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"To compare the clinical efficacy of intubating dose of atracurium versus cisatracurium in patients undergoing elective surgical procedures under general anaesthesia".

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Abstract:-
Background:- Neuromuscular blocking agents play a vitol role in facilitating tracheal intubation during general anaesthesia. The process of laryngoscopy and endotracheal intubation is commonly associated with a pressor response which can cause significant cardiovascular changes and can adversely affect the patient outcomes. Hence, these response needs to be suppressed.
Aim:- To compare the clinical efficacy of intubating dose of atracurium versus cisatracurium in patients undergoing elective surgical procedures under general anaesthesia".
Methods and materials :- A randomized double blind study was conducted in 60 participants (30 each) were allocated into 2 groups using sealed enveloped technique for comparing the clinical efficacy of intubating dose of Atracurium (Group A 0.5mg/kg) versus Cisatracurium (Group C 0.2mg/kg) in patients undergoing elective surgical procedures under general anaesthesia using neuromuscular monitor that is Train of four (TOF). The analysed parameters included demographic profiles and Hemodynamic Variables such as heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, Spo2. Hemodynamic parameters was assessed at baseline, immediate after intubation, 1 minute,5-minute, 20-minute, 35 minutes, 60minute as well as post-surgery. Additionally, Onset time, duration of action, intubating conditions, Intubation grading and side effects were evaluated.
Results:- Demographic parameters like age, sex, weight, ASA grade, mallampati were comparable but, not statistically significant for affecting the haemodynamic parameters in our study. The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was increased significantly, immediately after intubation, at 1minute, at 5 minutes with Atracurium compared to Cisatracurium.Vocal cords were more relaxed with Cisatracurium compared to Atracurium. Response to intubation was better tolerated with Cisatracurium compared to Atracurium. Intubation conditions were excellent in Cisatracurium compared to Atracurium.Onset time was early in Cisatracurium compared to Atracurium. Duration of action was prolonged in Cisatracurium compared to Atracurium. None of the groups had Seizures, Nausea & Vomiting, Bronchospasm, Allergic reactions but hypotension and tachycardia was noted in atracurium.

Conclusion:- We conclude that Cisatracurium(0.2mg/kg) provides more stable hemodynamic parameter with rapid onset and prolong duration of action with optimal intubating conditions and with less or no signs of histamine release compared to Atracurium (0.5mg/kg). Hence, Cisatracurium(0.2mg/kg) can be used as an ideal non depolarizing muscle relaxant.Therefore, Cisatracurium is safe and more effective neuromuscular blockade which can implicated in our routine practice.
Keywords :- cisatracurium, intubation, general anaesthesia, muscle relaxant.

I. INTRODUCTION

General anaesthesia is a medically induced, reversible state that ensures unconsciousness, amnesia, analgesia and akinesia while maintaining stable autonomic, cardiovascular, respiratory and thermoregulatory system.[1]A fundamental responsibility of the anaesthesiologist is to maintain a patent airway, ensuring adequate ventilation and oxygenation.[2]**Endotracheal intubation**, a critical component of general anaesthesia, requires optimal muscle relaxation, an appropriate depth of anaesthesia and skilled anaesthesiologists.However, **Laryngoscopy and intubation** can trigger a significant physiological stress response due to sympathetic nervoussystem activation, leading to sudden haemodynamics changes, which may precipitate myocardial ischemia, especially in patients with pre-existing heart conditions.[3] **Neuromuscular blocking agents (NMBAs)** are essential drugs in modern anaesthesia practice. The ideal NMBAs should have rapid adequate muscle relaxation, haemodynamic stability and a predictable return of muscle function with minimal side effects.[4] **Succinylcholine,** a Depolarizing NMBAs is widely used due to its rapid onset and short duration of action, but has several side effects including bradycardia, hyperkalemia, post-operative myalgia, increases intraocular &intracranial pressure, prolonged paralysis in patients with Pseudocholinesterase deficiency.[5]

Atracurium, an non-depolarizing NMBAs, gained popularity due to its shorter half-life and favourable non enzymatic degradation making suitable for patientswithrenalorhepaticimpairment.However,itssignificanthistamine release can cause cardiovascular instability.[6]
Cisatracurium, a cis isomer of atracurium is 3 to 4 times more potent, providing a more stable haemodynamic profile and a lower risk of histamine release. [7]
Neuromuscular monitor, particularly **the Train of four (TOF)** plays a crucial role in patients' safety by ensuring appropriate dosing, preventing unintended intraoperative awareness and reducing the risk of postoperative respiratory complication. [8]
"There are fewer studies evaluating the individual effect of Atracurium and Cisatracurium on haemodynamic response to laryngoscopy &intubation using **TOF monitoring.** However,very limited comparative data exist. This **study** specifically addresses this gap by directly comparing Atracurium (0.5mg/kg) versus Cisatracurium (0.2mg/kg) in terms of efficacy, haemodynamic stability and side effect profiles".

AIM
"To compare the clinical efficacy of intubating dose of atracurium versus cisatracurium in patients undergoing elective surgicalprocedures under general anaesthesia".

II. Materials and methods

SETTING: Study was conducted in Department of Anaesthesiology and critical care, Chhattisgarh Institute of Medical Sciences, Bilaspur (C.G.)
STUDY DESIGN: A prospective randomized double blind study design.
STUDY PARTICIPANTS: ASA Classification I and II patients of either sex aged 18-50 yrs, having Mallampati Classification I and II scheduled for elective surgeries under general anaesthesia.
STUDY DURATION: our study was started after getting permission from institutional scientific and ethics committee and was completed after the target sample size is achieved.
SAMPLE SIZE: Total 60 patients (30 each)
SAMPLING PROCEDURE
Patients were divided into 2 groups (Aand C) of 30 each, randomization was done by sealed Envelope technique using computer generated random number table.

INCLUSIONCRITERIA
1. Patients willing to participant in the study.
2. Age 18to50 years of both sexes.
3. ASAClassification1and2.
4. Mallampati Classification1and2.

EXCLUSIONCRITERIA:
1. Patient refusal.
2. Patients age<18years or >50years.
3. ASA status III or above.
4. Patients with Known Neuromuscular disease.
5. Known/Anticipated difficult airway.
6. Drop out patients in whom even after giving intubating dose of neuromuscular blockade, patient

fail to relax completely.
7. Pregnant and lactating females.
8. Patients receiving drugs known to interact with Neuromuscular blocking agents (local Anaesthetics agent, Aminoglycosides, Antiarrhythmic drugs & Diuretics).
9. Patients with known history of allergy to study drug.

MATERIALREQUIRED

1. Multipara monitor (Pulse oximeter ,Non invasive blood pressure monitoring, Electrocardiogram, End tidal carbon dioxide).
2. Peripheral neuromuscular monitor.
3. Electrodes
4. Anesthesia workstation.
5. Anaesthetic Drugs.
6. Emergency airway equipments.
7. Defibrillator

III. METHODOLOGY

- This study was conducted in department of Anaesthesiology and critical care unit Chhattisgarh Institute of Medical Sciences, Bilaspur after approval from institutional ethics committee.
- Writtenandinformedconsentwasobtainedfromall thestudyparticipants.
- All patients were thoroughly examined preoperatively with history, physical examination, and investigations.
- Xylocaine sensitivity was done one night prior to surgery.
- They were kept nil per oral atleast for 6 hours prior to surgery.
- On the day of surgery in preoperative room Patients were randomly allocated in 2 groups (AOR C) using sealed Envelope technique and then patients were shifted to Major operation theatre.
- In operation the a theater along with routine monitor, a neuromuscular monitor was attached.
- Baseline parameter PR,NIBP,SPO2,ECG was recorded.
- Intravenouslinewassecuredwith16or18GIVCannula.
- Preloadingwasdonewith500mlringerlactate.
- The study Drugs was prepared by the Anaesthesiologist who had randomly selected the study group.
- The Another Anaesthesiologist who performed the Laryngoscopy was blind to study group.
- The two electrodes of peripheral neuromuscular monitor were placed on the surface over the ulnar nerve at the wrist.
- The distal electrodes (black) were placed 1cm proximal to proximal flexion crease of the wrist and the proximal electrodes (white) was placed 2-5cm proximal to distal electrodes.
- The proximal electrode was connected to positive lead and the distal to the negative.

- All patients were Premedicated with Inj. Ondensetron 0.1mg/kg IV, Inj. Glycopyrrolate 0.004mg/kg IV and Inj. Midazolam 0.03mg/k IV,Inj. Fentanyl 2ug/kg IV.
- Preoxygenated with 100% oxygen for 3 minutes.
- Induction was done with Inj. Propofol 2mg/kg IV.
- After the patient had completely lost consciousness, baseline TOFresponse was recorded.
- The intubating dose of study drug was given over 5seconds.
- GROUPA received Intubating dose of Inj.Atracurium 0.5mg/kg i.v and GROUP C received Intubating dose of Inj. Cisatracurium 0.2mg/kg i.v. TOF monitoring was done every 12seconds, until TOFcount scores 0and then patients were proceeded with appropriate size endotracheal tube with Macintosh Laryngoscope.
- Assessment of Intubating conditions were assessed by the Intubating anesthesiologist using **Cooper R et al. scoring system.**[9]
- Endotracheal Tube position was confirmed by checking bilateral equal air entry on auscultation and by ETCO2, then connected to a Bains circuit for intermittent positive pressure ventilation till completion of surgery.
- Maintenance of anesthesia was done with 40% Oxygen + 60% Nitrous oxide + Sevoflurane (1-2%).
- The interval from the muscle relaxant administration to TOF COUNT 0 was noted as **onset time of Neuromuscular blockade.**
- **CONDITIONOF INTUBATION** was scored using cooper et al. scoring system.[9]

SCORE	JAWRELAXATION	VOCAL CORDS	RESPONSETO INTUBATION
0	Poor(impossible)	Closed	Severe coughing or bucking
1	Minimal(difficult)	Closing	Mild coughing
2	Moderate(fair)	Moving	Slight diaphragmatic movement
3	Good(easy)	Open	None

GRADING

INTUBATING CONDITIONS	SCORE
EXCELLENT	8-9
GOOD	6-7
FAIR	3-5
POOR	0-2

- After Intubation, every 5 minutes. TOF COUNT was recorded.
- Accordingly, maintenance dose of muscle relaxant **Atracurium (0.1mg/kg) OR Cisatracurium (0.03mg/kg)** depending upon the study group was given when TOF COUNT become 3.
- In both the study group A and C, Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was noted immediately after intubation, then at 1min,5min and then every 15min till end of Surgery.
- The interval between Injection of bolus dose of muscle relaxants to first Reappearance of TOFCOUNT 3 as **Duration of action of neuromuscular blockade**.
- Side effect was noted.
- After completion of surgery, All the anaesthetic agent were stopped and 100% oxygen was given.
- When TOF ratio **>0.7** patient was Reversed with Inj. Neostigmine 0.05mg/kg I.V and Inj. Glycopyrrolate 0.008mg/kg I.V.
- Patient was extubated when TOF ratio **>0.9** with complete oral / Endotracheal tube suction.
- After Extubation oxygen was given via simple facemask and then, postoperative vitals were recorded and patients were shifted to recovery room for monitoring.

STASTISTICALANALYSISPLAN

All numerical data were entered in Microsoft Excel 2021.Data analysis was performed by SPSS software 22.0 trial version. Continuous data was summarized as mean+/-sd (standard deviation) while discrete (Categorical data) in number and percentage with appropriate graphs. Statistical test whichever is applicable was applied. Categorical data was analyzed by chi square test or fisher exact test for non-normality data. All are test was applied after ascertaining normality by Shapiro-wilk test. A two tailed ($P<0.05$)will be considered statistically significant.

OBSERVATIONS AND RESULTS AND STATISTICS

A total of 60 patients were taken for this study, out of which 30 patients were enrolled into the Atracurium (GROUPA) and 30 patients were enrolled under the Cisatracurium (GROUP C).

Table 1: Distribution of age in the respective study group (n=60)

Age(years)	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
18- 20	3	10.0	0	0.0
21-30	8	26.7	7	23.3
31-40	9	30.0	8	26.7
41-50	10	33.3	15	50.0
Chi-Square = 4.13, P value = 0.248				

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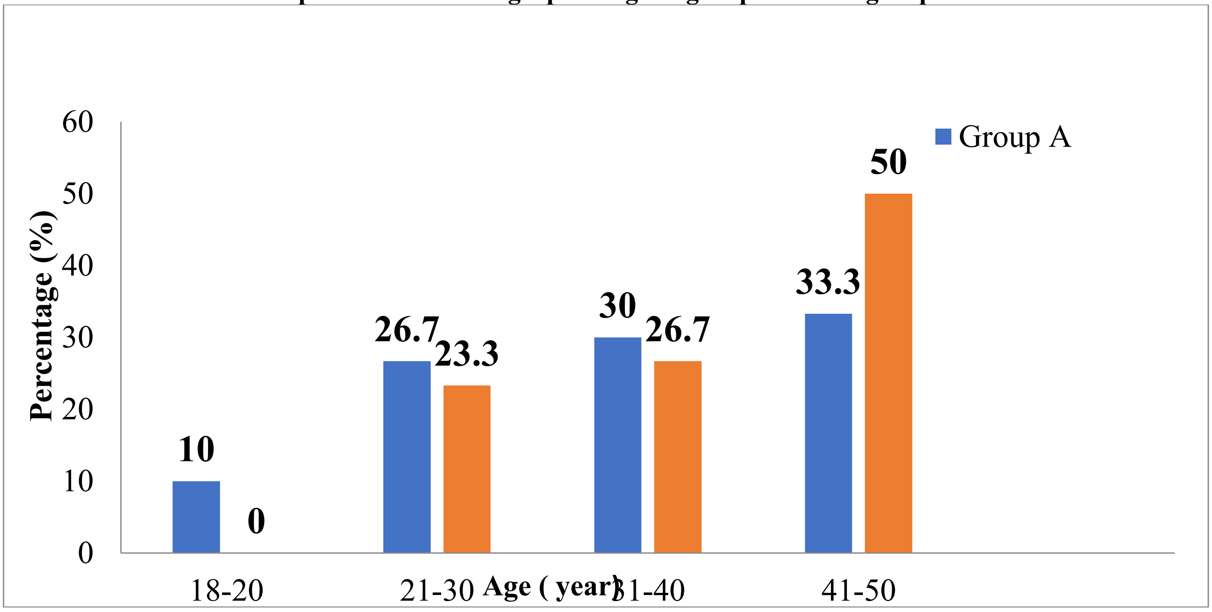
Graph 1: **Distribution graph of age in group A versus group C**

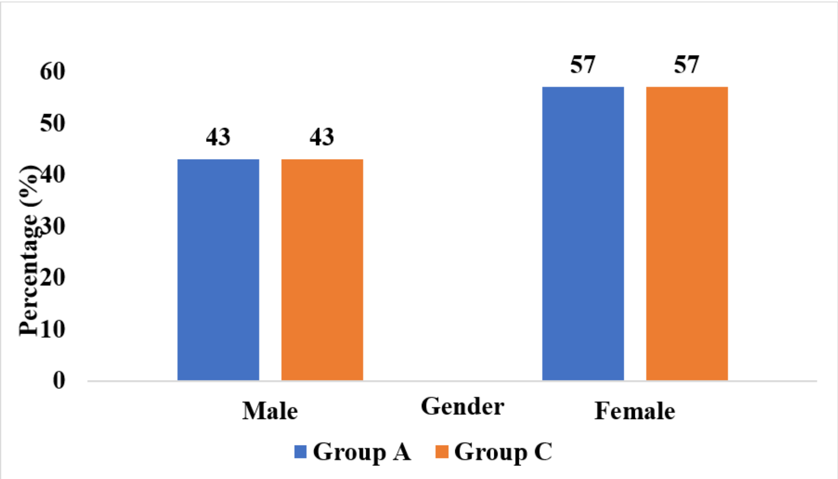


Group A had higher percentage of participants aged 31-40 (30%) compared to Group C (26.7%). In contrast, Group C has a greater percentage of participants aged 41-50 (50%) compared to Group A (33.3%).The Chi-Square value of 4.13 and a P value of 0.248 indicate no statistically significant difference in age distribution between the two groups. This suggests that the **age does not influence the study outcomes**.

Table 2: Distribution of gender in the respective study group (n=60)

Gender	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
Male	13	43.0	13	43.0
Female	17	57.0	17	57.0
Chi-Square = 0.000, P value = 1.000				

Graph 2: **Distribution graph of gender in group A versus group C**



Both groups had identical gender compositions ,with 43% male (13participants) and 57% female (17participants). The Chi-Square value of 0.000 and a P value of 1.000 indicate no difference in gender distribution between the two groups. This suggests that **the gender does not influence the study outcomes**, reflecting a balanced representation of males and females in both the groups.

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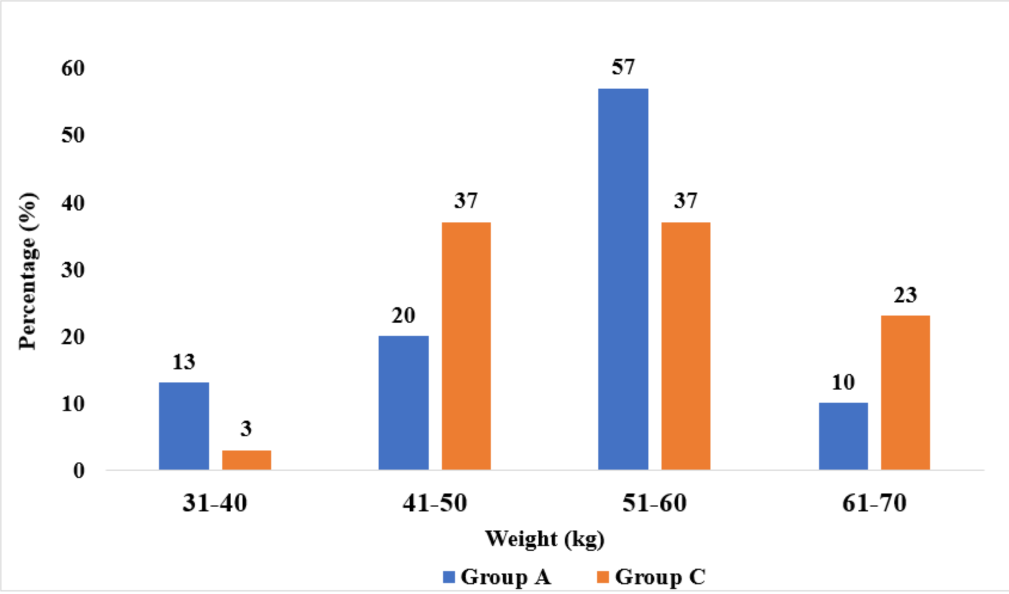
Table 3: Distribution of weight in the respective study group (n=60)

Weight (in kg)	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
31-40	4	13.0	1	3.0
41-50	6	20.0	11	37.0
51-60	17	57.0	11	37.0
61-70	3	10.0	7	23.0
Chi-Square = 6.156, P value = 0.104				

Graph 3 : Distribution of weight in group A versus group C



Group A had a higher percentage of participants in the 51-60 kg range (57%) compared to Group C (37%). Conversely, GroupC had a greater proportion of individuals in the 41-50kg range (37%) than Group A (20%).The Chi-Square value of 6.156 and a P value of 0.104 suggest that there is no difference in weight distribution between the two groups. indicating **weight does not influence the study outcomes**.

Table 4: Distribution of Mallampatti Classification in the respective study group

Mallampatti	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Class I	25	83.0	23	77.0
Class II	5	17.0	7	23.0
Chi-square = 0.417, P-value = 0.518				

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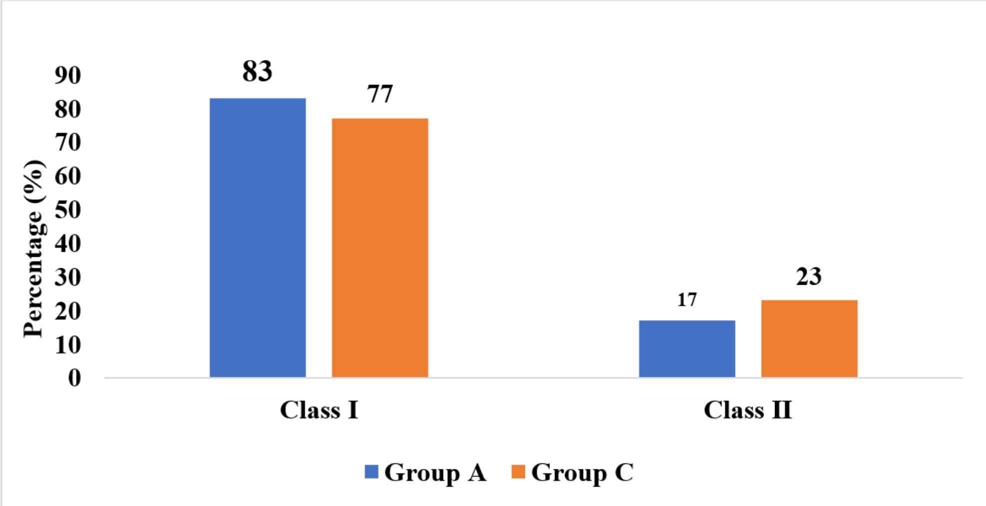
Graph 4: Distribution of Mallampati Classification in group A versus group C

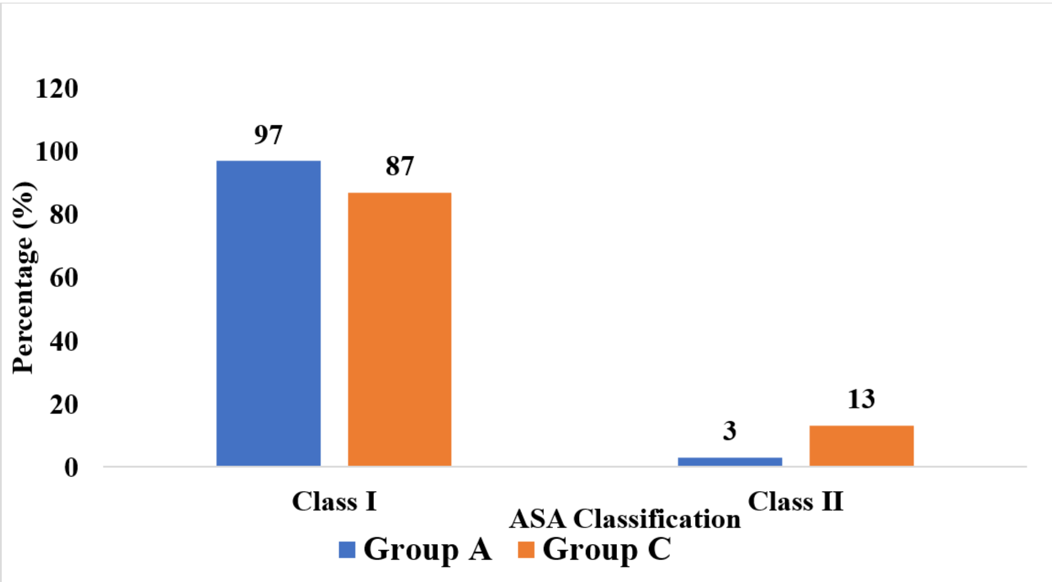


Group A had a higher percentage of participants in Class I (83%) compared to Group C (77%). Conversely, Group C had a greater percentage of participants in Class II (23%) than Group A (17%). The Chi-square value of 0.417 and a P-value of 0.518 indicate no difference in the Mallampatti classification between the two groups. This suggests that indicating **mallampati Classification does not influence the study outcomes**.

Table 5: Distribution of ASA classification in the respective study group

ASA scale	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
Class I	29	97.0	26	87.0
Class II	1	3.0	4	13.0
Chi-Square = 1.333, P-value = 0.248				

Graph 5: Distribution graph of ASA classification in group A versus group C



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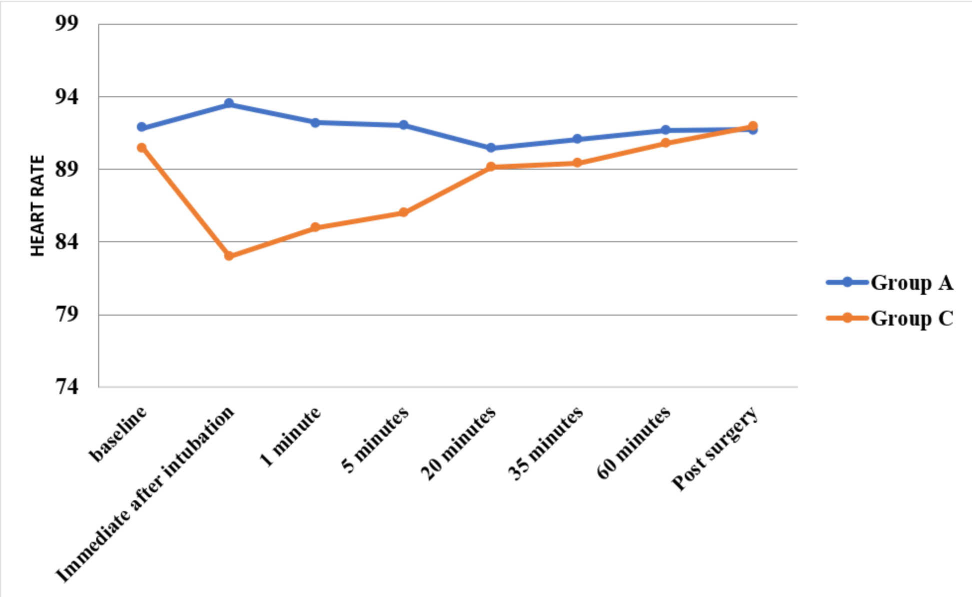
Group A had higher percentage of individuals in Class I (97%) compared to Group C (87%). Conversely, Group C had a higher percentage in Class II (13%) than Group A (3%). The Chi-Square value of 1.333 and a P-value of 0.248 indicate no difference in ASA classification between the two groups.This suggests that **ASA Classification does not influence the study outcomes**.

Table6. Heart Rate among the participants

Heart Rate	Group A (n=30)		Group C (n=30)		T -Test	P-Value
	Mean	SD	Mean	SD		
Baseline	91.83	8.10	90.50	8.37	0.63	0.51
Immediately after intubation	93.48	8.03	83.00	8.36	4.95	**0.000**
After 1 minute	92.20	9.46	85.00	8.40	3.12	**0.002**
After 5minutes	92.27	9.15	86.00	6.56	3.05	**0.003**
After 20 minutes	90.43	7.97	89.13	6.52	0.69	0.4921
After 35minutes	91.03	8.70	89.40	6.09	0.84	0.404
After 60minutes	91.67	7.20	90.80	5.67	0.52	0.60
Post surgery	91.73	8.34	91.97	5.78	-0.13	0.89

Graph6. Heart Rate among the participants



Baseline HR values were similar between the groups. Immediately after the intubation,1,5 minutes group A heart rate was increased significantly (p<0.05). However, at 20, and 35 minutes, 60-minute,post-surgerywere not statistically significantindicating, **Group C had better control over heart rate compared Group A**.

Table 7. Systolic Blood Pressure among the participants

Systolic Blood Pressure	Group A (n=30)		Group C (n=30)		T -Test	P-Value
	Mean	SD	Mean	SD		
Baseline	121.20	6.26	122.07	7.23	0.607	0.547
Immediately after intubation	134.78	11.90	120.23	20.51	6.17	**0.00**
After 1 minute	128.70	4.80	117.73	4.70	11.63	**0.00**
After 5minutes	124.00	2.18	119.47	6.51	6.48	**0.00**

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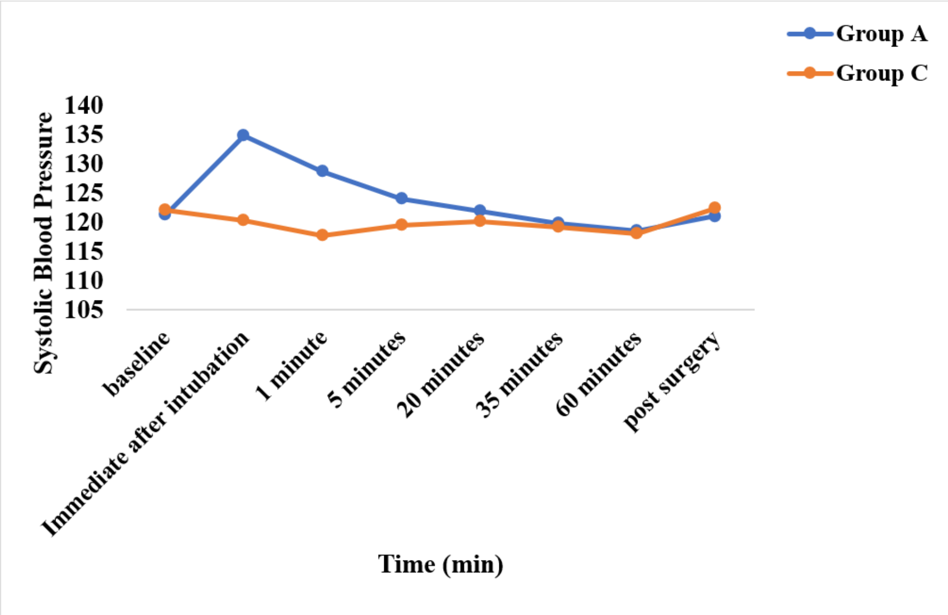
After 20 minutes	121.90	4.12	120.03	5.94	2.36	0.30
After 35minutes	119.80	4.00	119.10	4.50	0.85	0.40
After 60minutes	118.50	5.00	118.00	5.20	0.65	0.52
Post surgery	121.17	6.00	121.30	5.80	0.25	0.80

Graph 7. Systolic Blood Pressure among the participants

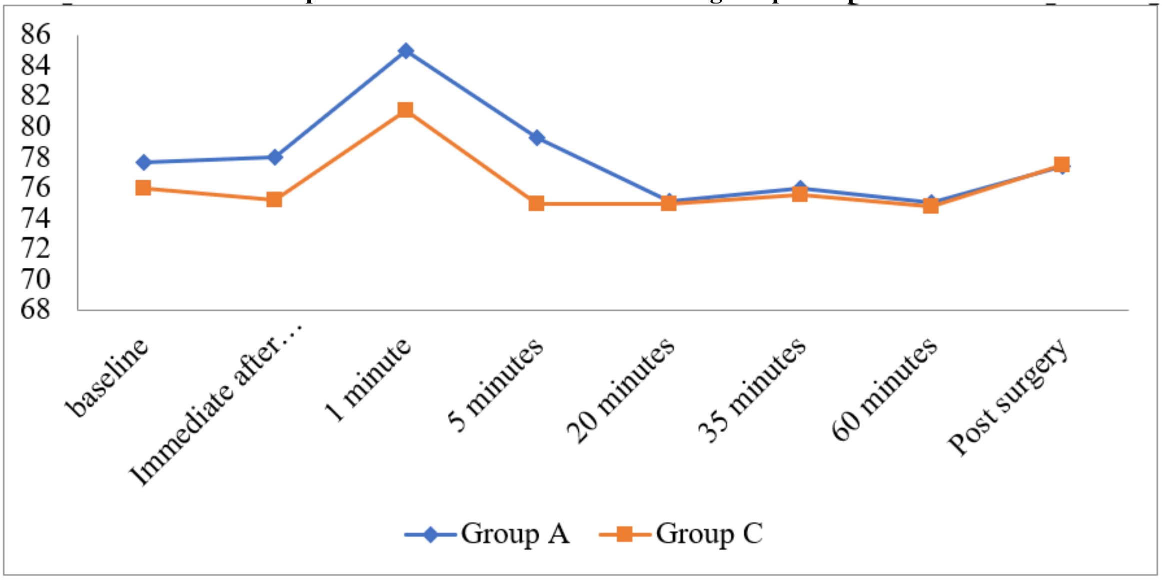


Baseline SBP values were similar. Immediately after the intubation,at 1, 5, minutes there was significantdifference(p value <0.05) shows group A exhibited consistently higher SBP compared to group C. After 20, 35and60 minutes, post-surgery the differences in SBP remained non-significant.indicating that **group C exhibited more stable SBP compared to group A**

Table 8. Diastolic Blood Pressure among the participants

DiastolicBlood Pressure	Group A (n=30)		Group C (n=30)		T - Test	P-Value
	Mean	**SD**	**Mean**	**SD**		
Baseline	77.70	3.72	75.97	7.53	-1.129	0.131
Immediately after intubation	77.97	6.08	75.20	6.78	-1.664	**0.050**
After 1 minute	84.97	5.24	81.03	4.32	-3.171	**0.001**
After 5minutes	79.27	5.07	74.90	4.28	-3.602	**0.000**
After 20 minutes	75.13	4.78	74.93	4.97	-1.747	0.52
After 35minutes	76.00	4.60	75.50	4.70	-0.450	0.654
After 60minutes	75.00	4.80	74.80	4.90	-0.200	0.841
Post surgery	77.37	5.75	77.53	5.59	0.113	0.454

Graph8. Diastolic Blood Pressure among the participants



At Baseline, 20, 35, 60 minutes and post-surgery DBP values showed no significant difference ($p>0.05$). However, immediately after intubation, 1,5-minute Group A also showed significantly higher DBP compared to Group C ($p <0.05$).) suggest **Group C provides better diastolic stability compared to Group A**.

Table 9. Mean Arterial Blood Pressure among the participants

Mean Arterial Blood Pressure	Group A (n=30)		Group C (n=30)		T - Test	P-Value
	Mean	SD	Mean	SD		
Baseline	91.83	3.93	90.50	6.95	-0.005	0.99
Immediately after intubation	91.80	5.49	87.73	5.65	2.527	**0.014**
After 1 minute	98.80	4.34	92.83	3.70	5.458	**0.000**
After 5minutes	92.27	4.88	89.07	3.79	2.967	**0.004**
After 20 minutes	91.00	4.72	92.50	4.00	3.021	0.20
After 35minutes	91.03	4.60	89.40	4.00	1.548	0.127
After 60minutes	90.86	15.94	91.67	4.10	1.341	0.185
Post surgery	91.73	5.36	91.97	5.00	-0.055	0.957

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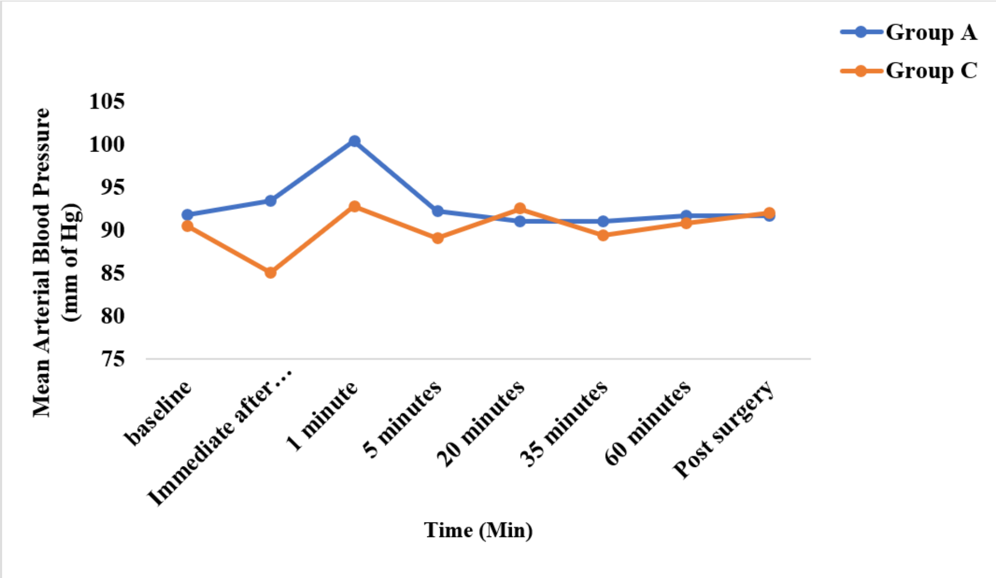
Graph 9. Mean Arterial Blood Pressure among the participants

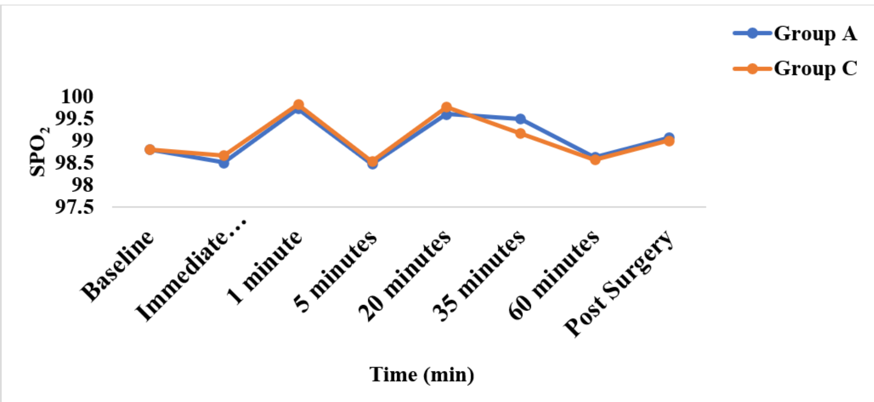


Baseline MAP at 20, 35 ,60-minute, post-surgery the difference was not significant values. However, immediately after the intubation, at 1 and 5minute Group A showed a significant increase in MAP compared to Group C. Suggest **Group C exhibits more stable MAP compared to Group A**.

Table 10. SPO_2 among the participants

SPO_2	Group A (n=30)		Group C (n=30)		T - Test	P-Value
	Mean	SD	Mean	SD		
Baseline	98.80	0.41	98.80	0.41	0.000	0.500
Immediately after intubation	98.50	0.68	98.67	0.76	-0.895	0.187
After 1 minute	99.73	0.45	99.83	0.38	-0.931	0.177
After 5minutes	98.47	0.78	98.53	0.78	-0.332	0.370
After 20 minutes	99.60	0.50	99.77	0.43	-1.386	0.085
After 35minutes	99.50	0.68	99.17	0.95	1.561	0.061
After 60minutes	98.63	0.81	98.57	0.77	0.326	0.372
Post Surgery	99.07	0.58	99.00	0.64	0.420	0.337

Graph 10. SPO2 among the participants



Baseline SpO2 values were identical for both groups at 98.80%. Post-procedure, immediately after intubation, at 1, 5 minutes, post-surgery there were no significant differences. Notably, at 20 minutes, the p-value approached significance (0.085), and at 35 minutes, it was close to significance (0.06). Overall, SpO2 levels remained consistently high, between both the groups, **suggesting stable oxygen saturation**between both the groups.

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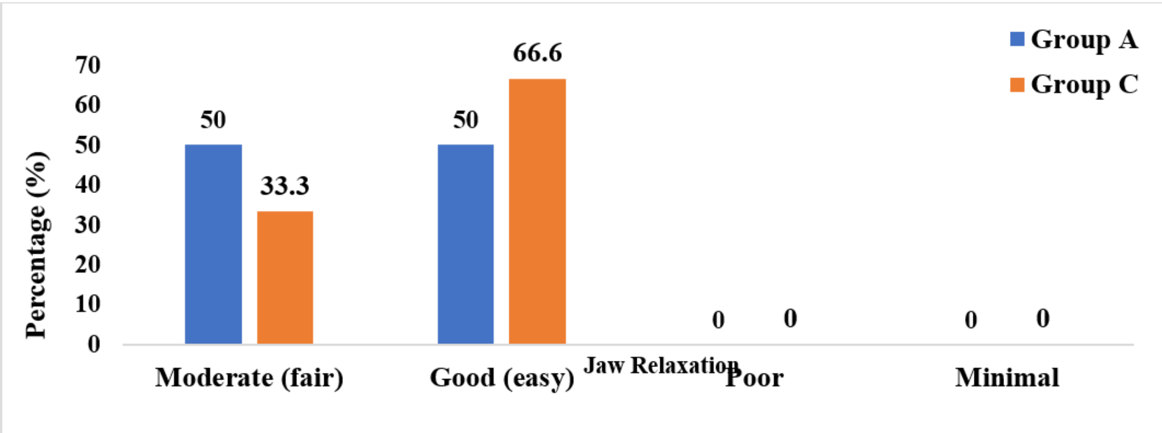
Table 11: Distribution of Jaw Relaxation in the respective study group

Jaw Relaxation	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Moderate (fair)	15	50	10	33.3
Good (easy)	15	50	20	66.6
Mean±SD	2.50±0.51		2.67±0.48	
Chi-Square = 1.701, P value = 0.190				

Graph 11: **Distribution graph of Jaw Relaxation in group A versus group C**



In Group A, 50% (15 participants) experienced moderate (fair) jaw relaxation, while the other 50% reported good (easy) relaxation. In contrast, Group C had 33.3% (10 participants) with moderate relaxation and 66.6% (20 participants) with good relaxation. The Chi-Square value of 1.701 and a p-value of 0.190 indicate no statistically significant difference in jaw relaxation suggesting that **both drugs provide acceptable condition for intubation.**

Table 12: Distribution of Vocal Cord Movement in the respective study group .

Vocal Cord Movement	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
Closing	1	13.3	0	0
Moving	9	30	2	6.7
Open	20	36.7	28	93.3
Mean±SD	2.63±0.56		2.93±0.25	
Chi-Square = 6.788, P value = 0.033				

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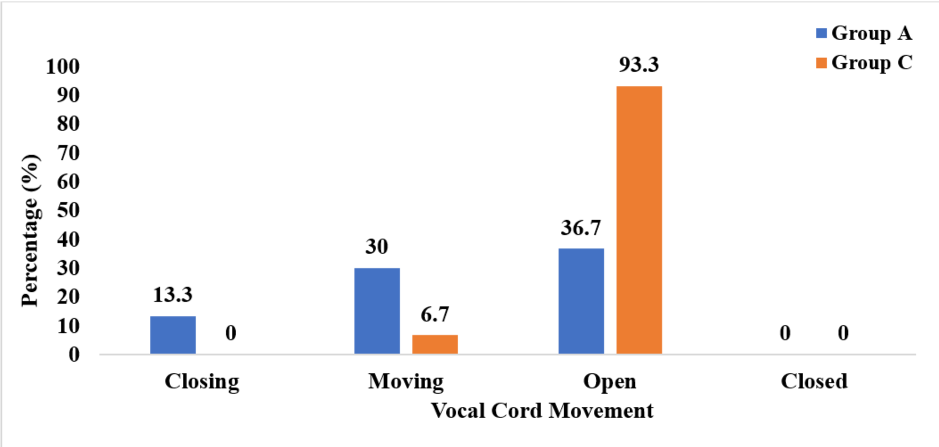
Graph 12: **Distribution graph of Vocal Cord Movement in group A versus group C.**

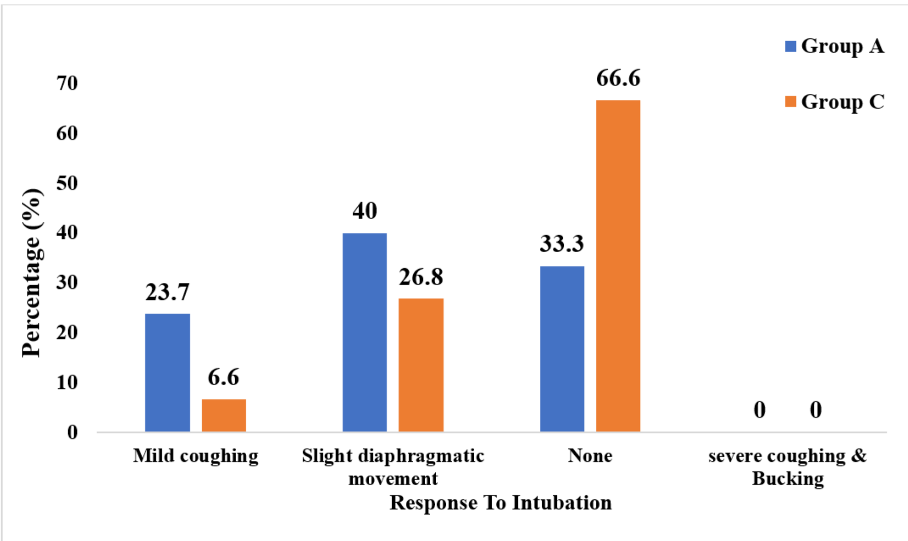


In Group A, 13.3% (1 participant) had closing vocal cords, 30.0% (9 participants) were moving, and 36.7% (20 participants) were open. In Group C, none had closing vocal cords, 6.7% (2 participants) were moving, and a significant 93.3% (28 participants) were open. The Chi-Square value of 6.788 and a p-value of 0.033 indicate a statistically significant difference in vocal cord status between the two groups. This suggests that Group **A had a higher prevalence of vocal cord movement compared to Group C**

Table 13: Distribution of Response to Intubation in the respective study group

Response To Intubation	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Mild coughing	7	23.7	2	6.6
Slight diaphragmatic movement	12	40	8	26.8
None	10	33.3	20	66.6
Mean±SD	2.07±0.78		2.60±0.68	
Chi-Square = 1.874, P value = 0.031				

Graph 13: **Distribution graph of Response To Intubation group versus group**



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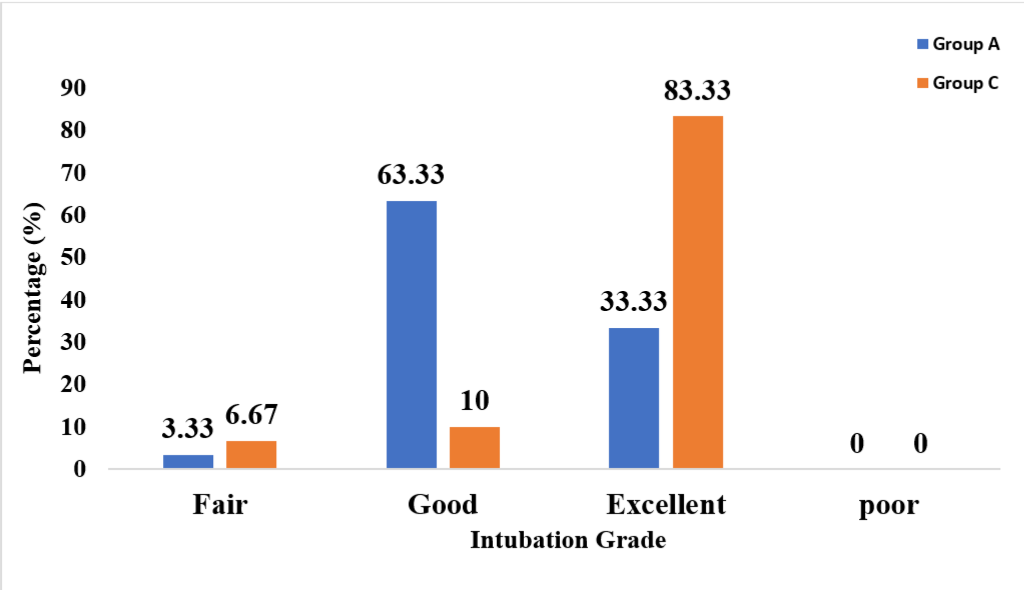
Group C had a significantly higher percentage (66.6%) of patients with no response to intubation compared to Group A(33.3%). Additionally, Group C lower patients with slight diaphragmatic movement (26.8%) and mild coughing (6.6%) compared to Group A which was (40% and 23.7% respectively). The chi-square test revealed a statistically significant difference between the two groups (p-value = 0.031). suggesting in **Group C has better suppression of airway reflexes compared to Group A**

Table 14: Distribution of Intubation Grade in the respective study group

Intubation Grade	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Fair	1	3.33	2	6.67
Good	19	63.33	3	10
Excellent	10	33.33	25	83.33
Mean±SD	2.30±0.53		2.77±0.57	
Chi-Square = 18.40, P value =0.0001				

Graph 14: **Distribution graph of Intubation Grade in group A versus group C**



Group C had significantly higher percentage of individuals achieving "Excellent" (83.33% versus 33.33%) and “fair” (6.67% versus 3.33%) intubation grade compared to Group A. Conversely, Group A had a higher percentage of "Good 63.33% compared to Group C10% Intubation Grade. No case of poor intubation was observed in either group. The chi-square test confirms a statistically significant difference between the groups (p-value = 0.000).suggesting **Group C provides superior intubation grade compared to Group A**.

Table 15: Distribution of Hypotension in the respective study group

Hypo-Tension	Group A (n = 30)		Group C (n = 30)	
	n	%	N	%
Yes	6	20.0	0	0.0
No	24	80.0	30	100.0
Chi-Square = 4.63, P value = 0.03				

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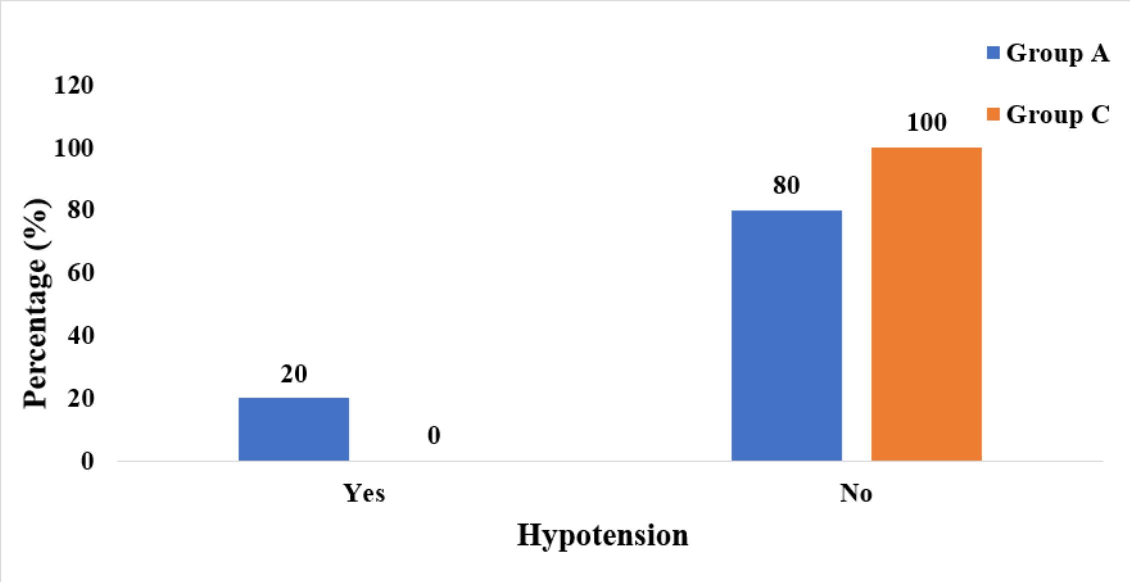
Graph 15: **Distribution graph of Hypotension in group A versus group C**

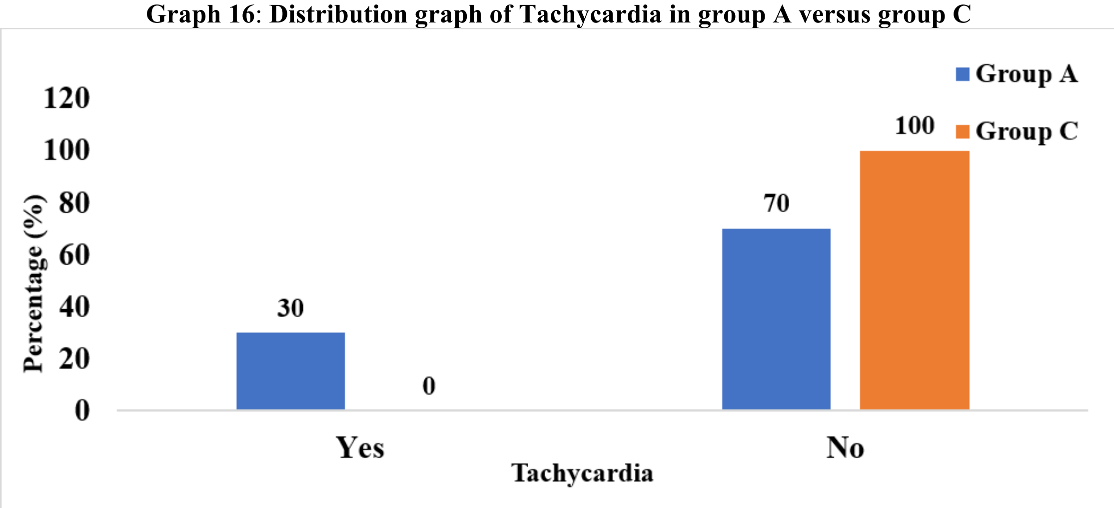


Hypotension was observed in Group A, 20.0% (6 participants) whereas no participants experienced hypotension in Group C (0%). The Chi-Square value of 4.63 and a p-value of 0.03.This study suggest that **histamine release was significant to cause vasodilation inGroup A compared to Group C**.

Table 16: Distribution of Tachycardia in the respective study group

Tachycardia	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	9	30.0	0	0.0
No	21	70.0	30	100.0
Chi-Square = 8.37, P value = 0.003				

Graph 16: **Distribution graph of Tachycardia in group A versus group C**



Tachycardia was observed in Group A, 30.0% (9 participants) experienced tachycardia whereas no participants Group C(0%). The Chi-Square value of 8.37 and a p-value of 0.003.suggest that **histamine release was significant enough to cause reflex tachycardia in Group A compared to Group C**

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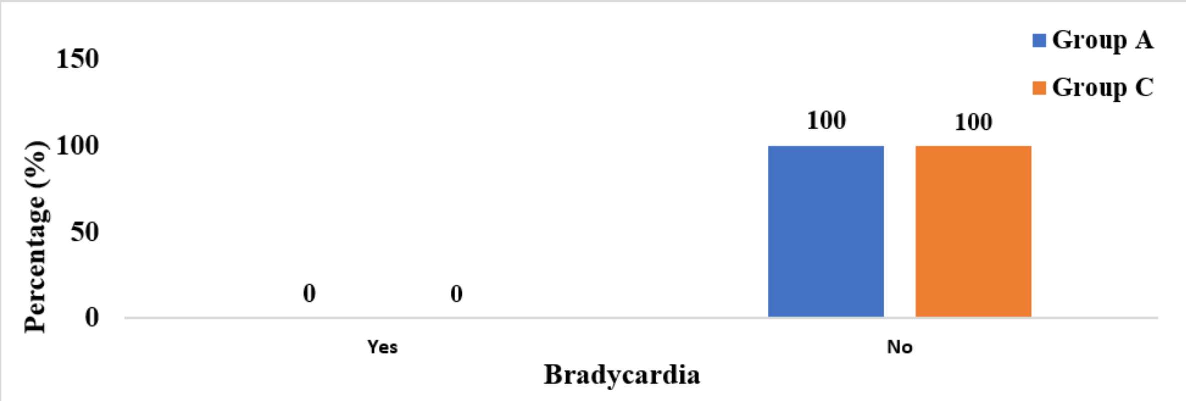
Table 17: Distribution of Bradycardia in the respective study group

Bradycardia	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0
Chi-Square = 0.000, P value = 1.000				

Graph 17: **Distribution graph of Bradycardia in group A versus group C**



In both groups, there were no instances of bradycardia, as indicated by 0.0% (0 participants) in either group. The Chi-Square value of 0.000 and a p-value of 1.000.This suggests that **both the drugs do not causes significant vagal stimulation**

Table 18: Distribution of Seizures in the respective study group

Seizures	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0
Chi-Square = 0.000, P value = 1.000				

Graph 18: **Distribution graph of Seizures in group A versus group C**

In both groups, there were no reported cases of seizures, as indicated by 0.0% (0 participants). The Chi-Square value of 0.000 and a p-value of 1.000 indicate no statistical difference between the two groups, **reflecting a single bolus dose or short-term use of neuromuscular blocking drugs rarely causes seizures**.

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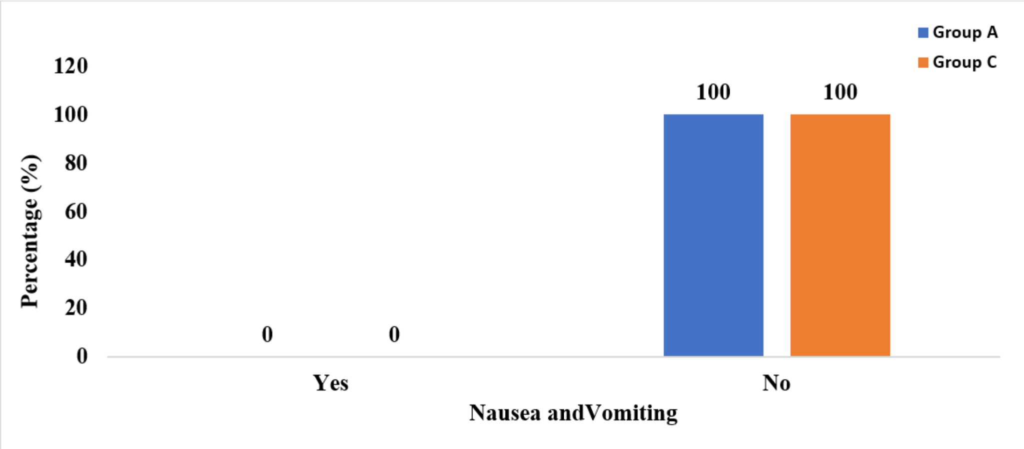
Table 19: Distribution of Nausea and Vomiting in the respective study group

Nausea & Vomiting	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0
Chi-Square = 0.000, P value = 1.000				

Graph 19: **Distribution graph of Nausea & Vomiting in group A versus group C**

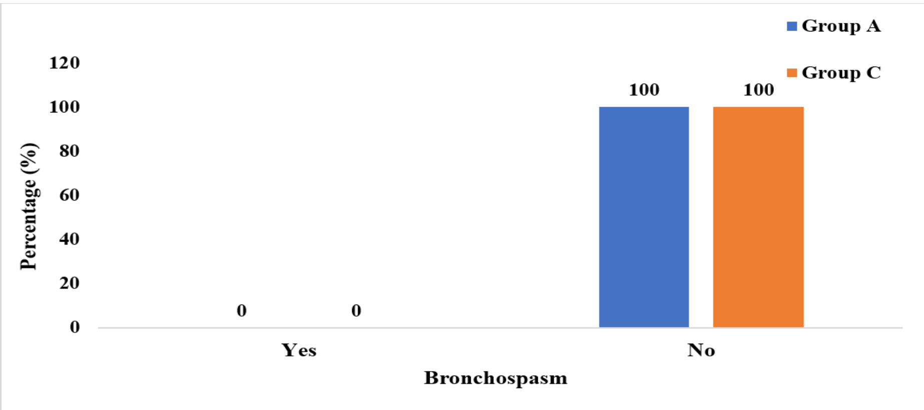


Nausea and vomiting in both groups as indicated by 0.0% (0 participants). The Chi-Square value of 0.000 and a p-value of 1.000. This study suggests that both groups had a **histamine release was not significant enough to cause gastrointestinal symptoms and also stable oxygenation and controlled anaesthetic depth contributed** lack of post operative nausea or vomiting in both groups.

Table 20: Distribution of Bronchospasm in the respective study group

Bronchospasm	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0
Chi-Square = 0.000, P value = 1.000				

Graph 20: **Distribution graph of Bronchospasm in group A Versus group C (n=60)**

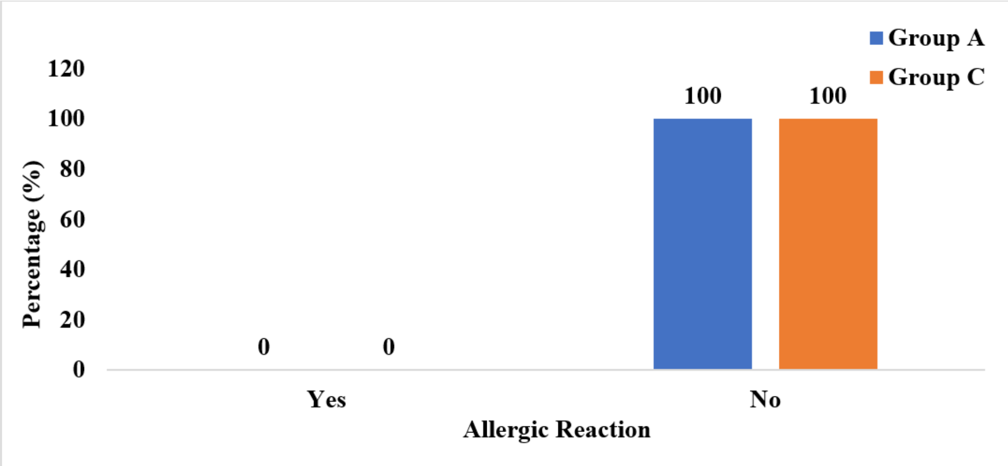


In both groups, there were no reported cases of bronchospasm, as indicated by 0.0% (0 participants). The Chi-Square value of 0.000 and a p-value of 1.000.suggests, **stable airway response, adequate depth of anaesthesia and no significant enough to cause histamine related bronchoconstriction** in both groups.

Table 21: Distribution of Allergic Reaction in the respective study group

Allergic Reaction	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0
Chi-Square = 0.000, P value = 1.000				

Graph 21: **Distribution graph of Allergic Reaction in group A versus group C**

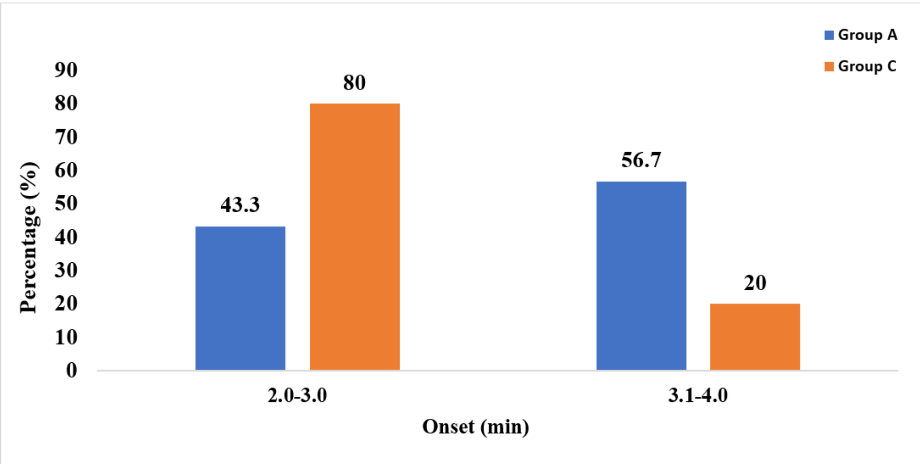


In both groups, there were no reported cases of allergic reactions, as indicated by 0.0% (0 participants).The Chi-Square value of 0.000 and a p-value of 1.000.suggests that both groups **maintained a stable immune response and histamine levels may rise slightly but remain below the threshold for significant allergic reaction**.

Table 22: Distribution of Onset (minutes) in the respective study group

Onset (minutes)	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
2.0-3.0	13	43.3	24	80
3.1-4.0	17	56.7	6	20
Mean±SD	3.32±0.43		2.97±0.39	
Chi-Square = 8.531, P value = 0.003				

Graph 22: **Distribution graph of Onset (minutes) in group A versus group C**



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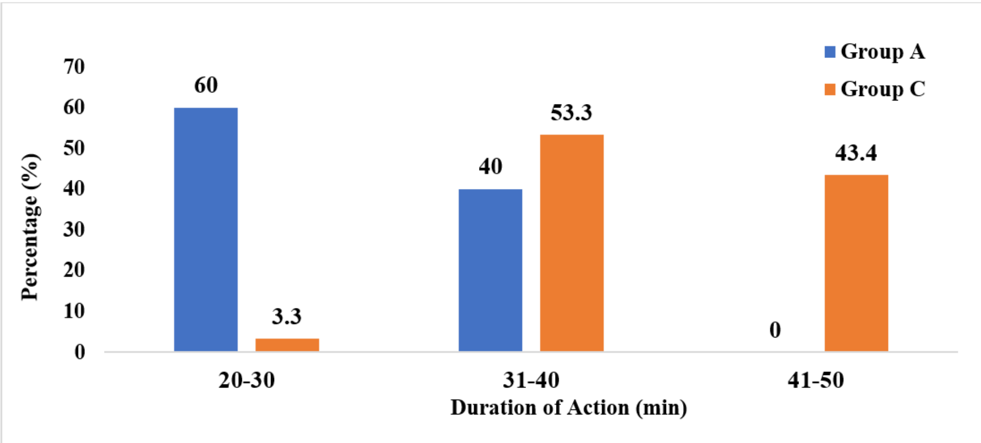
In Group A, 43.3% (13 participants) experienced an onset time of 2.0-3.0 minutes, while 56.7% (17 participants) had an onset time of 3.1-4.0 minutes. In contrast, Group C showed a higher percentage of participants (80.0%, 24 participants) with an onset time of 2.0-3.0 minutes, while only 20.0% (6 participants) experienced 3.1-4.0 minutes. The Chi-Square value of 8.531 and a p-value of 0.003 indicate a statistically significant difference.indicate a statistically significant difference, suggesting **Group C had faster onset compared to Group A**

Table 23: Distribution of Duration of Action (min) in the respective study group

Duration of Action (min)	Group A (n = 30)		Group C (n = 30)	
	n	%	n	%
20-30	18	60	1	3.3
31-40	12	40	16	53.3
41-50	0	0	13	43.4
Mean±SD	31.50±4.76		41.17±4.49	
Chi-Square = 26.422, P value = 0.000				

Graph 23: **Distribution graph of Duration of Action (min) in group A versus group C**



In Group A, 60.0% (18 participants) experienced a duration of 20-30 minutes, while 40.0% (12 participants) had a duration of 31-40 minutes. In contrast, Group C had only 3.3% (1 participant) in the 20–30-minute range, with 53.3% (16 participants) in the 31–40-minute range and 43.4% (13 participants) in the 41–50-minuterange.The Chi-Square value of 26.422 and a p-value of 0.000 indicate a statistically significant**Group C has longer duration of action compared to Group A.**

IV. DISCUSSION

Neuromuscular blocking drugs (NMBDs) are widely used by anaesthesiologists in the operating room and intensive care units. Among the available muscle relaxants, Atracurium and Cisatracurium are preferred due to their non –organ dependent metabolism, ensuring safer haemodynamic outcomes, particularly in elderly patients and those with compromised organ function.However, the primary drawback of these agents is histamine release, which can lead to anaphylactic reactions. Additionally, the risk of postoperative residual paralysis may exist, especially in overdose or improper dosing intervals. Traditionally, depth of anaesthesia & neuromuscular recovery was assessed using clinical parameter such as tidal volume, head lift, and hand grip strength.

With advancement in anaesthesia monitoring, the neuromuscular blockade was assessed using theTrain-of-Four (TOF).TOF monitoring assess both the degree of blockade and better titration of NMBAs, ensuring optimal recovery of neuromuscular function,minimizing the risk of perioperative complications.According to Suresh S.N. et al. [10], monitoring neuromuscular activity at

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the adductorpollicismuscleusingTOFstimulationoffersclinicallyrelevant insights of the appropriate timing for tracheal intubation and the assessment of intubation conditions better than the orbicularis oculi muscle.Traditionally, 2 times ED 95 was considered to be ideal intubating dose for non depolarising muscle relaxants (Farooq K[11]& Hunter J.M. 2011[11]). However, cisatracurium 2 times ED95 fails to provide satisfactory intubating conditions (jeong H.J. et al 2012). [12]

Lee,H et al 2013[13],kirov K et al 2004[14]have recommended 3 times its ED95 (0.05 mg/kg) for intubation with Cisatracurium.Adose response study (mandal P 2002) [15]compared different doses of cisatracurium and concluded 4 times ED95 (0.2mg/kg) provides better intubating conditions. But he assessed the intubating conditions clinically without any neuromuscular monitoring.
In our study, we compared atracurium at a dose of 0.5 mg/kg and cisatracurium at0.2mg/kgtoevaluatetheironsettime,durationofaction,intubatingconditions, andhemodynamiceffectsin60patients(30eachgroup)ofmallampati1&2,aged between 18 to 50 years having ASA I& II undergoing elective surgeries under general anesthesia using neuromuscular monitoring by TOF. Our findings contributetothegrowingbodyofevidenceaimedatoptimizingNMBDselection to enhance patient outcomes, minimize side effects, and improve anaesthetic management during surgical procedures.
Inthepresentstudy,thedemographicprofilesofpatientsinGroupA(Atracurium 0.5mg/kg)andGroupC(Cisatracurium0.2mg/kg)were comparedandobservedthat: The **AGE** distribution showed that Group A had a higher percentage of individuals aged 31-40 years (30%) compared to Group C (26.7%). Conversely, Group C had a greater proportion of participants aged 41-50 years (50%) than GroupA(33.3%)withChi-Squarevalueof4.13withaP-valueof0.248indicates **no significant difference** between the two groups. This suggests that the **age does not influence the study outcomes**.
The**GENDER**compositioninourstudywasidenticalinbothgroups,with43% males(13participants)and57%females(17participants)withChi-Squarevalue of 0.000 and a P-value of 1.000 indicates **no significant difference** in gender distribution, indicating perfectly matched gender proportions. This suggests that **the gender does not influence the study outcomes**, reflecting a balanced representation of males and females in both the groups.

The **WEIGHT** distribution, GroupAhad a higher percentage of participants in the 51-60 kg range (57%) compared to Group C (37%), while Group C had a greaterproportionofindividualsinthe41-50kgrange(37%)thanGroupA(20%) with Chi-Square value of 6.156 and a P-value of 0.104 suggest **no significant difference** between the groups. Indicating **weight does not influence the study outcomes**.
The**MALLAMPATIGRADE**,GroupAhadahigherpercentageofindividuals in Class I (83%) compared to Group C (77%), while Group C had a greater proportioninClassII(23%)comparedtoGroupA(17%) withChi-Squarevalue of 0.417 and a P-value of 0.518 indicate **no significant difference** between the groups. This suggests that indicating **mallampati does not influence the study outcomes**.
The **ASA** classification showed that Group A had a significantly higher percentageofindividualsinClassI(97%)comparedtoGroupC(87%),whereasGroupChadahigherproportioninClassII(13%)thanGroupA(3%) withChi- Square value of 1.333 and a P-value of 0.248 indicate **no significant difference** between the groups. This suggests that **ASA does not influence the study outcomes**.
When comparing our study findings with the study conducted by **Tanuja Chambyal et al.** [16] similar trends were observed. In Chambyal's study, the age distribution, gender composition, weight categories, Mallampati classification, and ASA grading also showed **no statistically significant differences** between both groups, **supporting the current study's observations**. Thus,**demographic profile does not have any effect on outcome of my study parameter.**

During Preinduction
HeartRate: In Group A&C both therewas**no sigfnificant difference (**P value 0.51) in heart rate.**Comparison with Vrinda P.OZA et al.** [17] Similar trends were observed, with a **no significant difference** (P value 0.22) in any groups, supporting the current study.
Blood Pressure: Systolic, diastolic, and mean arterial pressures were **not significantlysignificant**(Pvalue0.5,0.1,0.9)respectively,betweenboth the groups.**ComparisonwithTanujaChambyaletal.**[16]Similartrendswere observed with **no statistically significant** (P value 0.3, 0.7, 0.8) changes in systolic, diastolic, and mean arterial pressures respectively,werenotedinanygroups,whichisconsistentwithour current study.
SpO_2: No statistically significant (P value 0.5)

difference was observed between the two groups. **Comparison with Vrinda P. OZA et al.**[17]Similar findings were reported,with**nosignificantdifference**(Pvalue0.8)inS pO_2levels between both groups, supporting the current study.

Immediately After Intubation

Heart Rate: In Group A, there was an immediate increase in heart rate compared to Group C, showing a **significant difference**(Pvalue 0.000).**Comparison with Vrinda P. Oza et al.**[17]Similar trends were observed, with a **significant**(P value 0.0009) rise in heart rate immediately after intubation in atracurium group, supporting the current study.

Blood Pressure: Systolic, diastolic, and mean arterial pressures were **significantly higher**(P value 0.00, 0.05, 0.01) respectively, in Group A compared to Group C.**Comparison with Tanuja Chambyalet al.**[16]**statistically significant increase**(P value <0.001, <0.001, <0.001) in systolic, diastolic, and mean arterial pressures respectively, were noted immediately after intubation in Atracurium group which was consistent with our current study.

SpO_2:No statistically significant difference(P value 0.1) was observed between the two groups.**Comparison with Vrinda P. Oza et al.**[17]Similar findings were reported, with **no significant difference**(P value 0.4) in SpO_2 levels between both groups, supporting the current study.

At 1 Minute

Heart Rate: A significant difference(P value0.002) **persisted** between Group A and Group C, with higher values in Group A compared to Group C.**Comparison with Vrinda P. Oza et al.**[17] Similar**significant differences**(P value 0.0001) were observed at this interval, aligning with the current study.

Blood Pressure:Significantdifferences(P value 0.00, 0.001, 0.000) in systolic, diastolic, and mean arterial pressures respectively were noted, with Group A showing higher values compared to Group C.**Comparison with Tanuja Chambyalet al.**[16]Their study demonstrated **significant differences**(Pvalue 0.003, <0.001, <0.001) in systolic, diastolic, and mean arterial pressures respectively, at this time point, supporting the current study.

SpO_2:No significant difference(P value 0.1)between the groups.**Comparison with Vrinda P. Oza et al.**[17] Consistent with the current study, **no significant differences** (P value 0.2)were observed at this time point.

At 5 Minutes

Heart Rate: A **significant difference**(P value 0.003) remained between the groups, with Group A showing higher heart rates.**Comparison with Vrinda P. Oza et al.**[17]Their study reported **significant differences**(P value 0.004) in heart rate at 5 minutes, consistent with the current study.

Blood Pressure:Significantdifferences(P value 0.00, 0.00, 0.004) in all systolic, diastolic, mean arterial pressure respectively, persisted, favoring Group A with higher value compared to Group C.**Comparison with Tanuja Chambyal et al.** [16]In contrast, their study reported **no significant differences** (P value 0.406, 0.07, 0.2) respectively, at this time point, differing from the current study.

SpO_2:No significant difference(P value 0.3)between the groups.**Comparison with Vrinda P. Oza et al.**[17]Similar**no significant differences** (P value 0.1) were observed, supporting the current study.

At 20 Minutes

Heart Rate: The difference between the groups diminished, showing **no significant difference**(P value 0.49).**Comparison with Vrinda P. Oza et al.**[17]Similar trends were reported, with **no significantdifferences**(P value 0.7)**in** heart rate at this time points.

Blood Pressure:Nosignificantdifference(P value 0.2 to 0.5)respectively, was still observed in systolic, diastolic, and mean arterial pressures, with Group A showing higher values compared to Group C.**Comparison with Tanuja Chambyalet al.**[16]Their study found **no significant differences** (P value 0.8, 0.2, 0.3) respectively, supporting the current study.

SpO_2:No significant difference(P value 0.08) between the groups.Comparisonwith**Vrinda P. Oza et al.** [17]Consistent with the current study, **no significant** (P value 0.3) SpO_2 differences were noted at this time point.

At 35 Minutes, 60 Minutes, and Post-Procedure

Heart Rate:No statistically significant differences(P value 0.4 to 0.8) were observed between the groups at these intervals.**Comparison with Vrinda P. Oza et al.**[17]Similar findings were reported, with **no significant differences** (P value 0.7 to 0.07) in heart rate at these time points.

Blood Pressure:No significant differences(P value 0.1 to 0.8) in systolic, diastolic, or mean arterial pressures between the groups.**Comparison with Tanuja Chambyalet al.**[16]Consistent with the current study, **no significant differences** (P value

0.07 to 0.8) were observed at this time point.

SpO_2:No significant difference(P value 0.06 to 0.3) was observed at any of these time points.**Comparison with Vrinda P. Oza et al.**[17]Similar trends were observed, **no significant SPO2** (P value 0.1 to 0.2) difference supporting the current study.

HEMODYNAMIC CHANGES

The increase in mean heart rate, mean systolic pressure, mean diastolic pressure & mean arterial pressure during intubation, 1minute, 5 minute after intubation and gradually returning to baseline values is due to stress response to intubation.[18]

In general, Bisbenzylquinolinium compounds promote histamine release which causes reduction in mean arterial pressure and a compensatory increase in heart rate are most common cardiovascular consequences associated with histamine release. The circulatory changes are brief is dose related, lasting 60-90 seconds after atracurium administration and then disappear within 5 minutes.[19]Rapid injection is usually associated with fall in blood pressure and transient tachycardia.

The signs of histamine release like flushing at the site of injection, tachycardia, hypotension, erythema or wheals are clinically obvious when plasma histamine levels exceed 200-300% of baseline values and these effect involves chemical displacement of the contents of mast cells granules containing histamine, prostaglandins and possibly 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.[19]

The phenomenon of histamine release can be minimize by slow administration of injection of muscle relaxant from 30 to 60 seconds[20]. Combined H1 and H2 receptors blocker can be used to prevent the release of histamine with Atracurium[21] .

CONDITION OF INTUBATION

In present study tracheal intubating conditions were graded on the basis of degree of jaw relaxation, vocal cord movement and intubation response by using **Cooper et al. scoring system**[9], similar grading was used by **Priyanka Harle et al.**[22]

JAW RELAXATION

In the present study, moderate jaw relaxation was seen in 15 patients in Group A & 10 patients in Group C. Whereas, easy jaw relaxation was seen in 15 patients in Group A & 20 patients in Group C. Impossible and difficult jaw relaxation not seen in both the Groups A & C. The mean of jaw relaxation in Group A and Group C was 2.50±0.51 and 2.67±0.48 respectively indicating **no statistically significant difference**(P value 0.190)suggesting**both the groups provide acceptable conditions for intubation.**

Comparison with Priyanka Harle et al.[22] Impossible to open jaw relaxation in both the groups were in 0 patients. Open with difficulty jaw relaxation in Group A and Group CA was seen in 1 patients and 0 patients respectively, which was not observed in our study. Moderate jaw relaxation in Group A and Group CA was seen in 8 patients and 5 patients respectively, showing similar trends with our study. Easy jaw relaxation in Group A and CA was seen in 31 and 35 patients respectively. Showing **no statistically significant difference**(P value 0.38) between the groups. Thus, similar trends were observed, supporting the current study.

Comparison with Dr.PD Subha et al.[23]the mean jaw relaxation in Cisatracurium (Group B) was 2.90 ±0.31& Atracurium (Group A) was 2.55±0.5 which was **statistically significant**(P value <0.0001) , were no difference persist.Thus, differing from current study.

VOCAL CORD MOVEMENT

In the present study, closed vocal cord in Group A and Group C was 0 in both the groups. Closing vocal cord in Group A and Group C was 1 and 0 respectively. Moving vocal cord in Group A and Group C was 9 and 2 respectively. Open vocal cord in Group A and Group C was 20 and 28 respectively. The mean of vocal cord relaxation in Group A and Group C was 2.63±0.56 and 2.93±0.25 respectively was **statistically significant** (P value 0.03)suggesting**higher prevalence vocal cord relaxation Group C has compared to Group A**.

Comparision with Priyanka Harle et al.[22]closed vocal cord in Group A and Group CA was 0 in both groups. Closing vocal cord in Group A and Group CA was 0 which was present in our study Group A. Moving vocal cord in Group A and Group CA was 25 and 10 respectively. Open vocal cord in Group A and Group CA was 15 and 30 respectively. Showing **significant difference**(P value 0.001) in vocal cord relaxation between the groups. Thus, similar trends were observed, supporting the current study.

Comparision with Dr. PD Subha et al.[23]Cisatracurium(Group B) had mean vocal cord score of 2.77±0.42 and Atracurium (Group A) had 2.42±0.5 which was **statistically significant** (P value <0.0001). Thus, similar trends were observed, supporting the current study .

RESPONSE TO INTUBATION

In the present study, severe coughing in Group A & C was 0 in both the groups. Mild coughing in Group

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A & C was in 7 and 2 patients respectively. Slight diaphragmatic movement in Group A &C was in 12 and 8 patients respectively. No movement in group A & C was in 10 and 20 patients respectively.

Mean response to intubation in Group A 2.07±0.78 and Group B 2.60±0.68 was **statistically significant difference**(P value 0.03). suggesting **Group C has better suppression of airway reflexes compared to Group A.**

Comparision with Priyanka Harle et al.[22]severe coughing in Group A & CA was 0 in both the groups. Mild coughing in Group A & C was in 5 and 2 patients respectively. Slight diaphragmatic movement in Group A &C was in 24 and 10 patients respectively. No movement in group A & C was in 11 and 28 patients respectively. Cisatracurium(Group B) had mean intubation score of 8.51 and Atracurium (Group A) had 7.38 which was **statistically significant** (P value 0.001). Thus, similar trends were observed, supporting the current study

Comparision with Dr. PD Subha et al.[23]Cisatracurium(Group B) had mean intubation response score of 2.85±0.43 and Atracurium (Group A) had 2.43±0.5 which was **statistically significant** (P value <0.0001). Thus, similar trends were observed, supporting the current study.

INTUBATION GRADE

In the present study, fair intubation grade in Group A& C was 1 and 2 patients respectively. Good intubation grade in Group A & C was 19 and 3 patients respectively. Excellent intubation grade in Group A & C was 10 and 25 respectively. Poor intubation grade in both the groups was 0. Mean intubation grade in Group A 2.30±0.53 &Group C 2.77±0.57 had**statistically significant difference** in intubation grade between the groups. Suggesting **Group C provides superior intubating grade than Group A.**

Comparision with **Priyanka Harle et al.**[22] fair intubation grade in Group A& CA was 7 and 2 patients respectively. Good intubation grade in Group A & CA was 26 and 10 patients respectively. Excellent intubation grade in Group A & C was 7 and 28 respectively. Poor intubation grade in both the groups was 0. Thus, similar trends were obsereved, and was **statistically significant** supporting the current study.

Comparision with **Dr. PD Subha et al.**[23]Cisatracurium(Group B) had mean intubation score of 8.51±0.94 and Atracurium (Group A) had 7.38±1.1 which was **statistically significant**. Thus, similar trends were observed, supporting the current study.

ONSET OF ACTION

In the present study, Group C patients had 80% of onset time compared to Group A 43.3% at 2.0-3.0 minute. In contrast, Group A patients had 56.7% of onset time compared to Group C 20% at 3.1-4.0 minute. Mean onset time of Group A and Group C was 3.32±0.43 and 2.97±0.39 respectively, indicating Group C had early onset time than Group A which was **statistically significant**(P value 0.003) because of **higher potency and high affinity for nicotinic acetylcholine receptor**. Comparision with **Dr. Chaya Suryawanshiet al**.[24] The mean onset of action in Group A (atracurium) was 256.97±8.23 seconds and in Group B (cisatracurium) was 208.70±6.21seconds which was statistically signicifant (P value <0.0001), supporting the current study .

Comparision with **Dr. PD Subha et al.**[23]Cisatracurium(Group B) had mean onset time of 165.95±17.92 seconds and Atracurium (Group A) had 196.95±13.05 which was **statistically significant** (P value <0.001). Thus, similar trends were observed, supporting the current study.

The onset time of cisatracurium has been based on their dose in the study done by **EL- Kasabyet al.**[25]State that higher doses Cisatracurium provides more effective and faster onset compared to Atracurium.

In the studies done by **Carroll MT et al**.[26]Proposed a model to explain the reverse onset and potency relationship. The neuromuscular blocker with low potency has more number of molecules which diffuses to the central compartment causing rapid onset.

DURATION OF ACTION

In the present study, Group C patients had 3.3% of duration of action compared to Group A 60% at 20-30 minute. Group C patients had 53.3% of duration of action compared to Group A 40% at 31-40 minutes. In contrast, Group C patients had 43.4% of duration of action compared to Group A 0% at 41-50 minute.

Mean duration of action of Group A and Group C was 31.50±4.76 and 41.17±4.49 respectively, indicating Group C had longest duration of action than Group A which was **statistically significant** (P value 0.000) **because of greater receptor affinity, leading to more prolonged blockade.**

Comparision with **Dr. Chaya Suryawanshiet al**.[24]
The mean duration of action in Group A (atracurium) was 33.83±1.86 minutes and in Group B (cisatracurium) was 59.20±3.40minutes which was statistically signicifant (P value <0.0001), supporting the current study.

Comparision with Dr. PD Subha et al.[23]Cisatracurium(Group B) had mean duration of action of 57.41±2.37 and Atracurium (Group A) had 34.58±2.92 which was **statistically significant** (P value <0.001). Thus, similar trends were observed, supporting the current study.

SIDE EFFECTS

HYPOTENSION

In the present study, hypotension was 20% in Group A patients compared to Group C was 0% which is **statistically significant**(p value 0.031) suggesting, **histamine release was significant to cause vasodilation in Group A compared to Group C.**

Comparision with **Dr. Ashish Ameta et al**. [27] there was side effect of hypotension in one patients of group 1(Atracurium 0.5mg/kg) and 2(Cisatracurium 0.15mg/kg)whearas none in group 3(Cisatracurium 0.2mg/kg) with p value of 0.674which was **not statistically significant**. **Differing from the current study where differences persisted.**

TACHYCARDIA

In the present study, tachycardia was 30% in Group A patients compared to Group C 0% which was **statistically significant**(p value 0.03) suggesting **histamine release was significant enough to cause reflex tachycardia in Group A compared to Group C.**

Comparision with **Dr. Ashish Ameta et al.**[27]found that there was **no side effect of tachycardia** in any groups. **Differing from the current study where differences persisted.**

BRADYCARDIA

In the present study, bradycardia in Group A patients and Group C was 0% which was **statistically insignificant** with p value 1.000. Suggesting **both the drugs doesn't cause significant vagal stimulation.**

Comparision with **Dr. Ashish Ameta et al.**[27] found that there was**no side effect** of bradycardia in any groups, supporting the current study**.**

SEIZURES

In the present study, Seizures episode in Group A patients and Group C was 0% which was **statistically insignificant** with p value 1.000. Suggesting, **a single bolus dose or short term use of neuromuscular blockade rarely causes seizures.**

Comparision with **Dr. Ashish Ameta et al.**[27]found that there was**no side effect of seizures** in any groups, supporting the current study**.**

NAUSEA & VOMITING

In the present study, nausea & Vomiting in Group A patients and Group C was 0% which was **statistically insignificant** with p value 1.000. Suggesting **histamine release was not significant enough to cause gastrointestinal symptoms and also stable oxygenation and controlled depth of anaesthesia contributed lack of postoperative nausea & vomiting**.

Comparision with **Dr. Ashish Ameta et al.**[27] found that there was **no side effect of nausea and vomiting** in any groups, supporting the current study**.**

BRONCHOSPASM

In the present study, bronchospasm in Group A patients and Group C was 0% which was **statistically insignificant** with p value 1.000. Suggesting, **stable airway response, adequate depth of anaesthesia and not significant enough to cause histamine related bronchoconstriction**.

Comparision with **Dr. Ashish Ameta et al.**[27]found that there was **no side effect of bronchospasm** in any groups, supporting the current study**.**

ALLERGIC REACTION

In the present study, allergic reaction in Group A patients and Group C was 0% which was **statistically insignificant** with p value 1.000. Suggesting **stable immune response and histamine levels may rise slightly but remain below the threshold for significant allergic reactions.**

Comparision with **Dr. Ashish Ameta et al.**[27] found that there was **no side effectof allergic reaction** in any groups, supporting the current study.

LIMITATION OF OUR STUDY

- Sample size calculated was sufficient for detecting differences in primary outcomes, it may not be enough to capture rare adverse effects.
- Our study was single centered & limited to elective surgeries and adult populations, which may limit the generalizability of our findings to other patients populations or emergency surgical settings.
- We didn't include the patients with anticipated difficult intubation or patients with any comorbidity, higher grades of ASA and those who were in haemodynamically compromised state.
- We were unable to measure the plasma histamine levels due to non availability of this facility in our institute.

CONCLUSION

We conclude that Cisatracurium(0.2mg/kg) provides more stable hemodynamic parameter with rapid onset and prolong duration of action with optimal intubating conditions and with less or no signs of histamine release compared to Atracurium (0.5mg/kg). Hence, Cisatracurium(0.2mg/kg) can be used as an ideal non depolarizing muscle

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relaxant.Therefore, Cisatracurium is safe and more effective neuromuscular blockade which can implicated in our routine practice.

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