

A Comparative Study of Rocuronium with Suxamethonium for Endotracheal Intubation

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Abstract: Suxamethonium is the drug of choice for muscle relaxation for endotracheal intubation with its rapid onset and short duration of action. The newly introduced non-depolarizing drug rocuronium has got rapid onset and intermediate duration of action. The aim of the present study was to compare the intubating conditions of rocuronium bromide with suxamethonium chloride. Aim: To compare the onset and duration of action of Rocuronium Bromide and Suxamethonium Chloride. Methods: it is prospective randomized controlled study carried on 90 adult patients with age groups of 20-60 years of either sex. They were posted for elective surgery in MGM's Hospital Aurangabad. They were randomly divided into two groups of (n=45) each. Group I (R) patients received rocuronium at the dose of 0.9mg/Kg and Group II(S) patients received suxamethonium at the doses of 1.5mg/Kg. Results: In Group I (R) group there were 14 (31%) male patients and female were 31 (69%). In group II (S) there were 14 (31%) male and female were 31 (69%). In group II (S) suxamethonium showed acceptable intubating conditions in 100% of cases at 60 sec out of which 93.24% were excellent. In rocuronium group I(R) 100% cases had acceptable intubating conditions at 60 seconds out of which 77.7% excellent and 22.3% had good intubating conditions the P values were significant. In both the groups there was no significant difference jaw relaxation as well as vocal cord movements. There was the significant difference in response to intubation in Rocuronium group 6 (13%) patients had a mild cough on intubation whereas no patient in suxamethonium group II had any cough. In the Group I 24% patients had slight diaphragmatic movements on intubation and in group II 11% had diaphragmatic movements. There was no significant rise in HR difference in group I and group II preoperative, post muscle relaxant, 0 minutes after intubation, 5 minutes after intubation, and 10 minutes after intubation. Conclusion: Rocuronium bromide at the dose of 0.9 mg/Kg produces excellent and good intubating conditions in patients although slightly inferior to that provided by the Suxamethonium 1.5mg/Kg but there is more hemodynamic stability with rocuronium then suxamethonium. Therefore Rocuronium bromide may be considered as safe and good alternative to suxamethonium for endotracheal intubation. Hence rocuronium bromide can be used for a rapid sequence of induction and intubation if there is no prediction of difficult intubation.

Keywords: Rocuronium, Suxamethonium, Endotracheal intubation.

INTRODUCTION

The use of neuromuscular blocking drugs in anesthesia has its origin in the South American Indians arrow poison or curare [1]. In the present day practice skeletal muscle relaxants are used for facilitation of endotracheal intubation and to provide muscle duration of surgery. [2] In anesthesia practice during induction and intubation there are chances of gastric contents aspiration, which contributes to anesthesia morbidity and mortality [2]. Suxamethonium has got rapid onset, profound muscle relaxation and short duration which made it drug of choice for tracheal intubation [1, 2]. It has got many side effects like hyperkalemia, bradycardia, nodal rhythm, ventricular dysrhythmias, myalgia, a rise of IOP, increased ICP and malignant

hyperthermia [1, 3-6]. If suxamethonium is undesirable or contraindicated then other non-depolarizing muscle relaxant drugs are used for endotracheal intubation [1, 3]. Therefore research is still going on for ideal neuromuscular blocking agent focused on non-depolarizing drugs. Recently developed NDMR agents are of an intermediate duration of action and to a major extent free from the adverse effects of suxamethonium [1, 7]. The long-acting NDMR Pancuronium was introduced in 1960. Its onset of action is too long (3 to 5 minutes and the duration of action is 60 -90 minutes [4]. In 1980 Atracurium and Vecuronium were introduced, having an intermediate duration of action of 20 – 35 minutes. Both did not match with suxamethonium in onset time as their onset time is 3 - 5 minutes [1, 4]

Rocuronium bromide was recently introduced by Dr. Sleight and Dr. Savagein in the 1990s and approved by FDA in 1994. It is non-depolarizing animosterodial vecuronium derivative drug with an intermediate duration of action [1, 4, 8]. The intubation dose of rocuronium in ED 95 X 2 onset of action is 83 ± 33 sec and ED 95 X 3 dose onset is equal to that of suxamethonium $55 \pm$ sec [1, 4, 9] sides effects of suxamethonium are not generally observed with rocuronium bromide [7, 9] The present study was aimed at determining the efficacy of rocuronium for routine endotracheal intubation within 60 seconds in general patients undergoing elective surgeries.

MATERIALS AND METHODS

It is prospective, randomized, a cross-sectional study which was carried out in 90 adults patients with age range from 20 – 60 years of both sexes those who were posted for elective surgery in MGM Hospital. The study was carried in the Department of Anesthesiology of Mahatma Gandhi Mission’s Medical college and hospital, Aurangabad Maharashtra, India. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from the patients after explaining the study in their local language. The patients were randomly divided into two groups Group I (R) patients (n=45) received rocuronium at the dose of 0.9mg/Kg and Group II (S) patients received suxamethonium at the dose of 1.5mg/Kg. Inclusion criteria were, patients belonging to ASA grades I and II, also belonging to MPC grade I and II posted for elective surgeries. Exclusion criteria were: patients with anticipated difficult intubation, history of neuromuscular disease. Those on calcium channel blockers, morbid obesity, renal disease or hyperkalemia or increased ICP or IOP. After pre-anesthetic

evaluation, the patients were kept NBM for 6 hours prior to surgery and cap. Omeprazole 40mg night before surgery was given. On the day of surgery baseline preoperative PR, BP, SPO2, and ECG were recorded. They were premedicated with Midazolam 0.05m/Kg, Inj Pentazocin 0.5mg/Kg and Inj Glycopyrrolate 0.005 mg/Kg after which the patients were pre-oxygenated with 100% oxygen for induction Inj. Thiopentone was given at the dose of 5mg/Kg after the loss of eyelash reflexes muscle relaxants were given an IV bolus. Laryngoscopy was attempted in 60 seconds after injection of muscle relaxant. If the conditions were unsatisfactory then repeat scopy was attempted at 30 sec intervals. Bag-mask ventilation with 100% oxygen was continued till repeat scopy was attempted. [2] Maintenance of anesthesia was done with 60% oxygen 40 % Nitrous Oxide, Sevoflurane and IPPV were given with Brain's circuit. Monitoring of pulse rate O₂ saturation and blood pressures, ECG was recorded immediately after laryngoscopy at the end of 5 minutes and 10 minutes and after intubation. At the end of surgery, all anesthetics were stopped and 100% O₂ was resumed. After appearing in spontaneous respiratory efforts patients were reversed with slow IV injection of Neostigmine 0.05mg/Kg and Glycopyrrolate 0.001mg/Kg.

RESULTS

The present study sex distribution in both group I (R) and group II (S) were comparable had 14 male and 31 female patients each. The age and weight distribution were also comparable in both groups. The Mean age in group I (R) was 31.67 years and in group II (S) 32.02 years. Mean weight in group I was 49.43 Kgs and in group II 49.78 Kgs.

Table-1: Sex distribution in group I and group II involved in the study

Sex	Group I Rocuronium		Group II Suxamethonium	
	No	%	No	%
Male	14	31	14	31
Female	31	69	31	69
Total	39	100	39	100

Suxamethonium showed acceptable intubating conditions in 100% of the cases at 60 sec out of which 93.24% were excellent. In Rocuronium group I 100% of cases also had acceptable intubating conditions at 60

sec out of which 77.7% were excellent and 22.3% were good intubating conditions the calculated p values were significant given in table 2.

Table-2: Comparison of total intubation score among Group I (R) and Group II (S)

Total Intubation Period	Group I (R)		Group II (S)		P value
	No	%	No	%	
Poor (3 – 5)	00	00	00	00	0.042*
Good (6 – 7)	10	22.3	03	6.6	
Excellent (8 – 9)	35	77.7	42	93.24	
Mean ± SD	8.22 ± 0.97		8.71 ± 0.59		

* Significant

In group I (R) moderate jaw relaxation was seen in 7% and good jaw relaxation was seen in 93% of cases. In group II (S) moderate in 4% and good jaw

relaxation was noted in 96% of cases. The calculated p values were found to be significant given in table 3.

Table-3: Comparison of Jaw relaxation among the two groups involved in the study

State	Group I (R)		Group II (S)		P value
	No	%	No	%	
Minimal	0	00	0	00	0.0654*
Moderate	3	7	2	4	
Good	42	93	43	96	
Total	45	100	45	100	

* Significant

In group I mild coughing was seen in 13% of cases, a slight diaphragmatic movement was seen in 24% and no response to intubation was found in 63% of cases. In group II slight diaphragmatic movement in

11% and no response to intubation in 88.8% of the cases and the p values were found to be significant given in table 4.

Table-4: Comparison of response to intubation among the two groups at 60 sec after muscle relaxant

Response	Group I (R)		Group II (S)		P value
	No	%	No	%	
Mild coughing	6	13	0	00	0.006*
Slight diaphragmatic movement	11	24	5	11	
None	28	63	40	88.8	
Total	45	100	45	100	

* Significant

The mean HR changes in group I was a rise of HR by 12 bpm from the baseline preoperative values at 0 minutes of intubation in group II the mean rise of HR was 13 bpm from the baseline preoperative values at 0 minutes of intubation. The p values were not found to be significant. The SBP changes were the maximum rise of 10 mmHg in SBP from baseline preoperative values at 0 min of intubation was noted in group I in group II the rise was 21 mmHg. The calculated p values were significant.

DISCUSSION

The intubating conditions in the study were assessed as per Cooper et al; scoring system [10]. In our study suxamethonium showed acceptable intubating conditions in 100% of cases at 60 sec out of which 93.24% were excellent this findings were similar to one study by Shizan Hamid *et al.*, [7] Aparna Shukla *et al.*, [3] and KK Bhati *et al.*, [5] they also found good to excellent intubating conditions with suxamethonium at 60 seconds. In group II (R) 100% of cases had acceptable intubating conditions at 60 sec out of which 77.7% were excellent and 22.3% were good these findings were in agreement with findings of Magorian T *et al.*, [11] Weiss JH *et al.*, [12] and RK Verma *et al.*, [9] The present study showed that in Group I (R) jaw relaxation was good in 93% of the cases. This findings were in partial agreement with other studies by Mishra *et al.*, [2] who found only good jaw relaxation in 63.6% of cases. Similarly Jamshid *et al.*, [6] found good jaw relaxation in 68.8% and Liaquatunoor M *et al.*, [13]

in 60% of cases. The difference could be due to the lower dose of rocuronium 0.6mg/Kg used by these studies during endotracheal intubation. In group II (S) jaw relaxation was good in 96% of cases. These findings were similar with Mishra *et al.*, [2] (86.7%) and Jamshid *et al.*, [6] 81% in suxamethonium given patients. The opening of vocal cords in group I (R) was found in 87% of cases. This finding was similar with Mishra *et al.*, [2] they found vocal cords opening in 93.3% of cases. However, lower findings were found by Jamshid *et al.*, [6] 60% and Liaquatunoor *et al.*, [13] in 56.7% of cases. Again this difference could be due to the lower dose of rocuronium 0.6mg/Kg used by these authors. In group II (S) the open vocal cords were found in 87% of cases which is in agreement with other studies [6] in the present study at 60 second mild coughing was noted in 13% of cases in 24% of cases slight diaphragmatic movements were observed. Our findings were similar with Jamshid *et al.*, [6] 28%. Mishra *et al.*, [2] in 56.6% and Liaquatunoor *et al.*, [13] in 56.7% of cases. There was rise in mean HR in both groups from baseline values to just after muscle relaxant, 0 min, 5 min, and 10 min after intubation. The rise in HR was similar in both groups I and II there was no significant differences in HR of both the groups. This shows that the effect of both the agents on HR is very similar. These findings were similar to KK Bhati *et al.*; [5] in which they observed rise in HR from baseline preoperative values at just after muscle relaxant, peaks at 0 min of intubation and declined to baseline value at 5 minutes after intubation. There was an increase in

SBP by 10mmHg from baseline preoperative at immediately after intubation and increase of SBP by 21mmHg from baseline preoperative to immediately after intubation. The increase in SBP after intubation is attributed to stress response due to stimulation of sympathetic nervous system during laryngoscopy and tracheal intubation. There was a rise in mean DBP from baseline value after muscle relaxant at 0 min of intubation in both groups and declined to preoperative levels in 5minutes in group I and after 10 minutes in group II. The findings of changes in SBP and DBP were similar to results of KK Bhati *et al.*, [5] this suggests that rocuronium was more hemodynamically stable as compared to suxamethonium.

CONCLUSIONS

Rocuronium bromide at the dose of 0.9 mg/Kg produces excellent and good intubating conditions in patients although slightly inferior to that provided by the Suxamethonium 1.5mg/Kg but there is more hemodynamic stability with rocuronium than suxamethonium. Therefore Rocuronium bromide may be considered as the safe and good alternative to suxamethonium for endotracheal intubation. Hence rocuronium bromide can be used for the rapid sequence of induction and intubation if there is no prediction of difficult intubation.

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