

# PRETREATMENT WITH LIGNOCAINE; EFFECTS ON PAIN OF ROCURONIUM INJECTION AND WITHDRAWAL MOVEMENTS OF THE ARM

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**ABSTRACT... Objective:** To assess the frequency of pain and withdrawal movements after injection of rocuronium and effects of pre-treatment with lignocaine. **Study Design:** Double blind study. **Duration of Study:** This study was of six months duration and was carried out from March 2004 to September 2004. **Setting:** Combined Military Hospital Kharian. **Patients and Methods:** One hundred and twenty unpremedicated patients with ASA grade I and II, aged between 18-60 years and of both sexes were enrolled in the study. Patients were randomly divided into two groups of 60 patients each. After induction of anaesthesia with thiopentone, patients in group A received 3 ml of lignocaine plain while those in group B, received 3 ml of normal saline as pre-treatment before injection of rocuronium. Their effects on pain on injection and withdrawal movements of the arm were studied. **Results:** Out of total of 120 patients, only 17 patients (14%) developed withdrawal movements of the arm or wrist. In Group A, who received lignocaine plain before rocuronium injection, only 3 patients out of 60 patients had withdrawal movements while in Group B, who received normal saline as pre-treatment fourteen out of 60 patients developed withdrawal movements of the arm or wrist. Only one patient belonging to Group B experienced pain. **Conclusions:** Pretreatment with lignocaine plain greatly reduces the chances of withdrawal movements and pain on injection of rocuronium.

**Key words:** Rocuronium, lignocaine, Pain, Withdrawal Movements.

## INTRODUCTION

Muscle relaxants are widely used to facilitate tracheal intubations but are never used without anesthetics. The onset time of paralysis is different from a muscle relaxant to another and from one muscle group to another (adductor pollicis vs. laryngeal adductor muscles)<sup>1</sup>. It is 60 second for succinylcholine, rapacuronium and rocuronium with a dose of  $1.0 \text{ mg} \cdot \text{kg}^{-1}$  and it is more than two minutes for vecuronium, atracurium and rocuronium<sup>2</sup>.

Rocuronium bromide is a steroidal non-depolarizing neuromuscular blocking drug, related structurally to vecuronium and characterized by a rapid onset and intermediate duration of action<sup>3</sup>.

It provides intubating conditions almost similar to those seen with succinylcholine<sup>4</sup>. Its rapid onset of action makes it a nearly perfect substitute to succinylcholine without adverse effects like myalgias associated with the

later<sup>5,9</sup>.

There are several reports of sudden flexion and withdrawal movements of the wrist or arm into which rocuronium was administered<sup>3,6</sup>. These observations led to the hypothesis that the rocuronium like propofol may cause pain on injection<sup>3</sup>. Compared to mivacurium, rocuronium results in favourable intubating conditions more rapidly, improves hemodynamic stability, requires less frequent administration of maintenance doses and is not associated with erythema<sup>12</sup>.

## PATIENTS AND METHODS

This was a double blind study of 120 unpremedicated patients undergoing elective surgery under general anaesthesia. The duration of study was six months and was carried out in the Department of Anaesthesiology, Combined Military Hospital Kharian, after approval from ethical committee of the hospital. Informed consent was obtained from the patient before including him/her in the

study.

Patients were divided into two groups of 60 patients each. Patients in group A were given 3 ml of lignocaine plain as 1% solution while those in group B received 3 ml of normal saline solution before injection of rocuronium .The patients were randomly allocated to one of the two groups and were given a code, while patients having conditions (table-I) were excluded from the study.

On arrival in the operating room, non-invasive blood pressure, electrocardiography, heart rate and oxygen saturation were monitored and two 20 gauge intravenous cannula were placed, one on each forearm.

General anaesthesia was induced with injection thiopentone sodium 5 mg/kg given over a period of 15 seconds in one arm. On the opposite arm, manual occlusion of venous outflow was performed proximal to cannula and group A was given 3 ml of 1% lignocaine solution while group B received 3 ml of normal saline solution. Occlusion was relieved after 20 seconds and rocuronium 1mg/kg was injected over 5 second period into intravenous cannula. Thereafter, this cannula was flushed with 20ml sodium chloride 0.9% solution and maintained closed; no further drugs or fluids were injected in this cannula until its removal in the postanaesthesia care unit (PACU). The injection was prepared by one anaesthetist and was injected by another anaesthetist. The third anaesthetist who was unaware of the drug being given to the patient made all the observations. At the end of the study cases were decoded and analyzed. The incidence of spontaneous or withdrawal movements following injection of rocuronium were noted immediately after the injection and were graded on a four point scale [ none=(0), mild movements limited to the hand (1), moderate movements extending to the elbow (2) or severe movements involving the whole arm (3)].

On the next day patient were interviewed in the ward and inquired whether they could recall pain at the site of injection or withdrawal movements of the arm during induction. Grading of the withdrawal movements,

assessing the local signs of erythema and pain on injection was performed by the same anaesthesiologist for all.

**RESULTS**

Grading of the withdrawal movements was analyzed using Mann– Whitney U-test from SPSS version 10 (table-II), (table-III) and (table-IV).

This study included 120 patients out of whom 40 were male and 80 were female patients.

Seventeen (14%) patients out of total of 120 patients had withdrawal movements of the arm in which rocuronium was administered. Out of these 17 patients, 11 patients (64%) had mild movements limited to the hand. Four out of 17 (24%) patients had moderate movements limited to the elbow. 2 out of 17 (12%) patients had severe movements involving the whole arm as depicted in bar diagram.

The bar diagram showing the frequency of withdrawal movements is given below;



Out of 17 patients who developed withdrawal movements, 14 patients (82%) received 3 ml of normal saline as pre-treatment before injection of rocuronium.

Table-II.					
	Grad withdrawal movement				Total
	No movement	Mild movements	Moderate movements	Severe movements	
Group	58	02	-	-	60
	45	09	04	02	60
Total	103	11	04	02	120

Table-III.				
	Group	N	Mean rank	Sum of ranks
Grading withdrawal movement	A	60	53.90	3234.00
	B	60	67.10	4026.00
	Total	120		

Three (18%) patients received 3 ml of 1% lignocaine plain as pre-treatment. Thus the percentage of patients having withdrawal movements after injection of rocuronium was significantly higher in normal saline group as compared to lignocaine group.

Only one patient remembered pain in the arm in which rocuronium was administered even after the induction of anaesthesia. Similarly only two patients out of 120 patients developed erythema of the arm in which rocuronium was administered. Both developed 24 hours after rocuronium injection and had received normal saline as pre-treatment.

**Table-I. Exclusion criteria**

Following patients were excluded from the study.

1. Patients with known neuromuscular disease.
2. Patients on medication known to interfere with neuromuscular blocking agents.
3. Known allergy to trial drug.
4. Patients with chronic pain.
5. Patients with anticipated difficult airway.
6. Patients on analgesics or sedatives were not included in the study.
7. Pregnant patients.

Table-IV.	
	Grading withdrawal movement
Mann-Whitney U	1404.000
Wilcoxon W	3234.00
Z	-3.432
Asymp. Sig (2-tailed)	.001
<i>a Grouping Variable: Group</i>	
<i>The value .001 is less than p value of 0.05</i>	

**DISCUSSION**

Airway compromise is most common cause of death in severely injured patients. Succinylcholine is time tested drug for rapid sequence induction of anaesthesia but it is associated with adverse effects like hyperkalemia, malignant hyperthermia, rise in intraocular pressure and myalgias<sup>5,9,10</sup>. It was the need of the hour to develop a drug with characteristics comparable to succinylcholine without adverse effects associated with the latter<sup>5</sup>.

Rocuronium bromide is a non-depolarizing neuromuscular blocking drug and is characterised by rapid onset and intermediate duration of action<sup>13</sup>. Initially, there were several reports that injection of rocuronium like propofol causes severe pain on injection<sup>12,13,16</sup>, that and is associated with withdrawal movements of the arm

in which rocuronium is given<sup>13,17</sup>. Propofol-related pain was significantly reduced after either IV or epidural injection of lidocaine<sup>11</sup>. Similarly pre-treatment with remifentanyl<sup>16</sup>, dexmedetomidine<sup>18</sup> 0.2 micro gram /kg and ketamine 20 mg in adults<sup>19</sup> have shown to reduce the occurrence of pain of rocuronium injection and frequency of withdrawal movements. Women report more pain on injection of rocuronium<sup>20</sup> and pre-treatment with fentanyl 0.5 mg/kg and opioids reduces its occurrence in adults<sup>21</sup> while addition of 8.4% sodium bicarbonate reduces the chances of pain in children<sup>22</sup>.

Among the various approaches used to reduce propofol injection pain is the use of lidocaine. Lidocaine is administered either mixed with propofol or prior to injection of propofol. There is some evidence to suggest that the analgesic effects of the former technique may be more effective than the latter<sup>15</sup>.

Akkaya T et al described that if 30 mg ketamine is given intravenously before rocuronium injection, only 12% of the patients develop pain in the arm in which rocuronium is given while it is 78% in those patients who received normal saline before injection of rocuronium<sup>17</sup>.

The relatively low pH of rocuronium solution may be a possible cause but absence of pain following 0.9% sodium chloride in 1 ml adjusted to pH of 4, speaks against such a possibility. Similarly vecuronium is buffered at a pH of 4 and has not been associated with pain on injection. The short duration of pain for 10-20 seconds after rocuronium and decrease or absence of pain during subsequent administration may be due to local release of mediators<sup>3</sup>.

Similarly it was found that if rocuronium is given before induction of anaesthesia 50- 80% of the patients complain of severe distressing pain on injection and withdraw the arm in which it is given and used to recall pain of injection<sup>19</sup>. But the incidence of occurrence of pain on injection was reduced when rocuronium was given after the induction of anaesthesia<sup>14</sup>.

Kim JY and Kwak HJ concluded that pre-treatment with remifentanyl decreases the chances of withdrawal

movements of the arm after injection of rocuronium to 23% compared to 94% in normal saline group<sup>16</sup>.

In this study we also found that 14 out of 60 patients (23%) in normal saline group developed withdrawal movements of the arm in which rocuronium was given while only 3 out of 60 (5%) patients of lignocaine group had withdrawal movements.

The pain with rocuronium is sharp and burning and patient complains of intense burning pain and in one study, in in-vitro preparation, C-fibres showed a consistent excitatory response with rapid onset after stimulation with rocuronium. So the pain after injection of rocuronium can be attributed to direct activation of C-nociceptors<sup>7</sup>.

## CONCLUSION

We conclude that rocuronium when given intravenously in awake patients, causes severe burning pain in most of the patients and they suddenly flex the wrist or arm in which rocuronium is infused, so it should be given only after induction of anaesthesia. Furthermore, pre-treatment with lignocaine plain markedly reduces the incidence of withdrawal movements and pain on injection of rocuronium.

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