Original Article

Anesthesia

To Compare the Efficacy of Rocuronium Bromide and Succinylcholine in Elective Surgery for Endotracheal Tube

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ABSTRACT

Objective: To compare the efficacy of rocuronium bromide and Succinylcholine in elective surgery for endotracheal tube.

Study Design: Randomized, double blind study

Place and Duration of Study: This study was conducted in the Department of Anesthesia & Surgical ICU, Civil Hospital Karachi over a period of six months i.e. January 2009 to August 2009..

Materials and Methods: This study was conducted on sixty patients. They were aged between 20-60 years. Patients were divided into two groups following inclusion i.e. Group A and Group B. Patients in Group A were given inj. Rocuronium 0.9mg / kg and group B received inj. Succinylcholine 1.5mg / kg.

Results: In group A which was received rocuronium bromide 0.9mg / kg, showed excellent intubating conditions in 83.33 % of patients as compared to group B which was given Succinylcholine 1.5mg / kg, showed 96.66%.

Conclusion: The intubating conditions were significantly better in group B which received inj. Succinylcholine 1.5mg / kg as compare to group A was given inj. Rocuronium 0.9mg / kg.

Key Words: Rocuronium bromide, Succinylcholine, Endotracheal intubation, Elective surgery.

INTRODUCTION

The extremely brief duration of Succinylcholine and its rapid onset of action, complete and predictable paralysis, provide ideal conditions for rapid intubation of the trachea for situations where a rapid sequence induction and intubation are indicated to secure the airway and prevent aspiration of gastric contents.

The search of ideal neuromuscular blocking agent as focused on nondepolarizing muscular agents because of the side effects of suxamethonium reflects its depolarizing mechanism of action.[1]

Despite the recent introduction of short acting nondepolarizing neuromuscular relaxation. However its use is contraindicated in malignant hyperpyrexia and plasma cholinesterase deficiency, a variety of neurological conditions and sepsis.[2]

When confronted with the patient with advantages and disadvantages of awake intubation, conduction of anesthesia on an alternative muscle relaxant. Nondepolarizing muscle relaxant not only has a longer time of onset of action, also have other side effects like ganglion blockade, tachycardia and occasionally hypertension.

The lag time and onset time of rocuronium are significantly and hurters time those of all other presently available nondepolarizing muscle relaxant.[3]

Rocuronium bromide, a nondepolarizing muscle relaxant with rapid onset of action, intermediate duration of action and with minimal haemodynamic side effects has been reported to be a suitable alternative to Succinylcholine for producing muscle relaxation during rapid sequence induction and intubation.

Since rocuronium bromide acts as a competitive antagonist to acetylcholine, this has a stabilizing influence on post synaptic membrane.[4]

This study was designed to compare the rate of onset of rocuronium bromide and Succinylcholine and to evaluate and compare the intubating conditions obtained with rocuronium bromide to those with Succinylcholine.

MATERIALS AND METHODS

This study was conducted on sixty patients, in the department of anesthesia and surgical ICU, Civil hospital Karachi, all patients of grade I and II which were to undergo elective surgery were studied. They were aged between 20 to 60 years. Informed consent was obtained for participation in the study, which has been approved by the department and the hospital.

In this study patients of ASA grade III, IV, V and E, were below the age of 20 years and

above 60 years. Patients with renal or hepatic disease and those taking medications known to affect the neuromuscular junction were excluded.

Airway assessment that could make tracheal intubation difficult wad made with the help of Mallampatti Classification modified by Samson and Yong/ Wilson score (Table 1). Causes of difficult intubation not included in this study. None of the patients received sedative premeditations. On arrival in operation room an intravenous cannula was placed. Routine monitoring consist of continuous monitoring of ECG- long lead II was established, blood pressure and heart rate was measured using an automatic sphygmomanometer and oxygen saturation with pulse oxymeter.

All patients were preoxygented with 100 % oxygen for the period of 5 minutes and induction anesthesia was done with thiopentone sodium 5mg / kg body weight.

In a randomized double blind manner the patients were subdivided into two groups. Group A or group I received rocuronium bromide 0.9mg / kg body weight after thiopentone injection, Group B or group II received Succinylcholine 1.5mg/kg bodyweight after thiopentone injection.

Anesthesia was maintained in both groups by 33% oxygen and 67% nitrous oxide. Halothane 0.5% was given with manual ventilation by facemask before intubation.

The endotracheal intubation was done blinded by standing with the back to the patient. The intubation conditions evaluated at 60 seconds after the end of induction. Jaw relaxation, cords movements and degree of coughing were recorded using the method described by Krieg et al. (Table 2)

The results were analyzed by chi square test. Probability less than 0.05 (p less than 0.05) was considered statically significant. Acceptable intubation conditions meant as an excellent or good intubating conditions while unacceptable intubating conditions mean as poor or not possible intubating conditions.

RESULTS

By this study we compared the efficacy of new non-depolarizing neuromuscular muscle relaxant rocuronium bromide for endotracheal intubation with depolarizing muscle relaxant Succinylcholine.

In group A, which was given rocuronium bromide 0.9 mg/ kg, the intubation scores were noted excellent or good in all patients. In this group 83.33% were noted as excellent while 16.66% as good. While in group B which were given 1.5 mg/kg Succinylcholine and intubation scores were 96.66% which were noted as excellent, and 3.33% were noted as good. In group A the P value was < 0.0003 and in group B the P value was < 0.0000003. P < 0.05 was considered significant. Hence intubating conditions were significantly better in group B patients as compared to group A.

Table No.1: The intubation conditions evaluated after 60 seconds

Jaw relaxation (Opening)	▪ Poor (impossible ▪ Minimal (difficult) ▪ Moderate (fair) ▪ Good (easy)
Vocal Cords (Relaxation)	▪ Closed (cords opposed, firm pressure required to pass tube) ▪ Closing (almost adducted) ▪ Moving (gentle pressure required to pass tube) ▪ Open (wide abducted)
Response to Tube	▪ Severe soughing, bucking ▪ Mild coughing ▪ Slight diaphragmatic movement ▪ none

Adapted from: Twohig Wards S and Corall J.M Conditions for tracheal intubating using Atracurium corapared with pancuronium Br. J Anaesth 1983:55:87

Table No.2: Intubating conditions (Modification of Goldberg ME et al and Krieg and et al)

grade	Intubating conditions	description
1	Excellent	Visualization of larynx easy, vocal cord relaxed and open. Easy passage of endotracheal tube without bucking or coughing
2	Good	Visualization of larynx easy, vocal cord relaxed and open. Easy passage of endotracheal tube with slight bucking or coughing
3	Poor	Visualization of larynx difficult, vocal cords moving, reaction of vocal cord on intubation with moderate bucking or coughing
4	Not possible	Visualization of larynx difficult, vocal cord closed. Intubation not possible

Adapted from Krieg N, Mazur L, Booiji LHDJ, Crul JF, intubating conditions and reversibility of a new nondepolarizing neuromuscular blocking agent org-NC-45,acta anesthesiology scand 1980:24:423-5

Table No.3: Intubating condition as excellent, good, poor, not possible in Group A (case %)

Intubating conditions	0.9 mg/kg (rocuronium bromide)	Case %
Excellent	25	83.33 %
Good	05	16.66 %
Poor	0	0 %
Not possible	0	0 %

Chi-square = 13.33 P = 0.0003

Table No.4: Intubating condition as excellent, good, poor, not possible in Group B (case %)

Intubating conditions	1.5 mg/kg (Succinylcholine)	Case %
Excellent	29	96.66 %
Good	01	3.33 %
Poor	0	0 %
Not possible	0	0 %

Chi-square = 26.133 P = 0.0000003

DISCUSSION

Theoretically an excellent intubating condition is the standard goal for intubation in all patients especially in emergency cases; clinically serious complications are reported after good intubating conditions in elective cases. So both excellent and good intubating conditions are accepted. While poor and impossible intubating conditions causes serious complications such as hypoxia, hypercarbia, arrhythmia, aspiration, cardiac arrest and should be avoided in these patients.

Succinylcholine is currently a drug of choice to obtain rapid tracheal intubation. With its rapid onset of action and short duration of action complete and predictable paralysis can be achieved.

Depolarizing induced neuromuscular block probably needs approximately 15 to 25 % cholinoceptor occupancy[5, 6].

Succinylcholine provides ideal conditions for the passage of a tracheal tube in approximately 60 seconds when given at a dose of 1.5 mg/kg[7].

However its use is associated with certain undesirable effects such as malignant hyperthermia, increased IOP and intragastric pressure, Hyperkalemia and post-operative muscle pain. Never the less in most patients the drug is safe and its advantages largely overcome the disadvantages.

There are different techniques to reduce the Succinylcholine induce muscle pain. The most effective and widely used method is pretreatment with small dose of a nondepolarizing neuromuscular blocking drug. This technique may give rise to complications such as difficulty with intubation and it is recommended that a large dose of Succinylcholine is to be given.[8]

When the choice is among the non-depolarizing muscle relaxants, for endotracheal intubation, one tries to find an ideal neuromuscular blocking drug which should be rapidly acting and with a short duration of time. In addition lack of accumulation and absence of side effects would be beneficial.

Since relaxant like vecuronium, rocuronium, Atracurium due to their additional metabolism and elimination are classified as drug of intermediate duration[9]

It appears that rocuronium bromide could fill many of these criteria and also rapidly acting drug in terms of the time taken to attain complete blockade. We have studied the incidence of clinically excellent intubating conditions occurring with rocuronium bromide 0.9mg/kg or Succinylcholine 1.5mg/kg for endotracheal intubation. We observed that the incidence of excellent intubating conditions was 13.33% less with rocuronium than with succinylcholine.

B.Nonneman used 0.9mg/kg with the result of 80% of an excellent condition and 20% for good intubating conditions, compared to 83.33% and 16.66% form our study[10]

Our study suggests that rocuronium bromide 0.9mg/kg provides excellent to good intubating conditions at 60 seconds. So it is a suitable alternative to succinyl-choline.

CONCLUSION

From this study which was carried out at the Department of Anesthesiology and surgical intensive care unit, Dow Medical College and Civil Hospital, Karachi, we concluded that rocuronium bromide at a dose of 0.9mg/kg provide intubating conditions similar to succinylcholine 1.5mg/kg at 60 seconds. It is the first nondepolarizing amino steroid muscle relaxant to provide excellent to good endotracheal intubating conditions in 1 minute. So it is a suitable alternative to succinylcholine.

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