Original Article

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# A Comparative Study of Atracurium and Cisatracurium for Assessment of Intubating Conditions

**Pooja Shah**[1], **Rahul Chalekar**[2]

[1]Assistant Professor, Department of Anesthesiology & Critical Care, Subbaiah Institute of Medical Sciences, Shimoga, Karnataka, India, [2]Senior Resident, Department of Anaesthesia and Critical Care, BLDEA'S(DU) Shri B M Patil Medical College and Research Centre, Vijayapur, Karnataka, India.

## Abstract

**Background:** The present study was conducted to compare atracurium and cisatracurium for the assessment of intubating conditions. **Subjects and Methods:** 60 patients of the American Society of anaesthesiology (ASA) class I and II between the age group of 20-60 years were randomly divided into 2 groups of 30 each. Group I received atracurium in the dose of 0.5 mg/kg body weight and group II patients received cis-atracurium in the dose of 0.2 mg/kg body weight. Parameters such as arterial blood pressure, heart rate and onset time and duration of action were recorded. **Results:** The mean onset of action in group I was 3.4 minutes and in group II was 2.6 minutes. The mean duration of action in group I was 36.2 minutes and in group, II was 64.1 minutes. The mean heart rate was 98.2 beats/min, 96.1 beats/mins and 109.3 beats/mins at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 93.5 beats/min, 98.5 beats/min and 97.4 beats/min respectively in group II. The mean arterial pressure was 89.6 mmHg, 93.7 mmHg and 98.5 mmHg at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 90.4 mmHg, 92.5 mmHg and 94.1 mmHg respectively in group II. The difference was significant (P< 0.05). **Conclusion:** Cisatracurium is more efficacious as compared to atracurium with respect to intubating conditions.

**Keywords:** Cisatracurium, Intubation, Neuromuscular

**Corresponding Author:** Pooja Shah, Assistant Professor, Department of Anesthesiology & Critical Care, Subbaiah Institute of Medical Sciences, Shimoga, Karnataka, India.
E-mail: poojashah269@yahoo.co.in

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## Introduction

Atracurium and Cisatracurium are intermediate-acting nondepolarizing NMB. Cisatracurium is approximately four times as potent as atracurium. In contrast to atracurium, cisatracurium is devoid of chemically mediated histamine release. Routinely atracurium is used for the neuromuscular blockade in most pediatric surgeries. Cisatracurium is comparatively a newer drug with lesser histamine release. [1–3]

Hydrolysis by non-specific esterases is not an important pathway for cisatracurium degradation. It is not associated with histamine release in humans. Although the liver and kidneys play only a small role in the excretion of cisatracurium besilate, urinary and hepatic elimination pathways are important for the metabolites of laudanosine. According to the literature published an earlier comparison of the intubating conditions according to the 'Cooper et al scale' between 2 ED95 of atracurium and cisatracurium showed that atracurium provided better intubating conditions than cisatracurium. With regards to the onset of action, $2\times ED_{95}$ dose of atracurium had a more rapid onset of action as compared to the equivalent dose of cisatracurium ($2\times ED_{95}$). [4,5]

The magnitude of interpatient variability in the CL of cisatracurium besilate is low (16%), a finding consistent with the strict physiological control of the factors that affect the Hofmann elimination of cisatracurium besilate (i.e. temperature and pH). There is a unique relationship between plasma clearance and Vd because the primary elimination pathway for cisatracurium besilate is not dependent on organ function. The present study was conducted to compare atracurium and cisatracurium for the assessment of intubating conditions. [6]

## Subjects and Methods

The present study was conducted on 60 patients of the American Society of anaesthesiology (ASA) class I and II between the age group of 20-60 years of both genders. Ethical

approval for the study was obtained before starting the study from the institutional ethical committee. All patients were informed regarding the study and their consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were randomly divided into 2 groups of 30 each. Group I received atracurium in the dose of 0.5 mg/kg body weight and group II patients received cis-atracurium in the dose of 0.2 mg/kg body weight. Parameters such as arterial blood pressure, heart rate and onset time and duration of action were recorded. Results were tabulated and subjected to statistical analysis. A p-value of less than 0.05 was considered significant.

## Results

**Table 1: Distribution of patients**

| Parameters | Group I (30) | Group II (30) |
|---|---|---|
| Age (Years) | 28.2 | 30.4 |
| Male: Female | 18:12 | 16:14 |
| Weight (Kgs) | 56.2 | 58.1 |
| ASA I/II | 13/17 | 19/11 |

[Table 1] shows that mean age in group I was 28.2 years and in group II was 30.4 years, male: female ratio was 18:12 in group I and 16:14 in group II, mean weight was 56.2 Kgs in group I and 58.1 Kgs in group II and ASA I/II was 13/17 in group I and 19/11 in group II.

**Table 2: Comparison of onset and duration of action**

| Parameters | Group I | Group II | P-value |
|---|---|---|---|
| **The Onset of action (mins)** | 3.4 | 2.6 | 0.05 |
| **Duration of action (mins)** | 36.2 | 64.1 | 0.001 |

[Table 2, Figure 1] shows that the mean onset of action in group I was 3.4 minutes and in group II was 2.6 minutes. The mean duration of action in group I was 36.2 minutes and in the group, II was 64.1 minutes. The difference was significant (P< 0.05).

**Table 3: Assessment of heart rate**

| Group | Baseline | After injection of muscle relaxant | After the attempt of intubation | P-value |
|---|---|---|---|---|
| Group I | 98.2 | 96.1 | 109.3 | 0.01 |
| Group II | 93.5 | 98.5 | 97.4 | 0.14 |

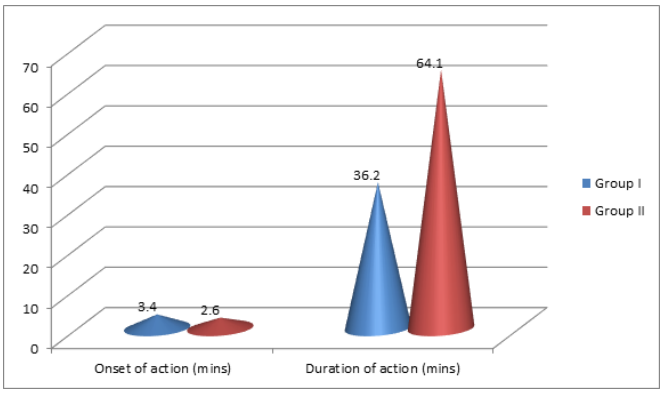


**Figure 1: Comparison of onset and duration of action**

[Table 3] shows that mean heart rate was 98.2 beats/min, 96.1 beats/mins and 109.3 beats/mins at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 93.5 beats/min, 98.5 beats/min and 97.4 beats/min respectively in group II. The difference was significant (P< 0.05).

**Table 4: Assessment of arterial pressure**

| Group | Baseline | After injection of muscle relaxant | After the attempt of intubation | P-value |
|---|---|---|---|---|
| Group I | 89.6 | 93.7 | 98.5 | 0.01 |
| Group II | 90.4 | 92.5 | 94.1 | 0.14 |

[Table 4] shows that mean arterial pressure was 89.6 mmHg, 93.7 mmHg and 98.5 mmHg at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 90.4 mmHg, 92.5 mmHg and 94.1 mmHg respectively in group II. The difference was significant (P< 0.05).

## Discussion

While selecting a neuromuscular agent for tracheal intubation or skeletal muscle relaxation, the main aim of an anaesthesiologist is to select an agent with rapid onset; longer clinical duration of action; better hemodynamic stability and good spontaneous reversal. [7] Various studies have been conducted earlier on cisatracurium to determine pharmacokinetics, pharmacodynamics, safety and efficacy. [8,9] The present study was conducted to compare atracurium and cisatracurium for the assessment of intubating conditions.

In this study, the mean age in group I was 28.2 years and in group, II was 30.4 years, male: female ratio was 18:12 in group I and 16:14 in group II, mean weight was 56.2 Kgs in group I and 58.1 Kgs in group II and ASA I/II was 13/17 in group I and 19/11 in group II. Jammar et al,[10] conducted a study in which 80 patients of ASA I and II in the age group of 20-60 years were selected. Patients were divided into two groups of 40 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 cisatracurium. After induction, MAP and HR shows a decrease in both groups but neither statistically nor clinically significant. Better hemodynamic stability and longer duration of action were found in group B compared to group A. No adverse effects were noted in both groups. 4×ED95 dose of cisatracurium provides a longer duration of action and a more stable hemodynamic status than 3×ED95. No associated signs of histamine release were detected clinically.[11]

We found that mean heart rate was 98.2 beats/min, 96.1 beats/mins and 109.3 beats/mins at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 93.5 beats/min, 98.5 beats/min and 97.4 beats/min respectively in group II. Shrey et al,[11] in their study 90 patients, 6 months-5 years, ASA class I &II were randomly allocated to cisatracurium and atracurium group. After the administration of the induction agent, a dose of neuromuscular blocking drug atracurium 0.5mg/kg or cisatracurium 0.2mg/kg was given to the patients. The intubating conditions were graded using 'Cooper et al' scoring system. In the atracurium group, the mean score according to 'Cooper et al' scale was 6.86±0.54, whereas in the cisatracurium group it was 8.12±0.64, the difference between the groups was statistically significant. The Time of onset was found to be 2.7±0.12 minutes in the cisatracurium group and 3.28±0.64 minutes in the atracurium group. The Duration of action was 64.6±6.18 minutes in the cisatracurium group as compared to 35.4±4.64minutes in the atracurium group. Cisatracurium (0.2mg/kg) is more efficacious as compared to atracurium (0.5mg/kg) with respect to intubating conditions, it has a faster onset of action, good intraoperative hemodynamic parameters, longer duration of action with no side effects.

We found that mean arterial pressure was 89.6 mm Hg, 93.7 mm Hg and 98.5 mm Hg at baseline, after injection of muscle relaxant and after the attempt of intubation respectively in group I. In group II was 90.4 mm Hg, 92.5 mm Hg and 94.1 mm Hg respectively in group II. Amini Shahram et al,[12] studied the effects of different doses of cisatracurium on the appropriate time for endotracheal intubation and hemodynamic changes during anesthesia and found that the mean clinical duration of action (recovery of evoked response to 25% 0f control) with 0.15 mg/kg was 44.93±5.40 minutes while with 0.2 mg/kg was 57.03±4.21 minutes.

The shortcoming of the study is the small sample size.

## Conclusion

The authors found that cisatracurium is more efficacious as compared to atracurium with respect to intubating conditions.

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