



## RESEARCH ARTICLE - MEDICAL TECHNIQUES

# Comparison between Rocuronium and Atracurium Effect on Blood Pressure during General Anaesthesia in Baghdad Hospital

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Article Info.	Abstract
<p><i>Article history:</i></p> <p>Received 13 October 2020</p> <p>Accepted 24 January 2021</p> <p>Publishing 31 March 2021</p>	<p>This study was aimed to assess the blood pressure influence of rocuronium drug under general anesthesia and compares it with atracurium drug. The study recruited 50 adult patients, divided in to two groups the rocuronium drug groups which included 25 patients and atracurium drug group which included 25 patients, age ranged from (18-60 years) of both sexes who were (ASAI and ASAII) patients undergoing (elective surgeries) in Baghdad education hospital during the period from (October 2019 to March 2020). Anesthesia was induced with using I.V. propofol drug (1.5-2.5 mg/kg), ketamine drug (0.5 mg/kg) or (2-3 mg/kg) propofol drug. For the endotracheal tube, and facility of intubation injection muscle relaxation the rocuronium drug (0.6 mg/kg) or atracurium drug (0.5 mg/kg), for maintenance rocuronium drug (0.1-0.2 mg/kg). 60 sec. was used after administration of the relaxant, attempt of intubation. Next intubation, lungs were mechanically ventilated, monitored, blood pressure recorded and MAP after five minutes and every five minute for 15 minutes. The resulting P-value of MAP in Rocuronium drug groups and Atracurium drug group at pre-operative was 0.811 which was non-significant (<math>P &gt; 0.05</math>). While at induction it was 0.309 which was also non-significant (<math>P &gt; 0.05</math>). After 1min it was 0.574 which was non-significant (<math>P &gt; 0.05</math>). After 5min it was 0.321 which was non-significant. After 10 min it was 0.954 which was non-significant (<math>P &gt; 0.05</math>). The blood pressure effected from rocuronium drug and atracurium drug are different under general anesthesia. The Atracurium drugs has less marked change in MAP. In healthy patients it maybe not be of importance, nevertheless it could be nonessential in patients with preexisting cerebral, cardiac diseases, hypertension or the elderly, but Rocuronium drug has a marked change in MAP. This could be cautiously in the patients with preexisting cardiac or cerebral pathology or elderly or hypertension. In conclusions the MAP was increased at induction of rocuronium drug and was decreased at induction of atracurium drug in this study.</p>

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**Keywords:** Rocuronium; Atracurium; Neuromuscular blocking drugs; Blood pressure; MAP.

## 1. Introduction

Anesthesia is an integral and vital part of modern medical practice, allowing for patients to safely and comfortably undergo various procedures, tests, and surgical operations. General anesthesia is a controlled state of loss of sensation, consciousness, and analgesia, along with relaxation of musculature and control of autonomic physiology [1]. Two main classes of drugs are used to facilitate general anesthesia: inhalational anesthetics and intravenous anesthetics. These drugs are often used in combination to provide a balanced anesthetic [2].

Arterial pressure is normally tightly regulated to ensure adequate flow of blood to tissues whilst avoiding the harmful effects of high pressures on the vasculature and end-organs. Mean arterial pressure (MAP) is normally 65-100mmHg, with normal systolic and diastolic blood pressures between 120-140 mmHg and 70-90 mmHg, respectively. Maintaining homeostasis relies on the modification of factors affecting MAP, namely (systemic vascular resistance SVR) and (cardiac output CO). Earlier, control of CO is described. The relationship among blood flow, pressure difference and resistance is described in Darcy's law. This in turn can be used to determine SVR [3].

In anesthesia neuromuscular blockade is greatly used to facilitate intubation of endotracheal tube, surgical conditions optimize, and in patients who have low lung compliance uses assist with mechanical ventilation [4]. (NMBAs) Neuromuscular blocking agents divided in two forms: agents of (depolarizing neuromuscular blocking) (succinylcholine) and agents of (non depolarizing neuromuscular blocking) (atracurium rocuronium, mivacurium, vecuronium, and cisatracurium,) [5].

Rocuronium bromide (brand names Zemuron, Esmeron) is non depolarizing neuromuscular blocker, aminosteroid or muscle relaxant in modern anaesthesia used to facilitate intubation of tracheal by injection skeletal muscle relaxation drug, commonly the most required for mechanical ventilation or surgery. For standard intubation uses endotracheal to fast concatenation induction [6]. Atracurium besylate also known atracurium besilate, it is medication uses with other medications to providing muscle relaxation of skeletal during mechanical ventilation or surgery it is (benzoisoquinoline) intermediate duration, neuromuscular blocker, has a degradation by (Hoffman reaction and ester hydrolysis uniquely) [7]. Use to help with intubation of endotracheal tube but (succinylcholine) suxamethonium in general occasion if quickly done when needs. Administration into a vein by injection. The effects are very great about four minutes, the last for up to 1 hour [8]. This study aimed to determine the blood pressure change by rocuronium drug and compare it with atracurium drug, in ASA I and ASA II patients during general anesthesia.

## 2. Patients and Methods

### 2.1. Sample collection

This is a Hospital existing prospective indiscriminate comparative study conducted to delineate blood pressure by using rocuronium and atracurium in ASAI and ASAII patients, passing to elective surgeries in Baghdad Education Hospital during the period October 2019 to March 2020. The study recruited 50 adult patients, divided into two groups the rocuronium groups which include 25 patients and atracurium group which included 25 patients, with an age range of (18-60 years) from both sexes who were (ASAI and ASAII) patients undergoing to (elective surgeries).

### 2.2. Pre - Operative Assessment

Patients' assessment was done through the pre evaluation of anaesthesia. Cardiac and renal problems patients were excluded depending on history and pre-operative results of the investigation, the patients passing to elective general surgery procedures for a period between (1-4 hours) were selected for this study. The total number of the rocuronium group was (25 patients), while the total of the atracurium group was (25 patients).

### 2.3. Induction Method

Every morning, anaesthetic machine check was accomplished before any procedure commencement. Patients injected cannula (18 or 20 G) cannula in one arm, before anaesthesia induction, dextrose 5% solution, infusion I.V. was started. Non-invasive blood pressure cuff in the other arm, pulse oximeter probe and ECG device connected with patients then starters heart rate and blood pressure readings were recorded, then assessment was done. Then Patients' premedication ranitidine drug was injected, metoclopramide, dexamethasone, tramadol, 3 minutes before induction. Pre oxygenation was done during this 3 minute after induction of anaesthesia using (I.V. propofol drug 1.5-2.5 mg/ kg), (ketamine drug 0.5 mg/ kg) or 2-3 mg/kg propofol injected. Intubation of the endotracheal tube was facilitated by muscle relaxation injection, rocuronium drug (0.6 mg/ kg) or atracurium drug (0.5 mg / kg) for maintenance rocuronium drug (0.1-0.2 mg/ kg) was used.

### 2.4. Peri - Operative Method

Sixty sec. after administration of relaxant, intubation was attempted. If intubation of tracheal was unsuccessful, protocol permitted for another try at 90 sec. Tracheal intubation occurrence was assessed in the first trying only, then record in a scale based on Mirakhr and Clarke grading. After intubation, lungs were (mechanically ventilated), to maintain end-tidal carbon dioxide ranging (35 and 40mmHg) ventilation must be adjusted. Monitoring and recording of blood pressure and MAP was done after five minutes and every five minutes for 15 minutes. Neuromuscular influence of the muscle relaxant was done by enlistment of the following: time onset (interval of time between accomplishment of injection the muscle relaxant and maximal depression time); the duration clinically (interval time between the accomplishment of the muscle injection the relaxant and the 25% of the control value are return). At surgery end, when twitch increase recovers to 10% of its started control increase, the neuromuscular blocker residual was antagonised by (atropine 15ug/ kg) and neostigmine (50 ug/ kg).

## 3. Results

The two groups, in expression of demographic data were comparable, divided in to two groups the rocuronium groups which include 25 patients and atracurium group included 25 patients. The Mean of rocuronium was 37.0800; the Mean of atracurium was 39.6800 as shown in (table 1).

Table 1. Distributing of studied sample depending on group of age and drugs

Age groups	Rocuronium drug		Atracurium drug	
	No.	%	No.	%
18 - 27	5	20	5	20
28 - 37	9	36	8	32
38- 47	5	20	7	28
48- 57	4	16	2	8
58- 67	2	8	3	12
<b>Total</b>	25	100.0	25	100.0
<b>Mean</b>	37.0800		39.6800	

Table (2) shows that in the Rocuronium group, the number of patients who have hypertension were 3 while those who don't have hypertension were 22. In the atracurium group, the number of patients who have hypertension were 6 and those who didn't have hypertension were 19.

Table 2. Distribution of cases according to hypertension disease and drugs

Hypertension	Rocuronium drug		Atracurium drug	
	No.	%	No.	%
Yes	3	12.0	6	24.0
No	22	88.0	19	76.0
<b>Total</b>	25	100.0	25	100.0

In this study, the Mean of MAP in rocuronium group at Pre-operative was 102.6400 and the Std. Deviation was 11.20223. At induction the Mean was 105.2400 with a Std. Deviation of 13.46687. After 1 minute the Mean was 104.8800 with a Std. Deviation of 24.08720. After 5 minutes the Mean was 97.3600 and the Std. Deviation 16.59036. After 10 minutes the Mean was 97.0400 with a std. Deviation of 14.83936. as explained in Table (3).

Table 3. Descriptive Statistics of cases according to MAP of Rocuronium groups

MAP\Rocuronium	Std. Error	Mean	Std. Deviation
Pre-operative	2.24045	102.6400	11.20223
At induction	2.69337	105.2400	13.46687
After 1min	4.81744	104.8800	24.08720
After 5min	3.31807	97.3600	16.59036
After 10min	2.96787	97.0400	14.83936

In this study, we made a comparison between MAP of rocuronium at pre-operative, at induction, after 1 min, after 5 min and after 10 min. In all groups there was no significant ( $P > 0.05$ ) except at induction\ MAP & After 5min\ MAP, at induction\ MAP & After 10 min\ MAP are significant ( $P < 0.05$ ) as explained in Table (4).

Table (4). Compare between MAP of Rocuronium groups

MAP of Rocuronium groups	t	P-Value	C.S
Pre-operative\ MAP& At induction\ MAP	1.353	0.189	$P > 0.05$ (NS)
Pre-operative\ MAP& After 1min\ MAP	0.468	0.644	$P > 0.05$ (NS)
Pre-operative\ MAP& After 5min\ MAP	1.453	0.159	$P > 0.05$ (NS)
Pre-operative\ MAP& After 10 min\ MAP	1.545	0.135	$P > 0.05$ (NS)
At induction\ MAP & After 1min\ MAP	0.083	0.935	$P > 0.05$ (NS)

At induction\ MAP & After 5min\ MAP	2.316	0.029	P< 0.05 (S)
At induction\ MAP & After 10 min\ MAP	2.532	0.018	P< 0.05 (S)
After 1min\ MAP& After 5min\ MAP	1.807	0.083	P> 0.05 (NS)
After 1min\ MAP & After 10 min\ MAP	1.425	0.167	P> 0.05 (NS)
After 5min\ MAP & After 10 min\ MAP	0.094	0.926	P> 0.05 (NS)

Table (5) shows the Mean of MAP in the atracurium group at Pre-operative was 103.6000 and the Std. Deviation was 13.60147. At induction the Mean was 100.0400 which was with a Std. Deviation of 19.34227. After 1min the Mean was 101.2800 and the Std. Deviation was 20.22894. After 5min the Mean was 102.0800 with a Std. Deviation of 21.51341. After 10min the Mean was 96.8000 which and the Std. Deviation was 16.19156.

Table 5. Descriptive Statistics of cases according to MAP of Atracurium groups

MAP	Std. Error	Mean	Std. Deviation
<b>Pre-operative</b>	2.72029	103.6000	13.60147
<b>At induction</b>	3.86845	100.0400	19.34227
<b>After 1min</b>	4.04579	101.2800	20.22894
<b>After 5min</b>	4.30268	102.0800	21.51341
<b>After 10 min</b>	3.23831	96.8000	16.19156

In table 6 we compared between MAP of atracurium at pre-operative, at induction, after 1 min, after 5min, After 10 min. There was no significant difference ( $P > 0.05$ ) except at pre-operative\ MAP and after 10 min\ MAP was significant ( $P < 0.05$ ).

Table 6. Comparison between MAP of Atracurium groups

MAP of Atracurium groups	t-test	P-Value	C.S
<b>Pre-operative\ MAP&amp; At induction\ MAP</b>	0.978	0.338	P> 0.05 (NS)
<b>Pre-operative\ MAP&amp; After 1min\ MAP</b>	0.720	0.478	P> 0.05 (NS)
<b>Pre-operative\ MAP&amp; After 5min\ MAP</b>	0.412	0.684	P> 0.05 (NS)
<b>Pre-operative\ MAP&amp; After 10 min\ MAP</b>	2.260	0.033	P< 0.05 (S)
<b>At induction\ MAP &amp; After 1min\ MAP</b>	0.388	0.702	P> 0.05 (NS)
<b>At induction\ MAP &amp; After 5min\ MAP</b>	0.366	0.718	P> 0.05 (NS)
<b>At induction\ MAP&amp; After 10 min\ MAP</b>	0.754	0.458	P> 0.05 (NS)
<b>After 1min\ MAP &amp; After 5min\ MAP</b>	0.160	0.874	P> 0.05 (NS)
<b>After 1min\ MAP &amp; After 10 min\ MAP</b>	1.199	0.242	P> 0.05 (NS)
<b>After 5min\ MAP &amp; After 10min\ MAP</b>	1.665	0.109	P>0.05 (NS)

The P-value of MAP in Rocuronium groups and Atracurium groups at pre-operative was 0.811 which was non-significant ( $P > 0.05$ ). At induction was 0.309 which was non-significant ( $P > 0.05$ ). After 1min, it was 0.574 which was not significant ( $P > 0.05$ ). After 5min, it was 0.321 which was non-significant. After 10 min, it was 0.954 which was not significant ( $P > 0.05$ ) as explained in Table (7).

Table 7. Comparison between MAP of Rocuronium groups and MAP of Atracurium groups

MAP of Rocuronium groups and MAP of Atracurium groups	t-test	P-Value	C.S
Pre-operative MAP of Rocuronium & Pre-operative MAP of Atracurium	0.242	0.811	$P > 0.05$ (NS)
At induction MAP of Rocuronium & At induction MAP of Atracurium	1.038	0.309	$P > 0.05$ (NS)
After 1min MAP of Rocuronium & After 1min MAP of Atracurium	0.570	0.574	$P > 0.05$ (NS)
After 5min MAP of Rocuronium & After 5min MAP of Atracurium	1.013	0.321	$P > 0.05$ (NS)
After 10 min MAP of Rocuronium & After 10 min MAP of Atracurium	0.058	0.954	$P > 0.05$ (NS)

In Fig. (1). Show the MAP of Rocuronium drug groups during Pre-operative, At induction, After 1min, After 5min and After 10 min.

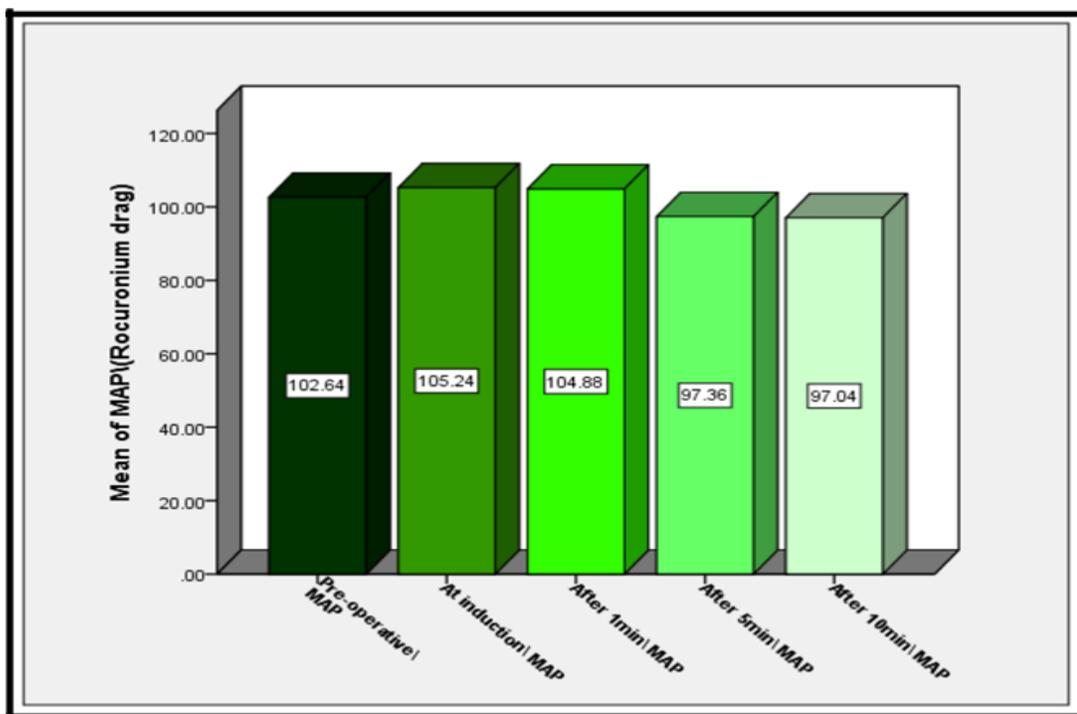


Fig.1. MAP of Rocuronium groups

In Fig. (2). Show the MAP of Atracurium drug groups during Pre-operative, At induction, After 1min, After 5min and After 10 min.

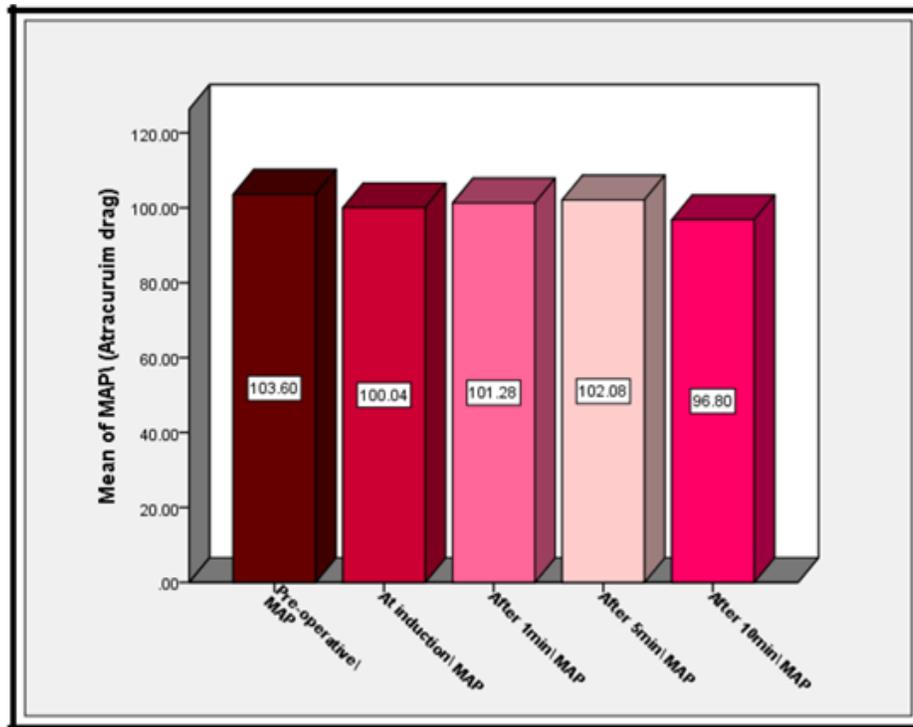


Fig. 2. MAP of Atracurium groups

#### 4. Discussion

Blood pressure changes by rocuronium and atracurium drugs, Rocuronium drug did not perform in elderly patients in this study, that cause hypertension or tachycardia, this result was in agreement with Gursoy et al [9] [10]. Adverse effects of atracurium are skin flushing and decrease of blood pressure, this result is in agreement with Doenicke and colleagues [11]. It was also observed that the MAP of rocuronium and atracurium after (1, 5, 10 min) had begun to return to the normal state of the patients (pre-operative). Response maybe of no importance clinically with healthy, patients with normotensive, but maybe hurtful with hypertensive patients, elderly, cerebral or aortic aneurysm, increased pressure of intracranial or other diseases of the cardiovascular system. In some cases, increased MAP maybe removed automatically and you do not need any use of hypertensive drugs, but if there is a significant increase in MAP (especially the elderly and those with cardiovascular diseases) and for a long time, we give antihypertensive drugs to reduce the MAP [12].

The compare between rocuronium and atracurium at induction, the MAP of rocuronium was increased and the MAP of atracurium was decreased, In case of hypotension, the amount given fluid must be increased and inhalation agent reduced, while in the case of hypertension, the amount given fluid must be decreased and inhalation agent increased [13].

Neuromuscular blockers (NMB) are the essential causes of intraoperative anaphylaxis, during anesthesia, they are responsible for (50% to 70%) of the cases as a rule; benzyloquinoline compounds lead to enhancement of the non-immunologic histamine releasing causing bronchoconstriction in impressible patients and lowering of the systemic blood pressure [14].

The hypotension incidence due to of atracurium is low, and the etiologic factor labeled with (18%) of the episodes of anaphylaxis with anesthesia [15].

Atracurium injection was not mixed with same syringe, or simultaneously administered in the same needle with solutions of alkaline (e.g. solutions of barbiturate). Levels dose more than (0.9 mg) rocuronium per kg of body weight may cause higher heart rate; this effect can encounter bradycardia produced by stimulation of vagal or by other agents of anaesthetic [16]. Rocuronium caused mild high rate of heart rate while the MAP decreased after the administration of the drug, in addition to rocuronium providing good intubation conditions; it exhibits good hemodynamic stability, has fast beginning of action with much lesser side-effects when compared to other nondepolarizing muscle relaxants [17]. Starting atracurium dose of (0.3 to 0.6 mg/ kg) (according to duration of complete block demanded), administration bolus injection intravenously will provide amplest about (15 to 35 minutes) of relaxation; atracurium only administered by intravenous injection which is in agreement with Belmont MR *et al*, 1993. Commonly with all agents of neuromuscular blocking, monitoring function of neuromuscular during the use of atracurium injection is recommended so as to individualize requirement of dosage. Atracurium drug is a neuromuscular blocker (benzyloquinoline), causing hypotension when injected with doses same or higher than (three times) in humans. The strength of influence relies on speed of administration and the dose [18].

#### 5. Conclusion

The MAP was increased at induction of rocuronium and was decreased at induction of atracurium in this study. A highly significant increase in MAP, when using both drugs atracurium and rocuronium (especially in the elderly and cardiovascular diseases) and for a long time, we give antihypertensive drugs to reduce the MAP. Atracurium drugs had a less marked change in MAP.

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