

Comparative study of intubating conditions after Rocuronium and Suxamethonium (study of 80 cases)

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Citation

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Abstract

Rocuronium has been developed as fastest acting non-depolarizing muscle relaxant among currently available non-depolarizing muscle relaxants. It was decided to study two important properties i.e. onset of action and intubating conditions after Suxamethonium - a time tested popular short acting depolarizing neuromuscular blocking agent and Rocuronium - recently introduced intermediate acting non depolarizing neuromuscular blocking agent, with Thiopentone as the sole anesthetic agent in elective, otherwise healthy adult population. This study was conducted in 80 adult patients, aged between 11-60 years undergoing various surgeries requiring general anaesthesia during the study period and were randomly allocated into two groups- Group A [Rocuronium bromide, 0.6 mg kg⁻¹ (n = 40)] and Group B [Suxamethonium chloride 1.5 mg kg⁻¹ (n = 40)]. Intubation conditions were rated as excellent in 92.5% and good in 7.5% of the patients who received Rocuronium, and excellent in 100% of the patients who received Suxamethonium.

Institute where the work was done: P. D. U. medical college & civil hospital, Rajkot.

INTRODUCTION

As endotracheal intubations is an integral part of administration of anaesthesia during surgical procedure. Suxamethonium, a depolarizing muscle relaxant with its rapid onset and short duration of action is still relaxant of choice to facilitate endotracheal intubation. In addition to fasciculation, Suxamethonium has got many side effects such as bradycardia and other dysrhythmias, rise in serum potassium, post - operative myalgia, rise in intraocular, intragastric and intracranial pressure, incidences of prolonged recovery in patients with pseudo - cholinesterase deficiency and triggering of malignant hyperthermia. Because most of the side effects of Suxamethonium reflect its depolarizing mechanism of action therefore research for ideal neuromuscular blocking agent focused on non-depolarizing type of relaxants which has rapid onset time and offers good to excellent intubating conditions, as rapidly as Suxamethonium and which lacks the above mentioned adverse effects.

Rocuronium bromide a newer amino - steroidal compound is a derivative of Vecuronium; Rocuronium has a rapid onset time, an intermediate duration of action and rapid recovery with cardiovascular stability, no significant histamine

release. Keeping these properties in mind it was decided to study two important properties i.e. onset of action and intubating conditions after Suxamethonium - a time tested popular short acting depolarizing neuromuscular blocking agent and Rocuronium - recently introduced intermediate acting non depolarizing neuromuscular blocking agent, with Thiopentone as the sole anesthetic agent in elective, otherwise healthy adult population.

MATERIALS AND METHODS

In this study after taking informed consent 80 adult patients aged between 11 and 60 years, of ASA physical status I or II posted for operative procedure from routine operation lists of Pandit Dindayal Upadhyay Hospital Rajkot were selected randomly for study to observe comparison of intubating conditions after Rocuronium versus Suxamethonium. Mallampatti grade of all patients were I or II.

The patients were divided into two groups, each consisting of 40 patients, group A and group B according to neuromuscular blocking agent received.

Group A: Rocuronium bromide, 0.6 mg kg⁻¹ (n = 40)

Group B: Suxamethonium chloride 1.5 mg kg⁻¹ (n = 40)

The criteria for selection of patients were:

Patients were healthy, no other systemic or metabolic disorder.

Patients were excluded if they were known to have neuromuscular disease or were receiving medications known to influence neuromuscular function.

Patients selected were for laparoscopic surgeries, ear surgery, renal surgery, thyroid surgery and other less than two hours duration for surgery.

PREOPERATIVE MANAGEMENT

(A)ASSESSMENT OF PATIENT

All patients were examined thoroughly and a detailed history was noted. History suggestive of major illness or major surgery and drug therapy was asked. General examination built, nutritional status was examined. Patients were examined for pallor, clubbing, cyanosis; lymphadenopathy, icterus, teeth and spine were also examined. Systemic examination of respiratory system, cardiovascular system, alimentary system, central and peripheral nervous system were carried out to rule out any pathological condition. Patients vital data e.g. temperature, pulse rate per minute blood pressure and respiratory rate were noted. Routine investigations like Hemoglobin estimation, urine for routine & microscopic examinations, blood sugar, blood urea, serum creatinine, chest x-ray, and electrocardiogram were done in all cases.

(B)PREPARATION OF PATIENT

Patients were kept nil by mouth from 10:00 pm on the day before surgery. On the arrival in operation theatre peripheral venous line was secured, chest leads of cardio scope were attached. After the monitor gadgets application, vital data like pulse rate, blood pressure, spo₂ were recorded and noted as before pre-medication data.

(C) PREMEDICATION

Injection Glycopyrrolate 4µg / kg

Injection Ranitidine 1 mg / kg

Injection Ondansetron 80 µg / kg

Injection Diclofenac Na 1.5 mg /kg

Then pulse, blood pressure, SpO₂, ECG was noted as preinduction data.

INTRAOPERATIVE MANAGEMENT

All patients were pre-oxygenated with 100% O₂ with face

mask for 3 minutes. Patients were divided into two groups.

In Group A: Anaesthesia was induced with inj. sodium Thiopentone 5 mg kg⁻¹ slowly followed by inj. Rocuronium bromide 0.6 mg kg⁻¹ IV.

In Group B: Anaesthesia was induced with inj. Sodium Thiopentone 5 mg kg⁻¹ IV slowly followed by inj. Suxamethonium 1.5 mg kg⁻¹.

Time was noted and all vital data recorded along with ECG and SpO₂ monitoring. The patients were ventilated with 100% oxygen with intermittent positive pressure ventilation on mask. In both group jaw relaxation and vocal cord relaxation were considered for atraumatic laryngoscopy at 60 seconds or if needed at 75 seconds and then at 90 seconds. Patient was intubated with proper sized endotracheal tube and anesthesia proceeded with O₂, N₂O, Isoflurane and further doses of muscle relaxant, with use of closed circuit with circle absorber with controlled ventilation. After completion of surgery, reversal of neuromuscular blockade was achieved with injection Neostigmine 0.05 mg kg⁻¹ and Injection Atropine 0.02 mg kg⁻¹ intravenously. After satisfactory recovery, patients were extubated. Post operatively all vital data e.g. pulse, blood pressure, respiratory rate were monitored. And patients were observed for nausea, vomiting, bradycardia, tachycardia, hypotension, respiratory obstruction.

Parameters observed:

Intubating conditions were assessed using cooper's intubation scoring system

The appropriate values were selected and added up to a total numeric score of a maximum of 9.

A total score of

8 - 9 excellent

6 - 7 good

3 - 5 Fair and

0 - 2 is rated as poor intubating conditions.

Good and excellent intubating conditions were taken to be "clinically acceptable" by Cooper et al.

An ECG was recorded continuously, and measurements of heart rate, non invasive blood pressure and arterial oxygen saturation using pulse oximetry, were recorded at base line

(preinduction values), at the time of intubation and from the time of intubation (time = 0 minute) every 5 minutes up to 30 minute and then every 10 minutes.

STATISTICAL ANALYSIS

In present study, we have calculated significance of difference ‘p’ value for qualitative data by using chi–square test. We have calculated mean and standard deviation and then applied t–test for calculating significance of difference between means of two different groups in the case of quantitative data. P<0.05 is considered statistically significant the probability of occurrence ‘P’ of this calculated value is determined by reference to ‘t’ table.

OBSERVATION AND RESULTS

The two groups are similar in characteristics like mean age, sex, duration of surgery and the type of surgery they underwent.

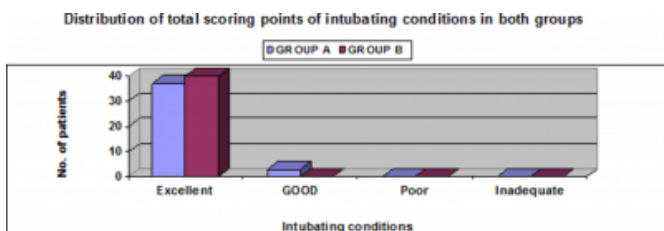
Figure 1

Table 2: Intubating Conditions After Rocuronium (Group A) And Suxamethonium (Group B)

Score	Jaw Relaxation	Vocal Cords	Response to intubation
0	Poor	Closing	Severe coughing / bucking
1	Nominal	Closing	Mild Cough
2	Moderate	Moving	Slight Diaphragmatic Movement
3	Good	Open	None

(Significant P <0.05)

Figure 2



Intubation conditions were rated as excellent in 92.5% and good in 7.5% of the patients who received Rocuronium, and excellent in 100% of the patients who received Suxamethonium.

Figure 3

Table 2: Changes In Mean Pulse Rate After Rocuronium (Group-A) And Suxamethonium (Group B)

Intubating condition	Group-A No. of patients (%)	Group-B No. of patients (%)	P value
Excellent	37(92.5%)	40(100%)	>0.05
Good	03(7.5%)	00	>0.05
Poor	00	00	>0.05
Inadequate	00	00	>0.05

(Significant p<0.05)

The heart rate changes returned to baseline levels at 5 min. after intubation in both the groups and these were statistically non-significant (p>0.05).

Figure 4

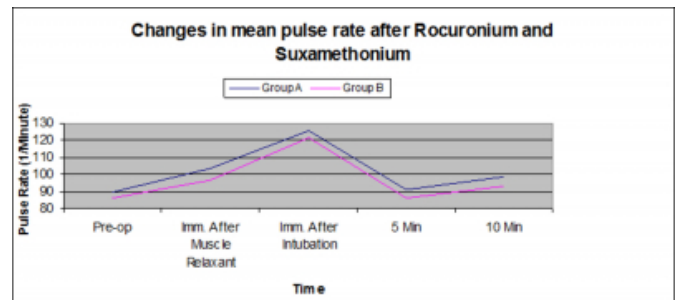


Figure 8

Time	Group A Mean ± SD	%	Group B Mean ± SD	%	p-value
Pre-Op	126.75±8.97	-	122.85±5.62	-	>0.05
Imm. After relaxant	131.60±18.64	3.82	132.25±6.72	7.65	>0.05
Imm. After Intubation	149.85±12.38	18.22	145.05±6.61	18.07	>0.05
5 min.	127.35±7.56	0.47	126.5±8.73	2.97	>0.05
10 min	123.70±10.79	-2.1	128.55±11.12	4.6	>0.05

(Significant p<0.05)

Systolic blood pressure increased in both the groups after intubation and came to baseline (at pre-induction value) within 5 minutes. The changes were not significant (p>0.05).

Figure 6

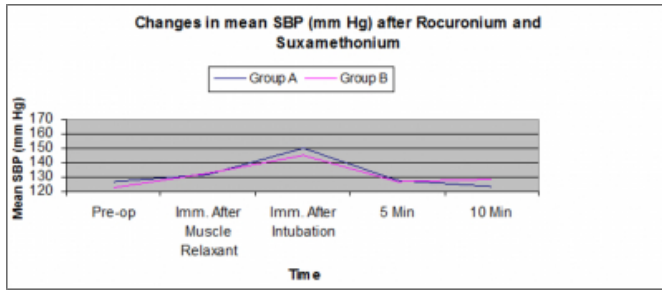


Figure 7

Table 4: Changes In Mean Diastolic Blood Pressure (Mm Of Hg) After Rocuronium (Group A) & Suxamethonium (Group B)

Time	Group A		Group B		P value
	Mean± SD	%	Mean± SD	%	
Pre-Op	79.35±6.99	-	78.70±10.04	-	>0.05
Imm. After muscle relaxant	83.30± 7.39	4.97	86.65±9.85	10.10	>0.05
Imm. After Intubation	100.90±8.78	27.15	101.80±4.25	29.35	>0.05
5 min.	82.2±6.11	3.59	84.7±6.83	7.62	>0.05
10 min.	79.75±8.84	0.5	81.95±7.02	4.12	>0.05

(Significant p<0.05)

Figure 9

Authors	Year	Intubating Conditions Clinically acceptable %	Clinically non acceptable
Puhringer et al	1992	Roc. 100 0 Sux. 100 0	0 0
Cooper et al	1993	Roc. 95 5 Sux. 100 0	5 0
Wierda et al	1995	Roc. 100 0	0
Dubois et al	1995	Roc. 100 0 Sux. 92.5	0 7.5
Dr. Singh Ajeet Series	2004	Roc. 95 5 Sux. 85 15	5 15
Our study	2007	Roc.100 0 Sux. 100 0	0

DISCUSSION

Suxamethonium, a depolarizing muscle relaxant with its

rapid onset and short duration of action is still relaxant of choice to facilitate tracheal intubation. In addition to fasciculations, Suxamethonium has got many side effects such as bradycardia and other dysrhythmias, rise in serum potassium, post operative myalgia, rise in intraocular, intragastric and intracranial pressure, incidences of prolonged recovery in patients with pseudo-cholinesterase deficiency and triggering of malignant hyperthermia.

Because most of the side effects of Suxamethonium reflect its depolarizing mechanism of action therefore search for ideal neuromuscular blocking agent focused on nondepolarising type of relaxants which has rapid onset time and offers good to excellent intubation conditions, as rapidly as Suxamethonium and which lacks the above mentioned adverse effects.

Rocuronium (ORG 9426), a new nondepolarising aminosteroidal muscle relaxant is chemically 2-morpholino, 3-desacetyl, 16-N-allyl pyrrolidino derivative of Vecuronium, differing from it at 3 positions on steroid nucleus. The present study compares intubating conditions and onset time of Rocuronium and Suxamethonium.

Intubating conditions can be influenced by the choice of the anesthetic agent and the use of adjuvant drugs such as narcotics, sedatives or lidocaine Propofol and Etomidate depress pharyngeal and laryngeal reactivity more than Thiopentone. In this study Thiopentone was selected to minimize enhancement of muscular relaxation. If Propofol or Etomidate has been selected, one would expect that intubating conditions would be improved. In the present studies no sedatives were administered in the pre-operative period to maintain the clarity of assessment.

In most studies, an appropriate timing of tracheal intubation has been determined by 3 ways.

1. Clinical judgment
2. Neuromuscular monitoring either by twitch Suppression (maximum blockade) or TOF ratio
3. Predetermined time after the administration of Neuromuscular blocking agent e.g. 60 secs, 90 secs, 120 secs etc.

We have relied on predetermined time for tracheal intubation.

Results of present study, regarding intubating conditions are summarized in table-1 showing total intubating score achieved and the frequency distribution of excellent, good, fair and poor conditions achieved after the administration of either Rocuronium 0.6 mgkg⁻¹ or Suxamethonium 1.5 mgkg⁻¹ following routine induction for elective operations. Taking together those patients with 'excellent' and 'good' intubating condition, pooled data of our study shows that there is not an appreciable difference in the frequency distribution of clinically acceptable intubating conditions, after the administration of Suxamethonium and Rocuronium. The clinically acceptable conditions are present in all the patients of the two groups receiving Rocuronium and Suxamethonium.

The comparative data amongst the results obtained by other workers and of our series are shown in the following table.

{image:9}

The result of this study supported the contention that 0.6 mgkg⁻¹ of Rocuronium might be a suitable alternative to Suxamethonium for rapid endotracheal intubation in 60 Sec in elective cases. Apparently, Rocuronium was not fully interchangeable with Suxamethonium, as demonstrated by the uniformly excellent intubating conditions after the administration of Suxamethonium (100%) but not with Rocuronium (92.5%) using Thiopentone as a sole anesthetic agent.

CONCLUSION

This clinical study was undertaken to evaluate, whether Rocuronium onset time was sufficiently short to permit its use for rapid sequence induction of anesthesia and whether intubating conditions achieved by Rocuronium were similar to those achieved by Suxamethonium.

It is concluded from this study that intubation can be performed under good to excellent conditions at 60-90 seconds after a bolus dose of Rocuronium of 0.6 mgkg⁻¹. The result of this study indicates that for rapid sequence induction technique to protect against gastric aspiration, to protect against increased intracranial pressure and to facilitate intubation without side effects of Suxamethonium,

the Rocuronium is the drug of choice with optimum dose and preferable induction regimen to provide excellent intubation condition.

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