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Effect of Pretreatment with Rocuronium and Vecuronium on Intubation Conditions Facilitated by Succinylcholine: A Prospective, Randomized, Double Blind Clinical Study

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Abstract

Introduction: Succinylcholine with rapid onset, short duration of action and complete paralysis has been the best drug in providing ideal conditions for endotracheal intubation but occurrence of side effects such as muscle fasciculations, postoperative myalgia, rise in serum potassium levels and myoglobinuria limits its use in full stomach, burns, massive trauma, metabolic acidosis and few myopathies. For attenuation of these effects many drugs have been studied but pretreatment with non depolarizing muscle relaxant found to be successful. One of the main concerns regarding pretreatment with nondepolarizing muscle relaxant is that intubation conditions may be affected adversely. The present clinical study was undertaken to assess the effect of Rocuronium and Vecuronium pretreatment on intubation conditions facilitated by succinylcholine.

Materials and Methods: 100 patients (ASA grade I & II) between the age of 20-50 years of either sex undergoing general anaesthesia for various surgical procedures were randomly allocated into two groups according to pretreatment with Rocuronium (Group R) and Vecuronium (Group V) prior to Succinylcholine administration. After 60 seconds of succinylcholine administration, intubation conditions were assessed.

Results: In our study, overall intubation conditions were good in 85% of the cases. No statistical difference was found between two study groups ($p>0.05$).

Conclusion: Intubation conditions provided by succinylcholine were not adversely affected by pretreatment with rocuronium and vecuronium

Keywords: Intubation conditions; Pretreatment; Rocuronium; Succinylcholine; Vecuronium

Introduction

The introduction of neuromuscular blocking agents revolutionized the practice of general anaesthesia. Laryngoscopy and endotracheal intubation is commonly facilitated with Succinylcholine, a depolarizing muscle relaxant which offers excellent intubation conditions within 30-60 seconds and its effect last for 3-5 minutes. [1]

Succinylcholine is cost effective with rapid onset, short duration of effect, and complete predictable paralysis remains the best drug in providing ideal conditions for endotracheal intubation in majority of the cases. [2] However, the usefulness of succinylcholine is limited by frequent occurrence of side effects such as rise in intracranial pressure, intraocular pressure, intragastric pressure, muscle

fasciculations, postoperative myalgia [3], rise in serum potassium levels and myoglobinuria.

In 1.5 to 89% cases the Succinylcholine induced fasciculations causes postoperative myalgia in the muscles of neck, shoulder, back and upper abdomen, commonly after 24-48 hours, which last for 2 -3 days but occasionally persists for as long as a week. [4]

Post fasciculation rise in serum potassium level could be deleterious in certain cases like severe burns, massive trauma, metabolic acidosis, myo\-neuropathies.

Different drugs have been studied to attenuate these undesirable effects associated with succinylcholine such as pretreatment with Gallamine, d-Tubocurarine, Dantrolene, Phenytoin, Pancuronium, Atracurium, Lidocaine, Ascorbic acid, Chlorpromazine, Aspirin, Magnesium sulphate, Calcium gluconate, Diazepam, Midazolam. Out of all, Non depolarizing neuromuscular relaxant drugs have been found most effective in attenuation of these side effects. [5-12] But one of the main concerns regarding pretreatment with nondepolarizing muscle relaxant is that intubating conditions may be affected adversely. [3, 13-15]

Hence, based on the above facts the present clinical study was conducted to assess the effect of Rocuronium and Vecuronium pretreatment on intubation conditions facilitated by succinylcholine.

Materials And Methods:

After obtaining the permission of Institutional Ethics Committee and informed consent, 100 patients (ASA grade I & II) between the age group of 20-50 years of either sex who were scheduled for elective surgery under general anaesthesia necessitating laryngoscopy and endotracheal intubation were enrolled for this study. Exclusion criteria were patient refusal, pregnant and lactating mothers, significant neurological, endocrinal, hepatic or renal dysfunction, patients susceptible to Succinylcholine induced hyperkalemia as mentioned in introduction.

Enrolled 100 patients were randomly allocated into two groups (n=50 each) using envelop method as below.

1. Group R - Received Inj. Rocuronium (0.06mg/kg, intravenously), 60 seconds before Succinylcholine.
2. Group V - Received Inj. Vecuronium (0.01mg/kg, intravenously), 60 seconds before Succinylcholine.

All the patients underwent detailed pre-anaesthetic assessment and investigations as per hospital protocol. All the patients were kept nil orally for 6 hours before procedure and were uniformly pre medicated with Inj. Glycopyrrolate 0.2 mg, intramuscularly, 30 minutes before shifting to operation theatre. Upon arrival of patient in the operation room, basal pulse rate (bpm), blood pressure (mmHg), SpO_2 (%) were measured and recorded. Then 5% Dextrose Saline infusion was started at 10-15 drops per minute. After intravenous Inj. Pentazocin 0.5 mg/kg body weight and pre oxygenation with 100% Oxygen for 3 minutes by facemask, pretreatment was done with either of the study drug (the anaesthetist on floor and researcher were unaware of the injection of study drug). After 60 seconds of pretreatment general anaesthesia was induced with inj. Thiopentone Sodium 5 mg/kg body weight. Tracheal intubation was facilitated with intravenous inj. Succinylcholine 2.0 mg/kg body weight. After 60 seconds, laryngoscopy was done by Macintosh laryngoscope followed by intubation with appropriate size endotracheal tube. During this, intubation conditions were assessed.

Grading for intubation conditions [16]:

Good – Well relaxed vocal cords, No patient movement during intubation, vocal cords not moving.

Fair – Minor patient movements or minor movements of vocal cords.

Poor – Obvious patient movements, bucking or coughing during intubation.

After endotracheal intubation general anaesthesia was maintained on Nitrous Oxide and Oxygen (66%:33%) with Halothane (0.5 MAC) and Inj. Vecuronium loading (0.1 mg/kg body weight) and intermittent (0.02 mg/kg body weight) doses.

At the end of surgical procedure residual effect of muscle relaxant was reversed with combination of inj. Glycopyrrolate 0.01 mg/kg body weight and inj. Neostigmine 0.05 mg/kg body weight. After

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extubation and complete recovery the patients were shifted to recovery room.

Patients were closely observed for bradycardia / tachycardia (± 20% of basal value), hypotension / hypertension (± 20% of basal value), bradyarrythmia and desaturation (<85%) during intra and postoperative period. During postoperative period along with above, nausea, vomiting, respiratory depression, sedation, shivering was also recorded if occurred. Any complication if occurred was treated with appropriate medications.

Statistical Analysis:

The observations were recorded and subjected to statistical analysis using student's "t" test and for qualitative variables chi square test was used. The observations were recorded; tabulated and statistical analysis was performed by using SPSS Statistics version 19 statistical software. For intergroup comparison, $p > 0.05$, $p < 0.05$ and $p < 0.01$ were considered as insignificant, significant and highly significant respectively.

Results:

Demographic data regarding the Age (years), Weight (kilograms) and Sex ratio (%) were comparable in both the study group. (Table 1)

In our study, overall intubation conditions were good in 85% of the cases. No statistical difference was found between two study groups (p>0.05). (Table 2)

With the exception of nausea in few patients (6% and 4% in group R and V, respectively), no other side-effects or complications were observed in both the study groups.

Discussion:

Succinylcholine has been the most suitable neuromuscular blocking drug to provide ideal conditions for endotracheal intubation in majority of the general anaesthesia cases. [2] but in recent years anaesthetists are avoiding its use because of side-effects like fasciculations, postoperative myalgia and rise in potassium level. Since being a cost effective drug it is still used in many developing countries, hence many studies are still done to minimize its side effects. A meta-analysis of clinical trials for prevention of succinylcholine induced myalgia revealed that pretreatment with different nondepolarizing muscle relaxants decreased the incidence of fasciculations and myalgia by approximately 30%. [17] In our study, the Rocuronium pretreatment dose of 0.06 mg/kg was chosen which was approximately equipotent to 0.01 mg/kg of Vecuronium and <20% of ED_{95} hence safe and effective. This was supported by the study conducted by Joshi GP et al. [18]

Pretreatment of nondepolarizing muscle relaxants and its effect on intubation conditions:

One of the main concerns regarding pretreatment with nondepolarizing muscle relaxant is that intubating conditions may be affected adversely. [3, 13-15] Antagonism of depolarizing blockade results from the competitive action of the nondepolarizing muscle relaxant with succinylcholine at the alpha-subunit of postjunctional nicotinic cholinergic receptor. [19] It is therefore recommended that a larger dose of succinylcholine should be given. [20-22] Motamed C et al [10] found that double the dose of succinylcholine was required after rocuronium pretreatment to obtain same effects, which was in accordance with a previous dose-response study by Szalados et al, [23] where succinylcholine ED_{50} was increased two-folds after precurarization with d-tubocurarine.

Few other authors also reported that increasing the dose of succinylcholine did not increase the incidence of side-effects [24, 25] such as heavy eyelids, difficulty in breathing and swallowing or generalized discomfort.

In our study, succinylcholine was used in the dose of 2.0mg/kg and overall intubation conditions were good in 85% of the cases. No statistical difference was found between three study groups (p>0.05).

Our results are well in accordance to Findlay and Spittal [5], Kacha AR et al, [8] Joshi V et al [9], Motamed C et al [10], Harvey SC et al [16], Abbas N et al [26], Reyes ED, [27] Joshi GP et al [18]. In above mentioned studies, no adverse effects on intubating conditions were observed due to pretreatment regimens.

In contrast to our observations, Abraham V et al [7]observed that intubating conditions were significantly better with rocuronium (0.06mg/kg) as compared to vecuronium (0.01mg/kg) when succinylcholine (1.5mg/kg) was used after 60 seconds of pretreatment with above mentioned drugs (p<0.01).

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Martin R et al [6] compared the effectiveness of pretreatment with d-tubocurarine (0.05mg/kg), rocuronium (0.06mg/kg), mivacurium (0.02mg/kg), vecuronium (0.01mg/kg), atracurium (0.05mg/kg) and 0.9% normal saline (control) given prior to succinylcholine (1.5mg/kg). They observed that intubation conditions were better in the control group than in all other groups ($p<0.05$). They observed ocular side-effects in 90% of the patients receiving pretreatment. In addition, 20% of the patients receiving mivacurium pretreatment complained of difficulty in swallowing and were unable to sustain a head lift for more than 4 seconds and 10% patients also complained of difficulty in breathing which suggested a need for a greater dose of succinylcholine.

We observed that, with the exception of nausea in few patients (6% and 4% in group R and V, respectively), no other side-effects or complications were observed in any study groups.

Conclusion:

We conclude, that Intubation conditions provided by succinylcholine were not adversely affected by pretreatment with rocuronium and vecuronium.

References

1. Donati F, Bevan DR. Neuromuscular blocking agents. Cullen BF, Stoelting RK, Cahalan MK, Stock MC, Barash PG. In: Clinical Anaesthesiology, 6th edition. USA : Lippincot Williams and Wilkins, 2009. pp. 520-521.
2. Kato N, Asakura Y, Misako M M, Kandastu N, Fujiwara Y, Komastu T. Anaesthetic management of electroconvulsive therapy in a patient with a known history of neuroleptic malignant syndrome. J Anaesth 2007; 21: 527-528.
3. Wig J, Bali IM. Relation to precurarization to suxamethonium to provide ease of intubation and to prevent post-suxamethonium muscle pains. Can Anaesth Soc J 1979; 26: 94-98.
4. Crawford JS. Suxamethonium muscle pains and pregnancy. Br J Anaesth 1971; 43: 677-680.
5. Findlay GP, Spittal MJ. Rocuronium pretreatment reduces suxamethonium-induced myalgia: comparison with vecuronium. Br J Anaesth 1996; 76: 526-529.
6. Martin R, Carrier J, Pirlet M, Claprood Y, Tetrault JP. Rocuronium is the best non-depolarizing relaxant to prevent succinylcholine fasciculations and myalgia. Can J Anaesth 1998; 45: 521-525.
7. Abraham V, Kumar AR, Afzal L. Evaluation of post succinylcholine myalgia and intubation conditions with rocuronium pretreatment: a comparision with vecuronium. Indian J Anaesth 2008; 52: 551-555.
8. Kacha AR, Patel HZ, Engineer SR. Comparison of precurarization with rocuronium bromide and vecuronium bromide for succinylcholine induced postoperative myalgia. Int J Res Med 2012; 1: 21-29.
9. Joshi VS, Todkari KV, Deshpande SG. Comoniumparitive study of pretreatment with rocuronium and vecuronium in postsuccinylcholine fasciculations, intubation condition and myalgia. J Evol Med Dent Sci 2016; 38: 2319-2324.
10. Motamed C, Choquette R, Donati F. Rocuronium prevents succinylcholine-induced fasciculations. Can J Anaesth 1997; 44: 1262-1268.
11. Farhat K, Waheed A, Pasha AK, Kazi WA. Prevention of succinylcholine induced muscular effects by pretreatment with rocuronium. Pak J Pharmacol 2012; 29: 25-31.
12. Singh S, Sinha AK, Palaria V, Chauhan AK. Comparison of biochemical changes and myalgia following administration of succinylcholine with or without pretreatment with rocuroniumin in patients undergoing tympanoplasty. Int J Sci Res 2020; 5(9): 46-48.
13. Cullen DJ. The effect of pre-treatment with non-depolarizing muscle relaxants on neuromuscular blocking action of succinylcholine. Anesthesiology 1971; 35: 572-578.
14. Paton WDM. Effects of muscle relaxants other than muscularrelaxation. Anesthesiology 1959; 20: 453-463.
15. Walts LF, Dillon JB. Clinical studies of interaction between d-tubocurarine and

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succinylcholine. Anesthesiology 1969; 31: 39-94.
16. Harvey SC, Roland P, Bailey MK, Tomlin MK, Williams A. A randomized, double-blind comparison of rocuronium, d-tubocurarine and "mini-dose" succinylcholine for preventing succinylcholine-induced muscle fasciculations. Anesth Analg 1998; 87: 719-22.
17. Pace NL. Prevention of succinylcholine myalgia: a meta-analysis. Anesth Analg 1990; 70: 477-483.
18. Joshi GP, Hailey A, Thompson-Bell G, Whitten CC. Effects of pretreatment with cisatracurium, rocuronium and d-tubocurarine on succinylcholine-induced fasciculations and myalgia: a comparison with placebo. J Clin Anesth 1999; 11: 641-645.
19. Stoelting RK. Neuromuscular blocking drugs. In: Stoelting RK ed. Pharmacology and physiology in anesthetic practice. 2nd ed. Philadelphia : JB Lippincott, 1991: 172-225.
20. Freund FC, Rubin AP. The need for additional succinylcholine after d-tubocurarine. Anesthesiology 1972; 36: 185-187.
21. Pauca AL, Reynolds RC, Strobel GE. Inhibition of suxamethonium relaxation by tubocurarine and gallamine pretreatment during induction of anaesthesia in man. Br J Anaesth 1975; 47: 1067-73.
22. Eisenkraft JB, Mingus ML, Herlich A. A defasciculating dose of d-tubocurarine causes resistance to succinylcholine. Can J Anaesth 1990; 37: 538-42.
23. SzaladosJE, Donati F, Bevan DR. Effects of d-tubocurarine pretreatment on succinylcholine twitch augmentation and neuromuscular blockade. Anesth Analg 1991; 71: 55-59.
24. Stoelting RK, Peterson C. Adverse effects of increased succinylcholine dose following d-tubocurarine pretreatment. Anesth Analg 1975; 54: 282-288.
25. McLoughlin C, Leslie K, Caldwell JE. Influence of dose on suxamethonium- induced muscle damage. Br J Anaesth 1994; 73: 194-198.
26. Abbas N, Tariq S, Khan WA, Murtaza G, Naqvi N, Khanzada A. To assess the effect of rocuronium pretreatment on succinylcholine induced fasciculations and postoperative myalgia. J Pak Med Assoc 2009; 59: 847-50.
27. Reyes ED. A comparative study among atracurium, vecuronium and rocuronium as pretreatment in preventing succinylcholine-induced fasciculations. Dr. Nicanor Reyes Med Found Med J 2006; 12: 20-25.

Tables:

Table 1: Demographic Data

S.No.	Parameters	Group R Mean (± SD)	Group V Mean (± SD)	P-value
1.	Age (years)	34.98± 8.26	35.26 ± 9.59	0.920(NS)
2.	Weight (kg)	55.74± 9.15	56.80± 7.32	0.523(NS)
3.	Sex (M:F) (%)	52:48	56:44	--

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Table 2: Grading and inter-group statistical comparison of intubation conditions in two study groups

S. No.	Intubation Conditions	Group-R		Group-V		Total		P-value
		(n)	(%)	(n)	(%)	(n)	(%)	
1.	Good	44	88	41	82	85	85	0.287 (NS)
2.	Fair	6	12	9	18	15	15	0.287 (NS)
3.	Poor	-	-	-	-	-	-	-

Above table shows that intubation conditions in both the groups were comparable and statistically not-significant. $p > 0.05$ – Not significant (NS)

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