

A Study of Comparison of Intubating Conditions and Haemodynamic Effects after the Administration of Succinylcholine and Rocuronium Bromide

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Abstract

Background and Aim: Though rocuronium has a rapid onset of neuromuscular blockade like succinylcholine without the latter's adverse effects, its use is limited due to its prolonged action. Present study was performed with an aim to compare the outcome of using Rocuronium and Succinylcholine as muscle relaxant (MR). *Material and Methods:* A single-center, prospective-randomized, blinded study of 60 patients, divided into 2 groups and intubation conditions were evaluated. *Results:* The intubating conditions were scored as excellent in 29 and 26, and Good intubating conditions were observed in 1 and 4 Patients of group I and 2 respectively. *Conclusion:* We conclude that rocuronium, an innovative nondepolarizing MR with a succinct onset of action and transitional duration, but lack of the unpleasant reactions connected with succinylcholine may be a appropriate alternative to succinylcholine for tracheal intubation.

Keywords: Muscle relaxant; Randomized trial; Rocuronium; Succinylcholine.

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Introduction

From the ancient time man has always been in the quest for perfection. Anesthesia has been receptive to new ideas & new discoveries for better patient care. Introduction of newer drugs & techniques have further helped in improvement in anesthesia practice. At present endotracheal intubation is an essential element of organization of general anesthesia throughout surgical procedures to maintain airway, to allow IPPV and to prevent aspiration. Dangerous period for aspiration is the

time interval between suppression of protective reflexes & development of satisfactory intubating conditions. Hence this time interval should be as short as possible.¹⁻⁵

Succinylcholine introduced by the Daniel Bovet *et al.* in 1949, revolutionized anaesthetic practice by providing intense neuromuscular blockage of very quick start & very small period of action, and yet relaxant of alternative for habitual intubation and quick succession initiation of anesthesia.⁵ Adding up to fasciculation it had numerous adverse effects as well. Therefore the search is on for agent, which

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has quick onset of action, quick revival, and non-cumulative effect, without cvs side effects, with high potency, pharmacologically inactive metabolites, and reversibility with cholinesterase inhibitors.⁶⁻⁸

Recently developed neuromuscular blocking drugs are of intermediate duration & to a major extent free of side effects. However even after intubating doses onset of action is relatively slow as compared to succinylcholine. Among the muscle relaxants in current utilize, the transitional acting non-depolarizing muscle relaxants- vecuronium & atracurium besylate are good-looking alternatives.⁹⁻¹⁵ However, neither of them has been demonstrated to have significant shorter onset time as required for quick tracheal intubation as compared to succinylcholine. The use of high initial bolus doses of either atracurium or vecuronium condensed the beginning time however at the cost of an extended period of action which may be undesirable in certain situations. Rocuronium bromide is a novel aminosteriod neuro-muscular blocking agent linked to vecuronium bromide but has a greater lipophilicity, lesser potency and a very fast onset of action. Good to excellent tracheal intubating condition have been reported with in 60-90 seconds after a dose in a range of 0.6-0.9 mg/kg.¹⁶⁻²¹ Several clinical studies conducted by various workers have confirmed the brief onset time of rocuronium bromide. In most studies the timing of tracheal intubation was determined by neuromuscular monitoring or the intubation was done at a prearranged moment in time following organization of neuromuscular blocking drugs. In clinical practice however neuromuscular monitoring and accurate timing are rarely used, and many anaesthesiologists commence laryngoscopy based on clinical assessment.

The aim of the current research is to examine and evaluate the intubating conditions, onset of time, time of action & haemodynamic effects in ASA Gr I/II receiving succinylcholine & rocuronium bromide for quick tracheal intubations.

Materials and Methods

Sixty patients of ASA grade I and II, aged between 20 to 60 years, go through a variety of surgical events were elected for the research. Ethical approval was taken from the institute ethical committee and written informed consent taken from the all participants. Exclusion criteria were: Patients with systemic Disease and those who were not willing to participate in the study.

60 Patients were separated in 2 groups. Group I Patients (n=30) received Inj.Succinylcholine chloride 1.5 mg/kg IV, Group II Patients (n=30) received Inj.Rocuronium Bromide 0.9 mg/kg IV For Tracheal Intubation.

On entrance to the operating room, vital parameters were evaluated and iv admittance was establish. Surface electrodes of neuromuscular monitor were applied to forearm at wrist to stimulate ulnar nerve. Patients were Premedicated with Inj. Glycopyrolate 4 µg/kg IV and Inj. Fentanyl 2 µg/kg IV, 15 min. before induction. After Pre-oxygenation for 3 minutes anesthesia was induced with Inj. Thiopentone 5-7 mg/kg IV till the loss of eye lashes reflex.

Prior to delivery of muscle relaxant the supramaximal stimulus was determined with the help of the peripheral nerve stimulation by observing contraction of adductor pollicis by visual, tactile assessment. After induction, muscle relaxant according to the group given in running IV line. After giving muscle relaxant the single twitch stimulus given all 10 seconds, the time interval from end of injection of muscle relaxant to maximum suppression of control twitch height (we called it onset time) was noted.

An experienced anaesthesiologist, unaware about the muscle relaxant, performed endotracheal intubation. Intubation attempt was tried at 60 seconds following deposition of the muscle relaxant. Intubating conditions were assessed as excellent, good, fair or poor based on jaw relaxation, location and faction of vocal cords and diaphragmatic response to intubation using Copenhagen consensus conference rating scale. If the intubation conditions assessed, not found satisfactory, the intubation stopped and subsequent attempts were made at 30 seconds interval until intubation was achieved with acceptable intubating conditions. Time duration of intubation after muscle relaxant noted at 60 sec, 90 sec, 120 seconds.

Table 1: Copenhagen Consensus Conference Rating Scale Intubating conditions clinically acceptable clinically unacceptable

Variables	Excellent	Good	Poor
1. Laryngoscopy	Easy	Fair	Difficult
2. Vocal Cords			
• Position	Abducted	Intermediate	Closed
• Movements	None	Moving	Closing
3. Reaction to Intubations			
• Movements of Limb	None	Slight	Vigorous
• Coughing	None	Diaphragm	Sustained (>10s)

Anesthesia was then maintained with 50% O₂ + 50% N₂O supplemented with sevoflurane 0.8-1% and rocuronium infusion with controlled ventilation. At impulsive T1 recovery of approximate 25% of control (after intubating dose), rocuronium infusion was started in a dose of 0.3 mg/kg/hr and rate was adjusted to maintain 1 to 2 response to TOF stimuli, if required. Rocuronium infusion was stopped 15-20 minutes prior to probable ending of surgery. At the end of surgery neuromuscular block was assessed by using TOF and when T1 returned to approximately 90% of control patient was reversed by using Inj. Neostigmine 0.05 mg/kg, Inj. Glycopyrolate 0.008 mg/kg. The extubation was performed when the patient was fully awake. The patient was monitored for 24 hrs in post operative period for a residual muscle Paralysis. Any adverse cardiovascular event or allergic reaction to the drug used was noted.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages, means and standard deviations. For

all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

We have studied 60 ASA Gr. I/II patients undergoing various elective surgeries. The mean onset time for group I was 47.33 ± 9.44 seconds, for group II was 72.67 ± 16.39 seconds. Statistically significant difference was observed between group I and group II (*p*<0.01). Clinical duration of intubating dose of succinylcholine 1.5 mg/kg was smaller than that of rocuronium 0.9 mg/kg and this difference was statistically significant. The intubating conditions were graded as excellent in 29 (96.7%) and 26 (86.7%) Patients of group I and II correspondingly. The difference was not statistically significant between group I and II (*p*>0.05). Good intubating conditions were seen in 1 (3.3%) and 4 (13.3%) Patients of group I and 2 respectively (Table 1) but this relationship was not significant. (*p*>0.05) The alter in Heart Rate and Mean Blood Pressure are described in the charts below. The parameters demonstrate a tendency analogous to each other in both groups (Figs. 1 and 2).

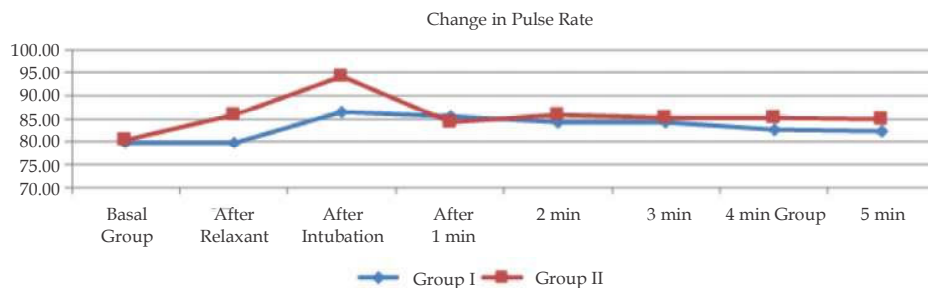


Fig. 1:

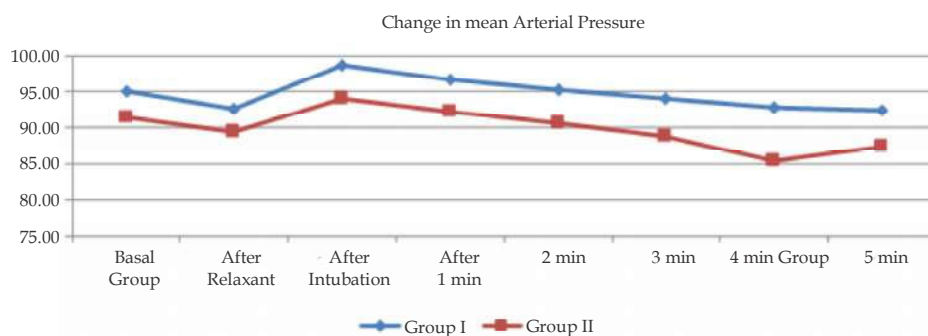


Fig. 2:

Discussion

Traditionally succinylcholine has been the neuromuscular blocking drug of preference for schedule intubations and quick string induction. The smaller onset of action has made it a preferred, except the utilize of succinylcholine can though be connected with many adverse effects as bradycardia, dysrhythmia, hyperkalemia, rise in intra ocular pressure, increase intra cranial pressure, increase intra gastric pressure, post op myalgia. Therefore, a non-depolarising neuromuscular blocker with a quick onset of action, comprising a lesser period of action is desirable.^{22,23}

Preliminary studies in animals demonstrated that rocuronium, being a small efficacy compound was connected with a quick onset of outcome contrast to other compounds such as pancronium and vecuronium.²⁴⁻²⁷

Preliminary trials in animal established rocuronium to be 10-20% as powerful as vecuronium and ED doses were set up to be from 0.26 mg/kg to 0.30 mg/kg. Intubating dose of rocuronium utilized in the present study are 0.6 mg/kg and 0.9 mg/kg. Use of superior dose of rocuronium to advance intubating conditions through rapid series intubation and to engrave short the onset time underneath 60 seconds has been advised by a variety of workers but doses superior then 0.6 mg/kg would be connected with a extended duration of action which may be unsuitable in numerous situations.²⁸

In the majority studies, a suitable timing of tracheal intubation has been resolute by 3 ways-

1. Clinical Judgement.
2. Neuromuscular monitoring either by Twitch suppression or TOF ratio.
3. Predetermined time after the administration of neuromuscular blocking Agent eg. 60 secs, 90 secs, 120 secs etc.

Method utilizing judgment alone is relatively insensitive. Onset time varies with diverse nerve stimulation rates utilized. Cooper *et al.*²⁴ establish onset time for rocuronium 0.6 mg/kg as 90 seconds by 0.1 Hz stimulation and 58 seconds using TOF stimulation. On the other hand, a fixed time for tracheal intubation can be utilized. In current study we have utilized all the 3 parameters.²⁹⁻³⁰

Clinical criteria like jaw relaxation, vocal cord movement were evaluated according to Copenhagen consensus conference rating scale. Onset time and duration of action were measured using neuromuscular monitoring. Patients were

intubated at predetermined intervals. At the time of intubation clinical conditions were noted. Land and Stovner²⁵ were most likely the primary to bring in a rating scale as a tool for the evaluation of intubating conditions in which the three main criteria: Jaw relaxation, vocal cords (position and motility) and reaction to intubation were rated by descriptive scores such as excellent, satisfactory and fair.

Findings of current research, concerning intubating conditions show excellent, good and poor conditions accomplished after the administration of rocuronium 0.9 mg/kg, or succinylcholine 1.5 mg/kg subsequent routine induction for voluntary operations. Present research data demonstrated that there is not an considerable dissimilarity in the intubating conditions after the administration of rocuronium 0.9 mg/kg, or succinylcholine 1.5 mg/kg. Parallel findings were establish in the studies done by, Cooper *et al.*⁹, Fredrick *et al.*¹⁴, Zhou *et al.*¹³, Wierda *et al.*¹⁵ and Weiss JH *et al.*

In a study carry out by Mc Court K C *et al.*⁵ the intubating conditions after 0.9 mg/kg rocuronium come out to be nearly indistinguishable to those observed after 1.0 mg/kg succinylcholine i.e. 96% v/s 97% clinically acceptable intubating conditions. Sparr¹⁹ and Crul¹⁶ *et al.*, examined rocuronium's efficacy in emergency intubating conditions utilizing it firmly as for the situation for rapid sequence induction in unintended but still optional cases. In those studies, the frequency distribution of 'excellent', 'good', or clinically acceptable intubating conditions, 60 seconds after 0.6 mg/kg or 0.9 mg/kg rocuronium were compared with those observed after 1.0 mg/kg succinylcholine. The findings specify that intubating conditions were more encouraging at 60 sec after administration of rocuronium in the dose of 0.9 mg/kg compared to dose of 0.6 mg/kg in unpremedicated patients. Analogous outcome were observed in further studies of Bhardwaj N. *et al.*²² In a study by cooper *et al.*⁹, they found the onset time of 88.90 seconds and 60.40 seconds for rocuronium 0.6 mg/kg and succinylcholine 1.0 mg/kg respectively. The time to accomplish utmost block of 72 seconds with rocuronium 0.9 mg/kg was significantly longer than a time of about 47 seconds with succinylcholine 1.5 mg/kg in the current study and is in agreement with the result of other studies.³¹⁻³²

There were no significant changes in HR and MAP after the administration of muscle relaxant in each of group in this study. The tiny rise in HR and diminish in MAP after induction and muscle relaxant may be owing to cardiovascular effects of induction dose of thiopentone.

Conclusion

We conclude that rocuronium, a newer nondepolarizing muscle relaxant with a concise onset of action and transitional duration, but devoid of the unfavorable reactions connected with succinylcholine may be a appropriate substitute to succinylcholine for tracheal intubation. Rocuronium in a dose of 0.9 mg/kg may be precious option to succinylcholine for quick tracheal intubation in emergency situations.

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