



COMPARISON OF EFFICACY OF ATRACURIUM AND CISATRACURIUM IN PATIENTS UNDERGOING ABDOMINAL SURGERIES UNDER GENERAL ANESTHESIA AT DMCH, LAHERIASARAI, BIHAR

Anaesthesiology

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ABSTRACT

Background: The present study was done to test compare the efficacy of atracurium and cisatracurium regarding onset time, intubating conditions, hemodynamic effects, duration of action, signs histamine release and evaluate whether cisatracurium is more effective than atracurium with regard to the criteria.

Materials And Methods: This study was done in the Department of Anaesthesia, Darbhanga Medical College and Hospital, Laheriasarai, Bihar. Study was done for a period from July 2019 to November 2020. An informed consent was taken from all patients. Group A (25 patients) received Atracurium 0.5mg/kg IV and Group B (25 patients) received Cisatracurium 0.3mg/kg IV.

Results: Duration of action of Cisatracurium (0.3 mg/kg) is significantly high compared to Atracurium (0.5mg/kg) with $p < 0.001$. 83% of patients treated with Cisatracurium had excellent intubating conditions as compared to 47% with Atracurium which was significant. Hemodynamic changes in either of them were clinically insignificant. Signs of histamine release was seen in two patients in Atracurium group whereas none in Cisatracurium group.

Conclusion: Cisatracurium at a higher dose of 0.3mg/kg as compared to Atracurium 0.5mg/kg provided more effective and rapid neuromuscular blockade with excellent intubating conditions, longer duration of action, stable hemodynamics and no associated signs of histamine release clinically.

KEYWORDS

Atracurium, Cisatracurium, Neuromuscular Monitoring

INTRODUCTION

Cisatracurium is a new intermediate duration, non-depolarizing, benzyloisoquinolinium neuromuscular blocking drug which is a stereoisomer of atracurium with a potency of approximately 3 to 4 times greater than that of atracurium. Despite the higher potency, cisatracurium is associated with more stable hemodynamics than atracurium and does not cause histamine release even at doses of up to 0.4mg/kg ($8 \times ED_{95}$). The recommended intubating dose is 0.15mg/kg ($3 \times ED_{95}$) and higher.

The same dose ($2 \times ED_{95}$) atracurium is more effective neuromuscular blocking agent than cisatracurium. However, higher doses of cisatracurium 0.2mg/kg ($4 \times ED_{95}$) and 0.3mg/kg ($6 \times ED_{95}$) provide more effective, more rapid neuromuscular blocking with longer duration of action, stable hemodynamic status and no signs of histamine release clinically during abdominal surgery.

The present study was first of its kind in DMCH, Laheriasarai, Bihar and will compare the neuromuscular blocking and hemodynamic effects of the above drugs and thereby assess the cost effectiveness.

OBJECTIVES OF THE STUDY

1. To compare the efficacy of atracurium and cisatracurium regarding onset time, intubating conditions, hemodynamic effects, duration of action & signs histamine release.
2. To evaluate whether cisatracurium is more effective than atracurium with regard to the above criteria.
3. To assess the cost effectiveness of using each of the drugs.

MATERIAL AND METHODS

Patients undergoing abdominal surgeries under general anaesthesia at Darbhanga Medical College & Hospital, Laheriasarai, Bihar. 50 patients of ASA Grade I & II aged 20 to 65 years of both sexes who are posted for abdominal surgeries were included. Patients with

cardiovascular, hepatic, renal or neuromuscular system disorders, patients with air way problems suggesting difficult intubation, patients receiving drugs known to interact with neuromuscular blocking agents were excluded from the study.

Method of collection of data (including sampling procedure if any)

Double blind randomized study was conducted on 50 patients after written informed consent. Details of the group and the drug to be given were sealed within envelopes, which are to be randomly picked and administered by the anesthesiologist unrelated to study. Group A (25 patients) will receive atracurium 0.5mg/kg IV and group B (25 patients) will receive cisatracurium 0.3mg/kg IV.

Baseline hemodynamic parameters (systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate) recorded. All patients will be premedicated with inj. midazolam 1mg IV. General anaesthesia will be induced in all patients with inj. fentanyl (1.5mcg/kg), inj. propofol (2mg/kg) IV.

The muscle relaxant will be given for patients according to the previously mentioned initial doses for each group. After 2 min, endotracheal intubation will be done using proper size tube (male: 8-8.5, female: 7-7.5) and the condition of intubation will be assessed and recorded as excellent, good, poor, or impossible based on the degree of jaw relaxation, vocal cords position and intubating responses. Anaesthesia maintained with N_2O/O_2 / isoflourane/boluses of the muscle relaxant (10% of the initial dose).

Hemodynamic parameters recorded at regular timed intervals during the surgery. Onset and duration of action recorded using neuromuscular monitor. Patients will be monitored for any signs of histamine release clinically through skin changes graded as flush (if redness lasted > 120 s), erythema, or wheals and presence of any hemodynamic changes or bronchospasm. Reversal will be achieved by administration of inj. neostigmine 2.5mg and inj. glycopyrrolate 0.5mg IV.

RESULTS**Table 1: Onset Time**

Onset time	Atracurium		Cisatracurium	
	No.	%	No.	%
110-150	2	8	25	100.0
160-200	23	92	0	0.0
Total	25	100.0	30	100.0
Mean $\pm$ SD	174.00 $\pm$ 13.02		122.33 $\pm$ 13.82	

Table 2: Duration Of Action Of Loading Dose (min)

Duration	Atracurium		Cisatracurium	
	No.	%	No.	%
35-40	17	68.0	0	0.0
41-50	8	32.0	0	0.0
51-60	0	0.0	25	100.0
Total	25	100.0	25	100.0
Mean $\pm$ SD	38.60 $\pm$ 2.90		70.21 $\pm$ 3.86	

Table 3: Intubating Condition

Intubation	No.	Atracurium %	No.	Cisatracurium
Poor	1	4.0	0	0
Good	12	48.0	4	16.0
Excellent	12	48.0	21	84.0
Total	25	100.0	25	100.0

Onset time taken for maximal depression of twitch response in train of four stimulus was found to be significantly lower with higher doses of cisatracurium (0.3mg/kg) than with atracurium (0.5mg/kg). Regarding the duration of action, higher doses of cisatracurium (0.3mg/kg) showed statistically significant longer duration of action than lower doses of cisatracurium and the atracurium (0.5mg/kg).

Excellent intubating conditions were observed in 48% and 84% of patients in Group A and B respectively. Good intubating conditions were observed in 48% and 16% of patients in Group A and B respectively. Poor intubating conditions were observed in one patient in Group A and none in Group B.

Heart rate changes were statistically insignificant between two groups. MAP was gradually decreased from preoperative values after 5 min of giving Atracurium. But this change was not observed with Cisatracurium. No signs of histamine release were noted with cisatracurium, whereas it was noted with atracurium in 2 cases.

Statistical Methods:

Descriptive and inferential statistical analysis has been carried out in the present study. Results are presented on Mean $\pm$ SD. Student t test, Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two groups. P value <0.05 is taken as significant.

DISCUSSION:

Cisatracurium is a new stereoisomer of atracurium with a potency of approximately 3 to 4 times greater than that of atracurium and is associated with stable hemodynamics without histamine release even at doses of up to 0.4mg/kg. The recommended intubating dose is 0.15mg/kg & higher.

In the present study, clinical comparison was made Atracurium besylate and Cisatracurium besylate. Initial (bolus) doses of the muscle relaxants administered were Atracurium (0.5mg/kg) and Cisatracurium (0.3mg/kg). All patients were assessed for hemodynamic state (heart rate, blood pressure), onset time, duration of action, and signs of histamine release clinically and intubating conditions. The neuromuscular monitoring is done to assess the onset time and duration of action.

In this study onset time was observed by time taken from injection of loading dose of muscle relaxant to maximal suppression of twitch response in train of four stimulation. Onset time was found to be significantly shorter for Cisatracurium 0.3mg/kg when compared to Atracurium 0.5mg/kg which is highly significant. (p<0.001**)

Similar to our study haemodynamics more stable in cisatracurium group compared to atracurium while in other studies the haemodynamics stable and comparable between the two groups. One study quoted that atracurium causes decrease in blood pressure due to release of histamine induced by atracurium. and also due to rapid

administration. Other study quotes that attempts of tracheal intubation done following complete paralysis of larynx detected by neuromuscular block monitoring of adductor pollicis compared to clinical monitoring results in less haemodynamic response. The tachycardia seen with benzylisoquinolinium compound is the result of histamine release. In our study there was increase in heart rate and blood pressure but within 20% of baseline in atracurium group. This can be due to more time taken in this group for intubation. Similar to our study no side effects or signs of histamine release seen in either of the groups but other studies found more side effects with atracurium compared to negligible side effects in cisatracurium group while few studies observed side effects in both groups and they were statistically significant with more side effects in atracurium groups. The side effect of histamine release is most often noted following administration of the benzylisoquinolinium class of muscle relaxants. The effect is of short duration (1-5mins), is dose related and clinically insignificant in healthy patients. And this side effect can be reduced considerably by using a slow injection rate. Erythema of face, neck and upper torso develop when large doses given. The clinical effects of histamine are seen when plasma concentration increases 200% to 300% of baseline values and these effect involve chemical displacement of the contents of mast cell granules containing histamine, prostaglandin and possible other vasoactive substances. The serosal mast cell located in the skin and connective tissue and near blood vessels and nerves is principally involved in degranulation process.

CONCLUSION:

Cisatracurium at a higher dose of 0.3mg/kg as compared to Atracurium 0.5mg/kg provided more effective, more rapid neuromuscular blockade with excellent intubating conditions, longer duration of action, stable hemodynamic status without clinical significant changes in HR and MAP, and no associated signs of histamine release clinically. Hence Cisatracurium, though more costly, is more effective and a better isomer of Atracurium.

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