

A Randomised Control Study to Compare the Pretreatment Effect of Rocuronium and Atracurium on Succinylcholine Induced Post Operative Myalgia

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Abstract

Background: Succinylcholine is a depolarizing muscle relaxant, provides ideal muscle relaxation for surgical procedures along with anesthetics. Which is extensively used short acting muscle relaxant, with several undesirable side effects. These side effects are muscular fasciculations, postoperative muscle pains, rise in serum potassium, rise in intraocular tension and intragastric pressure. Nondepolarizing muscle relaxants like Atracurium and Rocuronium are better in reducing the fasciculation and myalgia in comparison with other drugs. Hence, our main aim of this study to compare the effect of Rocuronium and Atracurium on Succinylcholine induced myalgia. **Methodology:** We compared the incidence of postoperative myalgia (POM) with Atracurium (ATR) and Rocuronium (ROC) in different groups prior to Succinylcholine for tracheal intubation by using ASA class 1 or 11 in all patients posted for surgery under general anesthesia. The subjects were assigned to one of three groups: group 1 received Normal saline 5ml; group 2 received 0.05 mg/kg Rocuronium; and group 3 Atracurium 0.05mg/kg. Thiopentone was administered 1min 45 sec after pretreatment to induce anesthesia. Three minutes after, Succinylcholine 2 mg/kg was given, and fasciculations were recorded on a scale of 03. Postoperative myalgia was assessed at 6,12 and 24hrs by questionnaire and graded 03. **Results:** Patient demographic profile and baseline parameters were comparable and there were no differences between these groups. Post operative myalgia though it is seen more with NS and Atracurium than Rocuronium. There was no statistical differences seen at 6, 12 and 24 hrs after surgery. **Conclusion:** The severity of Succinylcholine induced Post operative myalgia was reduced significantly with Rocuronium than Atracurium.

Keywords: Atracurium; Fasciculation; Myalgia; Rocuronium; Succinylcholine.

Introduction

Succinylcholine is the only standard depolarizing neuromuscular blocker as an adjuvant to general anesthesia for rapid sequence intubation due to its ability to produce intense and rapid relaxation (30 to 60 s) and a short duration of action (3 to 5 minutes) [1]. Myalgia are minor but frequent adverse effects of Succinylcholine [2]. reported incidence of myalgia is 0.2-89% [2,3]. This is accompanied by biochemical evidence of muscle damage as evidenced by raised

serum creatine kinase and hyperkalemia in many subjects [4]. Although self-limiting, it is generally agreed that iatrogenic postoperative myalgia is unacceptable in modern anaesthetic practice [5].

Postoperative myalgia due to Succinylcholine is commonly described as pain. One might suffer after an unaccustomed degree of physical exercise, appears on the first day after surgery lasting for 2 or 3 days but occasionally persists for a week and is usually located in the neck, shoulder and upper abdominal muscles [6,7].

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So different treatment modalities individually have been advocated to reduce the incidence and severity of myalgia with Diclofenac, Ketorolac, Diazepam, Lignocaine, small dose of Succinylcholine as self-taming Cis Atracurium, Remifentanyl, Gabapentin, d-Tubocurarine, Pancuronium, Vecuronium [4] and even with non-depolarizing agents like Rocuronium [8] and Atracurium [9].

Hence, present study has been taken to compare the efficacy of pretreatment with Rocuronium and Atracurium in reducing the incidence and severity of Succinylcholine induced myalgia in HIMS, HASSAN.

Materials and Methods

A randomized control study was conducted from department of Pharmacology in Department of Anesthesia and Pharmacology. Among 90 patients posted for surgery under general anesthesia. After written consent.

Study Period: December-2015 to December-2016,

Inclusion Criteria

1. Patients undergoing surgery under general anesthesia aged between 18- 60 yrs of either sex.
2. Patients who fulfill ASA(American Society of Anesthesiologists) criteria I and II [2,9,10].

Exclusion Criteria

1. Pediatric patients (<18 yrs)
2. Patients aged above 60 yrs

Preanesthetic check up was done in all patients before taking up for the surgery. Then they were divided into three groups by simple randomization, each group containing 30 patients undergoing elective surgery under general anesthesia.

Group 1 - 0.9% normal saline (control)

Group 2 - Rocuronium 0.05mg/kg

Group 3 - Atracurium 0.05mg/kg .

Monitoring for continuous electrocardiogram (ECG), heart rate, noninvasive blood pressure (NIBP), and pulse oximetry (SpO₂) was started. After administration of Atracurium, Rocuronium or saline, anesthesia is induced, followed by Succinylcholine 2 mg/kg IV. Patients were maintained on O₂ in 50% N₂O, isoflurane 1%-2%, injection vecuronium for maintenance of muscle relaxation. Postoperative myalgia was recorded at 6,12 and 24 hrs after surgical intervention and graded based on standard questionnaire [11,12].

0: No pain

1: Pain at one site without functional disability

2: Pain involving more than one site without functional disability

3: Pain involving more than one site with functional disability

Statistical Analysis

Data were analyzed by using descriptive statistics, Fisher exact test and Chi-square test.

Ethical clearance has been obtained from Institutional ethics committee, HIMS, HASSAN.

Results

Table 1: Mean age in study group

	N	Minimum	Maximum	Mean	Std. Deviation
Age	90	19	58	38.56	12.629

Age of the patients varied from 19-58 yrs and Mean age -38.56±12.629

Table 2: Post-operative myalgia at 6hr

Drugs	6 th hr		Total
	Present	Absent	
Atracurium	12	18	30
Rocuronium	12	18	30
NormalSaline	13	17	30
Total	37	53	90

ATR and ROC groups show equal incidence of myalgia (12) and NS group shows the higher incidence(13) but the results are not statistically significant with the P value< 0.995 (Chi-square test)

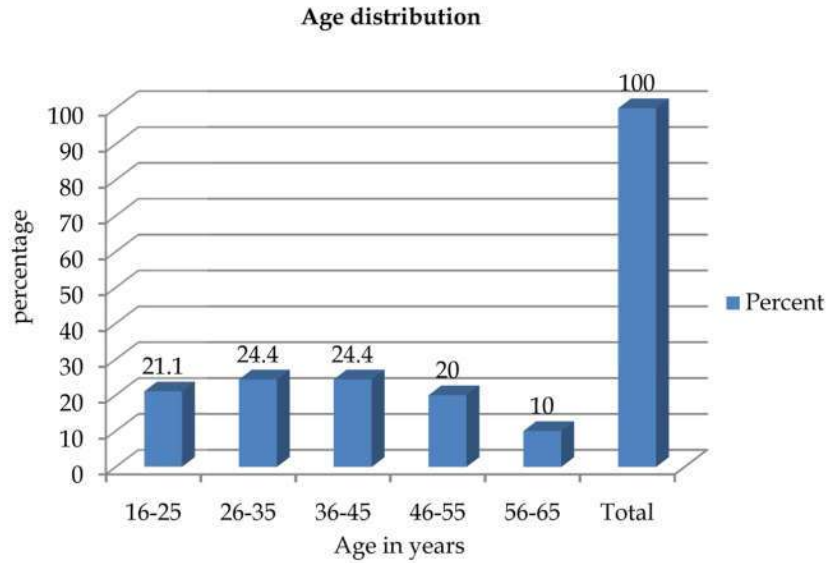


Fig. 1: Age Distribution
There were more number of patients in age group between -26-45 Yrs

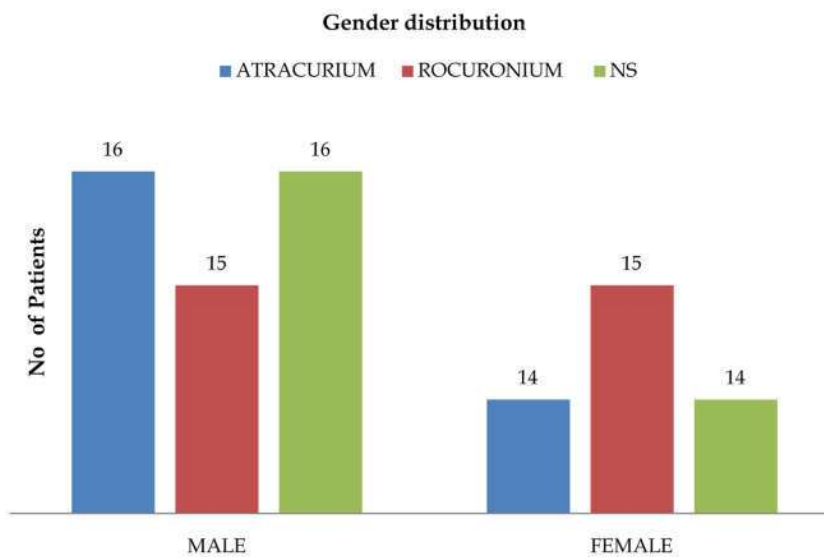


Fig. 2: Gender distribution
Number of males were more compared to females

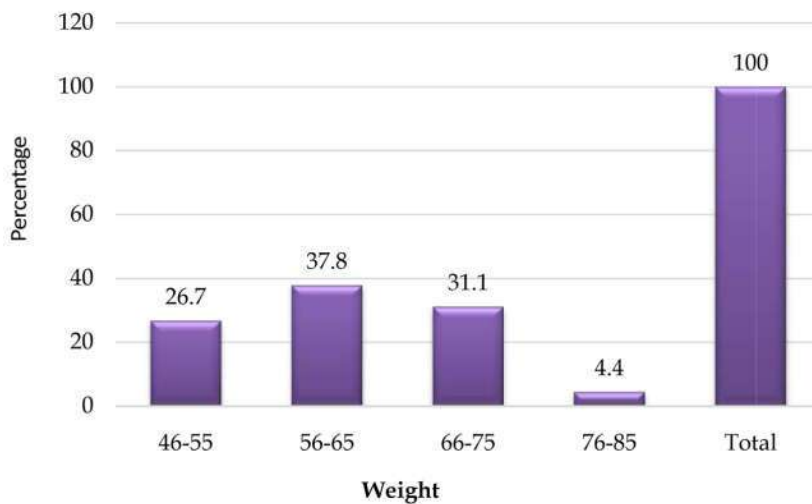


Fig. 3: Weight Distribution
Most of the patients were weighing around 56-65 kgs

Table 3: Grades of myalgia after 6 hrs

Drugs	Grade				Total
	0	1	2	3	
Atracurium	18	1	7	4	30
Rocuronium	18	5	5	2	30
NormalSaline	17	6	6	1	30
Total	53	12	18	7	90

ATR group shows the higher grades of myalgia than ROC and NS group but the results are not statistically significant with the P value < 0.438(Fisher exact test)

Table 4: Incidence of myalgia after 12 hrs

Drugs	12 hrs		Total
	Present	Absent	
Atracurium	20	10	30
Rocuronium	18	12	30
NormalSaline	21	9	30
Total	59	31	90

NS group shows the higher incidence of myalgia after 12 hrs but the results are not statistically significant with the P value < 0.709(Chi-square test)

Table 5: Grades of myalgia after 12 hrs

Drugs	Grade				Total
	0	1	2	3	
Atracurium	10	0	13	7	30
Rocuronium	12	6	8	4	30
NormalSaline	9	10	8	3	30
Total	31	16	29	14	90

ATR group shows the higher grades of myalgia (P value < 0.035)Fisher exact test.

Table 6: Incidence of myalgia after 24 hrs

Drugs	24 hrs		Total
	Present	Absent	
Atracurium	25	5	30
Rocuronium	18	12	30
NormalSaline	17	13	30
Total	60	30	90

ATR group shows the higher incidence of myalgia but the results are not statistically significant with the P value < 0.058 (Chi Square test)

Table 7: Grades of myalgia after 24 hrs

Drugs	Grade				Total
	0	1	2	3	
Atracurium	5	1	16	8	30
Rocuronium	12	4	9	5	30
NormalSaline	13	2	7	8	30
Total	30	7	32	21	90

ATR group shows the higher grades of myalgia and the results are not statistically significant with the P value < 0.093 (Fisher exact test).

Table 8: Grades of myalgia after 12 hrs

Drugs	Grade				Total
	0	1	2	3	
Atracurium	10	0	13	7	30
Rocuronium	12	6	8	4	30
NormalSaline	9	10	8	3	30
Total	31	16	29	14	90

ATR group shows the higher grades of myalgia (P value < 0.035)Fisher exact test.

Table 9: Incidence of myalgia after 24 hrs

Drugs	24 hrs		Total
	Present	Absent	
Atracurium	25	5	30
Rocuronium	18	12	30
NormalSaline	17	13	30
Total	60	30	90

ATR group shows the higher incidence of myalgia but the results are not statistically significant with the P value < 0.058 (Chi Square test)

Table 10: Grades of myalgia after 24 hrs

Drugs	Grade				Total
	0	1	2	3	
Atracurium	5	1	16	8	30
Rocuronium	12	4	9	5	30
NormalSaline	13	2	7	8	30
Total	30	7	32	21	90

ATR group shows the higher grades of myalgia and the results are not statistically significant with the P value < 0.093 (Fisher exact test).

Discussion

Succinylcholine is a depolarizing skeletal muscle relaxant that remains as standard treatment in facilitating endotracheal intubation, because it shows quick onset of action and spontaneous recovery. Despite its limitations and side effects, Succinylcholine is still a drug of choice for endotracheal intubation in operating rooms.

Myalgia is also one of the side effect of Succinylcholine. Several mechanisms have been proposed to explain the phenomenon of postoperative myalgia. Postoperative myalgia is often described as being similar to myalgia after unaccustomed exercise. Fasciculations involve vigorous contraction by muscle bundles with no possibility of shortening and without synchronous activity in adjacent bundles. This might produce fibre rupture or damage, thus causing pain [5].

In the present study post operative myalgia evaluated at 6, 12 and 24 hrs post surgery for who have received either of the pretreatment drugs.

The incidence of myalgia after 6 hrs of surgery among three groups in which ATR and ROC groups show equal numbers of myalgia [12] and NS group shows the higher incidence [13] but the results are not statistically significant with the P value < 0.995.

The grades of myalgia after 6 hrs of surgery among three groups in which ATR group shows the higher grades of myalgia than ROC and NS group but the results are not statistically significant with the P value < 0.438.

The incidence of myalgia after 12 hrs of surgery among three groups in which NS group shows the higher incidence (21) where the ATR shows 20 and ROC shows 18 but the results are not statistically significant with the P value < 0.709.

The grades of myalgia after 12 hrs of surgery among three groups in which ATR group shows the higher grades of myalgia than ROC and NS group and the results are statistically significant with the P value < 0.035.

The incidence of myalgia after 24 hrs of surgery among three groups in which ATR group shows the higher incidence (i.e 25) where the ROC shows 18 and NS shows 17 but the results are not statistically significant with the P value < 0.058.

Shows the grades of myalgia after 24 hrs of surgery among three groups in which ATR group shows the higher grades of myalgia than ROC and NS group and the results are not statistically significant with the P value < 0.093.

In a study conducted by Spencer et al where Rocuronium is compared with Lidocaine, which showed post operative myalgia at 24 and 48 hrs . In which Lidocaine showed more number of incidence than that of the Rocuronium group but the result was not statistically significant and the same outcome noted in case of 24 hrs with P value >0.05. But at 48hrs Lidocaine found to be better than that of Rocuronium in controlling myalgia with the statistically significant P value 0.0213 [13].

In another study conducted by Nighat Abbas there were 60 patients out of which 30 was given Rocuronium and the remaining 30 was given

Placebo. The statistical analysis showed the frequency of post operative myalgias with Rocuronium (16.66%) to be significantly less than with placebo (76.66%, $p < 0.001$) at 6 and 12 hours after surgery. After 24 hours the frequency of myalgias was (23.33%) in the Rocuronium group and (93.33%, $p < 0.001$) in the placebo group [14].

Sosis et al conducted a study on 44 ASA class I or II girls and women aged 16-50. The subjects were randomly assigned to one of three groups: group 1 ($n = 13$) received 0.025 mg/kg ATR, group 2 ($n = 17$) 0.05 mg/kg DTC, and group 3 ($n = 14$) saline (NS). Severe POM was not experienced by any patient. On postoperative day 1, the only myalgia in ATR patients was mild, occurring in 15%. POM was mild in 35% and moderate in 6% of DTC patients. The corresponding results for NS were 43% and 14% respectively. Significantly more ATR patients (85%) than NS patients (43%) were free of POM. There was no significant difference between ATR and DTC or between DTC and NS in this regard. On the third postoperative day, POM was rare and there were no significant differences among the groups. Of the six ATR patients who had fasciculations, only one had myalgia on postoperative day 1. After DTC, two patients had fasciculations but neither had POM on day 1. After NS, 11 patients had fasciculations but only five of these had POM on postoperative day 1. Of the seven patients given ATR who had no fasciculations, one had POM on day 1. Of the 15 patients given DTC who had no fasciculations, seven had POM on day 1. After NS, three patients had no fasciculations but all them had POM on postoperative day 1 [15].

A study by Pagani et al showed Myalgias on the postoperative day were observed in 80% of patients treated with saline solution, but only in 36% of patients who received atracurium. The difference between atracurium and saline solution was statistically significant (p less than 0.001) either for fasciculations or myalgias incidence. These findings show that atracurium 5 mg i.v. is effective in preventing succinylcholine-induced fasciculations and postoperative myalgias, and suggest atracurium as the drug of choice for this purpose, particularly in muscular subjects [16].

The present study showed that Rocuronium is the better drug when compared with Atracurium and NS with respect to the fasciculations by blocking presynaptic nicotinic receptors [17]. But it is not same with respect to myalgia current result showed no statistically significant difference between the groups though Rocuronium showed the better results. Certain studies showed that there is no clear

relationship between fasciculations and myalgia. Studies also suggest that post treatment of myalgia after the surgery should be considered with NSAIDs or Opioids since there is no superiority of pretreatment over the post-treatment is reported [18,19].

Conclusion

Pretreatment with intravenous Rocuronium found to be superior to Atracurium at the dose of 0.05 mg/kg over 3 minutes, prior to induction of general anaesthesia with Thiopentone sodium in reduction of incidence and severity of Succinylcholine (2mg/kg) induced Myalgia .

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