Volume-4, Issue-11, Nov-2015 • ISSN No 2277 - 8160

Research Paper | Medical Science

COMPARITIVE STUDY OF INTUBATING CONDITIONS BETWEEN ROCURONIUM BROMIDE WITH PRIMING AND WITHOUT PRIMING

Dr. (Col) V.R.R. Chari	Professor, Dept of anesthesiology, Dr. D. Y. Patil Medical college, Pimpri, Pune
Dr. Monika Gulati	Assistant Professor, Dept of anesthesiology, Dr. D. Y. Patil Medical college, Pimpri, Pune
Dr. Arnab Paul	Residents, Dept of anesthesiology, Dr. D. Y. Patil Medical college, Pimpri, Pune
Dr. Vinit Garg	Residents, Dept of anesthesiology, Dr. D. Y. Patil Medical college, Pimpri, Pune
Dr. Bhoomi Raval	Residents, Dept of anesthesiology, Dr. D. Y. Patil Medical college, Pimpri, Pune

ABSTRACT

Introduction

Priming principle refers to administration of a small dose of non-depolarising neuromuscular blocking agent which when followed by a large intubating dose after 2-4 minutes produces a relatively rapid and profound blockade to ensure a suitable condition for endotracheal intubation. It is considered clinically superior to the bolus method and is preferred in all elective cases and in those patients in whom succinylcholine is contraindicated. Rocuronium has the fastest onset time compared with other non-deploring neuromuscular blocking drugs and it may produce comparable intubating time and conditions to that of succinylcoline.

Aims and objectives

The study was conducted to compare the intubating conditions and pressor response after administration of Rocuronium bromide with and without priming.

Materials and Methods

After "Institute Ethics committee" approval and informed consent, 60 patients of ASA physical status I and II, aged between 18 and 60 years of both sexes, were divided into 2 groups of 30 each. Patients in the priming group (Group S) received 0.06 mg/kg of rocuronium and those in the control group (Group C) received normal saline. Intubating dose of rocuronium 0.54 mg/kg in Group S and 0.6 mg/kg in Group C were administered 3 min after priming. Vital parameters were recorded and assessment of intubating conditions were done in both groups as proposed by "Goldberg & colleagues".

Result

Both the groups were comparable with respect to their demographic profile. Group S produced excellent intubating conditions in 60 % patients and good intubating conditions in 40% patients. Whereas, Group C produced good intubating conditions in 20 % patients and poor intubating conditions in 80 % patients. Both the groups showed transient increase in vital parameters following tracheal intubation, which became normal after 10 minutes of intubation.

Conclusion

Priming with rocuronium provides excellent intubating conditions at 60 seconds with no adverse effects.

KEYWORDS : Rocuronium bromide, Priming principle, Intubating conditions.

Introduction

Endotracheal intubation has become an integral part of the anaesthetic management and critical care of the patient and has been practiced following its description by Rowbothom and Magill in 1921.1 Good intubating conditions minimize the risk of trauma associated with tracheal intubation.2 Tracheal intubation is commonly facilitated by muscle relaxants.

Succinylcholine chloride produce a dense and profound muscle relaxation with an onset time of 60 seconds. Thus airway could be rapidly secured within 60 seconds and has a short duration of action of about 4-8 minutes. But, succinylcholine has a number of undesirable side-effects like hyperkalaemia of about 0.5mEq/L for every dose, (3) bradyarrhythmias, (4) nodal and junctional rhythm and asystole following the second dose which was highly unacceptable. Further it was associated with rise in intraocular, intracranial (5) and intragastric pressures, malignant hyperthermia in susceptible patients and development of phase II block after a large dose or continuous infusion. Hence, it is not suitable in situations like neuromuscular disorders, burns, head injury, intracranial bleed, (6) open eye injury, spinal cord injury, (7) cerebrovascular accidents and renal diseases. These adverse effects were large in number to bring disrepute to the drug in clinical practice.

The above side-effects and contraindications of succinylcholine had prompted the use of non-depolarizing muscle relaxants using various techniques, such as timing principles, (8) combination of relaxant, (9) high dose of non-depolarizing muscle relaxants, (10) inhalational agents to augment the effect of non-depolarizing muscle relaxants, (11) use of intravenous anaesthetic agents with non-depolarizing muscle relaxants to augment neuromuscular blockade (12) and priming principle.

In our study, we have used another newer technique, "priming principle". It is a divided dose technique of non-depolarizing neuromuscular blocking agents, capable of producing a rapid onset of neuromuscular block and suitable intubating condition. A small priming dose is administrated to an awake patient. This dose is large enough to cause sufficient inhibition of neuromuscular transmission but small enough to cause any unpleasant adverse effects. It occupies 75% of end plate receptors. After 2–4 min, the

rest of the calculated intubating dose of the drug is administered to produce neuromuscular blockade.

Rocuronium bromide first came into clinical use in the early 1990s. Rocuronium is intermediate acting derivative of vecuronium. It is also devoid of systemic adverse effects and does not cause histamine release. It has the fastest onset time compared with other non-deploring neuromuscular blocking drugs. For our study we chose rocuronium bromide with an intubating dose of 0.6 mg/kg, (10) priming dose of 0.06 mg/kg (11) (10% of intubating dose) and priming interval of 3 min (12).

Methods

After "Institute Ethics committee" approval and informed consent, preliminary studies were carried out in 60 patients of ASA I and II aged between 18 and 60 years, of both sexes. It is a prospective randomized double-blind placebo-controlled study conducted between June 2012 to September 2014. Patients with neuromuscular diseases, anticipated difficult intubation (obesity, thyromental distance more than 6 cm and Mallampati grade 3 and 4), pregnancy, hepatic, renal diseases, patients receiving drugs interfering with neuromuscular action and history of allergic reaction to rocuronium were excluded from the study. All the patients were subjected to thorough pre-anaesthetic evaluation and relevant laboratory investigations. The patients were randomized into two groups; namely, group "S" (study group) and group "C" (control group).

All the patients were kept fasting overnight prior to the scheduled day of operation. In the operation theatre, the intravenous cannula was secured and intravenous fluids was started. All monitors such as NIBP, pulse oximeter and electrocardiogram (ECG) were connected to the patient. Base line vital parameters were recorded (T0).

Total intubating dose of rocuronium bromide 0.6 mg/kg was diluted to 5 ml. In group "C", 2 ml of normal saline was taken in a 2 ml syringe. In group "S", 0.5 ml of rocuronium bromide was taken from the 5 ml syringe (containing total dose) and diluted to 2 ml with normal saline, and the remaining 4.5 ml was diluted to 5 ml with normal saline. Drugs were loaded, labelled and administered by another experienced anaesthesiologist.

Premedication as injection Glycopyrolate 0.2 mg (0.004mg/ kg), injection Midazolam 1mg (0.02 mg/ kg) and injection Fentanyl 100mcg (2 mics/ kg) body weight were given intravenously 10 minutes prior to induction. The vital parameters were recorded once again (T1). Patients were preoxygenated with 100% oxygen for 3 minutes. After pre-oxygenation, the priming dose of rocuronium bromide 0.06 mg/kg (10% of intubating dose) or normal saline was given 3 min before the intubating dose as per randomization. The patients were enquired about the ptosis, double vision, difficulty in swallowing and difficulty in breathing. Two and half minutes after giving the priming dose, patients were induced with intravenous propofol 2 mg/kg body weight. The intubating dose of rocuronium bromide was injected 3 min after the priming or normal saline injection. The vital parameters were recorded once again (T2). Laryngoscopy and tracheal intubation was done after 60 seconds of the intubating dose of rocuronium bromide followed by, recording of the vital parameters (T3). Vital parameters were also recorded after intubation at 1 minute, 3 minute and 5 minute.

Assessment of intubating conditions were done in both groups as proposed by "Goldberg & colleagues" 86 as given below;

- Excellent - Jaw relaxed, vocal cords apart & immobile and no diaphragmatic movement.
- Good - Jaw relaxed, vocal cords apart & immobile, some diaphragmatic movements.
- Poor - Jaw relaxed, vocal cords moving & bucking.
- Inadequate – Jaw not relaxed, vocal cords closed.

Patients were extubated after the return of airway protective reflexes and monitored in post anaesthetic care unit (PACU) before transfer to their respective wards.

STATISTICAL ANALYSIS

The analysis of the data and application of various statistical tests was carried out with help of Statistical Package for Social Sciences (SPSS 11th version). Data was compiled, analyzed and presented as mean, standard deviation, and percentages. p value were used in the study. $P < 0.05$ was considered to be statistically significant

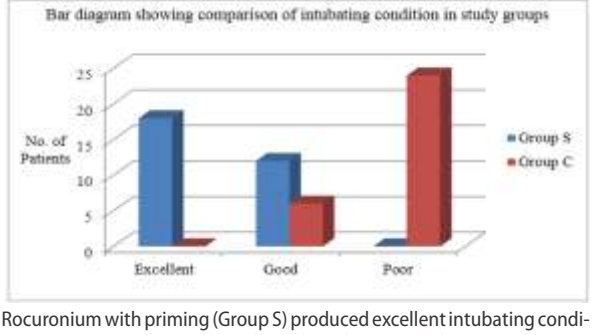
RESULT

In the present study, 60 ASA grade I and II patients of either sex and aged between 18 and 60 years were selected and randomized into two groups, the control group (normal saline and intubating dose of rocuronium 0.6 mg/kg as intubating dose) and study group (0.06 mg/kg of rocuronium as priming dose and 0.54 mg/kg of rocuronium as intubating dose) of 30 in each. There were no significant differences; both the groups were comparable with respect to age, weight, height, sex and ASA grading (table 1).

Table 1: Demographic Data

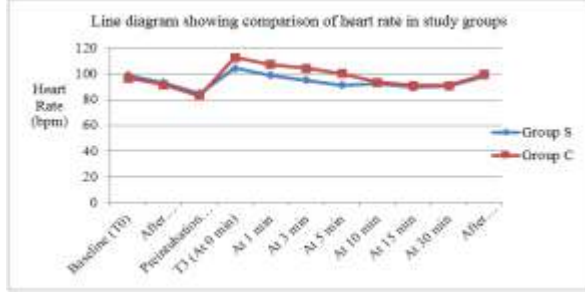
	GROUP S Mean SD (n=30)	GROUP C Mean SD (n=30)	P VALUE
AGE (years)	*35.67 12.55*	*38.77 14.19*	*> 0.05*
HEIGHT (cm)	*152 8.5*	*157 7.6*	*> 0.05*
WEIGHT (kg)	*57.57 6.04*	*57.30 6.02*	*> 0.05*
ASA GRADING (I / II)	*24 / 6*	*25 / 5*	*> 0.05*
SEX (MALE/FEMALE)	*19 / 11*	*17 / 13*	*> 0.05*

Figure 1:



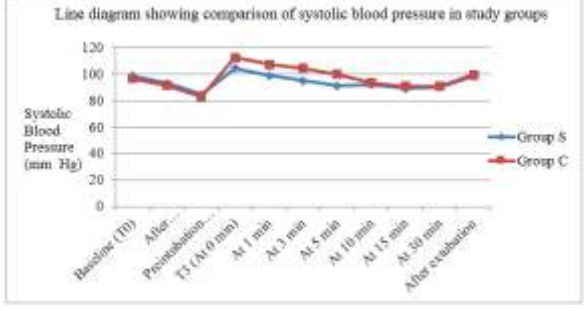
Rocuronium with priming (Group S) produced excellent intubating conditions in 18 (60 %) patients and good intubating conditions in 12 (40%) patients. Whereas, rocuronium without priming (Group C) produced good intubating conditions in 6 (20 %) patients and poor intubating conditions in 24 (80 %) patients

Figure 2:



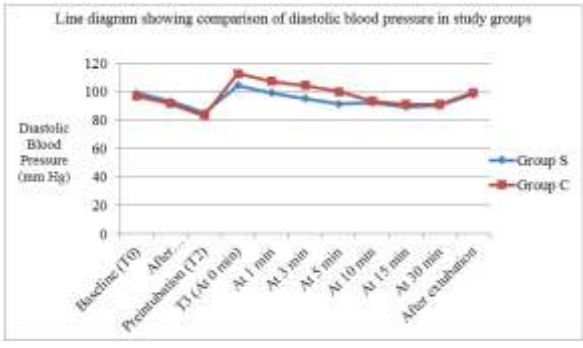
Heart rate among Group S & C in Preoperative Stage (baseline) T0, after pre medication (T1), pre intubation (T2), post intubation (T3) at 0 mins, 1 mins, 3 mins, 5 mins, 10 mins, 15 mins, 30 mins and after extubation.

Figure 3:

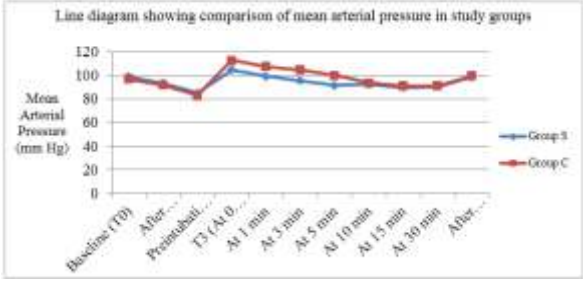


Systolic Blood Pressure among Group S & C in Preoperative Stage (baseline) T0, after pre medication (T1), pre intubation (T2), post intubation (T3) at 0 mins, 1 mins, 3 mins, 5 mins, 10 mins, 15 mins, 30 mins and after extubation.

Figure 4:

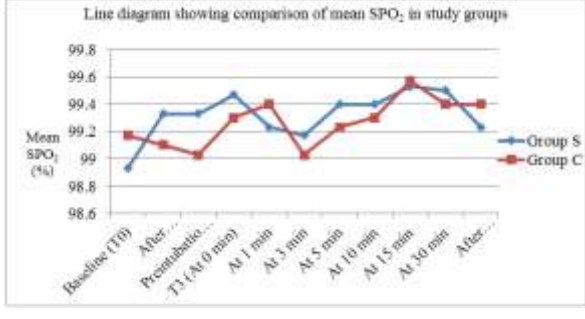


Diastolic Blood Pressure among Group S & C in Preoperative Stage (baseline) T0, after pre medication (T1), pre intubation (T2), post intubation (T3) at 0 mins, 1 mins, 3 mins, 5 mins, 10 mins, 15 mins, 30 mins and after extubation**.**



Mean Arterial Pressure among Group S & C in Preoperative Stage (baseline) T0, after pre medication (T1), pre intubation (T2), post intubation (T3) at 0 mins, 1 mins, 3 mins, 5 mins, 10 mins, 15 mins, 30 mins and after extubation.

Figure 6:



Mean SPO2 among Group S and Group C in preoperative stage (baseline) T0, after pre medication (T1), pre intubation (T2), post intubation (T3) at 0 mins, 1 mins, 3 mins, 5 mins, 10 mins, 15 mins, 30 mins and after extubation.

DISCUSSION

Neuromuscular blocking agents is used to serve two purposes: one to facilitate endotracheal intubation and other to provide surgical relaxation.13 The ideal neuromuscular blocking agent is one which has rapid onset of action, short duration, provides profound relaxation and minimal haemodynamic changes.

In the present study, we compared the intubating conditions, pressor response and side effects between rocuronium bromide with priming and without priming. We also assessed whether it is possible to intubate patients with rocuronium bromide in 60 seconds using 'Priming Principle' and whether use of this technique can substitute Rocuronium bromide without priming for tracheal intubation.

Karl E.Griffith et al studied the effect of Priming with rocuronium on the onset of neuromuscular blockade. They concluded that priming with rocuronium decreased the intubating times without increasing the clinical duration of action.14

Smith and associates studied the onset of action and intubating conditions of rocuronium and vecuronium and associates. They concluded that rocuronium resulted in significantly better intubating conditions compared with vecuronium.15

In a study by M Hanumantha Rao et al compared intubating conditions between rocuronium with priming and without priming. They concluded that priming with rocuronium provides excellent intubating conditions in less than 60 seconds. These results are similar to our study.16

In a study by Venkateswaran R. et al compared the intubating conditions following administration of low-dose rocuronium or succinylcholine in adults. Aim of the study was to evaluate whether reducing the intubating dose of rocuronium shortens its duration of action, yet provides clinically acceptable intubating conditions. They concluded that rocuronium in dose of 0.6 mg/kg gives clinically acceptable intubating conditions at 60 or 90 s, comparable to succinylcholine 1 mg/kg.17

Aparna Shukla et al. compared the intubating conditions after the administration of rocuronium bromide and succinylcholine choline. The authors concluded that rocuronium bromide is a safer alternative to succinylcholine choline for endotracheal intubation. But with doses of 0.6 mg.kg-1, it is prudent to wait for 90 seconds to achieve intubating conditions similar to succinylcholine choline.2

DS Shashank et al studied the effects of pretreatment with different neuromuscular blocking agents on facilitation of intubation with rocuronium. They compared the effects of rocuronium, vecuronium and atracurium as "pretreatment" drugs on intubating conditions with rocuronium facilitated endotracheal intubation. They concluded that pretreatment with rocuronium bromide can facilitate endotracheal intubation in 60 seconds with acceptable (excellent to good) intubating conditions. 18

In 2010, Veena Chatrath et al compared intubating conditions of rocuronium bromide and vecuronium bromide with succinylcholine using "Timing Principle". Haemodynamic variables were compared at 1, 3 and 5 minutes after intubation.they concluded that Rocuronium and Vecuronium are haemodynamically stable drugs as compared to Succinylcholine.19

In our study there was mild variations in the outcomes of the vital parameters be it blood pressure or heart rate. However, greater variations are seen amongst the Group C patients. This was due to the pressure response, because of poor intubating conditions.

There were no side effects in both the groups. All patients in group S were comfortable following IV administration of rocuronium and they did not complain of any pain. There was no incidence of hypoxia in this group. In group C also there were no side effects and complications following IV injection of rocuronium. None of the patient in both groups had any respiratory depression or fall in SPO2.

Findings of the above mentioned studies are similar to our study. Rocuronium with priming principle provides acceptable (excellent to good) intubating conditions within 60 seconds. In the present study, more number of patients with poor intubating conditions in Group C (rocuronium without priming) was probably because we intubated the patients after 60 seconds of intubating dose of rocuronium.

CONCLUSION

Priming with rocuronium bromide provides acceptable intubating conditions at 60 seconds following administration. It is prudent to wait for 90 seconds after administration of rocuronium without priming principle if uniformly acceptable intubating conditions are deemed important. Rocuronium with or without priming technique, cannot attenuate haemodynamic changes associated with laryngoscopy and intubation.

REFERENCES

1. Magill. Endotracheal Anaesthesia. Proceedings of the Royal society of Medicine. 1928; 22(2):85-8. | 2. Shukla A, Dubey KP, Sharma MSN. Comparative evaluation of haemodynamic Effects and intubating conditions after the administration of org 9426 (rocuronium) and succinylcholine. Ind J Anaesth 2004; 48(6):476-479. | 3. Birch AA, Jr, Mitchell GD, Playford GA, Lang CA. Changes in serum potassium response to succinylcholine following trauma. JAMA. 1969; 210:490–3. | 4. Stoelting RK, Peterson C. Heart slowing and junctional rhythms following intravenous succinycholine with and without intramuscular atropine preanaesthetic medication. Anesth Analg. 1975; 54: 705–9. | 5. Minton MD, Grosslight K, Stirt JA. Increase in intracranial pressure from succinylcholine: Prevention by prior non-depolarizing blockade Anesthesiology. 1986; 65: 165–9. | 6. Stevenson PH, Birch AA. Succinylcholine induced hyperkalemia in patient with a closed head injury.Anesthesiology. 1979; 51:89–90. | 7. Savarese JJ, Caldwell JE, Lien CA, Miller RD. Pharmacology of muscle relaxants and their antagonists. Miller.Philadelphia: Churchill Livingstone; 2004; 1: 490. | 8. Suzuki T, Aono M, Fukano N, Kobayashi M, Saeki S, Ogawa S. Effectiveness of the timing principle with high-dose rocuronium during rapid sequence induction with lidocaine, remifentanil and propofol. J Anesth. 2010; 24: 177–81. | 9. Lebowitz PW, Ramsey FM, Savarese JJ, Ali HH. Potentiation of neuromascular block in man produced by combination of pancuronium and metocurine or pancuronium and d-tubocurarine. Anesth Analg. 1980; 59: 604. | 10. Magorian T, Flannery KB, Miller RD. Comparison of rocuronium, succinylcholine, and vecuronium for rapid sequence induction of anesthesia in adult patients. Anesthesiology. 1993; 79: 913–8. | 11. 9. Savarese JJ, Caldwell JE, Lien CA, Miller RD. Pharmacology of muscle relaxants and their antagonists. In: Miller, editor. 5th ed. Vol. 1. Philadelphia: Churchill Livingstone; 2004. 424. | 12. 10. Lowry DW, Mirakhur RK, McCarthy GJ. Neuromuscular effects of rocuronium during sevoflurane, isoflurane and intravenous anaesthesia. Anesth Analg. 1998; 87: 936 – 40. | 13. Misra MN, Agarwal M, Pandey RP, Gupta A. A comparative study of rocuronium, vecuronium and succinylcholine for rapid sequence induction of anaesthesia. Indian J Anaesth. 2005; 49:469–475. | 14. Griffith KE, Joshi GP, Whiteman PF, Garg SA. Priming with rocuronium accelerates the onset of neuromuscular blockade. J Clin Anesth. 1997; 9:204–7. | 15. Smith I, Saad RS. Comparison of intubating conditions after rocuronium or vecuronium when the timing of intubation is judged by clinical criteria. British. J. Anaesth.1998; 80(2):235-7. | 16. Rao M H, Venkatraman A, Mallleswari R. Comparison of intubating conditions between rocuronium with priming and without priming: Randomized and double-blind study. Indian J Anaesth 2011;55: 494-8. | 17. Venkateswaran R, Chaudhuri S, Deepak K M. Comparison of intubating conditions following administration of low-dose rocuronium or succinylcholine in adults: A randomized double blind study. Anesth Essays Res 2012; 6:62-8. | 18. Shashank DS, Singh NR, Singh LK. Effects of pretreatment with different neuromuscular blocking agents on facilitation of intubation with rocuronium: A prospective randomized comparative study. Indian J Anaesth 2014; 58:303-8. | 19. Chatrath V, Singh I, Chatrath R, Arora N. Comparison of intubating conditions of rocuronium bromide and vecuronium bromide with succinylcholine using "Timing Principle". J Anaesthesiol Clin Pharmacol 2010; 26:493-7.