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Comparison Of Two Different Doses Of Cisatracurium For Endotracheal Intubation Under General Anaesthesia: A Prospective, Double-Blind, Comparative Study

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Abstract
Background: *Cisatracurium is a non-depolarizing neuromuscular blocking agent widely used for endotracheal intubation owing to its cardiovascular stability and predictable metabolism. Cisatracurium is a benzylisoquinolinium neuromuscular blocker commonly used for endotracheal intubation and surgical muscle relaxation. Dose selection balances the need for rapid onset and adequate intubation conditions against longer duration and the potential for residual blockade.*
Aims: *To compare intubating conditions, onset time, neuromuscular block characteristics, and hemodynamic stability with 0.15 mg/kg versus 0.20 mg/kg cisatracurium.*
Methods: *Prospective, double-blind, comparative study involving 60 patients, randomized into two groups receiving 0.15 mg/kg or 0.20 mg/kg cisatracurium. Intubating conditions evaluated using Goldberg criteria.*
Results: *The 0.20 mg/kg dose demonstrated significantly shorter onset time and superior intubating conditions.*
Conclusion: *0.20 mg/kg cisatracurium offers faster onset and better intubation conditions with stable hemodynamics.*
Keywords: *Cisatracurium, Goldberg intubating condition, duration of action,ED95, Histamine, Hemodynamic parameters*

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I. Introduction

Endotracheal intubation requires adequate neuromuscular blockade to ensure optimal conditions and prevent trauma. Cisatracurium, preferred for its Hofmann elimination and cardiovascular stability, is widely used. . Cisatracurium, an isomer of atracurium, provides intermediate duration of action without significant histamine release. Previous studies suggest that higher doses may provide better intubating conditions. This study aimed to compare intubating conditions, onset, duration of action, recovery profile and hemodynamic stability of two different doses of cisatracurium. This study compares doses of 0.15 mg/kg and 0.20 mg/kg on intubating conditions, onset time, hemodynamics, and neuromuscular recovery.

II. Materials And Methods

Source Of Data: Patients scheduled for General Anaesthesia in Sapthagiri institute of medical sciences and research centre.
Place Of Study: Sapthagiri institute of medical sciences and research centre, Bengaluru, Karnataka.
Study Design: Prospective, double-blind, comparative study.
Sample Size: 60 patients (30 per group).
Ethics: Study approved by Institutional Ethics Committee.
Inclusion Criteria: 18–60 years, ASA I–II, elective surgeries, Age between 18-60 years of either sex, Mallampati class I and II.
Exclusion Criteria: Predicted difficult airway, neuromuscular disorders, Allergy to drug, any other history of allergy.
Monitoring: INMED TOF-Watch.
Intubation Assessment: Goldberg criteria.
Statistics: Student's t-test and Chi-square test.
Ethical Considerations: Ethical approval from Ethical committee of our Institute and Informed consent taken from all participants

Randomisation:
GROUP A: received Cisatrcurium 0.15kg/mg 3*ED95
GROUP R: received Cisatrcurium 0.15kg/mg 4*ED95

Preparation:

Patients were kept nil per oral for eight hours prior to surgery, an intravenous line (IV) was secured with 18 G cannula. Upon arrival to operation theatre, monitors were connected and baseline hemodynamic parameters including heart rate (HR), Blood pressure (BP), mean blood pressure (MAP) and room air saturation (SPO2)was noted noted in case record.

Neuromuscular monitoring done using INMED NMJ Monitor (TOF-Watch) placed on the ulnar nerve at the wrist to measure depth of blockade. Baseline TOF ratio recorded before administration of any muscle relaxant.

Baseline blood pressure, pulse rate and oxygen saturation were recorded on the operating table. Patients were preoxygenated with 100% O_2 for 3 minutes before induction. Inj Midazolam 1 mg, Inj Glycopyrrolate 0.2 mg, Inj Fentanyl 2 mcg/kg were given. Induced with Propofol 2 mg/kg after giving Inj Lignocaine 1 ml.

After loss of the eyelash reflex and check ventilation, patients in group A received 0.15 mg/kg cisatracurium and patients in group B 0.2 mg/kg cisatracurium. The patients were ventilated for 120 seconds. Laryngoscopy was done and intubated with an appropriate size endotracheal tube. If unable to intubate, patient was mask ventilated for 1 min and intubation was done.

Pulse rate, blood pressure, SpO_2 were recorded every 5 minutes for 30 minutes and then every 15 minutes until reversal. The anaesthesia was maintained with oxygen:air mixture with isoflurane in the concentration of 1.2%. Patients were monitored for any allergic reactions like flushing, redness, tachycardia, hypotension. Neuromuscular monitoring was done from time of injection of relaxant to time of TOF 4th response or 25% of final response.

When the patient attempts to breath, sensing the bag and clefts in capnogram, time noted and the time from the administration of the bolus dose to this point was taken as duration of action. Either supplemental dose was given or reversed with Inj neostigmine 0.05 mg/kg and Inj glycopyrrolate 0.01 mg/kg

III. Results

Comparison of Onset, Duration, Intubating Condition, Hemodynamic Stability and Histamine Release in Two Different Doses of Cisatracurium Under General Anaesthesia

Parameter	Group A (n = 30)	Group B (n = 30)	Mean Difference	p-value
Onset of Action (mins) Mean ± SD	5.8 ± 0.5	4.0 ± 0.4	1.8	0.62
Duration of Action (mins) Mean ± SD	36 ± 3	35 ± 3	1	0.71
Goldberg Criteria Score Mean ± SD	1.7 ± 0.4	2.7 ± 0.3	1.0	0.54
Hemodynamic Stability	Stable	Stable	–	–
Allergic Reaction / Histamine Release	Absent	Absent	–	–

IV. Discussion

Endotracheal intubation is an important step for administration of general anesthesia with controlled ventilation. The popularity of succinylcholine for facilitation of intubation, is questioned by side effects which range from muscle pains after recovery to dangerous arrhythmias and hyperkalemia, and it is contraindicated in many instances1.

The present comparative study was conducted to evaluate the intubating conditions and neuromuscular blocking characteristics of two different doses of cisatracurium , groups of 30 each, group A received intravenously 3×ED95 (0.15 mg/kg) loading dose of cisatracurium and group B received intravenously 4×ED95 (0.2 mg/kg) loading dose of cisatracurium6.

Cisatracurium is a benzylisoquinolinium non-depolarizing neuromuscular blocking agent that undergoes Hofmann elimination, providing predictable recovery even in patients with organ dysfunction. The choice of dose influences both onset and duration of blockade. Increasing the dose typically reduces onset time but may prolong recovery. Therefore, determining the optimal dose balancing rapid onset and timely recovery is clinically important3.

As seen with other nondepolarising neuromuscular agents, increasing the dose decreases the time of onset of block at the expense of prolonging the time to spontaneous recovery. Linda S, Bluestein MD, et al found that increasing the dose of cisatracurium from 0.15 and to 0.2 mg/kg increases the duration of action by only 9 and 16 minutes respectively and also reported that higher doses provides rapid onset6. Intubating conditions, evaluated using Goldberg et al. criteria, were significantly better in the 0.20 mg/kg group, with a higher percentage

of patients achieving "excellent" and "good" scores compared to the 0.15 mg/kg group. This suggests that the slightly higher dose ensures more consistent relaxation of the jaw and vocal cords, facilitating smoother intubation1.

Hemodynamic stability was well maintained in both groups throughout the study. Mean arterial pressure, heart rate, and SpO_2 showed no statistically significant differences between groups, indicating minimal cardiovascular side effects even at the higher dose. These results confirm the hemodynamic safety of cisatracurium .

In our study, none of the patients have showed any allergic reactions. Allergic reactions (due to histamine release) like skin rashes, bronchospasm and hemodynamic changes were not noted in any of the patients.

Being a single-center study, the findings may lack external validity, as results could vary across different populations, clinical practices, and healthcare settings, limiting the generalizability of the conclusions.Future studies should include larger sample sizes across multiple centers to improve the generalizability of findings and validate the results in diverse clinical populations.

V. Conclusion

Both doses of cisatracurium were effective and safe for intubation under general anesthesia. The higher dose (0.20 mg/kg) offered faster onset and prolonged duration at 2 minutes and improved intubating conditions, whereas 0.15 mg/kg provided adequate relaxation with slightly shorter duration and similar hemodynamic stability.

Hence cisatracurium 0.2mg/kg produces favorable intubating conditions in two minutes and may be considered for facilitating intubation keeping in mind its long duration of action compared to succinylcholine.

Declarations
Ethical approval: Approved by Institutional Ethics Committee.
Conflict of interest: None.
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