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Original Research Paper

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DURATION OF INTENSE PARALYSIS FOLLOWING INDUCTION OF NEUROMUSCULAR BLOCKADE USING CISATRACURIUM VS ATRACURIUM AS ASSESSED BY TRAIN OF FOUR STIMULATION: A PROSPECTIVE RANDOMISED COMPARATIVE DOUBLE BLIND STUDY

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ABSTRACT

BACKGROUND: This study was undertaken to determine the duration of intense muscle paralysis after the initial paralyzing dose of Cisatracurium and Atracurium which are intermediate acting non-depolarizing neuromuscular blocking agents.

METHODS: After obtaining informed consent, 84 ASA 1 and 2 patients, 18 to 58 years scheduled for elective surgery under general anaesthesia with paralysis were included in the study. Patients were randomized to receive either Atracurium 0.5 mg /kg or Cisatracurium 0.1 mg /kg to facilitate tracheal intubation. Premedication and induction were similar for all patients .The duration of intense paralysis was assessed by delivery of supramaximal Train Of Four (TOF) stimuli on the adductor pollicis using a peripheral nerve stimulator.The time between disappearance of the response and reappearance of the first twitch in TOF was taken as the duration of intense paralysis.

RESULTS: There was a statistically significant difference in the duration of intense paralysis between the two drugs. The duration of intense paralysis of Cisatracurium was longer than Atracurium with no statistical difference in onset of action.

CONCLUSION: Although both Atracurium and Cisatracurium are intermediate acting non-depolarizing drugs Cisatracurium provides longer duration of intense paralysis than Atracurium.

KEYWORDS : Atracurium, Cisatracurium, Train Of Four

INTRODUCTION

General anaesthesia with neuromuscular paralysis is a common anaesthetic technique. Neuromuscular blocking drugs interrupt transmission of nerve impulses at neuromuscular junction (NMJ), aid endotracheal intubation and prevent patient movement to facilitate surgery. Non-depolarizing neuromuscular blocking agents [NMBA] competitively inhibit acetylcholine; differ in the onset & duration and method of action, potency, adverse effects and cost. Benzylisoquinolone compounds Atracurium and Cisatracurium are intermediate acting non-depolarizing NMBs. [1] Monitoring of neuromuscular blockade helps to detect the depth of neuromuscular blockade and adequacy of recovery of neuromuscular function following injection of muscle relaxants.[2,3] The response to Train of four stimulation (TOF) is the gold standard in monitoring the level of paralysis following use of non-depolarizing muscle relaxant.[4]The time between disappearance of the response and appearance of the first twitch will be taken as the duration of intense paralysis. This study is designed to compare the difference in the duration of intense muscle paralysis following the initial paralyzing dose of the two agents in Indian population.

METHODOLOGY

After obtaining clearance from the scientific and ethical committees of the institution, the study was undertaken.

INCLUSION CRITERIA

ASA 1 & 2 physical status patients coming for elective surgery under general anesthesia with controlled ventilation

- Age 18 -58 yrs.

EXCLUSION CRITERIA:

- ASA III & IV
- Patients coming for Emergency surgeries
- Patients not willing to participate in the study.
- Pregnant Patients

It is a prospective, randomized, controlled, double blinded, interventional study comparing Cisatracurium and Atracurium. Randomization was done using computer generated random numbers. All patients were given Tab. Alprazolam 0.25 mg night before surgery. All patients were pre-medicated with Inj. Ondensetron 4mg IV, Inj. Pantoprazole 40 mg IV half an hour prior to surgery. The pulse rate, NIBP, ECG, SPO_2 noted. The peripheral nerve stimulator (PNS) was used for neuromuscular monitoring. Patients were preoxygenated with 100% oxygen for 3 min.All patients were induced with Propofol (2mg/kg) iv, followed by Fentanyl (2mcg/kg) iv. A TOF stimulus was delivered after induction to note baseline response and then the calculated dose of Cisatracurium or Atracurium was given.

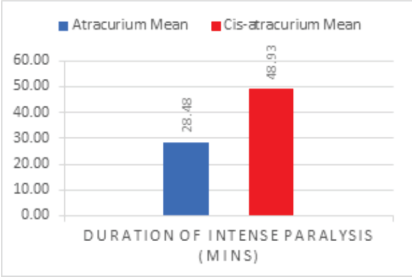
- Group A: Cisatracurium 0.1mg /kg body weight iv
- Group B: Atracurium 0.5mg/kg body weight iv.

A TOF stimulus was delivered every 30 seconds, laryngoscopy and intubation was performed as soon as the response to TOF stimulus had disappeared. Thereafter a TOF stimulus was delivered every 5 mins till 20 mins after intubation. Subsequently a TOF stimulus was delivered every 2mins until the appearance of first single twitch. The time between disappearance of the response and appearance of the first twitch was taken as the duration of intense paralysis.

RESULTS

TABLE 1: DURATION OF INTENSE PARALYSIS (MINS)

	Atracurium		Cis-atracurium		Student's t-test	
	Mean	SD	Mean	SD	t	p value
Duration of Intense Paralysis (mins)	28.48	3.58	48.93	3.47	-26.610	<0.001

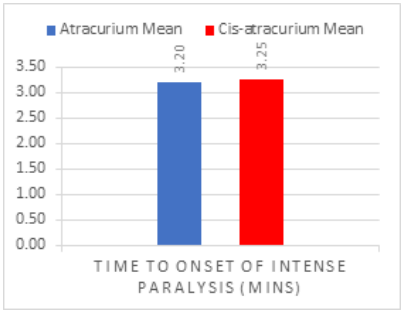


GRAPH 1: DURATION OF INTENSE PARALYSIS

There was a significant difference between the two groups in terms of Duration of Intense Paralysis (mins).

TABLE 2: TIME TO ONSET OF INTENSE PARALYSIS (MINS)

	Atracurium		Cis-atracurium		Student's t-test	
	Mean	SD	Mean	SD	t	p value
Time to Onset of Intense Paralysis (mins)	3.20	0.27	3.25	0.25	-0.831	0.408



GRAPH 2: ONSET OF INTENSE PARALYSIS

There was no significant difference between the two groups in terms of Time to Onset of Intense Paralysis (mins).

DISCUSSION

Two non-depolarising muscle relaxants of intermediate duration of action , Atracurium and Cisatracurim were compared in this study in terms of duration of intense paralysis and onset of action. Hemodynamic parameters including systolic blood pressure, diastolic blood pressure and heart rate were monitored.

Maximum duration of action of Atracurium is suggested to be 25-30 minutes and cisatracurium to be 30-35 minutes with their equipotent doses. In this study mean duration of intense paralysis in Cisatracurium group was 48.93 minutes with a dose of 0.1mg/kg which was more and statistically significant ($P < 0.001$) as compared to 28.48 mins minutes in Atracurium group with dose of 0.5mg/kg.

Similar results were observed by El –kasaby et al.[5] Bluestein and colleagues in their study observed that increasing the dose of cisatracurium (from 0.1 to 0.15 and 0.2 mg/kg) increases the mean time of clinically effective duration (45 to 55 and 61 min, respectively).[47] C.E. Smith, compared duration of action of cisatracurium 0.1mg/kg and atracurium 0.5mg/kg and found no statistical significance.[6]

In our study mean onset of action in cisatracurium group was 3.25 minutes and atracurium group was 3.20 minutes which was not statistically significant. El –kasaby et al in his study while comparing 3 groups of cisatracurium in different doses(2×ED95, 4×ED95, 6×ED95 dose) with 1 group of atracurium (2×ED95 dose). They observed that with the higher doses of cisatracurium (4×ED95 and 6×ED95) onset of action was significantly faster than with atracurium.[5]

In this study we found that, both groups had no significant difference in terms of change of pulse rate, no significant difference in terms of change of systolic BP, as evident by the results of 2-way repeated measures ANOVA. There was a significant difference between the two groups in terms of change of diastolic BP, as evident by the results of 2-way repeated measures ANOVA. There was fall of diastolic BP in the patients treated with cis-atracurium. El –kasaby et al in his study reported that hemodynamic stability for both heart rate and mean arterial blood pressure were more evident even with higher doses of cisatracurium.[5]

In this study we found that, two patients in atracurium group had skin rashes and bronchospasm. Similarly A. M. El-Kasaby, in his study while comparing atracurium with different doses of cisatracurium observed similar results where 2 case who received atracurium had signs of histamine release.[5] Also Basta SJ et al reported that atracurium releases histamine when doses of 0.5 mg/kg (two times ED95) or more are injected rapidly.[7]

CONCLUSION

This study concluded that there was a statistically significant difference in the duration of intense paralysis between the two groups .Cisatracurium had a longer duration of intense paralysis compared to Atracurium. There was no statistically significance difference in the onset of intense paralysis between the two groups.

Conflicts of Interests- Author declares no conflict of interest.
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Ethical approval - Obtained
Informed consent- Obtained

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