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Original research article

A study on rocuronium bromide and succinylcholine chloride for endotracheal intubation during general anaesthesia: A comparative study

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Abstract

Aim: To evaluate the non-depolarising muscle relaxant rocuronium bromide being a substitute for succinylcholine chloride for endotracheal intubation without its adverse effects.

Methodology: The study was conducted at ACSR Govt Medical College, Department of anaesthesiology, Nellore, Nellore District, Andhra Pradesh. The present study population consisted of 60 patients of ASA grade I and II were divided into two groups. Group R (n =30) was intubated with Rocuronium bromide 1.2 mg per kg body weight. Group S (n = 30) was intubated with Succinylcholine chloride 1.5 mg per kg body weight. In both the groups intubation was attempted at 60 s following injection of neuromuscular blocking drug. Observations were tabulated and analyzed using 'students unpaired t-test'.

Results: The demographic profile (age, gender, weight distribution) was comparable in both groups. The mean onset time of rocuronium bromide was 76.09±9.15 s and succinylcholine chloride was 56.13±3.76 s, the intubating conditions of both the groups were comparable. The duration of action of rocuronium bromide was 66.79±3.38 mins and succinylcholine chloride was 5.83±1.06 mins. The duration of action showed p value of <0.0001 which is highly significant. Haemodynamic parameters (HR, SBP, DBP, MAP) were comparable in both the groups. The present study shows that intubating conditions and onset time of rocuronium 1.2 mg per kg are comparable to those with succinylcholine mg per kg. However, the duration of action of rocuronium at this dose may present a clinical disadvantage, particularly in patients whose surgery is of short duration. Nonetheless, rocuronium may be a suitable alternative for succinylcholine particularly in patients who are at risk for the adverse sequalae of succinylcholine.

Conclusion: Rocuronium bromide is a safe alternative to succinylcholine chloride in adult patients in situations where succinylcholine is contraindicated and in whom there is no anticipated difficult airway.

Keywords: Rocuronium bromide, succinyl choline chloride, hemodynamic parameters, endotracheal intubation

Introduction

With the introduction of endotracheal intubation during World War I and balanced anaesthesia in 1926, a search was started for a drug which could cause jaw relaxation to facilitate endotracheal intubation. Most of the intubations were done with inhalational technique in those times. But with this inhalational technique they had problems like laryngospasm, bronchospasm. Further there was a need to take the patient sufficiently deep before intubation which led to hemodynamic disturbances.

Succinylcholine chloride (a synthetic depolarizing muscle relaxant) was introduced in 1951. It became the drug of choice for endotracheal intubation especially in rapid sequence intubation in emergency cases. But everything did not go smoothly with succinylcholine chloride when its adverse effects started surfacing especially hyperkalemia, malignant hyperthermia, muscular dystrophies, rise in intragastric, intraocular, intracranial pressures and cardiovascular effects. Thus, the quest began for a safer substitute for succinylcholine chloride.

The aim of research on neuromuscular drugs was to have non- depolarizing muscle relaxant (NDMR), which is similar to succinylcholine chloride without its side effects. Although many non-depolarizing muscle relaxant drugs like atracurium besylate, vecuronium bromide and mivacurium chloride were introduced, none of them could challenge succinylcholine chloride in terms of its time of onset.

The new non-depolarizing muscle relaxant rocuronium bromide introduced in 1994 became the first competitor for succinylcholine chloride.

Rocuronium is short-acting drug as succinylcholine chloride and is said to produce excellent intubating conditions in 60 seconds. Further rocuronium bromide is devoid of the adverse effects that are seen with succinylcholine chloride and is especially useful in rapid sequence intubation.

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Aims

To evaluate the non-depolarising muscle relaxant rocuronium bromide being a substitute for succinylcholine chloride for endotracheal intubation without its adverse effects.

Objectives

1. To study the time of onset and duration of action of rocuronium bromide and succinylcholine chloride.
2. And to see its hemodynamic changes.

Material and Methods

Place of study: The study was conducted at Department 0f Anaesthesia, ACSR Govt Medical College, Nellore.

Duration of study: October 2022 to July 2023.

Design: Prospective comparative study.

Study population: 60 adult patients of ASA grade I and II of both sexes in the age group of 18-50 years requiring intubation for various surgeries were selected and divided into 2 groups.

- Group R received 1.2 mg per kg of Rocuronium bromide IV.
- Group S received 1.5 mg per kg of Succinylcholine chloride IV. Informed consent was taken from the patients regarding the procedure.

Institutional and Ethical committee clearance was obtained for the study.

Pre-anaesthetic evaluation was done a day before surgery and all the necessary investigations were done. Tab Alprazolam 5 µg per kg and Tab Ranitidine 150 mg were given to all patients on the night before surgery. Patients were maintained nil by mouth for about 6-8 hours prior to the surgery.

On the day of surgery, in pre-operative room, an 18 G IV line was secured. After shifting the patient to OT, multi-channel monitors were attached and non-invasive blood pressure (NIBP), SpO2, pulse rate and electrocardiogram (ECG) were recorded.

- Inj fentanyl 1 µg per kg and midazolam 0.05 mg per kg IV were given to all patients 5 mins prior to the administration of induction agent. All the patients were pre-oxygenated with 100% oxygen for 3 mins and induced with Inj Propofol 2mg per kg body weight IV, after confirming the bag and mask ventilation muscle relaxation, relaxants were given.
- In Group-R Inj rocuronium 1.2 mg kg IV.
- In Group-S Inj succinylcholine 1.5 mg kg IV.
- Intubation score based on the scale adopted by Cooper *et al*.

Table 1: Cooper intubation scale

Score	Jaw relaxation (laryngoscopy)	Vocal cords	Response to intubation
0	Poor	Closed	Severe coughing or bucking
1	Minimal (difficult)	Closing	Mild coughing
2	Moderate (fair)	Moving	Slight diaphragmatic movement
3	Good (easy)	Open	None

- Ease of intubation was recorded.
- Hemodynamic parameters HR, SBP, DBP, MAP, continuous ECG and SPO2 were recorded after giving premedication, before induction, immediately after intubation and every 2 mins for 15 mins and every 5 mins until the surgery is completed. The patients were ventilated with 100% oxygen on mask, intubated with proper sized endotracheal tube and anesthesia was maintained with O2, N2O, halothane 0.3-0.5% and further doses of muscle relaxant.
- After completion of surgery, reversal of neuromuscular blockade was done with inj. neostigmine 0.05 mg per kg and inj. glycopyrrolate 0.01 mg per kg IV. After satisfactory recovery, patients were extubated.

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Observation and results statistical analysis

- All the data was collected and analysed as mean, standard deviation and P-values.
- Done in Microsoft excel sheet with the help of SPSS (26th version) software.

Results

Table 2: Age Distribution (Mean ± SD) in Study Groups (n=60)

Age groups (years)	Group R (n = 30)	Group S (n = 30)
18-30	13(43.33%)	14(46.67%)
31-40	7(23.33%)	8(26.67%)
41-50	10(33.33%)	8(26.67%)
Mean age ± SD	34.87±10.10	33.50±9.51

Results are comparable.

In Group R the mean age± SD was 34.87±10.10 years. In Group S the mean age± SD was 33.50±9.51 years.

Gender distribution

The following table shows the sex distribution in the study groups.

Table 3: Gender Distribution (Mean ± SD) in Study Groups (n=60)

Gender	Group R (n = 30)	Group S (n = 30)
Male	13(43.33)	19(63.33)
Female	17(56.66)	11(36.66)
Total number of patients	30	30

Results are comparable. In Group R, there were 13 males and 17 female patients. In Group S, there were 19 males and 11 female patients.

Weight distribution

The following table shows the weight distribution of the study groups.

Table 4: Weight Distribution (Mean ± SD) in Study Groups (n=60)

Weight (kilograms)	Group R (n = 30)	Group S (n = 30)
30-50	8(26.67%)	7(23.33%)
51-70	21(70%)	19(63.33%)
71-90	1(3.33)	4(13.33%)
Mean weight ± SD	55.10 ±7.89	59.03 ± 9.13

Results are comparable.

In GROUP R, mean weight ± SD was 55.10±7.89 In GROUP S, mean weight ± SD was 59.03±9.13.

Onset time

Table 5: Comparison of Onset Time of Study Groups

Onset time (seconds)	Group R (n = 30)	Group S (n = 30)
41-50	0	2
51-60	1	26
61-70	12	2
71-80	5	0
81-90	12	0
Mean ± SD	76.09 ± 9.15	56.13 ± 3.76

(Mean ± SD) (n=60)

Intubating conditions

The following table shows the intubating conditions in both the groups based on score adopted by Cooper *et al*.

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Table 6: Comparison of Intubating Conditions of Study Groups (n=60)

Intubating conditions	Group R (n =30)	Group S (n = 30)
Excellent	28(94%)	27(90%)
Good	2(6%)	3(10%)
Fair	0(0%)	0(0%)
Poor	0(0%)	0(0%)

Clinical duration of action

Clinical duration of action was taken as the time between the administration of neuromuscular blocking drug and first attempt at respiration.

Table 7: Comparison of clinical duration of action of study groups (Mean ± SD) (n=60)

Duration (minutes)	Group R (n = 30)	Group S (n = 30)
Mean ± SD	66.79 ± 3.38	5.83 ± 1.06
Range	60-75	4-8

The clinical duration of action of Group R ranges from 60 to 75 mins with mean duration of 66.79 mins. The clinical duration of action of Group S ranges from 4 to 8 mins with mean duration of 5.83 mins. $p<0.0001$ very highly significant difference

Table 8: Comparison of Mean Heart Rates (Mean ± Sd, Beats/Minute) of Study Groups (n=60)

Time	Group R (n = 30)	Group S (n = 30)	P value
Basal	82.63 ±5.97	80.13±6.62	P>0.05(NS)
Pre-induction	81.10±6.48	81.97±7.49	P>0.05(NS)
1 min after intubation	85.10±8.61	86.17±6.54	P>0.05(NS)
3 min after intubation	84.53±8.73	86.10±9.47	P>0.05(NS)
5 min after intubation	83.47±8.35	85.40±8.77	P>0.05(NS)
7 min after intubation	82.00±7.95	85.10±8.06	P>0.05(NS)
9 min after intubation	84.87±7.49	85.27±7.71	P>0.05(NS)
11 min after intubation	81.30±5.78	82.23±6.99	P>0.05(NS)
13 min after intubation	81.63±4.96	82.87±7.20	P>0.05(NS)
15 min after intubation	80.90±3.68	83.60±7.60	P>0.05(NS)

As shown in table, there was a rise in mean heart rate from pre-induction value 81.10.

and 81.97 for group R and group S respectively, at 1 minute 85.10 and 86.17 following intubation in group R and group S respectively.

This rise in mean heart rate started declining from 3 mins following intubation and returned to baseline mean heart rate after 15 mins in both the groups. There were no abnormal ECG findings noted in any of the cases following the administration of drugs.

Table 9: Comparison of mean systolic blood pressure (Mean ± SD, mmHg) of Study Groups (n=60)

Time	Group R (n = 30)	Group S (n = 30)	P value
Basal	120.27±5.8	122.27±8.14	P>0.05(NS)
Pre-induction	120.50±6.16	120.80±7.55	P>0.05(NS)
1 min after intubation	130.83±4.81	132.83±7.53	P>0.05(NS)
3 min after intubation	128.43±5.02	126.80±6.72	P>0.05(NS)
5 min after intubation	127.10±5.38	125.27±5.48	P>0.05(NS)
7 min after intubation	124.37±5.38	124.13±5.98	P>0.05(NS)
9 min after intubation	122.27±5.30	123.17±5.98	P>0.05(NS)
11 min after intubation	120.97±5.34	122.47±5.28	P>0.05(NS)
13 min after intubation	118.60±5.01	121.50±6.46	P>0.05(NS)
15 min after intubation	120.20±5.13	121.33±6.00	P>0.05(NS)

As shown in table, there was a rise in mean SBP from pre-induction value 120.50 and 120.80 for group R and group S respectively, at 1 min 130.83 and 132.83 following intubation in group R and group S respectively. This rise in mean SBP started declining from 3 mins following intubation and returned to baseline mean systolic pressure after 15 mins in both the groups.

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Table 10: Comparison of Mean Diastolic Blood Pressure (Mean ± SD, mmHg) of Study Groups (n=60)

Time	Group R (n = 30)	Group S (n = 30)	P value
Basal	80.53±3.15	82.83±8.99	P>0.05(NS)
Pre-induction	80.60±3.25	82.77±8.73	P>0.05(NS)
1 min after intubation	91.73±3.26	94.50±6.47	P>0.05(NS)
3 min after intubation	84.23±4.71	85.43±7.30	P>0.05(NS)
5 min after intubation	83.50±3.36	84.40±7.98	P>0.05(NS)
7 min after intubation	83.50±2.80	83.97±7.13	P>0.05(NS)
9 min after intubation	83.43±3.37	84.00±7.66	P>0.05(NS)
11 min after intubation	83.07±3.63	84.97±8.22	P>0.05(NS)
13 min after intubation	81.47±3.45	83.87±8.71	P>0.05(NS)
15 min after intubation	80.63±3.74	82.87±8.89	P>0.05(NS)

As shown in table, there was a rise in mean DBP from pre-induction value 80.60 and 82.77 for group R and group S respectively, at 1 min 91.73 and 94.50 following intubation in group R and group S respectively.
This rise in mean DBP started declining from 3 mins following intubation and returned to baseline mean DBP after 15 mins in both the groups.

Table 11: Comparison of Mean of Mean Arterial Pressure (Mean ± SD, mmHg) of Study Groups (n=60)

Time	Group R (n = 30)	Group S (n = 30)	P value
Basal	92.48±8.10	95.13±8.82	P>0.05(NS)
Pre-induction	93.90±3.52	95.20±6.27	P>0.05(NS)
1 min after intubation	104.77±2.80	107.28±4.98	P>0.05(NS)
3 min after intubation	98.97±4.04	99.64±5.37	P>0.05(NS)
5 min after intubation	98.03±2.87	97.99±5.75	P>0.05(NS)
7 min after intubation	97.12±2.67	97.36±5.53	P>0.05(NS)
9 min after intubation	96.38±2.95	97.06±5.67	P>0.05(NS)
11 min after intubation	95.70±3.41	97.49±5.93	P>0.05(NS)
13 min after intubation	93.84±3.15	96.48±6.49	P>0.05(NS)
15 min after intubation	93.82±3.32	94.32±10.42	P>0.05(NS)

As shown in table, there was a rise in MAP from pre-induction value 93.90 and 95.20 for group R and group S respectively, at 1 min 104.77 and 107.28 following intubation in group R and group S respectively.
This rise in MAP started declining from 3 mins following intubation and returned to baseline mean arterial pressure after 15 mins in both the groups.

Discussion

Rapid and safe endotracheal intubation is of paramount importance in practice of general anaesthesia. Securing patients airway smoothly and quickly, minimizes the chances of regurgitation and aspiration of gastric contents. The ease with which endotracheal intubation is performed depends upon the degree of muscle relaxation and depth of anaesthesia.
Since the introduction of concept of Balanced anaesthesia in 1926 by John S Lundy, Rees and Gray divided anaesthesia into narcosis, analgesia and relaxation. The search went on for a relaxant to complete the idea of narcosis, reflex suppression and relaxation. A breakthrough discovery in 1942 when d-tubocurarine was introduced into clinical anaesthesia. Though d-tubocurarine produced an excellent jaw relaxation to facilitate endotracheal intubation, it had its own drawbacks. The onset of action was slow, taking up to 3 mins to produce good intubating conditions. This made the drug unsuitable for use in emergency cases and full stomach cases where rapid airway procurement is the goal.
Succinylcholine chloride introduced in 1951 was unparalleled in terms of its onset and duration of action. The type of relaxation obtained with this drug was so good that even today it is used as a gold standard and other drugs are compared with it. However, with time the adverse effects of Succinylcholine chloride, like bradycardia, nodal and junctional rhythms, malignant hyperthermia in succeptible individuals, and rise in intraocular, intracranial pressure were observed and development of Phase 2 block after large dose or continuous infusion, also duration of succinylcholine was prolonged in patients with pseudo-cholinesterase deficiency.
Rocuronium is the first NMDR having an onset time nearer to succinylcholine without adverse side effects. The speed of onset is inversely proportional to the potency of NMDRs. Rocuronium has a molar potency of ED95 0.54μM per kg, that is about 13% that of the vecuronium and only 9% of cis-atracurium.
In view of this the present study compares the intubating conditions of rocuronium and succinylcholine at 60 s and hemodynamic responses, the onset time and clinical duration of action of the two drugs.

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Intubation dose

Selection of dosage of neuromuscular blockers is usually based on ED95 value. The ED95 dose of succinylcholine chloride is 0.392 mg per kg body weight. Four times the ED95 dose which approximates 1.5 mg per kg body weight has been employed for intubation in the present study which is similar to that of Kusuma Parikh *et al*. (2014) [1], SØrensen *et al*. (2012) [2], Aparna Shukla *et al*. (2004) [3], Neerja B *et al*. (1999) [4], Aleksandra JMazurek *et al*. (1998) [5], Weiss JH *et al*. (1997) [6].

The ED95 of rocuronium is 0.3 mg per kg body weight. In the present study the dose used is four times the ED95 i.e., 1.2 mg per kg body weight. It has been shown to provide good to excellent intubating condition at 60 s by Toni *et al*. (1993) [7].

Intubation time

The goal of general anaesthesia is securing airway non traumatically at the earliest i.e. within 60s. The time for intubation can be determined either by neuromuscular monitoring or by clinical methods.

In this study, both single twitch response and intubation score were measured to combine reproducible quantitative criteria with qualitative clinical criteria as employed in studies by Toni Magorian *et al*. [7], Friedrich K Puhringer *et al*. [8], Maddineni VR *et al*. [9], Aparna Shukla *et al*. [3].

Hence in the present study clinical criteria as adopted by Cooper RA *et al*. (1992) [10] were used for scaling intubating condition at 60 s and along with onset time defined as cessation of visual response of adductor pollicis muscle to single twitch nerve stimulus of 1 Hz is also recorded.

In the present study, we found that intubating conditions were considered excellent or good in most patients in both groups. The reason for a good, rather than an excellent, score was usually vocal cord movement.

In the present study, results are comparable with above mentioned authors. Rocuronium 1.2 mg per kg body weight produced excellent intubating conditions in 90% (n=30) of cases which is comparable with that of SØrensen *et al*. (2012) [2].

Onset time

The various authors have taken the onset time as time between administration of neuromuscular blocking drug and maximum twitch depression. In present study time interval from administration of neuromuscular blocking drug to cessation of visible motor response of adductor pollicis to single twitch ulnar nerve stimulation of 1 Hz is taken as onset time.

With rocuronium bromide 1.2mg per kg body wt., Tony Magorian *et al*. (1993) [7] noted onset time of 55±14 s and Wright C *et al*. (1994) [11] noted onset time of 65±21s, Aparna Shukla *et al*. (2004) [3] noted onset time of 80±5s, Kusuma Parikh *et al*. (2014) [1] noted onset time of 76 ± 10s.

Present study results are comparable with above mentioned results by various authors. In the present study, the minimum onset time was 60 s and maximum onset time was 89 s and mean onset time was 76±9 s which is consistent with the studies of Tony Magorian *et al*. [7], Wright C *et al*. [8], Aparna Shukla *et al*. [3] and Kusuma Parikh *et al*. [1].

The onset time with succinylcholine 1.5mg per kg body wt in present study was 56±3.7s which is comparable with the studies of Tony Magorian *et al*. [7] 50±17s, Wright C *et al*. [11] 56±15s, Aparna Shukla *et al*. [3] 46 ± 5s and Kusuma Parikh *et al*. [1] 46 ± 5s.

Thus, the present study can conclude that the onset time of rocuronium (1.2mg per kg body weight) is shorter than that of other non-depolarizing muscle relaxant and is comparable to that of succinylcholine (1.5mg per kg body weight).

Duration of action

The various authors who have studied rocuronium bromide and succinyl choline chloride have utilized the recovery of twitch height to 25% of baseline as the clinical duration of action. However, in the present study the time between the administration of neuromuscular blocking drug and first attempt at respiration was taken as the clinical duration of action.

With rocuronium bromide 1.2 mg per kg body weight, Toni Magorian *et al*. (1993) [7] noted a clinical duration of action of 73 ± 32 mins and Wright C *et al*. (1994) [11] noted clinical duration of 67 ± 25 min.

In the present study, the minimum duration of action for rocuronium bromide 1.2 mg per kg was 60 mins, maximum duration was 75 mins with a mean of 66.79 ± 3.38 mins which is consistent with studies of Toni Magorian *et al*. (1993) [7] and Wright C *et al*. (1994) [11].

The clinical duration of action of succinylcholine chloride 1.5 mg per kg body weight in the present study was found to range between a minimum of 4 mins to a maximum of 8 mins with a mean duration of action of 5.83 ± 1.06 mins which is consistent with studies of Aleksandra J *et al*. 1998 [5] (5.8 ± 3.3).

Sonam Motis compared Rocuronium with the current practice drug in use i.e. succinylcholine (i.e., endotracheal intubation as soon as possible) in patients requiring induction of anaesthesia and endotracheal intubation for elective surgery. When succinylcholine was used as the muscle relaxant drug for intubation during induction of anaesthesia, the median intubation sequence was 7 seconds shorter than when Rocuronium was used. It was found that Succinylcholine created excellent intubation

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conditions more often than Rocuronium, However, as far as clinically acceptable intubating conditions and failed intubation attempts are concerned, the two relaxants were not statistically different.
Interestingly, in the study, only a minority of failed first endotracheal intubation attempts and no desaturations were associated. If confirmed in further trials, these findings may lead to a modification of the scoring system presently used. What are the practical implications of our findings? Choosing rocuronium instead of succinylcholine for rapid sequence induction of anaesthesia prolongs the time of unprotected airway, i.e., the time interval from beginning of the induction until completion of endotracheal intubation, from a median time of 44 seconds to a median time of 51.7 seconds. The additional risk of aspiration and desaturation resulting from a prolongation of the intubation sequence by a median time of 7 seconds is unknown, but it is most likely very small in most patients. In conclusion, in the context of intubation during induction of anaesthesia with propofol and fentanyl in elective cases, succinylcholine allowed for a better endotracheal intubation sequence and created superior intubation conditions on comparing with Rocuronium but simultaneously Rocuronium also gave almost similar clinically acceptable intubating condition as succinylcholine. Large scale trials are required for addressing important safety issues such as failed intubation attempts and desaturations associated with the use of succinylcholine or rocuronium.

Hemodynamics
The studies conducted by Cooper *et al*. (1992) [12] and Mark E Hudson *et al*. (1998) [13] show similar cardiovascular effects. There was no significant change in hemodynamics after the administration of the muscle relaxant in either of the groups in the study.
In the present study, there was a rise in hemodynamic responses following administration of rocuronium bromide 1.2 mg per kg body weight and succinylcholine 1.5 mg per kg body weight one minute following intubation. This was a hemodynamic response to laryngoscopy and endotracheal intubation, which subsided to near pre induction values 5 mins after intubation.
Trend in hemodynamic changes to laryngoscopy and intubation were similar in both rocuronium bromide and succinylcholine chloride.

Conclusion
From the present study it can be concluded that, Rocuronium bromide 1.2 mg per kg body weight produces good to excellent intubating conditions in all the patients at 60 sec's with mean onset time of 76.09±9.15 sec's. Succinylcholine chloride 1.5 mg per kg body weight produces good to excellent intubating conditions in all the patients at 60 sec's with mean onset time of 56.13±3.76 sec's.
Rocuronium bromide is a safe alternative to succinylcholine chloride in adult patients in situations where succinylcholine is contraindicated and in whom there is no anticipated difficult airway.
The prolonged clinical duration of action with rocuronium 1.2mg per kg body weight may be a disadvantage but this can be overcome with the availability of sugammadex. However, study with larger samples are required to confirm the above findings.

Conflict of interest: None.

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References
1. Parikh K, Modh DB, Upadhyay MR. Comparision of rocuronium bromide with suxamethonium chloride for tracheal intubation. Int J Med Sci Public Health. 2014;3:610-615.
2. Sørensen MK, Bretlau C, Ga¨tke MR, Sørensen AM, Rasmussen LS. Rapid sequence induction and intubation with rocuronium-sugammadex compared with succinylcholine-a randomized trail. British Journal of Anaesthesia. 2012;108(4):682-689.
3. Aparna Shukla, Dubey KP, Sharma MSN. Comparative evaluation of haemodynamic effects and intubating conditions after the administration of ORG 9426 and Succinylcholine. Indian Journal of Anaesthesia. 2004;48(6):476-479.
4. Neerja B, Indu B, Virendra K, Arya, Pramila C. Comparison of intubating conditions after Rocuronium and Succinylcholine following "Rapid sequence Induction" with Thiopentone in emergency surgeries. Jour Clin Anaesth. 1999;15(3):285-289.
5. Aleksandra J Mazurek, Bronwyn Rac, Susan Hann, Ikakim J, Barbara Castro, Charles J Cote, *et al*. Rocuronium versus Succinylcholine: Are they equally effective during rapid sequence induction of anaesthesia? Anaesthesia Analgesia. 1998;87:1259-1.
6. Wiess JH, Cratz I, Goldberg ME, Afsar M, Insinga F, Lorijani G, *et al*. Double-blind Comparison of two doses of Rocuronium and Succinylcholine for rapid sequence induction of anaesthesia. Jour Clin Anaesth. 1997;9(5):379-382.
7. Toni Magorian, Flannery KB, Ronald D Miller. Comparison of rocuronium, succinylcholine and vecuronium for rapid sequence induction of anaesthesia in adult patients. Anaesthesiology

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1993;79:913-918.
8. Friedrich K Puhringer, Karin S, Khuenl-Brady, Johann Koller, Gottfried Mitterschiffthaler. Evaluation of endotracheal intubating conditions of Rocuronium and Succinylcholine in outpatient surgery. Anaesthesia Analgesia. 1992;75:37-40.
9. Maddineni VR, McCoy EP, Mirakhur RK, McBridge RJ. Onset and duration of action and haemodynamic effects of rocuronium bromide under balanced and volatile anaesthesia. Acta Anaesth Belg. 1994;45:41-48.
10. Cooper RA, Mirakhur RK, Wierda JMKH, Maddineni VR. Pharmcokinetics of Rocuronium bromide in patients with and without renal failure. European Journal of Anaesthesiology. 1995;12:43-44.
11. Wright C, Peter M, Caldwell James E, Ronald D Miller. Onset and duration of rocuronium and succinylcholine at the adductor pollicis and laryngeal adductor muscles in anaesthetized humans. Anaesthesiology. 1994;81:1110.
12. Cooper R, Mirakhur RK, Clarke RSJ, Boules Z. Comparison of intubating conditions after administration of Org 9426 (Rocuronium) and Suxamethonium. British Journal of Anaesthesia 1992;69:269-273.
13. Mark E Hudson, Kenneth P Rothfield, William C Tullock, Leonard L Firestone. Haemodynamic effects of Rocuronium bromide in adult cardiac surgical patients. Canadian Journal of Anaesthesia. 1998;45:139-143.