



THE COMPARISON OF ROCURONIUM AND SUCCINYLCHOLINE FOR ENDOTRACHEAL INTUBATION IN PATIENTS UNDERGOING ELECTIVE SURGERY UNDER GENERAL ANAESTHESIA

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ABSTRACT:

Background: Succinylcholine is a muscle relaxant of choice for intubation due to its fast onset and ultrashort duration of action but it is associated with unwanted side effects. Rocuronium bromide can be used alternatively to avoid those unwanted side-effects because of its fast onset and intermediate duration of action. This study was conducted to find a better alternate drug with minimal adverse effects and easy for intubations. Thus, our study aimed to compare the onset time, duration of action, intubating condition and hemodynamic effect of rocuronium bromide at the dose of 0.8 mg/kg and Succinylcholine at the dose of 1.5 mg/kg. **Methods:** A total of 140 cases; 70 cases in each group are calculated with 80 powers of the test, 5 positions of significance, and taking the anticipated chance of excellent intubation i.e. 93 with rocuronium and 76 with succinylcholine in cases witnessing surgery under general anesthesia. **Results:** The Rocuronium bromide 0.8 mg/kg provided excellent intubating conditions in 67.1% patients, good intubating conditions in 22.9% patients and poor intubating conditions in 10% patients, while succinylcholine 1.5 mg/kg provided excellent intubation conditions in 64.3% patients, good intubating conditions in 28.6% patients and poor intubating conditions in 7.1% patients. There was insignificant difference present in intubation scores between these two groups. The duration of action was longer with rocuronium bromide 0.8 mg/kg (44.4 ± 4.7 minute) as compared to succinylcholine 1.5 mg/kg (3.85 ± 3.3 minute). The mean of onset of action of succinylcholine is significantly shorter than that of rocuronium (48.07 ± 4.04 Vs 74.4 ± 9.1 sec). **Conclusion:** Rocuronium bromide 0.8 mg/kg gives the same intubating conditions as succinylcholine 1.5 mg/kg with good haemodynamic stability and no side-effects but the duration of action was longer with rocuronium bromide 0.8 mg/kg as compared to succinylcholine 1.5 mg/kg. Rocuronium bromide 0.8 mg/kg can be used as an alternative to succinylcholine 1.5 mg/kg in patients undergoing elective surgeries where early return of spontaneous recovery is not needed.

KEYWORDS: Endotracheal intubation, Succinylcholine, Rocuronium, General anesthesia, surgical airway management.

INTRODUCTION

The Neuromuscular Blocking Drugs (NMBDs) are used to provide muscle relaxant during intubation, which is most important process that involved in surgeries undergoing General Anaesthesia (GA). The main goal of NMBDs is to provide paralysis of vocal cords and muscles of jaw during intubation. To achieve successful

tracheal intubation with less laryngeal injuries, rapid onset of neuromuscular blockade is required Misra et al., (2005). In 1952, Foldes and associates have introduced succinylcholine, which rapidly gained attention and changed anaesthesia practise because of the rapid onset of effect and ultrashort duration of neuromuscular blockade. Due to this, rapid endotracheal intubation and

rapid recovery from neuromuscular blockade is possible Foldes et al. (1952). Succinylcholine has been the main neuromuscular blocking agent for the endotracheal intubation with special application in rapid sequence induction and difficult intubation Sinclair et al. (2005). The succinylcholine has ultra rapid onset and ultra-short duration of action Burkhart et al. (2005). For these qualities, the succinylcholine still occupies the first position in providing excellent conditions for endotracheal intubations in many conditions. Advantages like its quick launch (40 – 60 s) and short half-life (6 – 10 min) must be counted against the possibility of hyperkalaemia, shifting elevations in intracranial pressure (Larsen et al., 2005), and, to a lower degree, intraocular pressure (Vinik, 1999). thus, in cases of severe becks or crush injuries, acute abdominal infections, denervation runs, muscular dystrophy, nasty hyperthermia, or in cases where succinylcholine has preliminarily caused an antipathetic response, succinylcholine shouldn't be used (Moro et al., 2004). Rocuronium has the most rapid onset of action among the currently available non-depolarizing neuromuscular blocking agents Maddineni et al. (1994). Unlike succinylcholine, its use is not associated with muscle fasciculations, hyperkalaemia, post-operative myalgias etc., It exhibits a low potential for systemic histamine release Naguib et al. (1995) and does not produce any significant changes in cardiovascular parameters Maddineni et al. (1994). It also does not show any significant cumulative effect in most of the patients. Pancuronium, vecuronium, atracurium, and cisatracurium are some other agents; still, none of them can produce acceptable intubating circumstances as snappily as succinylcholine. A steroid-grounded non-depolarizing muscle relaxant called rocuronium has been employed to produce intubation circumstances akin to those brought on by succinylcholine. With regular boluses, the duration of action is extended to 37 – 72 twinkles (Magorian et al. 1993). Mislike is the sole complete contraindication to rocuronium. People with hepatic complaint, neuromuscular complaint, carcinomatosis, myasthenia gravis or myasthenic pattern, or severe cachexia should exercise caution as the duration of action may be significantly dragged (Stollings et al., 2014).

Multitudinous examinations comparing succinylcholine and rocuronium have yielded inconsistent results. These variations may have been caused by variations in the lozenge of rocuronium administered, the narcotic medicine used (propofol, thiopental, or etomidate), or the use of opioids (Magorian et al., 1993). Thus, the current study was conducted to compare the intubating conditions, onset and duration of action, and cardiovascular effects after the administration of rocuronium and succinylcholine in adult patients undergoing elective surgery. This review is pivotal because, with the arrival of a particular reversal medicine called sugammadex (Keating, 2016), Rocuronium is

decreasingly being employed in place of succinylcholine in rapid-fire sequence intubation.

Aim of the study

To study the comparison of rocuronium and succinylcholine for endotracheal intubation in patients undergoing elective surgery under general anaesthesia.

Objective of the Study

To compare the prevalence of excellent intubation conditions in cases entering general anesthesia after surgery using succinylcholine and rocuronium.

MATERIALS AND METHODS

The present study entitled “To study the comparison of rocuronium and succinylcholine for endotracheal intubation in patients undergoing elective surgery under General Anaesthesia” was carried out, in Aamina Hospital and Nursing Home, Nowgam, Srinagar, Jammu and Kashmir, Bharat, after obtaining the approval from the hospital ethical committee.

A total of 140 surgical patients of age 18-50 years, of weight 30-60 kgs, with ASA grade I and II, with BMI < 30kg/ m² were scheduled for elective lower abdominal surgeries. Written informed consent was taken from all the patients. All the patients were randomly divided into 2 groups of 70 each.

Group I (n=70): Patients received Inj. Succinylcholine 1.5 mg/kg iv.

Group II (n=70): Patients received Inj. Rocuronium 0.8 mg/kg iv.

Exclusion Criteria

- Patients with ASA class III or IV.
- Patients with BMI > 30kg/ m².
- Pediatric patients.
- Patients with age more than 50 years.
- Patients with weight more than 60 kgs.
- Patients unable to provide informed consent.
- Anticipated difficult airway.
- Patients with history of hyperactive airway disease.
- Patients with deranged serum creatinine level.
- Patients with deranged serum potassium level.

Pre-Anesthesia Checkup

A comprehensive pre-anaesthesia check-up, encompassing patients detailed clinical history and clinical examination was done and routine investigations like Hb, blood sugar, renal function test, liver function test, coagulogram, ECG, X ray chest were ordered. All patients were kept nil per oral (NPO) for 8 hours prior to surgery. All patients were administered Tablet Alprazolam 0.25 mg given one day prior to the surgery (for anxiolysis) and Tablet Ranitidine 150 mg night before the surgery and two hours prior shift to operation theatre (OT).

On arrival into the operation theatre, an appropriate size peripheral venous canula was obtained and Ringer lactate infusion was started as IV fluid. All the routine monitors (ECG, Pulse Oximeter, and NIBP) were applied and the baseline vitals were recorded.

All the patients were pre-oxygenated with 100% oxygen for two to three minutes. Patients were then premedicated with inj. fentanyl 1-2 mcg/kg, inj. glycopyrrolate 0.2 mg iv and inj. ondansetron 0.1 mg/kg iv. Anesthesia was induced with inj. propofol 1-2mg/kg iv (in incremental doses). After the loss of verbal commands, the patients were subjected to bag-mask ventilation with 100% oxygen (O₂) via Bain's circuit. After a positive bag-mask ventilation test, the process of induction was facilitated with airway management by giving group specific neuromuscular blocking agent. The endotracheal intubation was done with an appropriate size endotracheal tube by a trained anaesthesiologist. After confirming the correct placement of endotracheal tube by auscultation and capnograph the patient was put on controlled mechanical ventilation.

The anesthesia was maintained with nitrous oxide, oxygen, (60% N₂O: 40%O₂), and sevoflurane (1%) along

with controlled mechanical ventilation (CMV). Once the patient recovered from the effect of depolarising neuromuscular blocking agents, in that group muscle relaxation was maintained with inj. Atracurium 0.1mg/kg in incremental doses. Injection Paracetamol 15mg/kg was given for analgesia.

At the end of the surgery, after the return of spontaneous respiration, neuromuscular blockade was reversed with inj. neostigmine 0.05mg/kg and inj. glycopyrrolate 0.2mg iv. The endotracheal tube was removed once the patients had adequate spontaneous tidal volume, cough reflex, spontaneous eye opening and head lift.

The following parameters were recorded

- Demographic variables (age, weight, gender, BMI, ASA grade).
- The conditions for intubation were accessed using the following criteria (Tom heier)
- The criteria for endotracheal intubation were recorded by a trained anaesthesiologist with more than 10 years of experience.

Table 1: Distribution of criteria.

Criteria	Excellent	Good	Poor
Vocal cord position	Abducted	Intermediate	Abducted
Vocal cord movement	None	Moving	Closing
Easy of laryngoscopy	Jaw relaxed	Jaw resistant	Jaw very tight
Airway reaction	None	Transient	Sustained > 5s
Movement of legs	None	Slight	Vigorous

RESULTS

The demographic variables, age, weight, gender, ASA grade were comparable in both the groups. Table 2 shows that, in group I, the intubation conditions varied among the 70 patients. The majority, 45 patients (64.3%), experienced excellent intubation conditions, indicating a smooth and optimal process. Additionally, 20 patients (28.6%) had good intubation conditions, which were satisfactory. However, 5 patients (7.1%) faced poor intubation conditions, suggesting difficulties that might require further attention to improve outcomes in future procedures.

While in group II, consisting of 70 patients, the intubation conditions were as follows: 47 patients (67.1%) experienced excellent intubation conditions, indicating a highly effective and smooth process.

Additionally, 16 patients (22.9%) had good intubation conditions, which were satisfactory. However, 7 patients (10%) encountered poor intubation conditions, suggesting challenges that may require further attention and improvement.

Table 3 shows the mean onset of action of group I was 48.07 ± 4.04 seconds and in group II was 74.4 ± 9.1 seconds when compared statistically using student's t-test, the difference in the onset of action in both the groups was statistically significant ($P < 0.05$).

The duration of action of group I was 3.85 ± 3.3 minutes and 44.4 ± 4.7 minutes in group II and when compared statistically using student's t-test, the difference in the duration of action in both the groups was statistically significant ($P < 0.05$).

Table 2: The comparison of intubation condition in both the groups.

Parameter	Group I	Group II	P- Value
Excellent	45(64.3%)	47 (67.1%)	0.356
Good	20 (28.6%)	16 (22.9%)	0.773
Poor	5 (7.1%)	7 (10%)	0.603

Table 3: Comparison of the onset and duration of action of both the groups.

Parameter	Group I	Group II	P- Value
Onset of action (sec.)	48.07 ± 4.04	74.4 ± 9.1	0.0001
Duration of action (min.)	3.85 ± 3.3	44.4 ± 4.7	0.0001

Table 4: Shows the comparison of intra operative vitals in both the groups.

Parameter	Group I	Group II	P- Value
Pulse Rate (bpm)	83.9 ± 8.2	82.6 ± 6.6	0.42
SBP (mm Hg)	116.6 ± 8.2	117.5 ± 6.9	0.436
DBP (mm Hg)	70.1 ± 6.3	69.1 ± 6.3	0.34
MAP (mm Hg)	85.5 ± 6.6	85.1 ± 5.8	1.00
SPO2 (%)	98.3 ± 1.7	98.8 ± 1.2	0.67

In contrast, the analysis of vitals, revealed that pulse rate, systolic and diastolic blood pressure and mean arterial pressures and the mean oxygen saturation of the patients was statistically insignificant among both the groups.

DISCUSSION

In our study, we have compared two different muscle relaxants i.e. rocuronium with succinylcholine for endotracheal intubation in patients undergoing elective surgery under general anaesthesia and evaluated whether rocuronium can be an acceptable alternative to succinylcholine with regard to intubating conditions and hemodynamic variations.

The clinical study was conducted on 140 surgical patients of age 18-50 years, of weight 30-60 kgs, with ASA grade I and II, with BMI < 30kg/ m² scheduled for elective lower abdominal surgeries.

They were divided into two groups of 70 each, group I and group II.

Group I patients received Inj. Succinylcholine 1mg/kg and group II patients received Inj. Rocuronium 1mg/kg iv. for tracheal intubation.

Demographic and Baseline Characteristics

The initial evaluation of demographic and baseline characteristics such as age, weight, gender, ASA grade, height, and BMI showed no significant differences between the two groups. This uniformity is crucial as it implies that any differences observed in the outcomes can more reliably be attributed to the intervention rather than underlying demographic variations. The balanced demographic setup helps in minimizing confounding factors, providing a clean slate for assessing the impacts of the anaesthetic agents used.

Comparison of intubation condition in both the groups

According to our study results, there is insignificant difference between two groups in managing the proportions of excellent intubation conditions observed in the group I was 64.3% and 67.1% in group II.

Good intubation conditions observed in the group I was 28.6% similarly, in group II was 22.9%. Poor intubating conditions were observed in 7.1% and 10% group II.

A study conducted by Sørensen et al. (2012) 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 et al. (2017) and a local study by Ahad et al. (2018) and showed that rocuronium produces equally good intubating conditions when compared to succinylcholine.

Another study by Larsen et al. (2005) 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.

Comparison of the onset and duration of action of both the groups

In our study, Onset of action is shorter for succinylcholine 1.5 mg/kg than that of Rocuronium 0.8 mg/kg. (48.07 ± 4.04 sec. Vs 74.4 ± 9.1 sec.).

The onset of action of succinylcholine was similar to that of Misra et al. (2005). However, studies conducted by several scientists showed different onset of action for Succinylcholine due to selection of different dose in their studies. The onset of action of rocuronium was similar to that of study conducted by Magorian et al. (1993). Duration of action of succinylcholine 1.5 mg/kg is shorter than that of Rocuronium 0.8 mg/kg.

Intraoperative Hemodynamic Stability

Intraoperative hemodynamics, which includes the patient's blood pressure, heart rate, and oxygen saturation during the surgery, showed noteworthy variations, Succinylcholine 1.5 mg/kg produced similar hemodynamic changes with that of rocuronium 0.8 mg/kg.

Various studies have demonstrated the similar changes in hemodynamic parameter during and after intubation with the drugs. Succinylcholine is relatively safer in altering hemodynamic status and the fact that rocuronium 0.8 mg/kg did not alter hemodynamic status different from succinylcholine indicates that rocuronium could be a good alternative to succinylcholine.

CONCLUSION

In our study, we observed there is no significant change in hemodynamic variables after the administration of Succinylcholine and Rocuronium. Rocuronium is a better non-depolarizing muscle relaxant for endotracheal intubation where the use of succinylcholine is contraindicated. From the present study, it can be concluded that rocuronium bromide 0.8 mg/kg provided the same intubating conditions as succinylcholine 1.5 mg/kg with haemodynamic stability and no side-effects. There was a significant difference present in intubating conditions of rocuronium bromide 0.8 mg/kg as compared with succinylcholine 1.5 mg/kg. Though, the duration of action was longer with rocuronium bromide 0.8 mg/kg as compared to succinylcholine 1.5 mg/kg. Rocuronium bromide was found to be haemodynamically stable. Rocuronium bromide was not associated with any complications as compared to succinylcholine. So, Rocuronium bromide 0.8 mg/kg can be used as an alternative to succinylcholine 1.5 mg/kg in children planned for elective surgeries where the return of spontaneous recovery is not needed to avoid undesirable side-effects of succinylcholine.

Declaration By Authors

The authors hereby declared that it was their original piece of research and had not been sent to any other journal for publication.

Ethical Approval: Approved.

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