

COMPARISON OF INTUBATING CONDITIONS OF SUCCINYLCHOLINE WITH THAT OF ROCURONIUM

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ABSTRACT

Intubation is one of the common procedures performed during general anesthesia. Neuromuscular blocking agents are used to achieve muscle relaxation for tracheal intubation. In the present study tracheal conditions of succinylcholine and rocuronium are compared and evaluated. The study reveals that Rocuronium (0.6 mg/kg) is good to excellent conditions at 90 seconds in 90% of patients as compared to succinylcholine (2mg/kg) which produces excellent conditions in 100% of patients.

Keywords: *Intubation, Succinylcholine, Rocuronium*

INTRODUCTION

Mahdavi and Roopa (2002) conducted study in 40 ASA grade I-II children of age 1-5 years. Patients were given either rocuronium 0.6 mg/kg iv (n=20) or succinylcholine 1mg/kg iv and neuromuscular blockade was quantified by recording twitch response of adductor pollicis. Tracheal intubating conditions were assessed by a blinded assessor at 60 sec and after every 30 sec later until the patients could be intubated with good or excellent conditions. Onset time and duration of action were significantly more in rocuronium group as compared to succinylcholine. With rocuronium 13 patients (65%) could be intubated at 60 sec and 20 (100%) at 90 sec; while all were intubated at 60 sec with succinylcholine.

Magorian (1993) in his study showed that onset times for patients receiving 0.9 mg/kg to 1.2 mg/kg rocuronium and succinylcholine were similar. Onset times for the groups given 0.6 mg/kg rocuronium and vecuronium were significantly longer. They concluded that there is a dose – dependent decrease in onset time with rocuronium. The onset times for the two larger doses of rocuronium were similar to that for succinylcholine, but clinical duration of action with rocuronium was significantly longer. The brief onset time achieved with rocuronium indicates that administration of 0.9 – 1.2 mg/kg is an acceptable alternative to succinylcholine for rapid – sequence induction of anesthesia.

The study of Maria *et al.*, (2004) aimed at comparing intubation conditions after 0.6 mg/kg rocuronium at 60 seconds in children, adults and elderly patients and concluded that 0.6 mg/kg rocuronium was sufficient for tracheal intubation in 60 seconds in adult and elderly patients. It was, however, insufficient for clinically acceptable tracheal intubation conditions in 60 seconds in 100% of children.

Michael (2004) concluded that in terms of efficacy, there were no significant differences between the rocuronium and succinylcholine either in terms of the time before loss of train-of – four (the test used to assess the degree of neuromuscular blockade) or the time before intubation was completed. Intubation was complete for rocuronium patients on an average in 60 seconds, compared with 77 seconds for succinylcholine patients. No major side effects were seen with either drug.

Birnbaumer (2001) concluded that although succinylcholine had faster onset than rocuronium (mean, 39 seconds vs. 44 seconds) and slightly more relaxation, neither difference was clinically significant.

Bhardwaj *et al.*, (1999) in his study concluded that clinically acceptable intubation conditions were obtained in all patients after rocuronium 0.9 mg/kg and succinylcholine 1.5 mg/kg as compared to only 37 percent in rocuronium 0.6 mg/kg group ($p<0.0001$). Jaw relaxation was significantly better in rocuronium 0.9 mg/kg and succinylcholine 1.5mg/kg. The intubation time was significantly longer in rocuronium 0.6 mg/kg. They concluded, rocuronium in a dose of 0.9 mg/kg may be a valuable alternative to succinylcholine for rapid tracheal intubation in emergency situations where succinylcholine is contraindicated and surgery is of intermediate duration.

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Hemmerling *et al.*, (2000) compared the onset of neuromuscular block with succinylcholine (1mg/ kg) and two doses of rocuronium (0.6 and 0.9 mg/kg) at the adductor pollicis muscle using electromyography (EMG) and acceleromyography (AMG), and at the adductor laryngeal muscles with a new electromyography method using a disposable surface electrode attached to the cuff of a tracheal tube. At the larynx, 90% block and the onset time of succinylcholine were significantly shorter ($P<0.01$) than for rocuronium 0.6 mg/ kg and rocuronium 0.9 mg/ kg. They found that, with comparable degrees of neuromuscular block, the onset time of succinylcholine at the adductor pollicis was significantly shorter ($P<0.01$) than for rocuronium 0.6 mg/ kg and 0.9 mg/ kg. Clinical duration at the adductor pollicis (AMG) was significantly longer ($P<0.01$) for both rocuronium groups than for succinylcholine.

Gerd *et al.*, (1996) concluded that clinically acceptable intubating conditions are produced more rapidly with rocuronium than with atracurium or vecuronium.

McCourt *et al.*, (1998) concluded that rocuronium 1.0 mg/ kg can be used as an alternative to suxamethonium 1.0 mg/kg as part of a rapid sequence induction provided there is no anticipated difficulty in intubation. The clinical duration of this dose of rocuronium is, however, 50-60 min.

Cooper *et al.*, (1992) have assessed intubating conditions after administration of Org 9426 (rocuronium) 600 mcg/ kg at 60 or 90 secs in groups of 20 patients. The influence of prior suxamethonium administration on the potency of Org 9426 was studied also by constructing a dose-response curve. Intubating conditions after Org 9426 were found to be clinically acceptable (good or excellent) in 95% of patients at 60 secs and in all patients at 90 secs and in all patients at both times after suxamethonium. Prior administration of suxamethonium did not appear to influence the potency of Org 9426.

Friedrick *et al.*, (1992) concluded that inspite of the pharmacodynamic differences between Succinylcholine and rocuronium, the intubating conditions after administration of both compounds are similar and develop at the same rate.

Barkowshi *et al.*, (1993) concluded that rocuronium's onset time was significantly faster than rocuronium and atracurium during enflurane anesthesia in 60 patients. Enflurane also enhanced neuromuscular block in dose-related manner. Speed of onset is inversely related to potency.

Viby (1994) in this study concludes that pharmacodynamic effects of rocuronium and vecuronium are similar except that rocuronium is about six times less potent and hence significantly shorter onset time.

De-Mey *et al.*, (1994) in his study on 'Evaluation of the onset and intubating conditions of rocuronium bromide' conclude that rocuronium at 0.6 mg/kg or larger dose provides acceptable intubating condition at 60 secs after administration.

MATERIALS AND METHODS

The study conducted was double blind controlled study.

This study was conducted in 60 adult patients of either sex, aged between 18 to 60 years, undergoing gynecological surgery, general surgery and orthopedic surgery.

They were divided in two groups:

Group A included 30 adult patients who received succinylcholine (2mg/kg).

Group B included 30 adult patients who received rocuronium (0.6mg/kg).

The inclusion criteria included:

- 1) Patients aged 18 to 60 years.
- 2) ASA physical status grade I – II
- 3) Mallampatti class I – II airway

The exclusion criteria were:

- 1) Patients having neuromuscular disease.
- 2) Patients receiving medications known to influence neuromuscular function.
- 3) Patients with cardiac, renal, hepatic and metabolic diseases.
- 4) Patients expected to have difficult intubation, Mallampatti III – IV.

All patients included in the study were premedicated with inj.glycopyrolate 0.2mg intramuscularly ½ hr before surgery.

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Patients were shifted into the operation room on a trolley and made to lie on the operating table after loosening the clothes. Patient was connected to all the monitors like ECG, noninvasive blood pressure and pulse oximetry.

Before induction vital signs-pulse rate, noninvasive arterial blood pressure was recorded. ECG, peripheral oxygen saturation (pulse oximetry), pulse rate, non-invasive arterial blood pressure was monitored throughout the procedure.

General anaesthesia was induced with propofol 2mg/kg and fentanyl 2mg/kg intravenously.

Administration of Muscle Relaxant

Neuromuscular monitoring was established after induction of anesthesia and before the administration of muscle relaxant. Neuromuscular monitoring was done at the ulnar nerve at the wrist through the skin surface electrodes. Ulnar nerve was stimulated with increasing intensity of stimulus and the maximum response was established (supra maximal intensity stimulus). 1.5 times the full response was used for train of four, which was taken as the baseline measurement.

The patients were randomized into two groups of 30 patients, Group A and Group B. Randomization procedure was done in 1:1 ratio i.e., all patients numbered odds were allotted group A and all patients numbered evens were allotted group B.

All Group A patients received succinylcholine (2mg/kg) and all patients of group B received rocuronium (0.6 mg/kg).

After giving the muscle relaxant, patient was ventilated with oxygen, nitrous oxide, and isoflurane for 90 seconds. At 90 seconds, Train of four was measured and the response was noted. At the same time, the anesthetist blinded by the type of the relaxant used did laryngoscopy. The intubating condition is evaluated and scored according to the four step scale proposed by Goldberg and colleagues:

Excellent: Vocal cords relaxed, easy passage of the tracheal tube without coughing.

Good: Vocal cords relaxed passage of the tracheal tube with minimum coughing.

Poor: Some movements of the vocal cords, passage of tracheal tube with moderate coughing or bucking.

Impossible: Vocal cords adducted or not visualized, jaw not relaxed. If intubation was impossible, patients were again ventilated for another 30 sec. At 120 sec, laryngoscopy was done and the intubation condition was assessed again and scoring done according to Goldberg and colleagues. Train of four was again assessed and recorded.

Following intubation, anaesthesia was maintained with oxygen, nitrous oxide and 0.2 - 0.5% isoflurane. Patients were given intermittent positive pressure ventilation.

Throughout the procedure changes in heart rate, blood pressure, were measured.

RESULTS AND DISCUSSION

Table 1 shows the comparison of intubation conditions between the two groups.

All the patients in succinylcholine group (A) had excellent intubating conditions at 90 seconds.

In rocuronium group (B) 90% of patients had good to excellent intubating conditions at 90 seconds. 63.3% of patients had excellent intubating conditions. 26.7% of patients had good intubating conditions and only 10% of patients had poor intubating conditions during which patient bucked.

All the patients of rocuronium group could be intubated at 90 seconds.

Table 1: The comparison of intubation conditions between the two groups

Intubation condition	Succinylcholine (GROUP A) (n=30)	Rocuronium (GROUP B) (n=30)	Significance between two groups
Excellent	30 (100.0)	19 (63.3)	P<0.05**
Good	-	8 (26.7)	P<0.05**
Poor	-	3 (10.0)	P>0.05
Impossible	-	-	

Table 2 shows comparison of neuromuscular monitor (train of four) between the two groups.

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The responses were abolished in succinylcholine group (A) in the entire patient.

The responses were abolished in only 10% of the patients in rocuronium group (B). One patient (3.3%) showed one response to train of four. Three patients (10%) showed two responses to train of four. Five patients (16.7%) showed three responses to train of four. Whereas majority, 18 patients (60%) showed all the four responses to train of four.

Table 2: Comparison of neuromuscular monitor (train of four) between the two groups

Intubation condition	Succinylcholine (GROUP A) (n=30)	Rocuronium (GROUP B) (n=30)
No Response seen	30 (100.0)	3 (10.0)
1 Response seen	-	1 (3.3)
2 Response seen	-	3 (10.0)
3 Response seen	-	5 (16.7)
All response seen	-	18 (60.0)

The aim of the study was to compare the intubating conditions at 90 seconds following administration of rocuronium (0.6 mg/kg) and succinylcholine (2mg/kg). In this comparative study, intubating conditions at 90 seconds were better with succinylcholine group.

All the patients of Group A had excellent intubating conditions at 90 seconds. Although all patients of rocuronium group could be intubated at 90 seconds, 90% of them had good to excellent intubating conditions. Only 10% of the rocuronium group had poor intubating condition during which patient bucked.

In Neuromuscular monitoring, train of four was abolished in all patients of succinylcholine group but only 10% of the rocuronium group showed abolished response to train of four whereas majority (60%) of them showed all the four responses to train of four. Intubation was possible at 90 seconds with partial or no suppression of train of four responses.

The present study correlates well with Khuenl (1993) who concluded that rocuronium provided good intubating conditions after 30sec to 90sec after injection of 0.6 mg/kg (2x ED 90) and was equal to that observed with succinylcholine. Although the onset time of rocuronium at the adductor pollicis muscle is slower than that of succinylcholine.

Rocuronium (0.6 mg/kg) when compared with Succinylcholine (2mg/kg) shows:

1. Good to Excellent intubating conditions at 90 seconds in 90% of patients as compared to succinylcholine which produced Excellent conditions in 100% of patients.
2. Because of Excellent intubating conditions and minimum haemodynamic response, Rocuronium would be suitable for rapid intubation conditions.

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