

COMPARISON OF ROCURONIUM BROMIDE AND SUXAMETHONIUM CHLORIDE FOR USE DURING RAPID SEQUENCE INDUCTION OF ANAESTHESIA

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ABSTRACT

AIM

To evaluate the quality of intubating conditions with Suxamethonium chloride and Rocuronium bromide for rapid sequence induction intubation and to observe the correlation between the intubating conditions and the response to single twitch stimulation.

MATERIALS AND METHODS

The present study, entitled "Comparison of Rocuronium bromide and Suxamethonium chloride for use during rapid sequence induction of anaesthesia was done in 50 adult patients divided into two groups and were randomly allocated Group-I: IV Rocuronium 0.9mg/kg and Group-II: IV Suxamethonium 1mg/kg. Laryngoscopy was attempted at 60 sec. and assessment of quality of intubating conditions was performed by using a Viby Mogensen Scale. Neuromuscular monitor was used to observe the correlation between the intubating conditions and the adductor pollicis response to single twitch ulnar nerve stimulation.

RESULTS

Intubating conditions were excellent (Score 15) in 88% of cases in Group-I whereas vocal cord position was intermediate (10-14) in 12% of cases, in Group-II all cases could be intubated at 60 sec. (Score 15 in 100% cases). The onset of maximal blockade at adductor pollicis was found to correlate well with satisfactory intubating conditions in Group-II (Sch) whereas in 20% of patients in Group-I had single twitch response (though diminished) at the time of intubation.

CONCLUSION

Rocuronium bromide in dose of 0.9mg/kg provided neuromuscular blockade with a fast onset time and good to excellent intubating conditions at 60 sec. resembling those of Suxamethonium.

KEYWORDS

Rocuronium Bromide, Suxamethonium Chloride, Laryngoscopy, Neuromuscular Monitor

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INTRODUCTION: The practice of intubation though born long ago, started gaining popularity and with it came the need for muscle relaxation. In 1942, Griffith and Johnstone ushered in the era of muscle relaxants, giving a new dimension to the concept of "Balanced Anaesthesia".

Muscle relaxants thus came into their own as an integral part of balanced anaesthesia. Today, the prime concern and duty of the attending anaesthesiologist is protection of the airway, thus making tracheal intubation not only the most suitable, but also the most essential procedure.

The advent of Suxamethonium in 1949, as a depolarising neuromuscular blocking agent of rapid onset and brief duration of action, revolutionised the practice of anaesthesia, since the delay in onset and inadequate reversal seen with older relaxants could be circumvented.

Gradually, with extensive use of Suxamethonium in clinical practice, many of its drawbacks came to light, viz. hyperkalaemia, bradycardia, raised intraocular, intragastric and intracranial pressures. The shortcomings of this drug, which were initially accepted as unavoidable, soon became a challenge, which culminated in the discovery and clinical trials of non-depolarisers viz. pancuronium, vecuronium, and atracurium which had little or no tendency to cause hyperkalaemia, bradycardia, and rise in intraocular, intracranial, or intragastric pressures but trailed way behind Suxamethonium in rapidity of onset.

The obvious next step was the search for a non-depolariser with a quick onset of action—the initial attempt being the priming principle, followed by mivacurium and Rocuronium, the latter having an onset of action comparable in brevity to Suxamethonium. Rocuronium has

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a rapid onset time, intermediate duration of action, rapid recovery, no cumulation even on repeated administration, cardiovascular stability, virtually no histamine release or other significant side effects, and has been introduced into anaesthesiology practice in 1994.

Thereafter it has been extensively used clinically and has shown great promise in cases requiring rapid intubation where Suxamethonium is undesirable or contraindicated.

The present study, evaluation of intubating conditions with Suxamethonium and Rocuronium, is an attempt to put forth a comparative assessment of the two drugs.

MATERIAL AND METHODS: The present study, entitled "Comparison of Rocuronium bromide and Suxamethonium chloride for use during rapid sequence induction of anaesthesia was carried out in 50 adult patients of ASA grade I-II and between 18-65yrs, undergoing various surgical procedures.

Patients with renal disease, hepatic disease, cardiovascular, and respiratory problems, patients with anticipated airway difficulty, patients with known or suspected to have neuromuscular disorders, patients taking medication known to alter neuromuscular transmission, pregnant patients were excluded from the study.

Grouping was done in two lots of twenty-five each patients and were randomly allocated.

Group I: Intubation accomplished with IV Rocuronium 0.9mg/kg.

Group II: Intubation accomplished with IV Suxamethonium 1 mg/kg.

Anaesthetic Technique: An intravenous route was secured upon the patient's arrival in the operation theatre and premedicated with Inj. Atropine 0.01 mg/kg IV, Inj. Ranitidine 2mg/kg IV, Inj. Ondansetron 0.07-0.08mg/kg IV, Inj Pentazocine 0.5mg/kg IV. Pre oxygenation was done for 3 minutes on 100% oxygen, patient was induced by Thiopentone sodium 4-5mg/kg IV and patients were intubated with either Rocuronium 0.9mg/kg (or) succinylcholine 1 mg/kg IV randomly.

OBSERVATIONS AND RESULTS:
The observations were as follows:

Vocal Cords	Score	Group I (Rocuronium)			Group II (Suxamethonium)		
		Time in seconds					
		60	90	120	60	90	120
Abduction	3	22(88%)			25 (100%)		
Intermediate	2	3(12%)					
Closed	1						

Table 1: Scoring of intubating conditions with respect to vocal cords position

The above table depicts the distribution of scoring points in the respective groups with the two drugs, with respect to the position of vocal cords at laryngoscopy. Open (abducted) vocal cords were observed at 60 sec in 88% of cases in Group 1 and in 12% of cases had intermediate vocal cord position. In group II all cases had vocal cords in abducted position.

Assessment of quality of intubating conditions was performed by using a Viby Mogensen Scale based on vocal cord position, vocal cord movement, easiness of laryngoscopy (Jaw relaxation), Airway reaction and limb movement. Laryngoscopy was attempted at 60 sec. correlation between the intubating conditions and the adductor pollicis response to single twitch ulnar nerve stimulation.

Onset of action of intubating dose of muscle relaxant was taken as the time from administration of drug to the time of intubation with good to excellent intubating conditions as per Viby Mogensen score based on 5 criteria. Parameters monitored: Heartrate, pulse oximetry, systolic blood pressure, diastolic blood pressure; neuromuscular monitoring was accomplished using the organon technika neuromuscular monitor and the response to single twitch nerve stimulation was visually assessed. Anaesthesia maintained the N2O:O2=5:3lit/mt with controlled ventilation. Muscle relaxation was maintained with muscle relaxant. At the end of procedure, reversal of residual neuro muscular blockade was earned out if necessary using Inj. Atropine 0.02mg/kg and neostigmine 0.05mg/kg, patient was extubated after adequate oropharyngeal toilet.

Criteria	Excellent	Good	Poor
Vocal cord position	Abducted	Intermediate	Closed
Vocal cord movements	None	Moving	Closing
Easiness of laryngoscopy	Easy	Fair	Difficult
Airway Reaction (Diaphragmatic response)	None	Diaphragm (bucking)	Sustained more than 10 sec (Coughing)
Limb movements	None	Slight	Vigorous
Scoring of intubating conditions (Viby Mogensen Scale) clinically acceptable			

Easy: Jaw relaxed and no resistance; Fair: Jaw relaxed slight resistance. Each criteria is assigned points of 3 and a score in Excellent: 15, Good 10-14, Poor 5-9.

Vocal cords movements	Score	Group I Group II (Rocuronium) (Suxamethonium)					
		Time in seconds					
		60	90	120	60	90	120
None	3	22(88%)			25(100%)		
Moving	2	3(12%)					
Closed	1						

Table 2: Scoring of intubating conditions with respect to vocal cord movements

The above table depicts the distribution of scoring points in the respective groups with the two drugs, with respect to the vocal cord movements. In 88% of cases no movement of vocal cords in Group I and in 12% of cases vocal cords were moving in group I. In group II, in all cases there was no movement of vocal cords.

Ease of Laryngoscopy	Score	Group I Group II (Rocuronium) (Suxamethonium)					
		Time in seconds					
		60	90	120	60	90	120
Complete (Easy)	3	25(100%)			25(100%)		
Fair	2	0					
Closed	1						

Table 3: Scoring of intubating conditions with respect to ease of laryngoscopy (Jaw relaxation)

The above table depicts the scoring points on laryngoscopy in the respective groups with the two drugs. Laryngoscopy was found to be easy in all the patients of group I and II at 60 sec.

Airway reaction (Diaphragmatic)	Score	Group I Group II (Rocuronium) (Suxamethonium)					
		Time in seconds					
		60	90	120	60	90	120
None	3	25(100%)			25(100%)		
Bucking	2	0					
Sustained Coughing (>10 sec)	1						

Table 4: Scoring of Intubating Conditions with Respect to the Airway Reaction as Assessed by Diaphragmatic Movement in Response to Intubation

The above table depicts the distribution of scoring points with respect to the diaphragmatic response to intubation. None of the patients in Group I and II had any response to intubation.

Limb Movements	Score	Group I Group II (Rocuronium) (Suxamethonium)					
		Time in seconds					
		60	90	120	60	90	120
None	3	25(100%)			25(100%)		
Slight	2						
Vigorous	1						

Table 5

The above table depicts the distribution of scoring points with respect to the limb movement at the time of intubation. None of the patients in Group I and II had any limb movement.

Total Score	Score	Group I Group II (Rocuronium) (Suxamethonium)					
		Time in seconds					
		60	90	120	60	90	120
Excellent	15	22(88%)			25(100%)		
Good	10-14	3(12%)					
Poor	5-9						

Table 6: Total scoring of intubating conditions in the two groups

The above table depicts the distribution of total scoring in the two groups - an excellent score seen in all cases of Group II within 60 sec. In Group I, 88% had excellent and 12% had good intubating conditions within 60sec.

Time (Sec) After injection	No. of cases intubated	
	Group I (Rocuronium)	Group II (Suxamethonium)
60	25	25
90	None	None
120	None	None

Table 7: Intubating conditions with respect to the time after injection of drugs

The above table shows intubating conditions with respect to the time after injection in the two groups. Intubation could be satisfactorily accomplished at 60sec in all the cases of Group 1 and II.

Response to single twitch	Group I (Rocuronium)			Group II (Suxamethonium)		
	Time in seconds					
	60	90	120	60	90	120
Present	3					
Absent	22			25		
Poor						

Table 8: Response to single twitch nerve stimulation at the time of intubation

The above table depicts the distribution of the response to single twitch nerve stimulation at the time of intubation. None of the patients in group II showed any response, while 12% of patients in Group I showed some (though diminished) response to a single twitch ulnar nerve stimulation.

Grade	Score	Grade I (Rocuronium)		Group II (Suxamethonium)	
		No. of cases	%	No. of cases	%
Excellent	15	22	88%	25	100%
Good	10-14	3	12%	-	-
Poor	5-9	-	-	-	-

Table 9: Incidence of grades of intubating condition

The above table shows the grades of intubating conditions in the two groups.

Yates corrected Chi-square value=1.42, df=1, P=0.2337.

There is no statistical difference between Rocuronium and Suxamethonium (P >0.05), so we can say that Rocuronium can be used as an alternative to Suxamethonium for rapid sequence induction intubation.

DISCUSSION: Rapid and safe endotracheal intubation is of paramount importance in the practice of general anaesthesia. Patients in group I were intubated using Rocuronium 0.9mg/kg at 60sec. Intubating conditions were excellent (Score 15) in 88% of cases whereas vocal cord

position was intermediate (10-14) in 12% of cases. In 12% of the patient’s vocal cord movement was observed. These however, did not pose a problem to intubation. In group II, where Suxamethonium was used as intubating agent, all cases could be intubated at 60sec, with excellent conditions (score 15 in 100% cases). Full Jaw relaxation was seen in all cases and there was no diaphragmatic response or limb movement at the time of intubation.

Thus, we claim results comparable to R.K. Mirakhur et al,⁽¹⁾ who reported clinically acceptable intubating conditions (excellent in 95%) with Rocuronium 0.6mg/kg at 60sec, and in all patients at 90 sec, and also with S.S. Feldman et al,⁽²⁾ who reported that Rocuronium bromide produces smooth and easy intubating conditions at 60sec, 90sec. Weiss et al⁽³⁾ in their study, where Rocuronium 0.9mg/kg was found to produce clinically acceptable intubating conditions at 60scc comparable to Suxamethonium 1.5mg/kg. H.J. Sparr et al⁽⁴⁾⁽⁵⁾ in their study concluded that Rocuronium is a suitable alternative to Suxamethonium for rapid tracheal intubation under emergent condition, even under unsupplemented Thiopentone anaesthesia at least in elective, otherwise healthy patients. Latorre et al⁽⁶⁾ found clinically acceptable intubating conditions (good or excellent) in 90% of cases at 60 sec after Rocuronium 0.6 mg/kg and Suxamethonium 1.5 mg/kg. Jeffrey Joseph Perry ⁽⁷⁾ found ideal intubating conditions with Rocuronium and Suxamethonium. As McCort K.C.et al ⁽⁸⁾ al observed Rocuronium 1mg/kg can be used during rapid sequence intubation of anaesthesia as an alternative to Suxamethonium.

SUMMARY AND CONCLUSION: The present study entitled “Comparison of Rocuronium bromide and Suxamethonium chloride for use during rapid sequence induction of anaesthesia” was carried out in 50 patients, using Rocuronium bromide 0.9mg/kg and Suxamethonium 1 mg/kg. Rocuronium bromide in a dose of 0.9mg/kg (3x ED95) provided neuromuscular blockade with a fast onset time and good to excellent intubating conditions at 60sec, resembling those of Suxamethonium. Though it was inferior to succinylcholine in that vocal cords were not fully open in 12% of cases-it did not hamper laryngoscopy or intubation in anyway. Intubating conditions were clinically acceptable in 100% of cases with Suxamethonium and Rocuronium. The disappearance of single twitch response at adductor pollicis which correlated well with good to excellent intubating conditions with Suxamethonium was delayed in 20% of cases in Rocuronium.

Rocuronium is a low potency, intermediate acting, better and safer alternative to succinylcholine for rapid sequence induction intubation where use of succinylcholine is contraindicated or hazardous. Thus, though Rocuronium is not a panacea for all intubations nor a replacement for traditional succinylcholine but there is growing body of evidence that suggests its equivalence to (or) superiority over conventional succinylcholine.

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