

A Prospective Randomized Comparative Assessment of Inj. Rocuronium with Priming Dose and Inj. Rocuronium without Priming in Patients Undergoing General Anesthesia

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Abstract

Aim: The aim of the present study was to compare the effect of inj. Rocuronium with priming dose and inj. Rocuronium without priming on intubating conditions and onset time of intubation with respect to rocuronium as bolus.

Methods: The present study was single-center study, conducted in Department of Anaesthesiology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from February 2019 to Dec 2021. 50 patients were included in the study.

Results: We compared mean age, weight, gender and ASA grade between group C and group P and difference was statistically not significant (p value >0.05). We compared preoperatively baseline mean HR, mean HR at induction, mean HR at intubation, at 1 minute after intubation and at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. We compared mean MAP preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. We compared mean SPO2 preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. In group C mean Onset Time of Intubation was 93.36 ± 6.24 seconds, while in group P it was 57.00 ± 6.74 seconds, so the difference between the groups on the basis of OTI was statistically highly significant.

Conclusion: Rocuronium with priming would be an excellent alternative to succinylcholine, whenever fast induction will be needed. Intubating conditions were good to excellent and comparable in both rocuronium with priming and without priming. NMT monitoring is a useful tool for indicating the clinically acceptable paralysis.

Keywords: Rocuronium, priming dose, Intubating conditions, general anaesthesia

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Introduction

Rapid sequence induction and endotracheal intubation using succinylcholine is an established technique in patients at risk of gastric aspiration. But, succinylcholine has a number of undesirable side-effects like muscle fasciculation, myalgia, hyperkalaemia [1], bradyarrhythmias [2], increased intra-ocular tension, increased intracranial tension [3], increased intragastric pressure, anaphylaxis, malignant hyperthermia and Masseter spasm. Hence, it is not suitable in situations like neuromuscular disorders, burns, acute head injury, intracranial bleed [4], open eye injury, spinal cord injury [5], cerebrovascular accidents and renal diseases. The above side-effects and

contraindications of succinylcholine had prompted the use of non-depolarizing muscle relaxants using various techniques for rapid sequence intubation, such as (1) timing principles [6], (2) combination of relaxant [7], (3) high dose of non-depolarizing muscle relaxants [8], (4) inhalational agents to augment the effect of non-depolarizing muscle relaxants [9], (5) use of intravenous anaesthetic agents with non-depolarizing muscle relaxants to augment neuromuscular blockade [10] and (6) priming principle.

Rocuronium bromide has the fastest onset time compared with other non-depolarizing neuromuscular blocking drugs. We chose rocuronium bromide with

an intubating dose of 0.6 mg/kg [11], priming dose of 0.06 mg/kg [12] (10% of intubating dose) and priming interval of 3 min for the study. [13] Succinylcholine reliably produces muscle relaxation within 60 seconds of its administration, but it can produce serious side effects and is contraindicated in certain patients. [14] Different techniques that have been used to decrease the effective onset time of nondepolarizing muscle relaxants include priming and the administration of large doses. A technique that uses the "timing principle" has been applied to rapidly produce good intubating conditions. When this technique is used, a single bolus dose of a muscle relaxant is administered, and anesthesia is induced at the onset of clinical weakness. In this way, the time from the induction of anesthesia to complete muscle relaxation is reduced, and the peak effect of the muscle relaxant and IV induction drug may more closely coincide. [15] Rocuronium is a steroidal nondepolarizing muscle relaxant with an onset time (after 3-4 x the 95% effective dose) not different from that of succinylcholine.

The aim of the present study was to compare the effect of inj. Rocuronium with priming dose and inj. Rocuronium without priming on intubating conditions and onset time of intubation with respect to rocuronium as bolus.

Materials and Methods

The present study was single-center, prospective, randomized study, conducted in Department of Anaesthesiology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from February 2019 to Dec 2021. 50 patients were included in the study.

Inclusion criteria: Patients of age groups from 18-60 years of either sex, 40-60 kgs weight, ASA grades I and II, undergoing surgeries under general anaesthesia and given valid written consent for participation.

Exclusion criteria: Patients with neuromuscular diseases. Patients with anticipated difficult intubation. Patients with hepatic and renal diseases. Patients with history of any drug allergy. Pregnant female

Each patient was visited pre-operatively and non-dominant hand. Additional 20 G cannula on other hand was also secured for infusion of lactated ringer's solution to prevent dilutional effect. The patients were randomly allocated into 2 groups of 25 patients each:

1. GROUP C (CONTROL group) - Patients have received 2ml of Normal saline as placebo and then intubating dose of inj. Rocuronium.
2. GROUP P (PRIMING group) - Patients have received 2ml quantity of PRIMING dose and then remaining intubating dose of inj. Rocuronium.

On arrival in the operation room, baseline parameters viz. heart rate, non-invasive mean arterial blood pressure, oxygen saturation were noted. A 20G cannula was inserted into a vein on the dorsum of patient's non-dominant hand. Additional 20 G cannula on other hand was also secured for infusion of lactated ringer's solution to prevent dilutional effect. After explaining about the nerve stimulation technique to the patient, premedication was done with intravenous inj. Glycopyrrolate 0.004 mg/kg, and inj. Midazolam 0.02 mg/kg to all patients in both groups. Preoxygenation was started on venti-mask and after 10 minutes, priming dose/placebo as per group was given. Meanwhile supramaximal stimulus was fixed using NMT module in the Datex-Ohmeda, S/5 Advance machine. Total intubating dose of inj. Rocuronium bromide 0.6 mg/kg was diluted to 5 ml with normal saline. Drugs were loaded and administered by another experienced anaesthesiologist. The intubating anaesthesiologist was blinded to the study and diluting protocols. After pre-oxygenation, the priming dose of Rocuronium bromide 0.06 mg/kg (10% of intubating dose) or normal saline was given i.v., 3 minutes before the intubating dose as per randomization. Fentanyl 2mcg/kg body weight was given intravenous 1 minute after the priming dose. Two and half minutes after giving the priming dose, patients were induced with intravenous Propofol 2 mg/kg body weight. Then the intubating dose of Rocuronium bromide was injected intravenous 3 minutes after priming or normal saline, as per randomization. After giving it, a supramaximally set Train Of Four (TOF) stimuli was applied through surface electrodes over the Ulnar nerve at the wrist. The stimulus was repeated after every 10 seconds and visually assessed for disappearance of T1 of TOF stimuli and loss of adduction of thumb.

ONSET TIME OF INTUBATION (OTI): the time interval between the intubating dose and the disappearance of T1 of TOF. Using the Cooper's scoring system, the intubating conditions were graded as excellent when intubating scores were between 8 and 9, good with 6-7, fair with 3-5 and poor with 0-2.

All patients were monitored using electrocardiogram, non-invasive blood pressure and oxygen saturation with pulse-oximetry. Data noted included heart rate, mean arterial blood pressure, oxygen saturation with pulse oximetry, Cooper's score 7 indicating about the intubation conditions and onset time of intubation. The above data were recorded at baseline, at induction, at intubation, 1 min and 5 min after endotracheal intubation.

statistical analysis was performed using SPSS 20.0 (SPSS Inc. Chicago, IL, USA) statistical package. Statistical significance was considered if value of $P < 0.05$.

Results

Table 1: Comparison baseline characteristics between group C and group P

Baseline characteristics	Group C	Group P	P value
Age (in years)	39.4 ± 13.67	38.6 ± 11.82	.45
Weight (kgs)	57 ± 4.9	57.13 ± 3.66	.24
Gender			
Male	15	13	0.88
Female	10	12	
ASA grade			
1	22	23	.95
2	3	2	

We compared mean age, weight, gender and ASA grade between group C and group P and difference was statistically not significant (p value >0.05).

Table 2: Comparison of mean heart rate (HR)

Mean HR	Group C	Group P	P Value
Baseline	75.5 ± 9.6	76.34 ± 6.8	0.48
Induction	72.6 ± 8.2	76.95 ± 6.6	0.74
Intubation	92.8 ± 8.4	88.6 ± 6.4	0.18
1 min	82.4 ± 7.8	81.29 ± 5.6	0.7
5 mins	72.8 ± 7.3	73.46 ± 5	0.72

We compared preoperatively baseline mean HR, mean HR at induction, mean HR at intubation, at 1 minute after intubation and at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant.

Table 3: Comparison on basis of mean MAP

Mean MAP	GROUP C	GROUP P	P VALUE
	Mean ± SD	Mean ± SD	
Baseline	71.69 ± 7.152	68.22 ± 6.512	.07
Induction	70.55 ± 6.962	68.82 ± 6.318	0.72
Intubation	83.67 ± 7.163	78.52 ± 7.783	.36
1 min	76.85 ± 5.424	73.97 ± 6.484	0.5
5 mins	72.28 ± 4.636	68.36 ± 5.625	.12

We compared mean MAP preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant.

Table 4: Comparison on basis of mean saturation (SPO2)

Mean SPO2	GROUP C	GROUP P	P VALUE
	Mean ± SD	Mean ± SD	
Baseline	99.05 ± 1.375	99.24 ± 0.982	0.48
Induction	99.58 ± 0.812	99.82 ± 0.552	0.82
Intubation	99.14 ± 1.336	99.42 ± 0.934	0.18
1 min	99.58 ± 0.722	99.58 ± 0.862	0.4
5 mins	99.74 ± 0.584	99.84 ± 0.462	0.32

We compared mean SPO2 preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant.

Table 5: Comparison on basis of Cooper's score

Cooper's Score	Group C	Group P	P value
7	1	1	0.812
8	10	9	
9	14	15	

In group C, out of 25 patients, 14 patients were having score 9 while 10 patients were having score 8, while 1 patient had score 7 which was comparable with the group P in which out of 25 patients, 15 were having score 9, while 9 patients were having score 8 and 1 patient was of score 7, so in both groups most

of the patients had excellent intubating condition, and the groups were comparable as statistically no significant difference was found after applying Independent samples Mann-Whitney U test with the P value of .812.

Table 6: Onset time of intubation (OTI)

	Group C	Group P	P value
Onset time of intubation	93.36 ± 6.24	57.00 ± 6.74	0.001

In group C mean Onset Time of Intubation was 93.36 ± 6.24 seconds, while in group P it was 57.00 ± 6.74 seconds, so the difference between the groups on the basis of OTI was statistically highly significant.

Discussion

Succinylcholine is best known and used for faster induction in anaesthesia including rapid sequence intubation. It is a depolarizing type of muscle relaxant. [16] It is known for producing good to excellent intubating conditions, in very less time (onset time of intubation 30- 60 seconds). [17] But it is found to be associated with certain side effects like muscle fasciculations, myalgia, hyperkalemia [18], bradyarrhythmias [19], increased intracranial tension [20], increased intra ocular tension, malignant hyperthermia, increased intragastric pressure and sustained muscle spasm.

We compared mean age, weight, gender and ASA grade between group C and group P and difference was statistically not significant (p value >0.05). We compared preoperatively baseline mean HR, mean HR at induction, mean HR at intubation, at 1 minute after intubation and at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. . McCourt et al [21] found excellent intubating conditions at 60 s with succinylcholine 1 mg/kg and higher dose of rocuronium which was 1 mg/kg. Singh et al [22] had shown that with 0.6 mg/kg rocuronium and 1.5 mg/kg succinylcholine, the time to achieve maximum blockade was 87.94 and 65.59 s, respectively. The intubating conditions were comparable in the two groups at 60 sec. Above studies shows rocuronium can be used as an alternative to succinylcholine. Naguib et al [23] had given the priming dose as 0.06 mg/kg rocuronium or 0.015 mg/kg mivacurium followed by an intubating dose of 0.54 mg/kg of rocuronium. On priming with rocuronium and mivacurium, the onset times were 73 and 58 s, respectively. In the other group, 1 mg/kg

succinylcholine was administered and the onset time was found to be 54 s. Intubating conditions were similar in all three groups.

We compared mean MAP preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. We compared mean SPO2 preoperatively baseline, at induction, at intubation, mean HR at 1 minute after intubation and mean HR at 5 minute after intubation between group C and group P, the difference between two groups was statistically insignificant. The heart rate increase may be controlled by the prior administration of fentanyl. [24] Shorten et al [25] compared elderly patients given rocuronium 0.9 mg/kg with patients given vecuronium 0.12 mg/kg, and found no significant change in heart rate, arterial blood pressure or plasma epinephrine concentrations in either group.

In group C, out of 25 patients, 14 patients were having score 9 while 10 patients were having score 8, while 1 patient had score 7 which was comparable with the group P in which out of 25 patients, 15 were having score 9, while 9 patients were having score 8 and 1 patient was of score 7, so in both groups most of the patients had excellent intubating condition, and the groups were comparable as statistically no significant difference was found after applying Independent samples Mann-Whitney U test with the P value of .812. In group C mean Onset Time of Intubation was 93.36 ± 6.24 seconds, while in group P it was 57.00 ± 6.74 seconds, so the difference between the groups on the basis of OTI was statistically highly significant. Aziz et al [26] explained the effects of priming with vecuronium and rocuronium in younger and elderly patients.

Conclusion

Rocuronium with priming would be an excellent alternative to succinylcholine, whenever fast induction will be needed. Intubating conditions were good to excellent and comparable in both rocuronium with priming and without priming. NMT monitoring is a useful tool for indicating the clinically acceptable paralysis.

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