ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 68 . 16
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 4, Issue – 6, November - 2019, Page No. : 135 - 139

Efficacy of single dose of vecuronium on vecuronium divided doses and succinyl choline single dose on tracheal intubation in surgical emergencies

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Rapid and safe endotracheal intubation is an important procedure during surgical emergencies. Aim of the study was to compare the single dose of vecuronium with divided doses of vecuronium and succinyl choline single dose on the procedure of intubation during surgical emergencies. 60 subjects attending the surgical emergencies were enrolled for the study and divided into three groups of 20 each. Subject allocated to group I received succinyl choline 1.5mg/Kg, group II received Vecuronium in divided doses (7µg/Kg and 143µg/Kg) and group III received vecuronium in single dose 150µg/Kg body weight and their tracheal intubation was to be finished in 60 seconds for all the groups after injecting the experimental dose of drugs. Train of four (TOF) count was assessed at adductor pollicis muscle using nerve stimulator at intubation time to loss of TOF was observed. Intubating conditions were assessed according to a grading scale. Intubating conditions were excellent in group III 80%, in group II 40% and in group I was 30%. Onset of action of drug was excellent in group I and group III when compared to group II and statistically significant p< 0.0001, and time of blockade is more in group III when compared to other two groups and statically significant with ANOVA, p<0.00001. Single dose of vecuronium 150µg/Kg body weight may provide excellent intubating conditions when compared to the vecuronium in divided doses and succinyl choline in single dose.

Keywords: anaesthesia, priming dose, vecuronium, succinyl choline.

Introduction

In surgical emergency procedures rapid sequence induction is used to secure the airways, in order to avoid aspiration of gastric contents. Succinylcholine is a first choice of relaxant because of its rapid onset of action. However, due to its contraindications which produces muscle fasciculations, myalgia [1,2] and increases in intragastric, intraocular and intracranial pressures [3,4,5,6] it is less extensively used. Patients with burns, renal failure, patients with a history of malignant hyperthermia or pseudocholinesterase deficiency Succinylcholine should be avoided [7,8,9]. A nondepolarizing intermediate muscle relaxant, vecuronium, is essentially free of cardiovascular side effects has prompted us to investigate its efficacy for rapid sequence induction of anaesthesia and tracheal intubation. The effect of various priming and intubating

doses on onset time and clinical duration time were studied.

Materials and Methods

The research was conducted between 2017 to 2018 at department of anaesthesiology, Bidar institute of medical sciences, Bidar, Karnataka. 60 Patients were enrolled for the study who required surgical emergency. Ethical clearance was obtained from the institutional ethical committee to enrol the human subjects. Informed consents were obtained from all the participants enrolled for study. The participants age was between 20 to 60 years and weight 50-90 KG. There were 24 women and 36 men. The participants were grouped into 3 groups, group I received succinyl choline (1.5 mg/kg) and the group II received vecuronium in two divided doses (7µg/Kg and 143µg/Kg) and group III received vecuronium as single does (150µg/Kg), were injected (Table 1). ECG, blood pressure, pSO_2 and heart rate were closely monitored in all participants. Myoscan a constant current peripheral nerve stimulator was used to monitor the muscle blockade. A total of 300-400gms tension was applied to the thumb. The ulnar nerve at the wrist was stimulated through surface electrodes by supramaximal impulses of 0.2 msec duration at 0.1 Hz. The twitch tension of the adductor pollicis was noted. Train of four (T4), 2 Hz stimuli were applied prior to the intubating dose of vecuronium and recorded the presence of all four twitches. Onset time (seconds) and duration of muscle blockade (minutes) was recorded for each participant. Prior to administration of the priming dose of vecuronium, participants received fentanyl 100 µg/Kg. Group II and III participants who received vecuronium were informed of their eyelids might feel heavy and they might experience blurred vision. The participants breathed 100% oxygen by mask after they received priming dose and single dose, their respiratory tidal volumes were closely monitored in all the three groups. The initial response to train-of-four stimulation was determined as soon as the patient became unconscious after administration of thiamylal, 4-5 mg/kg, approximately 4 min after administration of the priming dose of vecuronium. Immediately, the remainder of the total dose of vecuronium was administered and Cricoid pressure was applied. The time when all twitches disappeared after the total dose in group I and Group II all intubations were attempted within 60 seconds and the time when the first twitch reappeared were recorded in all the three groups. Additional doses of 50-100 mg of thiamylal and 50-100 µg of fentanyl were kept ready to administer if further analgesia considered necessary. Ease of intubation was graded as 3 (excellent), no movement of cords; 2 (good), slight movement of cords; or 1 (poor), coughing and bucking. Effect of vecuronium was reversed at the conclusion of surgery in all patients by inducing glycopyrrolate, 0.015 mg/kg, and neostigmine 0.07 mg/kg; adequacy of reversal was determined both by peripheral nerve stimulator and the ability to sustain head lift.

Statistical Analysis

Data presented as Mean±SD with 95% CI and 80% of power of studies. Data was statistically analysed by using one-way ANOVA to compare the three study groups (I,II,III) by Graphpad Prism (7), USA. P value < 0.05 was considered statistically significant.

Result

Result of Intubating conditions were satisfactory with single dose of vecuronium (150µg/Kg), within 60 seconds 16 of 20 subjects (80%) were intubated. Only 08 of 20 subjects (40%) could be intubated in 60 sec, when a priming dose of vecuronium was used 5 min before the total dose, whereas group I (succinyl choline) 30% of the subjects where intubated. The mean onset time for group I was 55.89±1.48,

for the group II was 246.27±18.30 and group III 133.55±3.73 seconds. Statistical analysis using Oneway

Groups	Drug used	Total dose			No (n)
I	Succinyl Choline	1.5mg/Kg			20
II	Vecuronium (In 2 doses)	Ist dose	2nd dose	Total dose	20
		7µg/Kg	143µg/Kg	150µg/Kg	
III	Vecuronium (Single dose)	150µg/Kg			20

Anova F was 1571 and p<0.00001 for the onset of action of drugs in three groups and highly significant. Group III onset of time of action of the drug was greater than that of group I and lesser than group II. The duration of blockade in group I was 6.37±0.58 (95% CI- 6.09 to 6.63), group II was 15.88±1.12 (95% CI- 15.15 to 16.40) and group III was 40.08±3.23 (95% CI- 38.57 to 41.59) with F value 1514, p<0.00001 which is highly significant between the groups (Table 2)

Table -1 Injected anaesthetic dose of drugs

Treatment groups were divided in to I,II,III. Group II received dosage in two doses.

Table 2- Action of drugs onset time (seconds) and duration of blockade (minutes)

Group	Onset time of action of drug (seconds)	Blockade duration of drug (minutes)
I	55.89±1.48 (95% CI -55.20 to 56.59)	6.37±0.58 (95% CI- 6.09 to 6.63)
II	246.27±18.30 (95% CI - 131.87 to 135.30)	15.88±1.12 (95% CI- 15.15 to 16.40)
III	133.55±3.73 (95% CI – 237.70 to 254.84)	40.08±3.23 (95% CI- 38.57 to 41.59)
F-Value	1571	1514
p-Value	<0.00001	<0.00001

Values presented as Mean±SD. F value calculated by one way ANOVA. Statistically Significant p<0.05

Discussion

To facilitate endotracheal intubation and to provide surgical relaxation muscle relaxants are used[6]. An ideal neuromuscular blocking agent is one which has brief duration of onset of action and longer duration of blockade and should provide profound relaxation and free from haemodynamic changes. Succinylcholine reliably produces muscle relaxation within 60 seconds of its administration, but it can produce serious side effects such as hyperkalaemia, malignant hyperthermia, bradycardia and cardiac dysrhythmias and is contraindicated in certain patients [10]. As contraindications of succinyl choline is adverse an alternative muscle relaxant vecuronium, which is depolarizing blocker suitable for intubation that has the same advantages of rapid onset and good to excellent intubating conditions as succinylcholine with a fewer side effects is considered for the study [11]. Keeping this objective in mind we undertook this comparative study of vecuronium in single dose, vecuronium in divided doses and succinylcholine as single dose for our study to demonstrate excellent conditions of tracheal intubation during surgical emergencies. Vecuronium is depolarizing blockers generally used in anaesthetic procedures [12]. Schwartz et al demonstrated the onset of muscle relaxation with divided doses of vecuronium and atracurium in their studies are in compromise with our study on vecuronium. In their study when vecuronium was used intubation was accomplished in 60-80 sec with an intubation score not consistently good [12,13,14]. Seven of 40 patients had a score of 2 for intubation, indicating diaphragmatic movement in their study. Better intubating conditions are necessary for rapid sequence induction, especially in patients who have a penetrating eye injury or increased intracranial pressure [12,13,14]. In our study, 150µg/kg vecuronium as a

single dose provided good intubating conditions, when used in divided doses provided poor intubating conditions the same with succinyl choline. On the other hand, a priming dose of vecuronium, 7µg/Kg and 143µg/Kg total dose produced not only a mean onset time of action is more than that of single dose of vecuronium and succinyl choline. A nondepolarizing muscle relaxant must not only produce good intubating conditions but should also have an onset time approximating that associated with a paralyzing dose of succinylcholine. Our study demonstrates that a single dose of vecuronium, 150 µg/Kg fulfils these requirements. Indeed, in our study divided dose of vecuronium has proved to be insignificant to produce excellent conditions for intubating, which is contradictory to other studies[15]. In addition, 50-100 pg fentanyl administered just prior to the priming dose greatly ameliorated these symptoms [16]. Result of Intubating conditions in our study were satisfactory with single dose of vecuronium (150µg/Kg), within 60 seconds 80% of subjects were intubated when compared to 40% and 30% in vecuronium divided doses and succinyl choline single dose.

Limitations of the study

Smaller sample size is the limitations of the study, however further studies are warranted with more sample size and new neuromuscular junction blocker drugs.

Conclusion

Our study concluded that use of single dose of vecuronium is beneficial in surgical emergencies. when compared to divided doses of vecuronium (7µg/Kg +143µg/Kg) and succinyl choline as a single dose by considering time factor.

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