

Rapid Sequence Intubation: Ease of Intubation and Haemodynamic Effects of Succinyl Choline Chloride Vs Rocuronium Bromide in Adult Patients

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Abstract

Objectives: To compare the intubating conditions, clinical duration of action, cardiovascular responses, side effects associated with administration of rocuronium bromide 0.9mg/kg and succinylcholine chloride 1mg/kg for rapid sequence intubation. **Study Design:** Randomized controlled clinical trial. **Place and Duration of the study:** Rajah Muthiah Medical College, Chidambaram 2016-17. **Methodology:** After obtaining approval from institutional ethics committee and written informed consent from all patients, a randomized controlled double blinded clinical trial was conducted on 60 ASA I and II adult patients undergoing elective surgeries. Patients were randomly allocated into two groups group S and group R of 30 each. Patients in group S were to receive succinylcholine chloride 1 mg/kg and group R - rocuronium bromide 0.9 mg/kg and intubation attempted at 60 seconds. Haemodynamic variables (heart rate, systolic, diastolic and mean arterial pressures) were recorded. Intubating conditions were graded using the score adopted by Toni Magorian et al [1], and compared using Pearson's Chi-square test. **Conclusion:** Rocuronium bromide 0.9mg/kg is a safe alternative to succinylcholine chloride 1mg/kg for rapid sequence intubation in adult patients in situations where succinylcholine chloride is contraindicated and where there is no anticipated difficult airway.

Keywords: Succinylcholine Chloride; Rocuronium Bromide; Rapid Sequence Intubation.

Introduction

With introduction of endotracheal anesthesia during world war I and balanced anesthesia in 1926, a search began for a drug [2] which could cause jaw relaxation to facilitate endotracheal intubation. The first skeletal muscle relaxant, d-tubocurarine (prototype non depolarizing neuromuscular blocker) introduced in 1942 provided excellent muscle relaxation, but it caused additional ganglion blocking properties like salivary secretions, bronchospasm, hypotension even in clinical doses due to histamine release and had delayed onset of action, making it unsuitable for use during rapid sequence intubation [3].

Succinylcholine chloride introduced in 1951, a synthetic depolarizing muscle relaxant became the drug of choice for rapid sequence endotracheal intubation in emergency cases. When its adverse effects like hyperkalemia, rise in intragastric, intraocular, intracranial pressures and cardiovascular effects started surfacing, the quest began for a safer substitute [2].

The new NDMR drug rocuronium bromide introduced in 1994 became the first competitor for succinylcholine [5]. Hence the study undertaken to evaluate and to compare the intubating conditions with rocuronium bromide 0.9 mg/kg and succinylcholine chloride 1 mg/kg for use during rapid sequence intubation in adult patients.

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Methodology

The study population was randomly divided into two groups with 30 patients in each group.

The study was carried out as a randomized double blind study. Both the patient and the observer were blind to the type of drug being administered.

The study drugs were prepared, numbered and the register was maintained by another faculty member.

Group - S: consisting of 30 patients, who were to receive succinylcholine chloride 1mg /kg body weight and intubation attempted at 60 seconds

Group - R: consisting of 30 patients, who were to receive rocuronium bromide 0.9 mg/ kg body weight and intubation attempted at 60 seconds.

A thorough preanaesthetic evaluation was done to rule out any systemic disease and also anticipated difficult intubation patients were excluded from the study. Tab. Diazepam 10 mg and Tab. Ranitidine 150 mg were given on the night before surgery. Patients were maintained nil per oral for a duration of 8 hours prior to surgery.

On the day of surgery, the patient was shifted to the operating room. Intravenous access was secured. A multichannel monitor consisting of pulse oximeter, electrocardiogram, heart rate, non-invasive blood pressure and capnography was connected.

The baseline heart rate, oxygen saturation, electrocardiogram, systolic, diastolic and mean arterial blood pressures were recorded.

In patients posted for elective surgeries, a technique mimicking rapid sequence intubation in emergencies, was employed to test the efficacy of drugs.

Inj. Fentanyl 1mcg/kg. and inj. glycopyrolate 0.2 mg were administered intravenously to all patients, 3 minutes prior to administering induction agent [4].

All patients were preoxygenated with 100% oxygen via a face mask for 3 minutes. Then, induction was done with inj. thiopentone sodium 5 mg/ kg body weight intravenously. In all the patients, cricoid pressure was applied during the administration of induction agent as the patients became unconscious.

In Group S, succinylcholine chloride 1 mg/kg body weight was administered intravenously after the loss of eyelash reflex.

Similarly in Group R, rocuronium bromide 0.9 mg/kg was administered intravenously after the loss of eyelash reflex. No mask ventilation was done in any patient after administration of relaxant.

In both groups of patients, oral endotracheal intubation was attempted at 60 seconds following the administration of muscle relaxant and intubating conditions were graded using the score adopted by Toni Magorian et al (1993) [1].

Excellent: Jaw relaxed, vocal cords apart and immobile, no diaphragmatic movements

Good: Jaw relaxed, vocal cords apart and immobile, some diaphragmatic movement

Poor: Jaw relaxed, vocal cords moving and buckling

Inadequate: Jaw not relaxed, vocal cords closed.

All the patients were intubated with appropriate sized portex endotracheal tubes (cuffed). Bilateral air entry was checked and the tube was firmly secured.

Maintenance of anesthesia was done with 35% oxygen in nitrous oxide and 1% isoflurane with intermittent positive pressure ventilation.

Vital parameters like heart rate, oxygen saturation, systolic, diastolic and mean arterial blood pressures, electrocardiogram and ETCO₂ were monitored and recorded 1, 3 and 5 minutes following intubation.

The clinical duration of action (time from administration of relaxant to first respiratory attempt) of initial bolus doses of succinylcholine chloride and rocuronium bromide was noted. Subsequently, in Group S, muscle relaxation was maintained with vecuronium bromide till the end of surgery.

At the end of surgery all the patients were reversed with inj. neostigmine 0.05 mg/kg and inj. atropine 0.02 mg/kg and side effects were noted [5].

The hemodynamic parameters in the present study were compared statistically using p value obtained from chi square test.

Observation

In the present study, the mean age (in years) in Group S is 35.63 and Group R 36.36.

The mean weight (in kgs) in Group - S is 48.93 and Group R 47.10. The male: female ratio in Group S 17.3 and Group - R 16.14.

Excellent intubating condition was observed in all 30 (100%) patients with succinylcholine in Group - S while with rocuronium (Group-R), excellent intubating condition was obtained in 29 (96.67%) patients and good intubating condition in 1 (3.33%).

In Group - S, the mean heart rate was 84.13(preinduction), it went upto 104.34 after 1min, 98.12 after 3 min and 93.30 after 5 min. In Group - R, preinduction mean heart rate was 82.20, it went upto

107.46 after 1 min, 98.80 after 3 min and 86.46 after 5 min. The Mean blood pressure (mm Hg) in Group - S was 91.63(preinduction), it went upto 104.34 after 1min, 98.12 after 3min, and 93.30 after 5 min. In Group

- R, preinduction mean blood pressure was 90.23, it went upto 105.47 after 1 min 99.29 after 3 min and 94.27 after 5 min.

Intubation Condition

Conditions	Group - R		Group - S		Total
	No.	%	No.	%	
Excellent	29	096.7	30	100	59
Good	01	003.3	00	000	01
Total	30	100.0	30	100	60

Chi-Square Test

	Value	DF	p value
Pearson Chi-Square	1.017	1	0.313

Fig. 1:

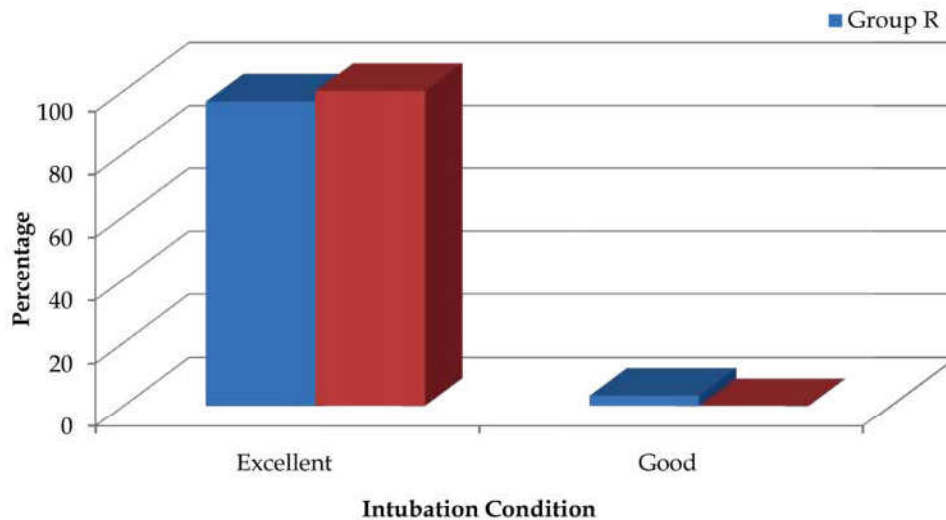
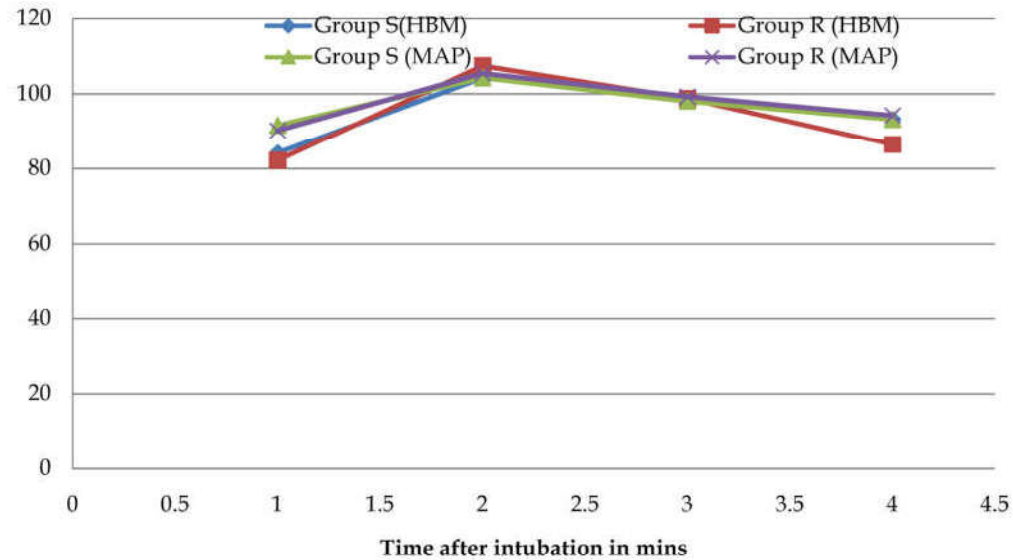


Fig. 2: Graph showing comparison of intubation conditions of the two groups:

Based on the scale adopted by Toni Magorian et al. (1991) [1].

Discussion

Though d-tubocurarine introduced in 1942 produced excellent jaw relaxation, the onset of action was slow, taking 3 mins to produce good intubating conditions which is unsuitable for use in emergency cases.

Many drugs like vecuronium bromide, atracurium and mivacurium were introduced into clinical practice, but none could challenge succinylcholine in terms of onset of time.

Rocuronium [6] introduced in 1994 became the first drug to challenge the onset time of Succinylcholine in that it produced good to excellent intubating conditions in 60 seconds and is devoid of adverse effects of succinylcholine [7]. Rocuronium has the added advantage of immediate reversal by sugammadex [8] (ORG 25969).

Dosage Selected

ED95 is the dose of relaxant needed to produce 95% suppression of single twitch response. The dose of relaxant needed for endotracheal intubation is usually more and is employed in multiples of ED95 dose. Employing single bolus dose in multiples of ED95 dose is a better technique of obtaining adequate relaxation than priming method, for hastening the onset of action.

Rapid sequence intubation involves rapid procurement of airway usually at 60 seconds. Intubating conditions are usually assessed using clinical criteria such as jaw relaxation, vocal cord movements and diaphragmatic relaxation. Toni Magorian et al., K.C. Mc Court et al [9], Friedrich K. Puhlinger et al., T. Fuchs Buder et al., Aparna Shukla et al [10], have preferred to use these clinical criteria for intubation at 60 seconds and have noted that both the drugs produced good to excellent intubating conditions at 60seconds in majority of patients [7].

In the present study (n=30 each), succinylcholine chloride 1 mg/kg produced excellent intubating condition in 30 (100%) patients and rocuronium bromide 0.9 mg /kg produced excellent intubating condition in 29 (96.67%) patients and good intubating condition in 1 (3.33%) patient at 60 seconds.

Cooper et al [11] (1992) and Naguib et al [12] (1992) and the present study have noted an excellent

intubating conditions with succinylcholine 1 mg/Kg in 100% of cases. With rocuronium 0.9 mg/Kg, 100% excellent intubating conditions were achieved in Naguib et al (1992) [11] study, 80% excellent intubating conditions and 20% good intubating conditions were achieved in Toni Magorian et al (1993) study [1].

The incidence of excellent intubating conditions with rocuronium 0.6 mg/Kg was 28% in KC Mccourt et al (1997) [9] study and 85% in Freidrich K. Puhlinger et al (1992) [7] study and good intubating conditions 15% in Freidrich K. Puhlinger et al (1992) [7] and 47% in KC Mccourt et al (1997) study [9].

No statistical difference in intubating conditions were found when succinylcholine 1 mg/Kg was compared to rocuronium 1.2 mg/Kg in Cochrane database system rev.2008 April 16 [13].

Conclusion

1. Succinylcholine chloride 1 mg/kg produces excellent intubating conditions in all the patients at 60 seconds with an average clinical duration of 4.74 minutes
2. Rocuronium bromide 0.9 mg/ kg produces excellent intubating conditions in 96.67% of patients and good intubating conditions in 3.33 of patients at 60 seconds with an average clinical duration of action of 44.7 minutes.
3. Rocuronium bromide is a safe alternative to succinylcholine chloride for rapid sequence intubation in adult patients in situations where succinylcholine is contraindicated and where there is no anticipated difficult airway.

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