

Comparative study of Atracurium and cisatracurium for intubating conditions under general anaesthesia

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Abstract:

Introduction: Good intubating conditions minimizes the risk of trauma associated with tracheal intubation. Atracurium and cisatracurium, non depolarising muscle relaxant can be used to facilitate intubation.

Aims and Objectives: To compare the intubating conditions of atracurium and cisatracurium

Material and Methods: 60 patients randomized into 2 groups of 30 each. Group A received inj atracurium 0.5mg/kg and Group B received cisatracurium 0.15mg/kg for intubation. Laryngoscopic grading, number of intubation attempts, time taken for intubation, haemodynamic parameters and signs of histamine release were observed.

Results: In 50% patients of Group A & 100% patients in Group B the laryngoscopic grading was I i.e. excellent & 50% in Group A laryngoscopic grading was grade II i.e. good. All patients in both groups intubated in first attempt. Time taken for intubation was statistically significant (Group A 58.33+5.4 secs, Group B 42.40+ 10.70 secs, $P < 0.005$). Haemodynamic parameters were comparable in both groups. There were no observed side effects of histamine release.

Conclusion: Atracurium and Cisatracurium are comparable in intubating conditions and haemodynamic stability with no side effects of histamine release

Keywords: Atracurium, Cisatracurium, intubating conditions

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I. Introduction

Since the first administration of d-tubocurarine in 1942 to facilitate muscle relaxation, neuromuscular blocking drugs have been utilized by anaesthesiologists to facilitate surgery and to improve quality of intubation. Good intubating conditions minimises the risk of trauma associated with tracheal intubation. Ideal intubating conditions involve decrease muscle tone, optimal vocal cord position and minimal reaction to laryngoscopy and tube positioning in trachea. Avoiding neuromuscular blocking agents is associated with difficult laryngoscopy.¹ Endotracheal intubation is commonly facilitated by muscle relaxant succinylcholine, a depolarizing neuromuscular blocker which achieves good intubating condition but has undesirable side effects and is being used only for few indications like full stomach, difficult airway etc. Rocuronium, atracurium and cisatracurium are being used for their advantages².

Atracurium besylate a non depolarizing muscle relaxant was introduced into clinical practice in year 1983. It has rapid onset of action, intubation is accomplished within 2 to 3 minutes of 2 xED₉₅ dose, has intermediate duration of action, not dependent on liver metabolism or renal elimination, no cumulative effects, undergoes decomposition to inactive metabolites by hoffmann elimination and ester hydrolysis and has least cardiovascular effects and easily antagonised by neostigmine³.

Cisatracurium another nondepolarizing muscle relaxant introduced in year 1995 is five times more potent than atracurium and is similar to atracurium in other aspects but devoid of cardiovascular effects and histamine releasing properties of atracurium^{4,5}.

Both drugs have been compared in bolus and injection forms.⁶ They have been studied for intubating conditions and some studies have found that atracurium gives intubating condition in the score of excellent to good when compared to cisatracurium^{7,8,9} while many studies quote that intubating conditions are excellent-good for both drugs.¹⁰

The rationale for the study was to find out the efficacy and safety of atracurium and cisatracurium for providing ideal intubating conditions in patients under general anaesthesia.

II. Material and Methods

This prospective randomised double blind study was undertaken after institutional ethical committee approval. Study population was patient schedule for surgical procedures under general anaesthesia with endotracheal intubation. Convenient sample used and sample size of 60 was taken. The inclusion criteria was patients in age group of 18 -60 years of both gender, weight 45 kg-60 kg, ASA grade 1 and 2, mallampati grade 1 and 2. Exclusion criteria was pregnant women, neuromuscular disease, hepatic disease, renal disease, cardiac disease, respiratory disease and anticipated difficult intubation.. Informed consent was taken and simple randomisation was done and patient allocated to either of the two groups Group A: injection atracurium 0.5 mg/ kg and Group B injection cisatracurium 0.15 mg/kg. Allocation concealment done by opaque sealed envelope method. The resident who prepared the syringes did not take further part in the study. The anaesthesiologist performing the intubation was blinded to the drugs given to the patients.

Thorough pre-anaesthetic evaluation was done and patient kept nbm overnight. On arrival in operation theatre monitors attached and baseline parameters recorded. Patient premedicated with injection midazolam 0.02 mg/kg and injection fentanyl 1 ug/kg. Anaesthesia induced with injection propofol 2 mg/ kg followed by injection atracurium 0.5 mg/kg or injection cisatracurium 0.15 mg/kg according to group allocation. Muscle relaxant was given over 5 seconds and line flushed with saline over 15 seconds. After 2 minutes of mask ventilation intubating conditions observed if excellent or good. Patient intubated with adequate sized oral endotracheal tube. If not able to intubate, next attempt done after 30 seconds.

Number of attempts of intubation noted, time taken for intubation noted from introduction of laryngoscope to visual passing of endotracheal tube beyond the vocal cords. The intubating conditions were graded as 1-4 a)excellent: easy passage of the endotracheal tube without coughing. Vocal cords relaxed.b) good: passage of the tube with slight coughing and/or bucking. Vocal cords relaxed.c) poor: passage of the tube with moderate coughing and /or bucking. Vocal cords moderately adducted d) not possible: vocal cords not relaxed, tightly adducted

After intubation patient maintained on Oxygen, nitrous oxide, isoflurane and injection atracurium 0.1mg/kg or injection cisatracurium 0.05 mg/ kg. At the end of surgical procedure reversal done with inj. neostigmine 0.04 mg/ kg and inj. glycopyrrolate 0.08mg/kg and patient extubated.

Monitoring done for intra operative haemodynamic parameter, side effects of histamine release like bradycardia, tachycardia, hypertension, hypotension, flushing, itching, urticaria, wheezing, bronchospasm and injection reaction.

STATISTICAL ANALYSIS: Data was entered in windows excel format. Frequency tables and measures of central tendency (mean) and measures of dispersion (Standard deviation) were obtained by using the statistical package SPSS software. Test of significance (p values) were obtained with appropriate level of significance. To compare means of two groups students ‘t’ test was used with appropriate degrees of freedom and levels of significance

III. Results

Demographic parameters like age, gender, weight, ASA grade I and II, mallampati grade 1 and 2 were comparable in both groups and statistical insignificant. Both group A and B were having 40% males and 60% females with statistically insignificant difference. ASA grade I was present in 3.33% and 0% among group A and B respectively while ASA grade II was found in 96.67% of group A and 100% of group B. Statistically insignificant difference(p>0.09) was found between group A and B when compared in relation to ASA grade. MPC grade II was found in 100% of group A as well as group B. (table1)

Table No.1: Demographic characteristics

Parameters	Group A	Group B	P value
Age	34.37±10.56	36.87±11.74	0.389
Gender			
Male	12 (40%)	12 (40%)	
Female	18 (60%)	18 (60%)	0.99
Weight (mean±SD)	54.67±5.22	50.47±7.04	0.09
MPC Grade			
I (%)	00 (00)	00 (00)	
II (%)	30 (100%)	30 (100%)	
ASA			
Grade I(%)	01 (03.33)	00 (00)	
Grade II(%)	29 (96.67)	30 (100)	>0.99

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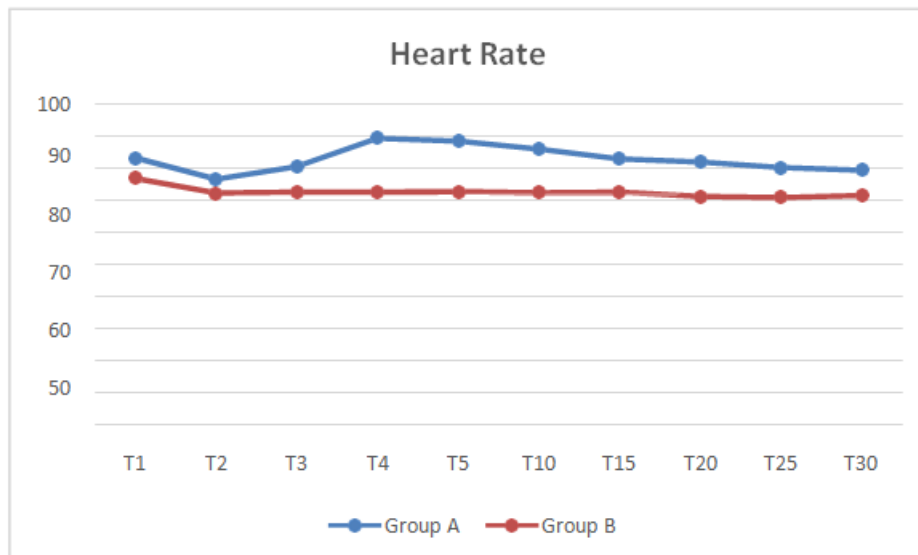
Laryngoscopy grading was excellent in 50% patients and good in 50% patients in Group A but the grading was excellent in 100% person patients in Group B. . Regarding number of attempts at intubation all patients in both groups where intubated in first attempt. The time taken for intubation was within 60 secs in both group but the difference was statistical significant ($p < 0.05$)with more time needed in patients receiving atracurium

Table No 2: Intubating conditions

Study Parameters	Group A	Group B	P value
Laryngoscopic grading			-
Grade I(excellent)	15(50%)	30(100%)	
Grade II(good)	15(50%)	00 (00%)	
Number of attempts			1
1	30(100%)	30(100%)	
2	00	00	
Intubation time(sec) \pm SD	58.33 \pm 5.14	42.40 \pm 10.71	0.001

When the heart rate from T1 to T30 were compared statistically between group A and B, it was found to be statistically significant ($p < 0.05$) with increase in heart rate in atracurium group.(graph no. 1)

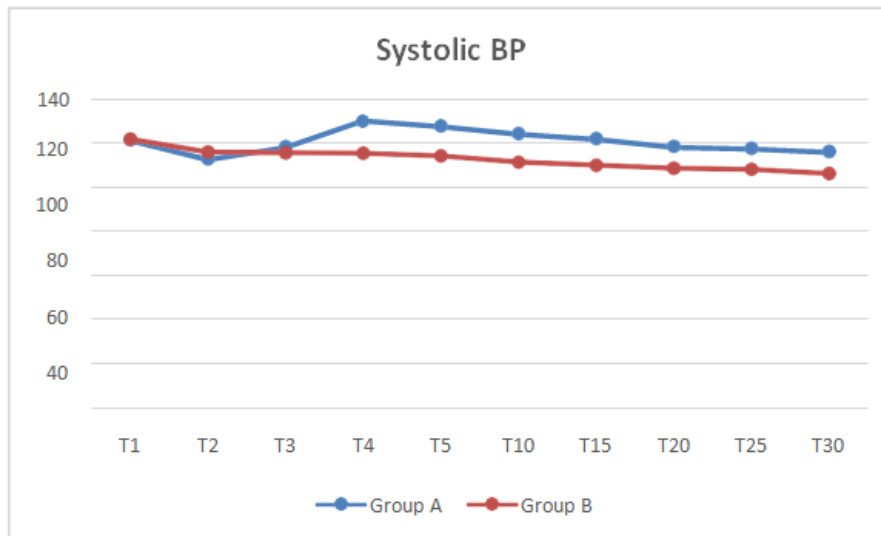
Graph No.1: Comparison between the groups for Heart Rate



T1= Baseline, T2=After Propofol, T3= After muscle relaxant, T4=immediately after intubation, T5= 5 minutes after intubation, T10=10 minutes after intubation, T15= 15mins after intubation, T20=20mins after intubation, T25=25mins after intubation, T30=30mins after intubation.

The difference in systolic blood pressure measured at various interval was statistically significant ($p < 0.05$)with high systolic blood pressure in GroupA compared to Group B but within 30% of baseline. When the mean SBP from T1 to T30 were compared statistically between group A and B, it was found to be statistically significant ($p = 0.01$) except at T1.(graph no. 2)

Graph No. 2: Comparison between the groups for Systolic Blood Pressure



T1= Baseline, T2=After Propofol, T3= After muscle relaxant, T4=immediately after intubation, T5= 5 minutes after intubation, T10=10 minutes after intubation, T15= 15mins after intubation, T20=20mins after intubation, T25=25mins after intubation, T30=30mins after intubation

There were no side effects and no signs of histamine release observed.

IV. Discussion

In our study, demography was comparable between group A and group B. In our study, intubating conditions were excellent in 100% patients in group B and excellent to good in group A while in other studies the intubating conditions were excellent in atracurium group and good in cisatracurium group^{8,9} while in few studies the intubating conditions were excellent to good and comparable between the two groups.^{7,10} Good to excellent intubating conditions were observed in more than 90% of patients after disappearance of the TOF at the corrugators supercilli. The onset of maximal blockade in the larynx corresponds with the point at which the adductor pollicis begins to show palpable evidence of weakening¹¹ Also intubation is easy following neuromuscular monitoring¹² In our study we went with clinical monitoring for intubation. Similar to our study 100% patients intubated in first attempt^{7,13} In our study time taken for intubation was less than 60 secs in both groups but less time required in cisatracurium group compared to atracurium group.

Similar to our study haemodynamics more stable in cisatracurium group^{7,14-16} compared to atracurium while in other studies the haemodynamics stable and comparable between the two groups^{10,13,17-19} One study quoted that atracurium causes decrease in blood pressure due to release of histamine induced by atracurium.²⁰ and also due to rapid administration¹¹ Other study quotes that attempts of tracheal intubation done following complete paralysis of larynx detected by neuromuscular block monitoring of adductor pollicis compared to clinical monitoring results in less haemodynamic response¹² The tachycardia seen with benzyisoquinolinium compound is the result of histamine release¹¹ In our study there was increase in heart rate and blood pressure but within 20% of baseline in atracurium group. This can be due to more time taken in this group for intubation.

Similar to our study no side effects or signs of histamine release seen in either of the groups^{17,19} but other studies found more side effects with atracurium compared to negligible side effects in cisatracurium group^{7,10,13} while few studies observed side effects in both groups and they were statistically significant with more side effects in atracurium groups^{15,21} The side effect of histamine release is most often noted following administration of the benzyisoquinolinium class of muscle relaxants. The effect is of short duration(1-5mins), is dose related and clinically insignificant in healthy patients. And this side effect can be reduced considerably by using a slow injection rate.¹¹ Erythema of face, neck and upper torso develop when large doses given¹¹ The clinical effects of histamine are seen when plasma concentration increases 200% to 300% of baseline values and these effect involve chemical displacement of the contents of mast cell granules containing histamine, prostaglandin and possible other vasoactive substances¹¹ The serosal mast cell located in the skin and connective tissue and near blood vessels and nerves is principally involved in degranulation process¹¹

V. Conclusion

Atracurium and cisatracurium are comparable in intubating condition and hemodynamic stability with no side effects or signs of histamine release.

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