MEDDOCS Open Access Publisher

Annals of Anesthesia and Pain Medicine

Open Access | Research Article

Comparative study of different doses of rocuronium bromide for endotracheal intubation

Nidhi V Sardhara[1*]; Sonal A Shah[2]; Dhaval P Pipaliya[3]; Shivansh Gupta[3]

[1]SVP hospital, 13th floor, Room no 13125, Near Ellis bridge, Ahmedabad, Gujarat-380006

[2]Assistant Professor, Department of anesthesia, Smt. NHL Municipal Medical College, Ahmedabad, Gujarat, India

[3]First year Resident, Department of anesthesia, Smt. NHL Municipal Medical College, Ahmedabad, Gujarat, India

***Corresponding Author(s): Nidhi V Sardhara**

SVP hospital, 13th floor, Room no 13125, Near Ellis bridge, Ahmedabad, Gujarat-380006

Tel: +91-9428-44-7878, Fax: 7926-57-8452

Email: nidhisardhara@yahoo.com

Received: Mar 11, 2020

Accepted: Apr 24, 2020

Published Online: Apr 30, 2020

Journal: Annals of Anesthesia and Pain Medicine

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Keywords: Rocuronium bromide; Endotracheal intubation; General anesthesia

Abstract

Background: Endotracheal intubation is one of such development without which general anesthesia cannot be considered safe for any major surgery particularly head and neck, thoracic and abdominal surgeries. Ever since the advent of anesthesia, anesthesiologists have been in search of an ideal muscle relaxants which can provide ideal intubating conditions in ultrashort duration with minimal side effects. Rocuronium bromide provides fast onset of action, an intermediate duration of action and rapid recovery, good to excellent intubating conditions at doses having minimal or no haemodynamic changes. Present study is to compare the effect of different doses (0.6 mg/kg, 0.9 mg/kg, 1.2 mg/kg) of Rocuronium bromide for endotracheal intubation at 60 seconds.

Material and methods: This study was carried out by taking 60 patients aged 18-60 years who were divided into 3 groups of 20 patients each. Group A received 0.6 mg/kg, group B 0.9 mg/kg and group C 1.2 mg/kg of injection Rocuronium bromide. After 60 seconds of giving Rocuronium bromide intubating conditions were assessed using Cooper et al criteria.

Results: In group A 85% patients had clinically acceptable intubating conditions and 15% patients had clinically unacceptable intubating conditions, while in group B and C all (100%) patients had clinically acceptable intubating condition. Rocuronium bromide has rapid onset of action providing better clinically acceptable intubating conditions at 60 seconds after bolus dose of 0.9 mg/kg and 1.2mg/kg as compared to 0.6 mg/kg. There was no statistically significant difference in haemodynamic parameters like hear rate and mean arterial pressure among all three groups of Rocuronium bromide.

Conclusion: Rocuronium bromide in the dose of 0.9 mg/kg and 1.2 mg/kg provides better clinically acceptable intubating conditions at 60 seconds than 0.6 mg/kg. Rocuronium bromide is a haemodynamically stable neuromuscular blocking agent with all the three doses0.6 mg/kg, 0.9 mg/kg and 1.2 mg/kg.

Cite this article: Sardhara NV, Shah SA, Pipaliya DP, Gupta S. Comparative study of different doses of rocuronium bromide for endotracheal intubation. Ann Anesth Pain Med. 2020; 3(1): 1011.

Introduction

Endotracheal intubation is one of such development without which general anesthesia cannot be considered safe for any major surgery particularly head and neck, thoracic and abdominal surgeries. Endotracheal intubation is of paramount importance in general anesthesia requiring relaxation of laryngeal musculature leading to total inactivity of vocal cords. Ever since the advent of anesthesia, anesthesiologists have been in search of an ideal muscle relaxants which can provide ideal intubating conditions in ultrashort duration with minimal side effects.

Out of all the relaxants Suxamethonium chloride have been the drug of choice for intubation since its introduction in 1952. Suxamethonium chloride in the dose of 1-1.5mg/kg provide excellent intubating condition in 60-90 seconds with short duration of action on the diaphragm and adductor muscles of the larynx involved in respiration and airway protection.

Unfortunately, Suxamethonium chloride has many side effects like

- Increase in intragastric, intracranial and intraocular pressure.
- Rhabdomyolysis with hyperkalemia.
- Changes in cardiac rhythm including bradycardia and cardiac arrest.
- Malignant hyperthermia in susceptible individuals.
- Life threatening increase in serum potassium levels seen in patients

with burns, massive trauma, denervating injuries and upper motor neuron lesions.

Therefore it is contraindicated in patients with head injury, eye injury, patients having recent history of burns and patients with denervating injuries. Considering the side effects and contraindications efforts were made to find out a newer neuromuscular blocking agent with a comparable fast onset and shorter duration of action but without associated side effect of Suxamethonium chloride.

Nondepolarizing neuromuscular blocking agents like Pancuronium, Vecuronium and Atracurium have been used for endotracheal intubation, but more time taken for achieving favorable intubating condition with these agents.

Rocuronium bromide is a new aminosteroidal neuromuscular blocking agent related structurally to Vecuronium. Chemically it is,

1–[17β-acetyloxyl–3-α-hydroxy–2B(4Morpholinyl)5α-androstan-16β-y1]–1–(2–propenyl) pyrolidinium bromide

The new NDMR drug Rocuronium bromide introduced in 1994 became the first competitor for Suxamethonium chloride. Rocuronium bromide has proven its onset time and intubation condition are comparable with Suxamethonium chloride and without the side effects.

An alternative drug suggested and used in recent times for rapid sequence induction is Rocuronium bromide in dose of 0.6-1.2 mg/kg. Its main advantage over other currently used drugs of this kind is its fast onset of action, an intermediate duration of action and rapid recovery. It provides good to excellent intubating conditions at doses having minimal or no haemodynamic changes.

Present study is to compare the effect of different doses (0.6 mg/kg, 0.9 mg/kg, 1.2 mg/kg) of Rocuronium bromide for endotracheal intubation at 60 seconds.

Aims of study

- To compare the intubating conditions of different doses (0.6 mg/kg, 0.9 mg/kg, 1.2 mg/kg) of Rocuronium bromide at 60 seconds in adults.
- To observe haemodynamic changes after administration of different doses.

Material and methods

This prospective, randomized, clinical study was carried out by taking 60 patients aged 18-60 years of either sex, ASA physical status I/II and Mallampatti Grade I/II, who were scheduled for various elective surgeries under general anesthesia. Informed consent was taken from all the patients. Patients were divided into 3 groups of 20 patients each.

Group-A: Rocuronium bromide 0.6 mg/kg i.v. (2x ED_{95})

Group-B: Rocuronium bromide 0.9 mg/kg i.v. (3 x ED_{95})

Group-C: Rocuronium bromide 1.2 mg/kg i.v. (4 x ED_{95})

Exclusion criteria

1.Known or anticipated difficult airway

2. Patients with neuromuscular disease

3. Drugs known to interact with neuromuscular blocking agents

4. Renal or Hepatic disorder

5. Known allergy to drugs

Preoperative evaluation

All the patients were evaluated preoperatively for any past or present medical and surgical illness, any history of previous anaesthetic exposures, drug treatment or drug-allergy, any specific family history and drug addiction.

Patients were thoroughly examined generally and systemically. Airway was graded according to modified Mallampatti classification. Weight of patients were recorded. Investigations like complete blood count, blood Sugar, renal function test, serum electrolytes, liver function test and chest X-Ray, ECG were reviewed.

Monitoring

In the operation theatre, i.v. line was secured. I.v. Ringers Lactate solution started. BP cuff, ECG monitor, pulse oximeter and leads for neuromuscular monitor were attached.

Premedication

Injection Glycopyrrolate0.005 mg/kg i.v. and

Injection Fentanyl 1 µg/kg i.v. 5 minutes before induction of anesthesia.

Induction

Patients were preoxygenated with 100% O_2 by facemask for

3 minutes and were induced with Injection Thiopentone sodium 5 mg/kg i.v. slowly and Injection Rocuronium bromide according to group allocation and the time of Injection of Rocuronium bromide was noted.

In Group A - 0.6 mg/kg of Rocuronium bromide

In Group B- 0.9 mg/kg of Rocuronium bromide

In Group C - 1.2 mg/kg of Rocuronium bromide

Patients were ventilated with 100 % oxygen with facemask. At 60 seconds after completion of Rocuronium bromide injection, laryngoscopy was done by an experienced anesthetist and patients were intubated with disposable cuffed endotracheal tube of appropriate size. Bilateral breath sounds checked for equality. $EtCO_2$ monitor applied after fixing the tube.

Laryngoscopy and endotracheal intubation were accessed and graded

According to Cooper et al criteria.

Cooper et al criteria

Score	Jaw relaxation	Vocal cords positions	Response to Intubation
0	Poor (Impossible)	Closed	Severe bucking or coughing
1	Minimal (Difficult)	Closing	Mild coughing
2	Moderate (Fair)	Moving	Slight diaphragmatic movement
3	Good (Early)	Open	None

And Total score for intubation condition

Score

8-9=	Excellent	}	
		}	Clinically acceptable
6-7=	Good	}	
3-5=	Poor	}	
		}	Clinically unacceptable
0-2=	Bad	}	

Observations and results

The vital parameters like pulse rate, systolic, diastolic and mean arterial blood pressure were recorded at fixed time intervals i.e.

-Before Induction (I_B)

-After Induction (I_A)

-l min after Intubation (T_1)

-3 min after Intubation (T_3)

-5 min after Intubation (T_5)

Maintainance

Anesthesia was maintained with Oxygen and Nitrous oxide, Sevoflurane and incremental dose of Injection Rocuronium bromide (0.15 mg/kg) was given at TOF count ≥ 2.

Peroperatively patients heart rate, blood pressure, ECG, $SpO_2$and $EtCO_2$were monitored. Patients were also watched for any adverse reactions like anaphylactic reaction, rash, exanthema, urticaria and bronchospasm.

Reversal

At the end of surgery patients were reversed with Injection Glycopyrrolate 0.01 mg/kg and Injection Neostigmine 0.05 mg/kg after recovery of spontaneous respiration and after attainment of TOF count 4. Oropharyngeal suction was done and patient was extubated when fully awake and after recovery of adequate muscle power, tone, cough reflex and sustained head lift of 15 seconds.

Statistical analysis

The results were expressed as mean±SD and percentages. All recorded data were entered using MS Excel software and analysed using SPSS® computer software for determining the one-way statistical significance Analysis of Variance (ANOVA) with Kruskal Wallis test was used to study the significance of mean of various study parameters among the three groups.

P value

>0.05	Non Significant(NS)
<0.05	Significant(S)
<0.001	Highly Significant(HS)

Table 1: Demographic data

Parameter	Group A	Group B	Group C	P value	Inference
Age	34.2±11.2	33.45±11.59	34.35±11.97	0.96	NS
Weight	64±6.3	64.15±8.68	63.15±7.56	0.97	NS
Sex(M/F)	12/8	12/8	11/9	-	-
ASA Grade(I/II)	15/5	14/6	15/5	-	-
Mallampatti Grade(I/II)	12/8	10/10	9/11	-	-

This table shows that age distribution, Weight distribution, Sex distribution are comparable in all the three groups.

Table 2: Jaw relaxation

Condition	Score	GROUP A	GROUP B	GROUP C
Good (early)	3	13 (65%)	17 (85%)	20 (100%)
Moderate (fair)	2	4 (20%)	3 (15%)	0 (0%)
Minimal (difficult)	1	3 (15%)	0 (0%)	0 (0%)
Poor (impossible)	0	0 (0%)	0 (0%)	0 (0%)

Table-2 shows that jaw relaxation was good in 65%, 85% and 100% in group A, B and C respectively and moderate in 20%, 15% and 0% of group A, B and C respectively. It was minimal in group A (15%) as compared to group B (0%) and group C (0%). Poor jaw relaxation was seen in none of the patients in all groups.

Table 3: Vocal cord position

Condition	Score	GROUP A	GROUP B	GROUP C
Open	3	12(60%)	17(85%)	20(100%)
Moving	2	6(30%)	3(15%)	0(0%)
Closing	1	2(10%)	0(0%)	0(0%)
Closed	0	0(0%)	0(0%)	0(0%)

Table-3 shows that open vocal cords were seen in 60%, 85% and 100% in group A, B and C respectively. While moving vocal cords were seen in 30%, 15% and 0% in group A, B and C respectively and closing cords were seen in 10%, 0% and 0% in group A, B and C respectively. None of the patients in all three groups showed closed vocal cords.

Table 4: Response to intubation

Condition	Score	GROUP A	GROUP B	GROUP C
None	3	10(50%)	16(80%)	20(100%)
Slight diaphragm movement	2	7(35%)	4(20%)	0(0%)
Mild coughing	1	3(15%)	0(0%)	0(0%)
Severe bucking or coughing	0	0(0%)	0(0%)	0(0%)

Table-4 shows that 50%, 80% and 100% of group A, B and C patients respectively had no response to intubation. While 35%, 20% and 0% patients had slight diaphragmatic movement in respective group A, B and Cand 15% patients in group A had mild coughing. None of the patientsin any group showed severe bucking or coughing.

Table 5: Intubating Condition

Condition	Score	Group A	Group B	Group C
Excellent	8-9	12 (60%)	17 (85%)	20 (100%)
Good	6-7	5 (25%)	3 (15%)	0(0%)
Poor	3-5	3 (15%)	0(0%)	0(0%)
Bad	0-2	0(0%)	0(0%)	0(0%)

Table-5 shows that 60%, 85%, 100% patients had excellent intubating conditions in group A, B, C respectively. 25% and 15% patients had good intubating condition in group A and B respectively, while only group A had poor intubating condition in 15% of patient.

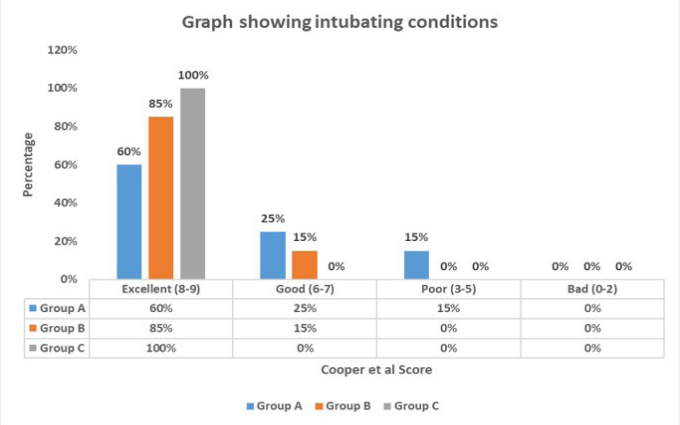


Table 6: Intubating conditions

Condition	Score	Group A	Group B	Group C
Clinically acceptable	6-9	17(85%)	20(100%)	20(100%)
Clinically unacceptable	0-5	3(15%)	0(0%)	0(0%)

Table-6 shows that in group A85% patients had clinically acceptable intubating conditions and 15% patients had clinically unacceptable intubating conditions, while in group B and C all (100%) patients had clinically acceptable intubating condition.

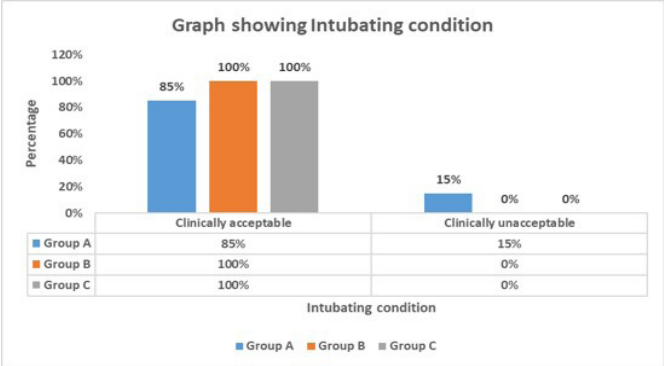


Table 7: Heart Rate Variation (Mean)

Time	Group A	Group B	Group C	P value	Inference
Before Induction	86.5±4.49	85.6±7.15	85.5±6.32	0.927	NS
After Induction	94.1±5.05	91.3±7.26	90.5±6.42	0.169	NS
1 min after Intubation	103±5.97	99.2±6.11	97.8±7.51	0.130	NS
3 min after Intubation	94.8±5.72	92.2±6.15	91.3±6.32	0.168	NS
5 min after Intubation	90.7±4.33	89.2±5.99	88.5±5.97	0.432	NS

This table shows that there was no significant difference in heart rate variation among the three groups as per the times in table.

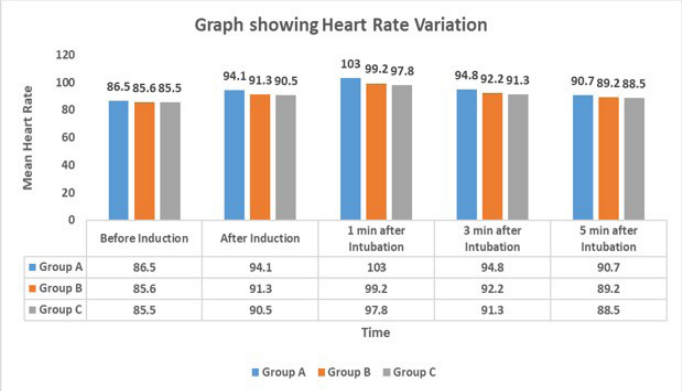


Table 8: Systolic Blood Pressure (Mean) mmHg

Time	Group A	Group B	Group C	P value	Inference
Before Induction	123.6±9.37	122.6±6.90	122±7.43	0.864	NS
After Induction	119±8.07	116±6.43	115.4±6.99	0.266	NS
1 min after Intubation	140±5.6	136±6.3	135±5.81	0.634	NS
3 min after Intubation	130.3±8.88	128±5.74	127±5.56	0.319	NS
5 min after Intubation	124.5±7.89	123.7±6.13	123.1±7.58	0.740	NS

This table shows that there was no significant difference in systolic blood pressure variation among the three groups as per the times in table.

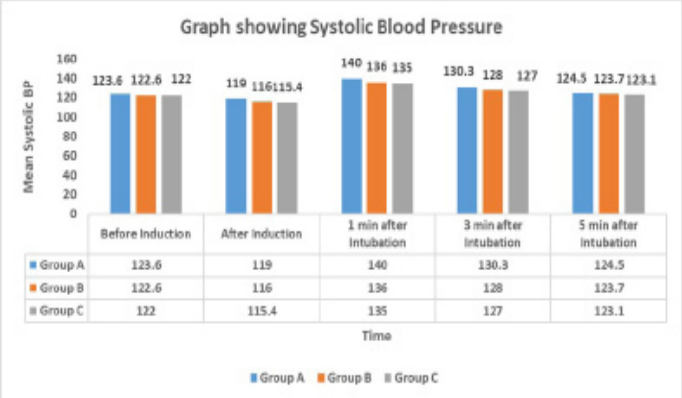


Table 9: Diastolic Blood Pressure (Mean) mmHg

Time	Group A	Group B	Group C	P value	Inference
Before Induction	78.3±5.99	77.1±8.12	76.4±6.31	0.678	NS
After Induction	73.7±6.37	71±8.14	70.2±6.43	0.279	NS
1 min after Intubation	90±5.98	85.6±8.32	84.5±5.87	0.803	NS
3 min after Intubation	84.8±7.80	82.3±7.71	80.4±6.07	0.165	NS
5 min after Intubation	81.2±7.35	79.8±7.59	77.6±5.75	0.264	NS

This table shows that there was no significant difference in diastolic blood pressure variation among the three groups as per the times in table.

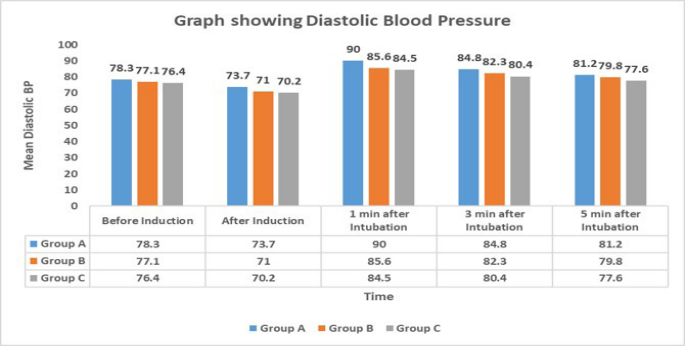
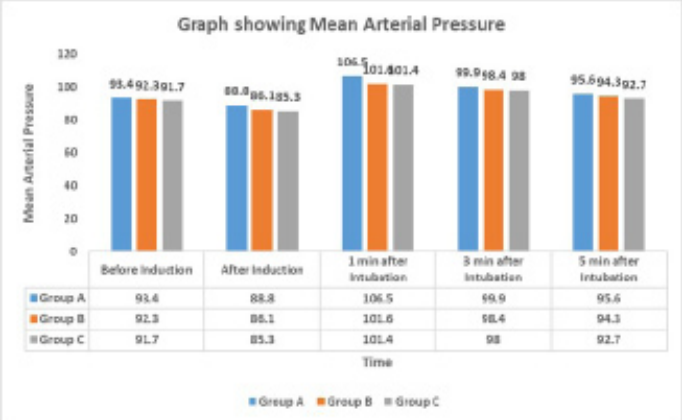


Table 10: Mean arterial Pressure (Mean) mmHg

Time	Group A	Group B	Group C	P value	Inference
Before Induction	93.4±5.21	92.3±5.36	91.7±4.82	0.557	NS
After Induction	88.8±5.13	86.1±5.23	85.3±4.93	0.093	NS
1 min after Intubation	106.5±4.92	101.6±5.60	101.4±4.41	0.182	NS
3 min after Intubation	99.9±5.49	98.4±5.07	98±4.49	0.292	NS
5 min after Intubation	95.6±5.32	94.3±5.15	92.7±4.56	0.342	NS

This table shows that there was no significant difference in mean arterial pressure variation among the three groups as per the times in table.



Discussion

Neuromuscular blocking agents are required for smooth endotracheal intubation during general anesthesia. There are maximum chances of hypoxia, regurgitation and aspiration after induction of anaesthesia and before tracheal intubation with cuffed endotracheal tube. So, muscle relaxant should be such that it facilitates early intubation to decrease the chances of hypoxia and regurgitation.

The provision of muscle relaxation during endotracheal intubation demands a drug that can provide good to excellent intubating conditions, as early as possible, with minimal side effects and stable hemodynamic profile. Suxamethonium chloride is the drug of choice for this purpose since its introduction in 1952 for endotracheal intubation. Dose of Suxamethonium chloride 1-1.5 mg/kg provide excellent intubating condition in 60-90 seconds with short duration of action. Unfortunately, it has many side effects because of which it has been fallen in disrepute.

In search of alternatives, Nondepolarising muscle relaxant Rocuronium bromide has emerged which has rapid onset (60-90 seconds), intermediate duration of action depending on dose and also it is free from side effects related to Suxamethonium chloride.

The present study was conducted to access and compare intubating condition provided by three different dose of Rocuronium bromide 0.6 mg/kg, 0.9 mg/kg, 1.2 mg/kg after 60 seconds of their administration.

The present study was conducted by taking 60 randomly selected patients for various elective surgeries under general anaesthesia belonging to ASA Grade I/II aged 18 to 60 years of either sex and Mallampatti grade I/II. Patient were divided into 3 groups of 20 patients each.

Group A received 0.6 mg/kg of Rocuronium bromide

Group B received 0.9 mg/kg of Rocuronium bromide

Group C received 1.2 mg/kg of Rocuronium bromide

Demographic data

In our study, Table 1 shows that Age, Weight, Sex, ASA Grading, Mallampatti Grading were comparable in each group. ($p>0.05$)

Jamshid Ali et al (2008) [3] had comparable demographic data. ($p>0.05$)

Premedication

In our study, all the patients were premedicated with Injection Glycopyrrolate0.005mg/kg i.v. and Injection Fentanyl 1 µg/kg i.v. 5 minutes before induction of anesthesia. Glycopyrolate is used as antisecretory agent. By giving Fentanyl as premedication we blunt sympathetic response to laryngoscopy during intubation.

Cooper et al (1992) [2] used Fentanyl as premedication.

Somboonviboon W et al (2000) [11] studied intubating conditions in patientspremedicated with Fentanyl.

Induction

In this study, induction was done with Injection Thiopentone sodium 5 mg/kg I.V. and Injection Rocuronium bromide in three different doses(0.6 mg/kg, 0.9 mg/kg, 1.2 mg/kg) according to group.

Cooper et al (1992) [2] anaesthetised patients with Thiopentone sodium.

Jamshid Ali et al (2008) [3] induced patients with Thiopentone sodium.

Raghavan L et al (2016) [9] induced patient with Injection Thiopentone sodium.

Anaesthesia was maintained with oxygen, nitrous oxide, sevoflurane and Injection Rocuronium bromide (0.15mg/kg).

Dose of rocuronium bromide

In our study, we compared intubating conditions with three different doses of Rocuronium bromide 0.6,0.9 and 1.2 mg/kg in fascilitating tracheal intubation.

Magorian et al (1993) [7] compared the effects of one of the three doses of Rocuronium bromide (0.6,0.9,1.2 mg/kg) with Vecuronium (0.lmg/kg), or Succinylcholine (1.0 mg/kg).

Raghavan L et al (2016) [9]compared three different doses of Rocuronium bromide 0.6, 0.9, 1.2 mg/kg for intubating conditions.

Raizada et al (2018) [8] compared three different doses 0.6, 0.9, 1.2 mg/kg Rocuronium bromide.

Time of intubation

In our study we aimed to achieve tracheal intubation at 60 seconds after Rocuronium bromide injection. We choose 60 seconds because this is within the time range (60-90 seconds) recommended for tracheal intubation so as to avoid aspiration and hypoxia and within the range used in previous studies.

Alvarez-Gomez JA et al (1994) [1] used 0.6 mg/kg Rocuronium bromide for endotracheal intubation within 60 seconds.

Kumar A et al (2018) [4] evaluated the intubating conditions with Rocuronium bromide at 0.6 and 0.9 mg/kg at 60 seconds.

Criteria for assesment of intubating conditions

In our study we used Cooper et al criteria for grading intubating condition.

Cooper et al (1992) [2] used Cooper et al criteria for comparision.

Jamshed Ali et al (2008) [3] used Cooper et al criteria for comparing intubating condition.

Sudha et al (2016) [12] used Cooper et al criteria for comparision.

Raghavan L et al (2016) [9] used Cooper et al criteria for comparing intubating condition.

Intubating conditions

In this study, patients were divided in 3 groups according to dose of Rocuronium bromide given as

Group A- 0.6 mg/kg

Group B- 0.9 mg/kg

Group C- 1.2 mg/kg

After 60 seconds of giving Rocuronium bromide intubating conditions were assessed and patients were intubated. We have used Cooper et al criteria for assessment and grading of intubating conditions with different doses of Rocuronium bromide at 60 seconds. Neuromuscular monitoring at time of intubation may be misleading because the onset of neuromuscular block is significantly faster at diaphragm and laryngeal adductor than adductor pollicis. Onset of blockade occurs one to two minutes earlier in larynx than adductor pollicis. So we have not used neuromuscular monitoring at 60 seconds to assess intubating condition.

Table no 2, 3, 4 shows jaw relaxation, vocal cord position, response to intubation in three groups. Table no 5, 6shows intubating conditions according to Cooper et al criteria in three groups.

The intubating conditions achieved in this study are as under:

In Group A (0.6 mg/kg)

-60% patients had excellent

-25% patients had good

-15% patients had poor intubating condition.

i.e. 85% patients had clinically acceptable and 15% patients had clinically

unacceptable intubating condition.

In Group B (0.9 mg/kg)

-85% had excellent

-15% had good intubating condition.

i.e. 100% patients had clinically acceptable intubating condition.

In Group C (1.2 mg/kg)

-100% patients had excellent

i.e. clinically acceptable intubating condition.

So, Rocuronium bromide in the dose of 0.9 mg/kg and 1.2 mg/kg offers better clinically acceptable intubating condition at 60 seconds than the dose of 0.6 mg/kg.

As all the patients in 0.9 and 1.2 mg/kg group had clinically acceptable intubating conditions at 60 seconds, there seems to be no further advantage in increasing the dose from 0.9 to 1.2 mg/kg.

Cooper et al (1992) [2] assessed intubating conditions by using Cooper et al criteria and intubating condition in Rocuronium bromide (0.6 mg/kg) were found to be clinicallyacceptable (good and excellent) in 95% of patients at 60 seconds and in 100% ofpatients at 90 seconds.

Magorian et al (1993) [7] concluded that onsettimes for patients receiving 0.9 mg/kg and 1.2 mg/kg of Rocuronium bromide andSuccinylcholine were similar. Onset times for groups given 0.6 mg/kg of Rocuroniumand Vecuronium were significantly longer. Intubating conditions did not differ significantly in the five groups.

Somboonviboon et al (2000) [11] evaluated the intubating conditions at 60 seconds after 0.3, 0.6 and 0.9 mg/kg of Rocuronium in one hundred and eight patients. They concluded that in a situation where an excellent intubating condition is very important, a dose of ≥0.9 mg/kg of Rocuronium is recommended especially in male patients.

Schultz P et al (2001) [10] compared intubating condition at 60 seconds after onehundred and eight patients were randomized to one of three doses of Rocuronium 0.6,0.9 and 1.2 mg/kg. The intubating conditions are graded as excellent or good in allpatients except in two patients following 0.6 mg/kg dose of Rocuronium. Theyconcluded that there is no further improvement in intubating conditions of 60 secondsby increasing the Rocuronium dose from 0.9 mg/kg to 1.2 mg/kg.

Sudha P et al (2016) [12] compared two different doses 0.6 and 0.9 mg/kg on intubating conditions. Rocuronium bromide 0.6 mg/kg produced excellent intubating condition in of 69% patients but produced good intubating conditions in 28.6% of patients. Rocuronium bromide 0.9 mg/kg produced 88.1% excellent intubating conditions and good intubating conditions in 11.9% of patients.

Raghavan L et al (2016) [9] concluded that patients receiving 0.6 mg/kg were more likely to experience moderate coughing and bucking after tracheal tube insertion. Both 0.9 mg/kg and 1.2 mg/kg produce similar onset time and intubating con-

ditions with no statistically significant difference between the two groups. Rocuronium in doses of 1.2 mg/kg produces similar intubating conditions as 0.9 mg/kg, but the duration of action is very much prolonged. No further improvement in intubation conditions were achieved by increasing the dose of Rocuronium from 0.9 mg/kg to 1.2 mg/kg.

Kumar et al (2018) [4] evaluated the intubating conditions with Rocuronium at 0.6 mg/kg (2*ED 95) and 0.9 mg/kg (3*ED 95) at 60 seconds using the timing principle. 60 patients were divided into 2 groups of 30 each. Clinically acceptable intubating conditions were present with both 0.6 mg/kg and 0.9 mg/kg ofRocuronium but 0.9 mg/kg offered better conditions than those of 0.6 mg/kg.

Hemodynamic parameters

Change in Heart rate

In this study as shown in table 7, in group A the baseline heart rate was 86.5±4.49. It increased after induction and maximum increase in heart rate occurred 1 min after intubation which was 103±5.97, it came to near normal of baseline value which was90.7±4.335min after intubation.

Similarly, in group B and group C heart rate increased after induction and touched maximum value 1 min after intubation but at the time of 5 min after intubation it decreased and came to near normal to baseline value. The changes of heart rate in group A were more than group B and group C, but changes in all the three groups were not statistically significant. (p>0.05) (Table-7)

Changes in blood pressure

Systolic blood pressure

In this study as shown in table 8, in group A baseline systolic blood pressure was 123.6±9.37. It decreased after induction and maximum increase in systolic blood pressure occurred 1 min after intubation which was 140±5.6, it came to near normal of baseline value which was 124.5±7.89 5 min after intubation.

Similarly, in group B and group C systolic blood pressure decreased after induction and touched maximum value 1 min after intubation but at the time of 5 min after intubation it decreased and came to near normal to baseline value. The changes of systolic blood pressure in group A were more than group B and group C, but changes in all the three groups were not statistically significant. (p>0.05) (Table-8)

Diastolic blood pressure

In this study as shown in table 9, in group A baseline diastolic blood pressure was 78.3±5.99. It decreased after induction and maximum increase in diastolic blood pressure occurred 1 min after intubation which was 90±5.98, it came to near normal of baseline value which was 81.2±7.35 5 min after intubation.

Similarly, in group B and group C diastolic blood pressure decreased after induction and touched maximum value 1 min after intubation but at the time of 5 min after intubation it decreased and came to near normal to baseline value. The changes of diastolic blood pressure in group A were more than group B and group C, but changes in all the three groups were not statistically significant. (p>0.05) (Table-9)

Mean arterial pressure

In this study as shown in table 10, in group A baseline mean arterial pressure was 93.4±5.21. It decreased after induction and maximum increase in mean arterial pressure occurred 1 min after intubation which was 106.5±4.92, it came to near normal of baseline value which was 95.6±5.325 min after intubation.

Similarly, in group B and group C mean arterial pressure decreased after induction and touched maximum value 1 min after intubation but at the time of 5 min after intubation it decreased and came to near normal to baseline value. The changes of mean arterial pressure in group A were more than group B and group C, but changes in all the three groups were not statistically significant. (p>0.05) (Table-10)

From the above, changes in heart rate and mean arterial pressure following intubation with Rocuronium bromide with all three doses is minimal. Statistical analysis revealed that there was no statistically significant difference with regard to mean heart rate and mean arterial pressure during intubation among all the three groups.

Maddineni et al (1994) [6] found no significant changes in both heart rate and mean arterial pressure while using 0.6 or 0.9 mg/kg of Rocuronium.

Levy et al (1994) [5] concluded that between three dose groups, there was no significant difference with respect to these hemodynamic parameters with Rocuronium bromide 0.6,0.9 and 1.2 mg/kg.

Raghavan L et al (2016) [9] observed that there was no statistically significant difference with regard to mean heart rate and mean arterial pressure during intubation.

Raizada et al (2018) [8] observed no significant difference in pulse rate and Mean arterial pressure among three groups of 0.6, 0.9 and 1.2 mg/kg Rocuronium bromide.

Adverse effects

In present study no adverse side effect had been reported in the doses used.

Conclusion

In conclusion, Rocuronium bromide in the dose of 0.9 mg/kg and 1.2 mg/kg provides better clinically acceptable intubating conditions at 60 seconds than 0.6 mg/kg. No further improvement in intubating conditions at 60 seconds was evident by increasing dose from 0.9 mg/kg to 1.2 mg/kg.Rocuronium bromide is a haemodynamically stable neuromuscular blocking agent withall the three doses0.6 mg/kg, 0.9 mg/kg and 1.2 mg/kg.

References

1. Alvarez-Gomez JA, Fabregat J, Estelles ME, Brugger AJ, Aguilar R. Perez F. Speed of intubating using a new neuromuscular blocker. Rocuronium bromide (ORG 9426) Rev Esp Anesthesiol Reanim 1994; 41: 3-6.

2. Cooper R, Mirakhur RK, Clarke RSJ, Bombs Z : Comparison for intubating conditions after administration of ORG 9426 (Rocuronium) and Suxamethonium, Br.J. Anaesthesia 1992; 69: 269-273.

3. Jamshid Ali, Showkat Alimad Gurekao Asif Shora. Shagufta Qazi. Intubating conditions of Rocuroniunm bromide and Succinylcholine during rapid sequence induction of anaesthesia in unpremedicated adult patients. J. Anaesth clinical pharmacology

2008; 24: 337-342.

4. Kumar-A, Suchetha S. Comparison of intubating Conditions at 60 Seconds with Different Doses of Rocuronium Using the Timing Principle. J Anesth Clin Res 2018; 9: 815.

5. Levy JH, Davis G. Duggon J, Szlem F. Determination of the hemodynamics and histamine release of Rocuronium when administered in increased doses under N2O/O- Sufentanil anaesthesia. Anesth. Analog 1994; 78: 318-321.

6. Maddineni UR, Mcloy EP, Mirakhur RK, Mc Bridge RJ, onset and duration of action and hemodynamic effects of Rocuronium bromide under balanced and volatile anaesthesia. Acta Anaesth. Analog 1994; 45: 41-48.

7. Magorian T, Flannery KB, Miller RD: Comparison of Rocuronium, Succinylcholine and Vecuronium for rapid sequence. Induction of anaesthesia in adult patients. Anaesthesiology 1993; 79: 913-918.

8. Neena Raizada, Gaurav, Manoj Kumar Yadav, R. B. Singh, T. Prabhakar. Comparison of Different Doses of Rocuronium for Endotracheal Intubation. International Journal of Contemporary Medical Research 2018; 5: B13-B17.

9. Raghavan L, Venkatesan G, Padmanabhan KR. A prospective randomised clinical trial of three different doses of rocuronium for intubation in adults. J. Evolution Med. Dent. Sci. 2016; 5: 6560-6564.

10. Schultz P, Ibsan M, Ostergaaed D, Skovgaard LT. Onset and duration of action of Rocuronium from tracheal intubation through intense block to complete recovery. Acta Anaesthesiologica Scandinavica 2001; 5: 612-617.

11. Somboonviboon W, Bunburaphong P. Randomized controlled study of evaluation intubating conditions of Rocuronium in 108 Thal. Patients. J. Med. Assoc. Thal. 2000; 83: 850-855.

12. Sudha P, Manju B, Comparison of the effect of two different doses of Rocuronium on intubating condition. International surgery journal. 2016; 3: 582-585.