premedication. To provide fluids and medications, an 18 G catheter was placed into a vein in the forearm. Throughout the surgery, monitoring devices for non-invasive blood pressure (NIBP), ECG, oxygen saturation (SpO2), and end-tidal CO2 were used. The patient was induced with Inj. glycopyrrolate 0.2 mg, Inj. fentanyl 2 ug/kg, and Inj. propofol 1.5 mg/kg after 3 minutes of preoxygenation. As soon as the phonation response vanished, the nerve stimulator was switched to the single-twitch mode, and the neuromuscular blocking medication was administered (rate, one twitch per second). When a visible motor response to continuous single-twitch nerve stimulation stopped, laryngoscopy was initiated. The time it took for the reaction to stop was documented. A Macintosh size 3 blade and a tracheal tube with an internal diameter of 7.5 cm for women and 8.5 cm for males were used for endotracheal intubations. The accurate timing of occurrences was recorded.

The following parameters are evaluated as Parameters to be Monitored: Main outcome metrics included: The following criteria are typically used to assess intubation conditions: Laryngoscopy ease, vocal cord position and movement, and airway and limb response to intubation are the first three factors. Ratings are based on the Modified Viby-Mogenson Scoring System, which was proposed for good clinical research practice in studies of neuromuscular blocking drugs. The criteria used to attribute scores in evaluating intubating conditions are jaw relaxation, vocal cord position, and diaphragmatic activity. The laryngoscopy's simplicity, the vocal cords' motion and location, and the patient's response to intubation will all be graded by the anesthesiologist doing the intubation. The scoring system for Endotracheal intubating conditions was evaluated based on the modified timing principle. Secondary outcome measures included: Side Effects like Hyperkalemia, Dysrythmia, myalgia, and Patient satisfaction score.

Results

Out of the n=30 cases included in group I n=14 (46.67%) cases were males and n=16 (53.33%) cases were females. Similarly, in group II n=18 (60.0%) of cases were males and n=12(40.0%) of cases were females. The age range in group I was from 19 – 57 years and the mean age of the cases in group I was 35.18 ± 4.15 years. In group II the age ranges were from 20 - 55 years the mean age was 38.51 ± 5.15 years (table 1). The weight range of group I was from 51 – 80 Kgs and the mean weight was 58.91 ± 10.98 Kgs. Similarly in group II, the mean weight was from 55.5 – 78 Kgs the mean weight was 56.27 ± 8.55 Kgs. The mean height of group I was 160.22 ± 8.59 cms and group II was 158.36 7.22 cms.

The mean duration of onset of action in seconds in group II was 47. 51 seconds as compared to group I 50.33 seconds and the p-values were 0.026 and significant. Similarly, the duration of action of group II was slightly greater than group I, and the p-values are (<0.05) and significant depicted in table 1.

Table 1: shows the mean value of parameters recorded in both groups.

Groups	Age in years		P value
	Mean	**± SD**	
Group I	35.18	4.15	0.235
Group II	38.51	5.15	
	Duration of onset of action in seconds		
Group I	50.33	7.83	0.026*
Group II	47.51	6.73	
	Duration of action in minutes		
Group I	44.01	11.20	0.045*
Group II	50.22	0.91	

On analyzing the intubating condition according to the grading system as per Viby-Mogensen et al., grading of intubating conditions, there are a greater number of patients having better intubating conditions in both groups. while comparing both the groups' group II was found to be somewhat better than group I scores although the differences were not found to be statistically significant.

Comparing the changes in potassium ion concentration, the group receiving succinylcholine has a statistically significant increase whereas the group receiving rocuronium experiences essentially no change. Comparing the two groups after medication delivery reveals a considerable shift as good, the details have been depicted in table 2.

Table 2: Showing the scores recorded as per Viby-Mogensen et al., grading of intubating conditions. [5]

	Group I			Group II		
Scores	**Score 1**	**Score 2**	**Score 3**	**Score 1**	**Score 2**	**Score 3**
Jaw Relaxation	2	2	26	0	2	28
Resistance to Blade	2	3	25	1	2	27
Vocal cords						
Position	0	3	27	1	1	28
Movement	1	4	25	0	2	28
Intubation response						
Limb movement	1	3	27	1	1	28

As shown in figure 1, there was an increase in the mean heart rate by 30.5% and 35.5% in group I and group II respectively when compared with the preinduction heart rates. The increase in heart rates declined by 3.2% and 3.9% in group I and group II respectively from the baseline values at the 5 minutes interval following intubation. They were no changes in ECG found in the groups during the administration of these drugs.

There was an increase in mean arterial pressure by 32.50% and 29.10% in group I and group II from the basal pre-induction values at the end of 1-minute. The increase in mean arterial pressure declined by 1.28% and 1.35% in group I and group II at the end of 5 minutes post-induction and in both groups, there was a trend toward a return to the baseline values after 5 minutes depicted in figure 2.

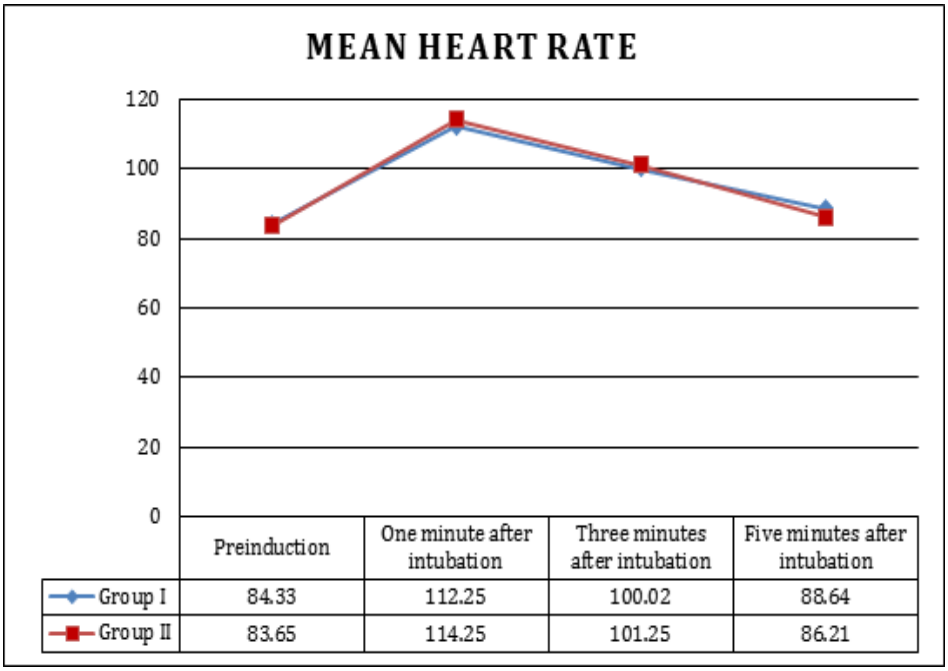

Figure 1: Showing the mean heart rate variability at different intervals of intubation.

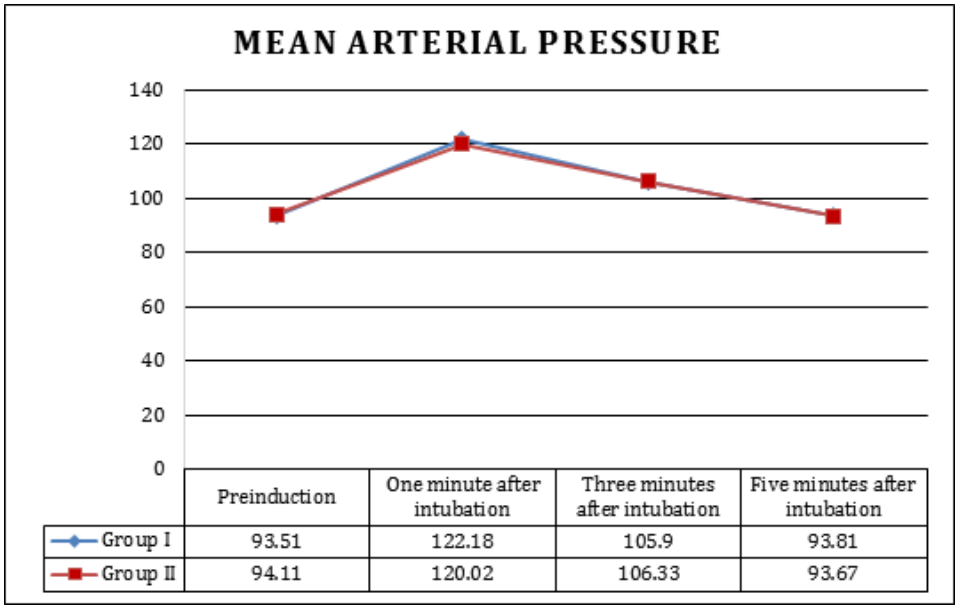

Figure 2: Showing the Mean Arterial Pressure variability at different intervals of intubation.

Discussion

In the current study, we compared the medication succinylcholine, which is currently used in practice, with rocuronium in patients who needed induction of anesthesia and endotracheal intubation for elective surgery (i.e., endotracheal intubation as soon as feasible). The median intubation sequence was 3 seconds shorter when succinylcholine was administered (group II) as the muscle relaxant medication during induction of anesthesia than when rocuronium (group I). It was discovered that succinylcholine more frequently than rocuronium produced ideal intubation circumstances. Nevertheless, there was no statistically significant difference between the two relaxants in terms of clinically acceptable intubating circumstances or unsuccessful intubation attempts. A Cochrane Review [6] that examined the data up to the year 2015 concluded that succinylcholine produced better endotracheal intubation circumstances than rocuronium for fast sequence anesthesia induction. The two medications did not statistically vary under the therapeutically appropriate intubation settings.

In the current study, we assessed the actions of neuromuscular broking agents by clinical methods which included the onset of apnoea and cessation of chest movements. The mean time of onset of action of group I was 50.33 seconds our results were in concordance with observations of Cooper et al 8, 45-59 seconds depending upon the dose (0.5-0.9 mg/kg body wt). For group II the mean duration of onset of action was 47.51 seconds. Misra MN et al., [7] in a similar study found the mean duration of onset of action 46.69 seconds and Morgan et al., [8] found the mean duration of action was 50 seconds. In the current study, we found excellent intubation conditions in 90 -94% of cases of group II at the end of one minute (table 2). Using succinylcholine chloride 1 mg/kg body weight, many authors including Cooper et al., [9] have successfully intubated patients in 95% and 90% of instances. The majority of authors have stated that 100% of the time, intubating circumstances are good to outstanding. Just one patient (3.33%), which is equivalent to that of Cooper et al., [9] and Naguib et al., [10] had good intubating circumstances in the current investigation. Succinylcholine chloride 1.5 mg kg-1 body weight caused excellent

intubating conditions in 29 patients (96.67%) out of 30 instances. Similarly, in group I the intubation conditions was found to be excellent in 84 – 90% of cases at 60 seconds which agrees with studies of F Buder et al., [5] and Naguib M et al., [10]. According to the study by F. Buder et al., [11] N=2 patients (6.67%) had satisfactory intubating conditions with rocuronium bromide 0.9 mg kg-1 body weight, there were no cases of difficult intubation. Rocuronium was administered at a dosage of 1 mg/kg since higher doses of the medicine appeared to not affect intubating circumstances when propofol was the induction agent. Rocuronium has been shown to have a dose-dependent influence on the onset and duration of neuromuscular block in earlier research. So, higher Rocuronium dosages might enable earlier intubation. [12] The intubation circumstances were only compared in trials following various dosages of rocuronium, and this time was typically 60 seconds. So, it is unknown if the potential for earlier intubation with at least the same intubation would result from the faster start of the neuromuscular block associated with dosages of more than 1 mg/kg of rocuronium at the end of 60 seconds. No substantial adverse effects were noticed during laryngoscopy or intubation in the current trial. However, some patients experienced less serious issues including arrhythmias, which were probably caused by adrenergic reactions rather than a drug's influence.

Conclusion

This study leads us to the conclusion that the intubating circumstances produced after rocuronium bromide 1mg/kg are almost identical to and clinically acceptable intubating conditions as those obtained by succinylcholine 1mg/kg, with a reduced incidence of adverse effects when compared to succinylcholine. Although Rocuronium bromide is a safe alternative to succinylcholine chloride for rapid sequence induction of anesthesia in situations where succinylcholine is contraindicated and in whom there is no anticipated difficult airway, succinylcholine chloride appears to be a safer agent for use in patients with anticipated difficulty in intubation.

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