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Original Research Article

A Comparative Study of the Efficacy of Atracurium and Cisatracurium in Adults Undergoing Elective Surgeries

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Abstract

Introduction: The present study was conducted to compare the efficacy, intubating conditions, hemodynamic effects and recovery profile of Atracurium versus Cisatracurium in patients undergoing surgeries under General Anaesthesia. A total of 56 patients were equally divided into two groups and evaluated across various parameters including time of onset, duration of action, recovery time, intubating conditions, heart rate, blood pressure, oxygen saturation, end-tidal CO_2, signs of histamine release, and side effects. Both groups were comparable in terms of age, gender, weight, and ASA grade distribution.

Material & Method: A randomised controlled trial titled "A Comparative Study of the Efficacy of Atracurium and Cisatracurium in Adults Undergoing Elective Surgeries" were carried out at the Department of Anaesthesiology, SNR District Hospital, Kolar for a period of 15 months on patients satisfying inclusion criteria and who gives consent for the study.

Result: A total of 56 patients were equally divided into two groups and evaluated across various parameters including time of onset, duration of action, recovery time, intubating conditions, heart rate, blood pressure, oxygen saturation, end-tidal CO_2, signs of histamine release, and side effects. Both groups were comparable in terms of age, gender, weight, and ASA grade distribution.

Conclusion: The present study was conducted to compare the efficacy, intubating conditions, hemodynamic effects and recovery profile of Atracurium versus Cisatracurium in patients undergoing surgeries under General Anaesthesia. When it comes to neuromuscular inhibition, Cisatracurium outperforms Atracurium in a number of ways. Better intubating circumstances, more stable haemodynamic parameters, a longer half-life, and no adverse effects are all provided with cisatracurium. When compared to atracurium, it offered better consistency and safety. Atracurium is more cost-effective than Cisatracurium and showed a somewhat quicker beginning of action.

Introduction

Anaesthesiology is defined as the practice of medicine that provides insensibility to pain during surgical, obstetric, therapeutic, and diagnostic procedures by the American Board of Anaesthesiology [1] The reversible condition of general anaesthesia, which is brought on by drugs, includes amnesia, antinociception, immobilisation, and unconsciousness while maintaining physiological stability [2].

When administering anaesthesia during surgery, endotracheal intubation is a crucial step. Inhalation or intravenous drugs were used to produce and maintain anaesthesia prior to the development of muscle relaxants. Although tracheal intubation was rare, deep inhalation anaesthesia, which carries the danger of respiratory or cardiac depression, was used to guarantee muscular relaxation when necessary. Neuromuscular blocking medications have been used by anaesthesiologists to expedite surgery and enhance the quality of intubation from the initial administration of d-tubocurarine in 1942 to promote muscle relaxation.

The risk of trauma related to tracheal intubation is reduced under ideal intubating settings. Reduced muscular tone, ideal vocal cord position, minimal reaction to laryngoscopy, and proper endotracheal tube placement in the trachea are all characteristics of ideal intubating settings. Avoiding neuromuscular blocking drugs is linked to challenging intubation and laryngoscopy [3]. Succinyl choline is a depolarizing muscle relaxant with rapid onset of action and short duration and is the relaxant of

choice to facilitate tracheal intubation. But in addition to fasciculations, Succinylcholine has many side effects such as bradycardia, dysrhythmias, increased release of potassium, postop myalgia, increased intraocular pressure, increased intracranial tension, increased intragastric pressure, prolonged recovery in patients with pseudocholinesterase deficiency, masseter spasm and triggering malignant hyperthermia in susceptible individuals [4,5].

Since these side effects are due to depolarizing mechanism of action of succinylcholine, research has been focused on to find an ideal non depolarizing muscle relaxant with rapid onset time and offering excellent intubating conditions and lacking all the above-mentioned side effects.

The benzylisoquinolinium structure of atracurium and cisatracurium, two therapeutically useful non-depolarizing skeletal muscle relaxants (often referred to as competitive muscle relaxants), relates them chemically. Atracurium is a racemate that has ten distinct isomers, each of which has a significantly different level of action. Cisatracurium is the brand name for one of the isomers, 1R-cis atracurium.

Materials and Methods

A randomised controlled trial titled "A Comparative Study of the Efficacy of Atracurium And Cisatracurium in Adults Undergoing Elective Surgeries" were carried out at the Department of Anaesthesiology, SNR District Hospital, Kolar for a period of 15 months on patients satisfying inclusion criteria and who gives consent for the study.

Study place: SNR District Hospital, Kolar.

Study duration: 15 months

Sample size: Two groups of 28 subjects each.

Inclusion Criteria:

1. Age 20 – 50 years of both sexes undergoing surgeries under general anaesthesia without any comorbidities other than surgical indication.
2. American Society of Anaesthesiologists grade 1 and 2.
3. Patients coming for elective surgeries.

Exclusion Criteria:

1. Patients other than ASA 1 and ASA 2
2. Patients with airway problems suggesting difficult intubation.
3. Patients with disorder of cardiovascular, hepatic, renal or neuromuscular systems
4. Pregnant and lactating mothers.
5. Patients receiving drugs known to interact with neuromuscular blocking agents.
6. Patient with history of allergy.
7. Patients with co morbidities.

Methodology:

This clinical study includes the patients undergoing elective surgeries under General Anaesthesia at SNR District Hospital, Kolar for a period of 15 months. This study was conducted on patients coming under ASA 1 and ASA 2, aged between 20-50 years of either sex after taking informed written consent.

After taking informed written consent and institutional committee approval, a comparative study was carried out on adult patients. Double blind randomized study was conducted on 56 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 Anaesthesiologist unrelated to study. Baseline hemodynamic parameters (systolic blood pressures, diastolic blood pressure, mean arterial pressure, heart rate, SpO_2, respiratory rate) will be recorded.

Results

Table 1: Distribution of the Study Population Based On Age in Years

	Atracurium		Cisatracurium		Total	
	N	%	N	%	N	%
20 – 30	2	7.1%	4	14.3%	6	10.7%
31 – 40	13	46.4%	13	46.4%	26	46.4%
41 – 50	13	46.4%	11	39.3%	24	42.9%
Total	28	100%	28	100%	56	100%
Mean ± SD	39.25 ± 6.64		38.89 ± 6.76		39.07 ± 6.64	
Chi square test= 0.83, p=0.65, Not Statistically significant						

This table presents the age distribution of patients in the Atracurium and Cisatracurium groups. In the 20–30 age group, 2 patients (7.1%) received Atracurium and 4 (14.3%) received Cisatracurium, totalling 6 patients (10.7%). In the 31–40 group, 13 patients (46.4%) were in each group, totalling 26 (46.4%). In the 41–50 group, 13 patients (46.4%) received Atracuriumand 11 (39.3%) received Cisatracurium, totalling 24 (42.9%). The total number of participants in each group was 28, and the overall mean age was 39.07 ± 6.64.

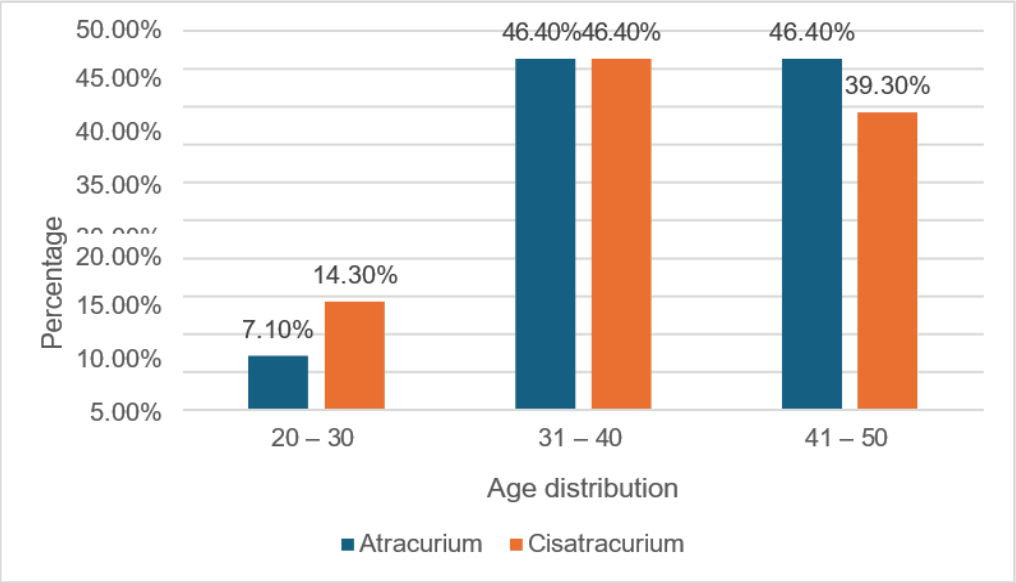

Figure 1: Age distribution

Table 2: Distribution of the Study Population Based On Gender

	Atracurium		Cisatracurium		Total	
	N	%	N	%	N	%
Male	17	60.7%	16	57.1%	33	58.9%
Female	11	39.3%	12	42.9%	23	41.1%
Total	28	100%	28	100%	56	100%
Chi square test= 0.07, p=0.78, Not Statistically significant						

This table details the gender distribution across both groups. In the Atracurium group, 17 patients (60.7%) were male and 11 (39.3%) were female. In the Cisatracurium group, 16 patients (57.1%) were male and 12 (42.9%) were female. The overall gender distribution among the 56 participants was 33 males (58.9%) and 23 females (41)

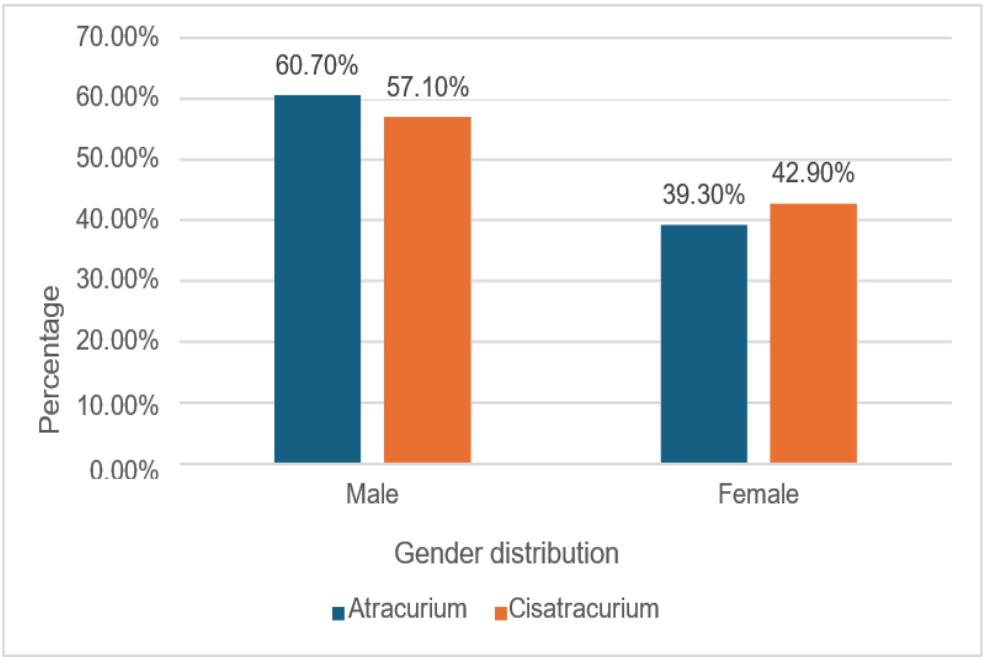

Figure 2: Gender distribution

Table 3: Distribution Based On Weight in Kg

	Atracurium	Cisatracurium	P value
Weight in kg	57.71 ± 4.60	56.21± 4.45	0.22

This table presents the average weight in kilograms of patients in both groups. The mean weight in the Atracurium group was 57.71 ± 4.60 kg, and in the Cisatracurium group, it was 56.21 ± 4.45 kg.

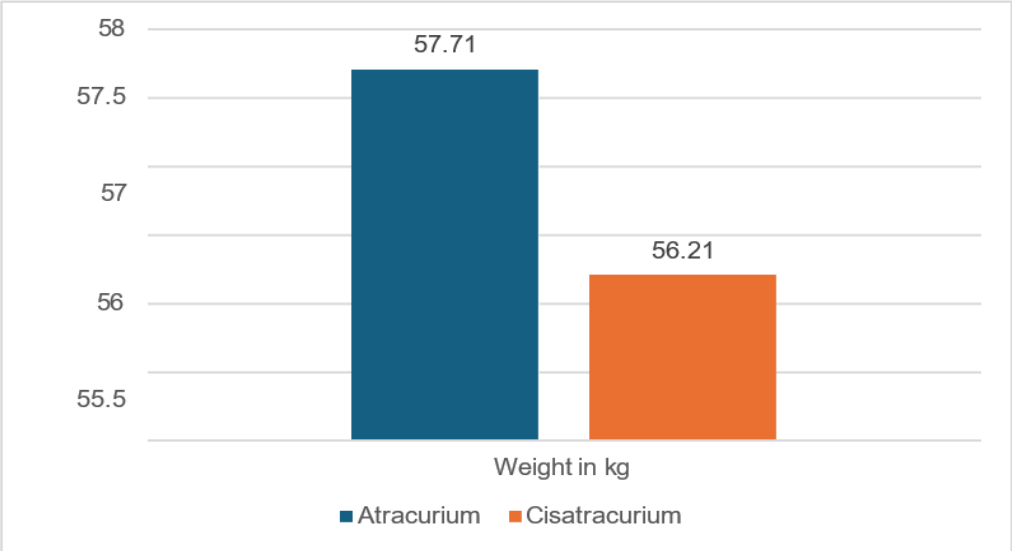

Figure 3: Weight in Kg

Table 4: Distribution Based On ASA Grading

	Atracurium		Cisatracurium		Total	
	N	%	N	%	N	%
ASA 1	11	39.29%	12	42.86%	23	41.07%
ASA 2	17	60.71%	16	57.14%	33	58.93%
Total	28	100%	28	100%	56	100%
Chi square test= 0.07, p=0.78, Not Statistically significant						

ASA physical status grading is displayed for both groups. In the Atracurium group, 11 patients (39.29%) were ASA Grade 1, and 17 (60.71%) were ASA Grade 2. In the Cisatracurium group, 12 patients (42.86%) were ASA Grade 1, and 16 (57.14%) were ASA Grade 2. The total population included 23 patients (41.07%) with ASA Grade 1 and 33 (58.93%) with ASA Grade 2.

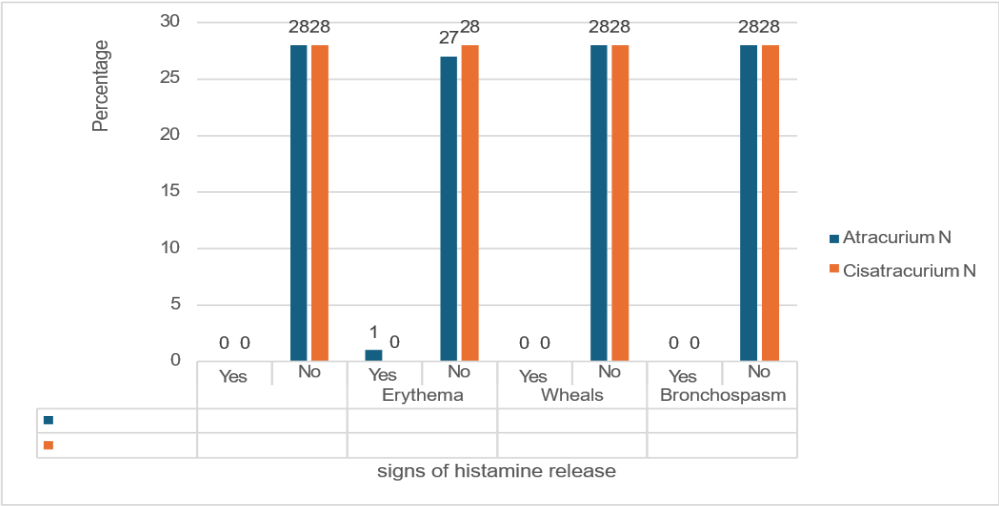

Figure 4: Signs of histamine release

Table 5: Side effects

	Atracurium		Cisatracurium		Total	
	N	%	N	%	N	%
Hypotension	2	7.1%	0	0%	2	3.6%
Skin erythema	1	3.6%	0	0%	1	1.8%

In the Atracurium group, 2 patients (7.1%) experienced hypotension and 1 patient (3.6%) had skin erythema. In contrast, there were no side effects reported in the Cisatracurium group. Overall, among the total study population of 56, there were 2 cases (3.6%) of hypotension and 1 case (1.8%) of skin erythema.

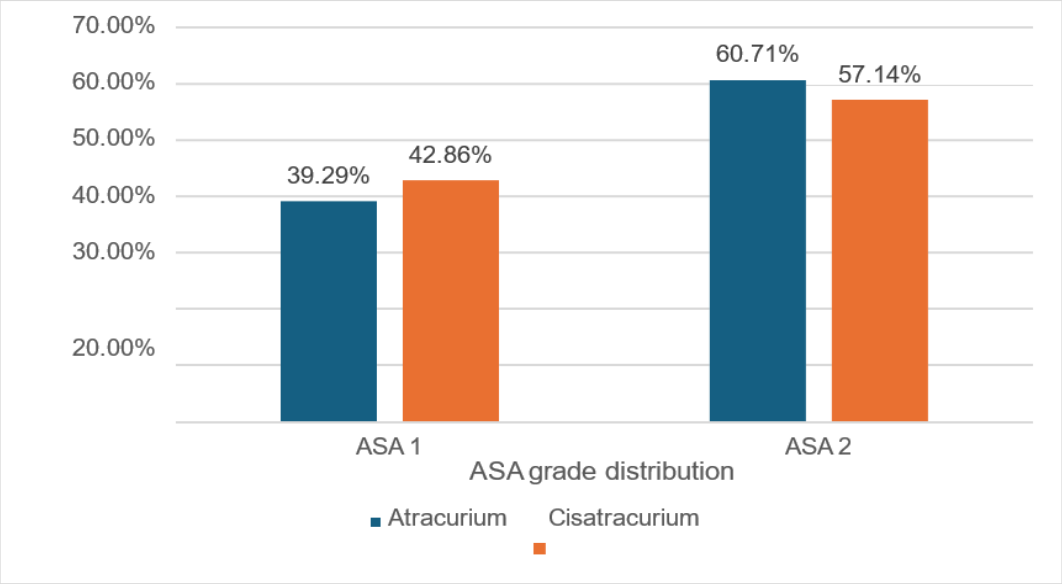

Figure 5: ASA grade distribution

Discussion

The study's participants were divided into three age groups: those aged 20–30 (10.7%), 31–40 (46.4%), and 41–50 (42.9%). The mean age of the participants was 39.07 ± 6.64 years. The mean age in the Atracurium group was 42.63 ± 16.85 years, whereas the Cisatracurium group's mean age was 43.66 ± 14.54 years, which is older than the study population in this one. This is in contrast to the study by Oza et al [6] (2024) the mean age in the Atracurium group was 42.63 ± 16.85 years and 43.66 ± 14.54 years in the Cisatracurium group, indicating an older study population than in the present study.

Similarly, in the study by Pathak et al [11]. (2023), the mean ages were 36.58 ± 10.42 years for Atracurium and 34.9 ± 9.65 years for Cisatracurium, which is comparable to the present study. Nair et al [13] (2022) categorized age into three bands: 18–20, 20–40, and 40–60 years, with the majority falling into the 20–40 years range, similar to the distribution in the present study.

In Gurjar et al [10] (2023), patients ranged from 20–65 years, but specific age group distribution was not tabulated; however, the inclusion criteria and average age suggest a comparable range. Harle et al [12]. (2022) included patients aged 20–50 years, with a similar demographic split: 41.2% aged 20–35 and 58.8% aged 36–50. This closely mirrors the age structure in the present study.

Siddiqui et al [8] (2024) reported a mean age of 36.68 ± 8.12 years, with 57.35% aged 36–50, closely aligning with the present study's age trend.

Gender Distribution: In the present study, the gender distribution in the Atracurium group included 17 males (60.7%) and 11 females (39.3%), while the Cisatracurium group had 16 males (57.1%) and 12 females (42.9%). Overall, out of 56 participants, there were 33 males (58.9%) and 23 females (41.1%). This indicates a relatively balanced gender distribution across both groups.

ASA Grading: In the present study, ASA (American Society of Anaesthesiologists) grading was used to assess the preoperative physical status of patients. In the Atracurium group, 11 patients (39.29%) were ASA Grade I, and 17 patients (60.71%) were ASA Grade II.

Signs of Histamine Release: In the present study, signs of histamine release, erythema, was noted in atracurium group. Pathak et al [11]. (2023) reported one case of transient facial flushing in the Atracurium group and no reactions in the Cisatracurium group

Side Effects: In the present study, 2 patients (7.1%) in the Atracurium group experienced hypotension and 1 patient (3.6%) had skin erythema, while no side effects were reported in the Cisatracurium group. Pathak et al [11]. (2023) similarly reported 1 case of histamine-related flushing in the Atracurium group, and none in the Cisatracurium group. Nair et al [13] (2022) observed minor adverse effects such as flushing and wheals in both groups, with no statistically significant difference. Oza et al [6] (2024) noted that while 10% of Atracurium patients experienced histamine-related side effects, Cisatracurium had no such cases.

Gurjar et al [10] (2023) reported transient hypotension in 6% of Atracurium patients and none in the Cisatracurium group. Harle et al [12]. (2022) described minor side effects like flushing and hypotension in the Atracurium group (around 5–10%), with none reported for Cisatracurium. Siddiqui et al [8] (2024) observed no adverse effects in either group, although histamine-related effects were discussed in the background.

Conclusion

When used as a neuromuscular blocking drug, Cisatracurium has a number of advantages over Atracurium. Cisatracurium has a longer half-life, more stable haemodynamic parameters, improved intubating circumstances, and no adverse effects. It offered better consistency and safety than atracurium. Compared to Cisatracurium, Atracurium is more cost-effective and showed a somewhat quicker beginning of action.

Cisatracurium is recommended for patients whose haemodynamic stability is a concern due to its superior cardiovascular haemodynamics and lack of histamine-mediated side effects. For general anaesthesia treatments that need for extended neuromuscular blockade and a smooth recovery, cisatracurium may be a safer and more effective option than atracurium for muscle relaxation.

References

1. Urban BW, Bleckwenn M. Concepts and correlations relevant to general anaesthesia. British journal of anaesthesia. 2002 Jul 1; 89(1):3-16.
2. Brown EN, Pavone KJ, Naranjo M. Multimodal general anesthesia: theory and practice. Anesthesia & Analgesia. 2018 Nov 1; 127(5):1246-58.
3. Dr. Mitali KhobragadeN, Et.Al. "Comparative study of Atracurium and cisatracurium for intubating conditions under general anaesthesia." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(2), 2020, pp. 52-56.
4. Hager HH, Burns B. Succinylcholine Chloride. [Updated 2023 Feb 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan.
5. Dexter, Franklin MD, PhD*; Epstein, Richard H. MD, CPHIMS†; Wachtel, Ruth E. PhD, MBA‡; Rosenberg, Henry MD§. Estimate of the Relative Risk of Succinylcholine for Triggering Malignant Hyperthermia. Anesthesia & Analgesia 116(1): p 118-122, January 2013. | DOI: 10.1213/ANE.0b013e31826f5e3b.
6. Oza VP, Parmar VS, Patel MB, and Thakkar FC.Efficacy of Cis-atracurium vs Atracurium in Patients undergoing Abdominal Procedures: A Randomised Clinical StudyJ Clin of Diagn Res.2024; 18(4):UC26-UC30.
7. Nazemroaya B, Taei S. Comparison of the Impact of Atracurium and Cisatracurium on the Neutrophil-To-Lymphocyte Ratio in Addition to Hemodynamic Changes during Anesthesia Induction. Archives of Anesthesiology and Critical Care. 2024 Jun 19; 10(Supp. 2):608-14.
8. Siddiqui A, Raza S, Shafqat S, Zehra S, Bozdar S, Munir M. Comparison of The Variability of Recovery Profile and Hemodynamic Effects of Neuromuscular Blockade with Cisatracurium Versus Atracurium. Biol Clin Sci Res J. 2024 Mar; (1):761.
9. Sarvepalli Shravya Et Al; "Efficacy of Low Dose Cis-Atracurium and Low Dose Atracurium in Facilitating I-Gel Insertion: A Randomized Comparative Study2023; 12(06).
10. Gurjar Vs, Lall T, Meena S. Comparative Study of Cisatracurium and Atracurium in Different Doses for Intubation During General Anesthesia in Lower Abdominal Surgery: A Prospective Randomized Double-Blind Interventional Trial. Int J Curr Pharm Res.; 15(4):57-60.
11. Pathak DG, Dutta S. Comparison of efficacy of atracurium and cisatracurium in patients undergoing surgeries under general anaesthesia. International Journal of Scientific Research. 2023 Apr 1; 6–9.
12. Harle P, Goyal P, Gupta A, Jain N, Kothari D. A clinical comparative study to evaluate the efficacy of intubating doses of atracurium and cisatracurium in patients undergoing general anesthesia. Asian Journal of Medical Sciences. 2022 Nov 1; 13(11):38-44.
13. Nair VS, Gangadhar S, Krishnamurthy TK. A comparative study of atracurium and cis-atracurium for intubating conditions under general anaesthesia. International Journal of Scientific Research. 2022; 37–40.
14. Shaikh SA, Jadhav AB, Patil AR, Sahasrabudhe AD. Efficacy of Different Doses of Cisatracurium for Intubation for Surgeries

under General Anaesthesia- A Randomised Clinical StudyJ Clin of Diagn Res.2022; 16(3):UC01-UC04.
15. Upadhyay M, Narang D, Chaurasia A, Kumar G. Comparative study to evaluate equipotent doses of cisatracurium and atracurium in patients undergoing abdominal laparoscopic surgery. Anaesthesia, pain & intensive care. Anaesthesia, Pain & Intensive Care; 2021; 25(5).
16. Aswani B, Arun kumar A, Mavanavila Vijayakumar D, Balamurugan B. Comparison of efficacy of atracurium versus cisatracurium in patients undergoing surgeries under general anaesthesia. Annals of Tropical Medicine and Public Health. 2020 Oct 1; 23(15):231–519.
17. Subha P, Jeyalakshmi B, Ananda M. A prospective randomized comparative study of the efficacy of atracurium and cisatracurium during general anaesthesia. Comprehensive Publications; 2020; 3(1):122–6.
18. Mohanty AK. Cisatracurium in different doses versus Atracurium during general anaesthesia for thyroid surgery: A comparative study. Journal of medical science and clinical research. Valley International; 2018; 6(7).
19. Bakhshi R, Nagaria A, Mohite S, Ahluwalia G. Comparison of neuromuscular blockade and recovery characterstics of cisatracurium besylate versus atracurium besylate in adult surgical patients. J Med Sci Clin Res. 2016 Dec; 4(12):14613-21.
20. El-Kasaby A, Atef HM, Helmy AM, El-Nasr M. Cisatracurium in different doses versus atracurium during general anesthesia for abdominal surgery. Saudi Journal of Anaesthesia. Medknow Publications; 2010; 4(3):152–7.
21. Utting JE. The era of relaxant anaesthesia. Br J Anaesth 1992; 69(6):551–3.
22. Adeyinka A, Layer DA. Neuromuscular Blocking Agents [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2020 [cited 2020 Jul 26]. Available from: Http://Www.Ncbi.Nlm.Nih.Gov/Books/NBK537168/
23. Gillies D, Wynands JE. Harold Randall Griffith. The pioneer of the use of muscle relaxants in anaesthesia. Br J Anaesth 1986; 58(9):943–5.
24. Kyle RA, Shampo MA. Harold R. Griffith--introduction of muscle relaxants to anesthesia. Mayo Clin Proc 1992; 67(3):237.
25. Cook D, Simons DJ. Neuromuscular Blockade [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2020 [cited 2020 Jul 26]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK538301/.