

Comparison of intubating conditions with two doses of rocuronium at 60 and 80 seconds

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Abstract

Introduction: Rapid sequence induction and intubation involves securing the airway rapidly in the shortest possible time using a rapidly acting muscle relaxant in patients who present for emergency surgery with full stomach. succinylcholine is the drug which has been commonly used for this purpose because of its quick action in spite of few drawbacks. Rocuronium bromide a new muscle relaxant, an analogue of vecuronium is rapidly replacing succinylcholine. **Aim:** To compare the intubating conditions using two doses of rocuronium 0.6mg/kg and 1mg/kg at both 60 and 80 seconds. **Material and Method:** It is a prospective and double blinded study involving 80 patients who presented for the operation theater to undergo surgery under general anesthesia. Patients were divided into four groups group A n=20 were given 0.6mg rocuronium and intubated in 60 seconds, group B n=20 were given 0.6mg/kg rocuronium and intubated at 80 seconds, group C n=20 were given 1 mg/kg rocuronium and intubated at 60 seconds and group D n=20 were given rocuronium 1 mg/kg and intubated at 80 seconds. The intubating conditions were assessed using the scale followed by cooper *et al.* **Statistical Analysis:** the obtained data was analyzed using the one way analysis of variance test and chi-square test. **Results:** Group A produced excellent intubating condition in 50% of patients, group B 90% and group C and D 100%. **Conclusion:** Rocuronium at 1 mg/kg produced excellent intubating condition within 60 seconds. **Keywords:** Rocuronium, Intubation, RSII, Succinylcholine.

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INTRODUCTION

Rapid sequence induction and intubation (RSII) is a common anesthetic technique which is usually followed in patients with risk of gastro-esophageal reflux to secure the airway quickly and smoothly to prevent aspiration of gastric contents. This technique involves preoxygenation followed by giving an rapid acting induction agent, cricoid pressure and short acting muscle relaxant and intubating the patient. Succinylcholine is the gold standard for RSII which has stood the test of time despite

its various side effects.¹ succinylcholine although acts very rapidly are associated with various drawbacks. It can cause malignant hyperthermia², hyperkalemia,³ increase intra gastric pressure and can produce prolonged paralysis in patients with pseudo cholinesterase deficiency. However because of its rapid action and short acting potential it is still considered by many as the first choice muscle relaxant for RSII. Few muscle relaxants like Atracurium and Vecuronium were introduced to replace succinylcholine but they did not provide as short a intubating time as succinylcholine. Rocuronium a desacetoxy analogue of Vecuronium was introduced 1994. Due to its rapid action it is quickly replacing succinylcholine. Lot of studies have proven its efficacy for RSII with different doses and time.⁴⁻¹¹ The most commonly used dosage for rapid intubation are 0.6 mg/kg and 1mg/kg have been showed to be as effective as succinylcholine in providing good and rapid intubating conditions.^{12,13} In this study we evaluate the intubating conditions with rocuronium 0.6 mg/kg and 1 mg/kg at 60 seconds and 80 seconds.

AIMS AND OBJECTIVES

1. To study the intubating conditions with 1mg/kg of rocuronium and 0.6mg/kg of rocuronium at 60 sec ,and 80 sec.
2. To study the hemodynamic response associated with intubation.
3. To look for complications if any.

MATERIALS AND METHODS

It is a prospective randomized double blinded study involving 80 patients who present to Chettinad hospital and research institute for surgery requiring general anesthesia and intubation with endotracheal tube. After obtaining ethical committee approval from the institution and getting a written informed consent.

80 patients were divided into group of four according to computer randomization.

Group A n=20 were intubated after 60 seconds following 0.6mg/kg rocuronium.

Group B n=20 were intubated after 80 seconds following 0.6mg/kg rocuronium.

Group C n=20 were intubated after 60 seconds following 1mg/kg rocuronium.

Group D n=20 were intubated after 80 seconds following 1mg/kg rocuronium.

Inclusion Criteria

1. ASA grade I/II
2. either sex

3. age group between 18-60 years
4. mallampatti grade I and II.

Exclusion criteria

1. ASA grade III/IV
2. Mallampatti grade III/IV
3. Patients with increased risk of aspiration
4. Contraindications to rocuronium.
5. Morbid obesity.

All patients are kept nil per oral overnight followed by premedication with tablet anxit 0.5 mg in the morning with sips of water. In the operation theater after securing an intravenous access and attaching all basic monitors patient is preoxygenated for 3 minutes with 100% oxygen fentanyl is given at a dose of 2 microgram per kilogram and induced with injection propofol 2mg/kg. Rocuronium bromide is used for intubation at a dose of either 0.6mg/kg or 1mg/kg. Patient is ventilated with bag and mask and intubated at either, 60 sec, or 80 sec as per randomization. patients will be intubated with appropriate size macintosh blade by an experienced anesthetist. The anesthetist is called into the theater 30 seconds before intubation so that he is blinded to the time .if any difficulty in intubation or failure to intubate in the first attempt the patients are excluded from the study The intubating conditions are noted as per criteria of cooper etal.¹⁴

Criteria and score of intubating conditions

Jaw relaxation	Vocal cords	Response to intubation	Score
Poor (impossible)	Closed	Severe coughing bucking	0
Minimal (difficult)	Closing	Mild coughing	1
Moderate (fair)	Moving	Slight diaphragmatic movement	2
Good (easy)	Open	None	3

Intubating conditions were graded as excellent, good fair or poor depending on the score.

Grading of intubation

Intubating conditions	Score
Excellent	8-9
Good	6-7
Fair	3-5
Poor	0-2

The patients hemodynamic were also noted immediately after intubation including heart rate, systolic, diastolic, mean arterial pressure and rate pressure product was also calculated. After intubation the patient’s anesthesia was maintained as per the anesthetists choice.

OBSERVATION AND RESULTS

The obtained data was analyzed statistically using the one way analysis of variance test and the chi-square test. The groups were similar with respect to the age

Table 1: Age

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
A	20	36.30	10.633	2.378	31.32	41.28

B	20	40.65	8.324	1.861	36.75	44.55
C	20	41.05	12.356	2.763	35.27	46.83
D	20	42.55	8.413	1.881	38.61	46.49
Total	80	40.14	10.153	1.135	37.88	42.40

Table 2: Age ANOVA

	Sum of squares	DF	Mean square	f	sig
Between Groups	432.838	3	144.279	1.422	.243
Within Groups	7710.650	76	101.456		
Total	8143.487	79			

The p value for the age is 0.243 which is more than 0.05 which is not statistically significant. The groups were comparable with respect to the weight.

Table 3: Weight in kg

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
A	20	73.60	11.878	2.656	68.04	79.16
B	20	66.00	11.635	2.602	60.55	71.45
C	20	70.85	11.550	2.538	65.44	76.26
D	20	67.85	10.236	2.289	63.06	72.64
Total	80	69.58	11.501	1.286	67.02	72.13

Table 4: Weight ANOVA weight in kg

	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	671.650	3	223.883	1.740	.166
Within Groups	9777.900	76	128.657		
Total	10449.550	79			

The p values for the weight between the groups is 0.166 which is greater than 0.05 and so not significant The jaw relaxation between groups were compared using cross tab

Table 5: Jaw relaxation cross tab

		Group				Total	
		A	B	C	D		
jaw relaxation	2	Count	1	0	0	0	1
		% within jaw relaxation	100.0%	.0%	.0%	.0%	100.0%
		% within group	5.0%	.0%	.0%	.0%	1.3%
	3	% of Total	1.3%	.0%	.0%	.0%	1.3%
		Count	19	20	20	20	79
		% within jaw relaxation	24.1%	25.3%	25.3%	25.3%	100.0%
	Total	% within group	95.0%	100.0%	100.0%	100.0%	98.8%
		% of Total	23.8%	25.0%	25.0%	25.0%	98.8%
		Count	20	20	20	20	80
		% within jaw relaxation	25.0%	25.0%	25.0%	25.0%	100.0%
	% within group	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	25.0%	25.0%	25.0%	25.0%	100.0%	

Table 6: Jaw relaxation Chi-Square Tests

	Value	DF	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.038 ^a	3	.386
Likelihood Ratio	2.811	3	.422
Linear-by-Linear Association	1.800	1	.180
N of Valid Cases	80		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .25. None of the patient in the four groups had jaw relaxation which was poor or

minimal. Only one patient in group A had a score of 2 which indicated moderate jaw relaxation. All the other members had good jaw relaxation. There was no

significant difference statistically using the chi-square test which was 0.386.

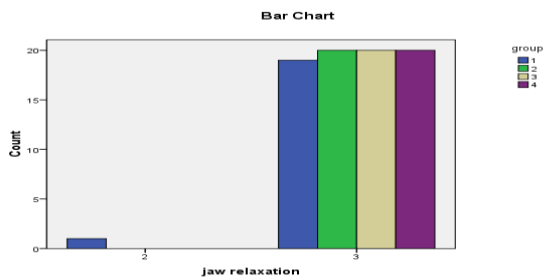


Figure 1:

In group A 1 patients vocal cord was closing while 6 patients vocal cord was moving and 13 patient had a completely opened vocal cord.

Table 7: Vocal cord Crosstab

		Group				
		A	B	C	D	Total
vocal cord	Count	1	0	0	0	1
	% within vocal cord	100.0%	.0%	.0%	.0%	100.0%
	% within group	5.0%	.0%	.0%	.0%	1.3%
	% of Total	1.3%	.0%	.0%	.0%	1.3%
	Count	6	1	0	0	7
	% within vocal cord	85.7%	14.3%	.0%	.0%	100.0%
	% within group	30.0%	5.0%	.0%	.0%	8.8%
	% of Total	7.5%	1.3%	.0%	.0%	8.8%
	Count	13	19	20	20	72
% within vocal cord	18.1%	26.4%	27.8%	27.8%	100.0%	
% within group	65.0%	95.0%	100.0%	100.0%	90.0%	
% of Total	16.3%	23.8%	25.0%	25.0%	90.0%	
Count	20	20	20	20	80	
% within vocal cord	25.0%	25.0%	25.0%	25.0%	100.0%	
% within group	100.0%	100.0%	100.0%	100.0%	100.0%	
% of Total	25.0%	25.0%	25.0%	25.0%	100.0%	

Table 8: Vocal cords Chi-Square Tests

	Value	DF	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.032 ^a	6	.004
Likelihood Ratio	18.461	6	.005
Linear-by-Linear Association	12.359	1	.000
N of Valid Cases	80		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .25. In group b 1 patient had a moving vocal cord while the rest had there vocal cords completely opened. Group C and D had all patients with

there vocal cord completely opened. The chi-square test showed a value of 0.004 which was statistically significant showing that group A had poor vocal cord relaxation scores compared to the other groups.

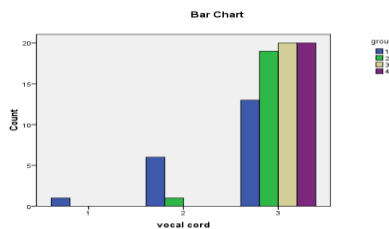


Figure 2:

In group A, 3 patients had mild coughing, 16 patients had mild diaphragmatic movement and 1 patient was silent. In group B, 14 patient had mild diaphragmatic movement and 6 patients was silent. In group C, 6 patient had mild

diaphragmatic movement and 14 patients was silent. In group D, 2 patient had mild diaphragmatic movement and 18 patients was silent.

Table 9: Response to intubation

		Group				
		A	B	C		
		Count	3	0	0	
response to intubation	1	% within response to intubation	100.0%	.0%	.0%	
		% within group	15.0%	.0%	.0%	
		% of Total	3.8%	.0%	.0%	
			Count	16	14	6
	2	% within response to intubation	42.1%	36.8%	15.8%	
		% within group	80.0%	70.0%	30.0%	
		% of Total	20.0%	17.5%	7.5%	
			Count	1	6	14
	3	% within response to intubation	2.6%	15.4%	35.9%	
		% within group	5.0%	30.0%	70.0%	
		% of Total	1.3%	7.5%	17.5%	
			Count	20	20	20
Total	% within response to intubation	25.0%	25.0%	25.0%		
	% within group	100.0%	100.0%	100.0%		
	% of Total	25.0%	25.0%	25.0%		

The chi –square test showed a value of 0.000 which was highly significant.

Table 10: Response to intubation

		Group			
		D	Total		
		Count	0	3	
Response to intubation	1	% within response to intubation	.0%	100.0%	
		% within group	.0%	3.8%	
		% of Total	.0%	3.8%	
			Count	2	38
	2	% within response to intubation	5.3%	100.0%	
		% within group	10.0%	47.5%	
		% of Total	2.5%	47.5%	
			Count	18	39
	3	% within response to intubation	46.2%	100.0%	
		% within group	90.0%	48.8%	
		% of Total	22.5%	48.8%	
			Count	20	80
Total	% within response to intubation	25.0%	100.0%		
	% within group	100.0%	100.0%		
	% of Total	25.0%	100.0%		

Table 11: Chi-Square Tests

	Value	DF	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.918 ^a	6	.000
Likelihood Ratio	45.931	6	.000
Linear-by-Linear Association	35.397	1	.000
N of Valid Cases	80		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is .75.

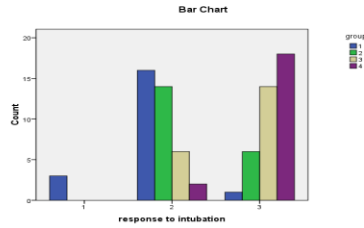


Figure 3:

The intubating grading in group A is 1 patient had fair conditions and 18 patients had excellent intubating conditions. In group B 2 patients had good intubating conditions and 18 patients had excellent intubating conditions. In group C and D all patients had excellent intubating condition.

Table 12: Intubating grading Crosstab

		Group			
		A	B	C	
intubation grading	5	Count	1	0	0
		% within intubation grading	100.0%	.0%	.0%
		% within group	5.0%	.0%	.0%
		% of Total	1.3%	.0%	.0%
	6	Count	1	0	0
		% within intubation grading	100.0%	.0%	.0%
		% within group	5.0%	.0%	.0%
		% of Total	1.3%	.0%	.0%
	7	Count	8	2	0
		% within intubation grading	80.0%	20.0%	.0%
		% within group	40.0%	10.0%	.0%
		% of Total	10.0%	2.5%	.0%
8	Count	9	12	6	
	% within intubation grading	31.0%	41.4%	20.7%	
	% within group	45.0%	60.0%	30.0%	
	% of Total	11.3%	15.0%	7.5%	
9	Count	1	6	14	
	% within intubation grading	2.6%	15.4%	35.9%	
	% within group	5.0%	30.0%	70.0%	
	% of Total	1.3%	7.5%	17.5%	
Total	Count	20	20	20	
	% within intubation grading	25.0%	25.0%	25.0%	
	% of Total	100.0%	100.0%	100.0%	

Table 13: Intubating grading crosstab

		Group		
		D	Total	
intubation grading	5	Count	0	1
		% within intubation grading	.0%	100.0%
		% within group	.0%	1.3%
		% of Total	.0%	1.3%
	6	Count	0	1
		% within intubation grading	.0%	100.0%
		% within group	.0%	1.3%
		% of Total	.0%	1.3%
	7	Count	0	10
	% within intubation grading	.0%	100.0%	
	% within group	.0%	12.5%	

	% of Total	.0%	12.5%
	Count	2	29
8	% within intubation grading	6.9%	100.0%
	% within group	10.0%	36.3%
9	% of Total	2.5%	36.3%
	Count	18	39
9	% within intubation grading	46.2%	100.0%
	% within group	90.0%	48.8%
	% of Total	22.5%	48.8%
	Count	20	80
Total	% within intubation grading	25.0%	100.0%
	% within group	100.0%	100.0%
	% of Total	25.0%	100.0%

The chi-square test was 0.00 which is a highly significant difference between the groups.

Table 14: Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.880 ^a	12	.000
Likelihood Ratio	53.648	12	.000
Linear-by-Linear Association	36.040	1	.000
N of Valid Cases	80		

a. 12 cells (60.0%) have expected count less than 5. The minimum expected count is .25.

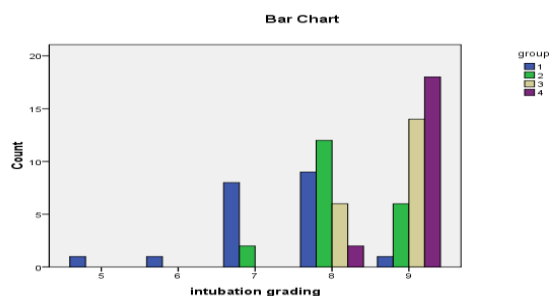


Figure 4:

DISCUSSION

Rocuronium is a newer muscle relaxant which has been replacing succinylcholine for rapid sequence intubation. In our study 1 mg/kg has excellent intubating conditions both at 60 seconds and 80 seconds, this is similar to Mccourt *et al* whose randomized double blind controlled study compared the tracheal intubating conditions during rapid sequence induction of anesthesia using rocuronium 1mg/kg, tracheal intubation was attempted at 60 sec . He concluded that rocuronium 1mg/kg can be used as an alternative for suxamethonium in RSII provided there is no anticipated difficulty in airway.⁴ Rocuronium 0.6 mg/kg at 60 seconds produced good to excellent intubating conditions in 95% of the patients and it rose to 100% when intubated after 80 seconds. Stephan c et al (2011) in this prospective randomized single blind trial conducted on 401critically ill patients receiving either 1mg/kg succinylcholine or 0.6mg/kg rocuronium for neuromuscular blockade. They concluded that there was no difference between the two drugs with respect to the

quality of intubation conditions and the number of failed intubations.⁸ Cooper R et al (1992) assessed intubating conditions at 60seconds and 90 seconds after administering Rocuronium 0.6 mg/kg. Comparing with Suxamethonium 1 mg/kg in similar groups they found out that clinically acceptable intubating conditions (good to excellent) were observed in 95% of patients at 60 seconds and in all patients at 90 seconds.¹⁴ Mostly the fear of using rocuronium in RSII is because rocuronium is long acting and so in case of a cannot ventilate, cannot intubate condition it may be dangerous compared to succinylcholine. Now the introduction of sugammadex a drug which has shown to produce a dose dependent rapid reversal of rocuronium¹⁵ can allay the fears. The availability and the cost will be the main concern in our country.

CONCLUSION

Rocuronium at a dosage of 1 mg/kg gives excellent intubating conditions within 60 seconds only and can be

used for RSII. If used at a dosage of 0.6 mg/kg it is better to wait for 80 seconds to get optimal intubating condition.

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