Original Article

Comparison of Rocuronium and Succinylcholine for Rapid Sequence Induction in patients undergoing surgery under General Anaesthesia

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Author`s Contribution

[1,2,3,4] *Conception of study*
[1,2,3,4] *Experimentation/Study conduction*
[1,2,3] *Analysis/Interpretation/Discussion*
[1,2,3] *Manuscript Writing*
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Abstract

Objectives: To compare the frequency of excellent intubation condition with Succinylcholine and rocuronium for rapid sequence induction in patients undergoing surgery under general anesthesia.

Design: Randomized control trial.

Place and duration of study: Department of anesthesiology and pain medicine, Combined Military Hospital Malir Cantt Karachi from 25th June to 10th August 2019.

Methodology: In this randomized control trial, a non-probability consecutive sampling technique was used. Anesthesia was given through a standard approach. Then patients were randomly divided into two equal groups. In group A, succinylcholine (1mg/Kg) was given while in group B, rocuronium (1mg/Kg) was given. Laryngoscopy was attempted after 60 seconds. Intubating conditions were labeled as excellent, good, poor, and impossible. All the data was collected in two groups, the data was entered and analyzed on SPSS version 21.

Results: The mean age of the patients was 40.11±9.49 years. The male to female ratio of the patients was 0.7:1. The study results showed the excellent intubation conditions were noted in 11 from group A and 9 from group B, good intubation condition was noted in 29 from group A and 25 from group B, poor conditions were noted in 17 from group A and 16 from group B and the impossible intubation conditions were noted in 13 from group A and 20 from group B. Statistically insignificant difference was found between the study groups with intubation conditions i.e. p-value=0.570.

Conclusion: It has been proved in our study that both the succinylcholine and rocuronium are statically equally effective in terms of excellent intubation conditions in the management of rapid sequence induction in patients undergoing surgery under general anesthesia.

Keywords: General, Anaesthesia, Intubation, Excellent, Succinylcholine, Rocuronium.

Introduction

Rapid and safe endotracheal intubation is of paramount importance in general anaesthesia.[1] Difficult airway has been a focal point for research in the field of anaesthesiology. "Cannot intubate, cannot ventilate" (CICV) after induction of general anesthesia can prove to be a nightmare of anesthesiologists.[2]

Many researchers have long been looking for a set of anesthesia induction drugs to meet the requirements of both rapid intubation and instant recovery of spontaneous ventilation in case of CICV to prevent severe consequences.[3]

Succinylcholine, a muscle relaxant, with standard dose (1 mg/kg) might increase apnea time, while a smaller dose of succinylcholine may not provide good intubation conditions, but could avoid the prolongation of respiratory depression.[4] Rocuronium is a steroidal nondepolarizing muscle relaxant with onset time comparable to succinylcholine.[1]

Rocuronium has little or no adverse cardiovascular effects, nor does it cause histamine release[5]. For these reasons, it may be preferred over succinylcholine in compromised patients in whom hemodynamic or other changes are to be minimized. A dose of rocuronium usually used for Rapid Sequence Induction (RSI) 1mg/kg, allows rapid paralysis (60 to 90 seconds) but the duration of action is prolonged (35-75 minutes), making it unsuitable in difficult airway scenarios in the unavailability of sugammadex[6].

One study by Sørensen M et al[7] has shown that with rocuronium, 93% of cases had excellent intubation, while with succinylcholine, 76% of cases had excellent intubation. The difference was found to be significant (p=0.045) and showed that rocuronium is more effective.

Another study by Mencke T et al[8] showed that with rocuronium, 57% of cases had excellent intubation, while with succinylcholine, 89% of cases had excellent intubation. The difference was found to be significant (p=0.0001) and showed that succinylcholine is more effective. The Succinylcholine group showed significantly better intubating conditions as compared to the rocuronium group.

A study conducted by Larsen PB et al[9] showed different results. This study showed that clinically acceptable conditions were present in 93.5% of patients in the succinylcholine group whereas 96.1% of patients in the rocuronium group (P=0.59).

A local study by Ahad A et al[10] and another study by Biswajit S et al[11] showed that rocuronium and succinylcholine produce equally good intubating conditions.

Through literature, controversial results have been reported. Some studies favor rocuronium while others supported succinylcholine. But there is limited local evidence present in this regard which can help us in implementing the use of the more effective drugs. So through this study, we want to confirm whether rocuronium is better or we should adopt succinylcholine for better intubation conditions. This will improve our knowledge as well as practice.

Material & Methods

OBJECTIVE

The objective of our study is to compare the frequency of excellent intubation conditions with rocuronium and succinylcholine for rapid sequence induction in patients undergoing surgery under general anesthesia.

OPERATIONAL DEFINITION

Excellent intubation

It was measured as good jaw relaxation, immobile vocal cords, no response to laryngoscopy and intubation 60 seconds after induction of trial drug.

Study Design

Randomized Controlled Trial

Setting

Department of Anesthesia, CMH, Malir Cantt.

Sample Size

A sample size of 140 cases; 70 cases in each group are calculated with 80% power of the test, 5% level of significance, and taking the expected percentage of excellent intubation i.e. 93%[6] with rocuronium and 76%[6] with succinylcholine in patients undergoing surgery under general anesthesia.

Sampling Technique

Non-probability, consecutive sampling.

Sample Selection

Inclusion criteria

- Patients of age range 25-55 years of either gender undergoing elective surgery under general anesthesia with ASA I & II and Mallapati score ≤ 2.

Exclusion criteria

- Patients with chronic pain syndromes, neurological deficits, and difficult airway (Mallampati score >2).
- Patients with ASA class 3 or greater.
- Patients are allergic to trial drugs (in history).
- Patients with class II obesity (BMI>35kg/m^2).

Data Collection Procedure

After approval from the hospital ethical committee, 140 patients fulfilling selection criteria were included in the study. Informed consent and demographics of patients (name, age, gender, BMI) were obtained. Anesthesia was given through a standard approach. Then patients were randomly divided into two equal groups by using the lottery method. In group A, succinylcholine (1mg/kg) was given while in group B, rocuronium (1mg/kg) was given immediately after induction of anesthesia by the researcher himself. Intubation conditions were graded from I to IV, 60 seconds after induction of the trial drug. (Table 1)
Muscle relaxant was prepared by the assistant in advance in the absence of the researcher and was labeled as "Muscle relaxant" rather by the drug name. The screen was used to cordon the area where neuromuscular transmission was being monitored to avoid observer bias. All the information was recorded on a specially designed proforma.

Table 1: Grading of intubation conditions

Grade	*Description*
I (Excellent)	Good jaw relaxation, immobile vocal cords, no response to laryngoscopy and intubation 30 seconds after induction of trial drug.
II (Good)	Slight reactive coughing but with relaxed vocal cords.
III (Poor)	Moderate reactive coughing or bucking with some vocal cord movement.
IV (Impossible)	Vocal cords adducted or uncontrolled coughing and bucking.

Data Analysis
IBM SPSS 21.0 was used to enter and analyze the data. Quantitative variables like age and BMI are presented as means and standard deviations. Qualitative variables like gender and excellent intubation are presented as frequency and percentage. A Chi-square test was used to compare the excellent intubation in both groups. P-value<0.05 was considered significant. Post-stratification, the Chi-square test was applied taking P-value≤0.05 as significant.

Results

In this study total, 140 patients were selected. 61(43.57%) patients were male and 79(56.43%) were female. The male to female ratio of the patients was 0.77 (Figure 1**).**

The mean age of the patients was 40.11±9.49 years with minimum and maximum ages of 25 & 54 years respectively. The study results showed that the mean value of age in group A was 38.73±9.74 years and its mean value in group B was 41.50±9.103 years.
The study results showed that the mean BMI in group A was 24.67±2.92 kg/m^2 and mean BMI in group B was 24.68±2.75 kg/m^2.

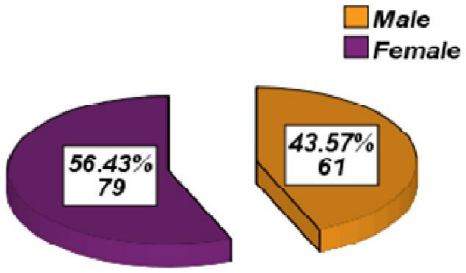

Figure 1: Frequency distribution of gender

In this study, excellent intubation conditions were noted in 20(14.29%) patients, good conditions were noted in 54(38.57%) patients, poor conditions were noted in 33(23.57%) patients and impossible intubation condition was noted in 33(23.57%) patients. (Figure 2)

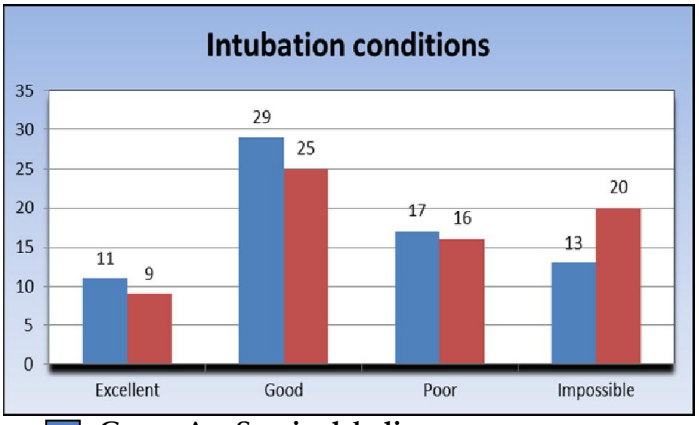

Figure 2: Frequency distribution of intubation condition

The study results showed the excellent intubation conditions were noted in 11 from group A and 9 from group B, good intubation conditions were noted in 29 from group A and 25 from group B, poor conditions were noted in 17 from group A and 16 from group B and the impossible intubation conditions were noted in 13 from group A and 20 from group B. Statistically insignificant difference was found between the study groups with intubation conditions i.e. p-value=0.570. (Table 2)

Table 2: Comparison of intubation condition with study groups

Intubation condition	Study Groups		Total
	Group A	Group B	
Excellent	11(7.86%)	9(6.43%)	**20(14.29%)**
Good	29(20.71%)	25(17.85%)	**54(38.57%)**
Poor	17(12.14%)	16(11.43%)	**33(23.57%)**
Impossible	13(9.29%)	20(14.29%)	**33(23.57%)**
Total	**70(50%)**	**70(50%)**	**140(100%)**

Group A= Succinylcholine
Group B= Rocuronium
Chi value=2.011
p-value=0.570 (Insignificant)

Discussion

According to our study results, there is insignificant difference between two groups in managing the excellent conditions of intubation (p-value=0.570), however, the excellent intubation conditions were noted in 11 from succinylcholine group [group A] and 9 were from rocuronium group [Group B], good intubation conditions were noted in 29 from group A and 25 from group B, poor conditions were noted in 17 from group A and 16 from group B and the impossible intubation conditions were noted in 13 from group A and 20 from group B.

One study by Sørensen M et al[8] has shown that with rocuronium, 93% of cases had excellent intubation, while with succinylcholine, 76% of cases had excellent intubation. The difference was found to be significant (p=0.045) and showed that rocuronium is more effective.

Another study by Sutradhar B et al[9] and a local study by Ahad A et al[12] and showed that rocuronium produces equally good intubating conditions when compared to succinylcholine.

Another study by Mencke T et al[10] showed that with succinylcholine, 57% cases had excellent intubation conditions compared with 21% in case of rocuronium, while clinically acceptable conditions with succinylcholine were 89% compared to 59% of cases in rocuronium group The difference was found to be significant (p=0.001) and showed that succinylcholine is more effective.

Another study by Larsen PB et al[11] showed a contradiction that clinically acceptable intubation conditions were present in 93.5% and 96.1% of patients in the succinylcholine group and the rocuronium group, respectively (P=0.59), showing rocuronium 0.6mg/kg as equivalent to succinylcholine 1mg/ml.

Herbstritt 2012[13] is a short review looking at the use of equivalent doses of rocuronium and succinylcholine (1 mg/kg) for RSI. They included seven papers of varying quality (retrospective review, RCT and meta-analysis), and concluded that there are no differences in intubating conditions between the two.

One more study by Stephan C Marsch et al[14] demonstrated in their study that the Intubation conditions (succinylcholine 8.3 ± 0.8; rocuronium 8.2 ± 0.9; P = 0.7) and failed first intubation attempts (succinylcholine 32/200; rocuronium 36/201; P = 1.0) did not differ between the groups.

The five paediatric trials (Cheng 2002[15], Kulkarni 2010[16]) did not demonstrate a difference in creating excellent intubation conditions between the rocuronium and succinylcholine groups.

On the other hand a study by Tran DT et al[17] concluded that succinylcholine was superior to rocuronium for achieving excellent intubating conditions: RR 0.86 (95% confidence interval (CI) 0.81 to 0.92; n = 4151) and clinically acceptable intubation conditions (RR 0.97, 95% CI 0.95 to 0.99; n = 3992, 48 trials). Succinylcholine created superior intubation conditions to rocuronium in achieving excellent and clinically acceptable intubating conditions.

Conclusion

It has been shown by our study that both the succinylcholine and rocuronium are statistically equally effective in terms of excellent intubation conditions in the management of RSI in patients undergoing surgery under general anesthesia.

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