International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2023: 1.843

Haemodynamic Effects - A Comparison Between Succinylcholine (1.5mg/kg) and Rocuonium Bromide (0.9mg/kg) for Rapid Sequence Induction of Anaesthesia

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Abstract: ***Background and Aims: Rapid Sequence Induction (RSI) is a critical technique used to secure the airway in patients at risk of aspiration, involving preoxygenation, cricoid pressure, and rapid intubation. Succinylcholine and Rocuronium are two muscle relaxants frequently used in RSI. This study aims to compare the haemodynamic effects in adult patients undergoing elective surgery. Methods: A total of 60 patients, aged 18-60 years, with ASA Grade I and II physical status, who were undergoing various elective surgical procedures, were enrolled. Patients were randomly divided into two groups of 30 each. Group I received*** *Succinylcholine* ***(1.5 mg/kg), and Group II received*** *Rocuronium* ***(0.9 mg/kg) as neuromuscular blocking agents for intubation. Hemodynamic monitors were noted. Result: Both Succinylcholine and Rocuronium caused a statistically significant increase in heart rate (HR) and mean arterial pressure (MAP) immediately after intubation due to the stress response ($p < 0.01$), which then normalized within five minutes. Both agents were effective for securing the airway with minimal adverse effects, and the transient haemodynamic changes observed were primarily attributed to the intubation process rather than the neuromuscular blocking agents themselves. Oxygen saturation remained stable across both groups, with no significant differences observed ($p > 0.05$). Conclusion: We conclude that both Succinylcholine and Rocuronium observed transient haemodynamic changes primarily attributed to the intubation process rather than the neuromuscular blocking agents.***

Keywords: rapid sequence induction, rocuronium bromide, succinylcholine, intubation, laryngoscopy

1. Introduction

Rapid Sequence Induction (RSI) is a technique used to secure the airway in patients at risk of aspiration, involving preoxygenation, cricoid pressure, and rapid intubation.[1] Succinylcholine and Rocuronium are two muscle relaxants commonly used in RSI. Succinylcholine has a rapid onset and short duration but may cause cardiovascular side effects, hyperkalemia, and muscle fasciculations, making it unsuitable in certain conditions (e.g., burn or spinal cord injuries). Rocuronium, a non-depolarizing agent, also has a rapid onset and fewer cardiovascular side effects, with a longer duration of action.[2] The study aims to compare these two drugs in terms of intubating conditions, onset of muscle relaxation, and cardiovascular side effects in adult patients undergoing elective surgery.

2. Aims and Objectives

The present study ***"Haemodynamic Effects – A Comparison Between Succinylcholine (1.5mg/kg) and Rocuronium Bromide (0.9mg/kg) for Rapid Sequence Induction of Anaesthesia"*** has been carried out in the department of Anaesthesiology, Bombay Hospital, Indore, with the following aims and objectives:

1. To compare the haemodynamic effects produced by drugs.

3. Material and Methods

This observational study was conducted at the Department of Anaesthesiology, Bombay Hospital, Indore, from September 2012 to August 2013. A total of 60 patients, aged 18-60 years, with ASA Grade I and II physical status, who were undergoing various elective surgical procedures, were enrolled. After obtaining informed consent, the patients were randomly divided into two groups of 30 each. Group I received **Succinylcholine** (1.5 mg/kg), and Group II received **Rocuronium** (0.9 mg/kg) as neuromuscular blocking agents for intubation. All patients underwent a thorough pre-operative clinical examination to rule out any uncontrolled systemic diseases. The inclusion criteria were patients aged 18-60 years, of either sex, with ASA Grade I or II, and scheduled for elective surgery. Exclusion criteria included refusal to participate, predicted difficult airways, pregnancy, uncontrolled renal, hepatic, metabolic, neuromuscular, endocrine, or respiratory diseases, hypertension, coronary artery disease (CAD), epilepsy, hemodynamic instability, severe cardiac conditions, and hypersensitivity to the study drugs.

Before anaesthesia induction, all patients were premedicated with **Glycopyrolate** (0.01 mg/kg) and **Ranitidine** (1 mg/kg) intramuscularly, 30 minutes prior to anaesthesia. Upon arrival in the operating room, intravenous access was established, and baseline measurements (mean arterial pressure, heart rate, and oxygen saturation) were recorded. Preoxygenation was performed for 5 minutes, and anaesthesia was induced with

Fentanyl (1-2 µg/kg) and **Propofol** (2 mg/kg). Cricoid pressure was applied before administering either Succinylcholine (1.5 mg/kg) for Group I or Rocuronium (0.9 mg/kg) for Group II. After a 60-second period of oxygenation via a facemask, laryngoscopy was performed, and response to intubation, as described by Cooper et al. Following successful intubation, the endotracheal tube cuff was inflated, and cricoid pressure was released.

4. Result

Table 1: Mean Heart Rate ± S.D (Beats / Minute)

Time Interval	Group I (Succinylcholine)	Group II (Rocuronium Bromide)
T0 (baseline values)	81.2 ± 8.0	77.9 ± 5.28
T1 (after induction)	77.4 ± 7.9	80.6 ± 4.52
T2 (after intubation)	91.4 ± 7.7	86.2 ± 4.79
T3 (after 2 minutes)	84.6 ± 6.3	82.8 ± 6.19
T4 (after 5 minutes)	84.7 ± 6.4	82.0 ± 4.48

There was significant change in HR compared to baseline after administration of Succinylcholine in group I($p<0.01$) and Rocuronium in group II ($p<0.01$).

We did observe an increase in HR immediately after intubation (T2) in both the groups. This was found to be statistically significant (p value<0.01) in both the groups. There was increase in HR as compared to baseline after intubation till 5 minutes in both the groups. Though the peak was seen at (T2) after intubation minutes of intubation in both the groups.

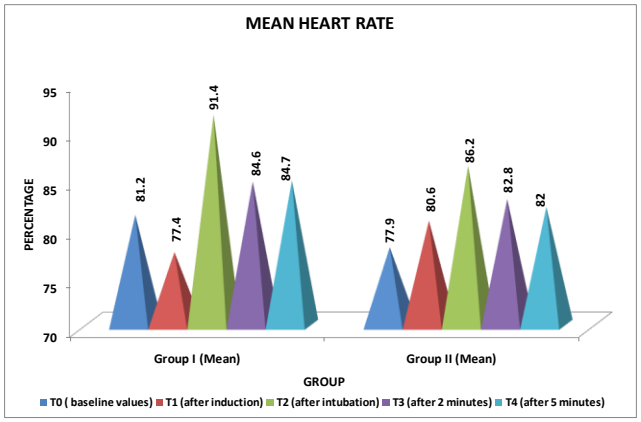

Figure 1: Mean Heart Rate ± S.D (Beats / Minute)

Table 2: Mean Arterial Pressure ± S.D (mm Hg)

Time Interval	Group I (Succinylcholine)	Group II (Rocuronium Bromide)
T0 (baseline values)	95.4 ± 6.55	91.1 ± 7.36
T1 (after induction)	86.4 ± 4.91	84.2 ± 6.62
T2 (after intubation)	97.8 ± 7.51	93.5 ± 5.63
T3 (after 2 minutes)	96.2 ± 9.3	90.1 ± 8.72
T4 (after 5 minutes)	95.5 ± 8.5	90.3 ± 8.76

** Calculated by the formula: [{2XDBP} +SBP]/3*

There was significant change in MAP compared to baseline after administration in both the groups.

There was a significant change in MAP from baseline till intubation in Rocuronium group and then the MAP nearly returned to its baseline. The change in MAP at 2 min and 5 min was not significant ($p > 0.05$).

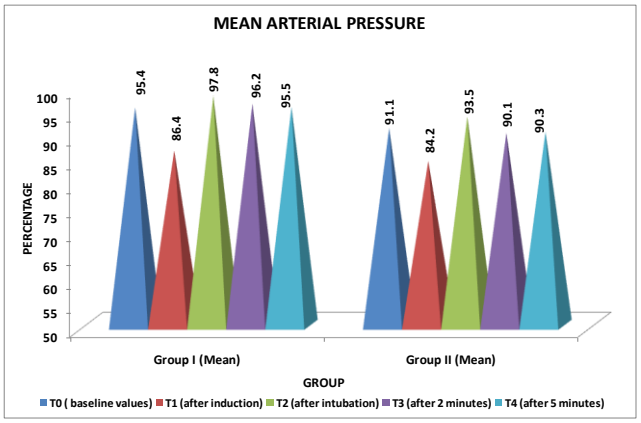

Figure 2: Mean Arterial Pressure ± S.D (mm Hg)

Table 3: Mean Oxygen Saturation (%)

Time Interval	Group I (Succinyl-choline)	Group II (Rocuronium Bromide)
T0 (baseline values)	99.6 ± 0.67	99.7 ± 0.59
T1 (after induction)	99.0 ± 1.21	99.8 ± 0.35
T2 (after intubation)	99.8 ± 0.61	99.9 ± 0.25
T3 (after 2 minutes)	99.9 ± 0.40	99.9 ± 0.31
T4 (after 5 minutes)	100.0 ± 0.00	100.0 ± 0.00

There was no difference in the mean oxygen saturation between the baseline value and the values at different time interval in two groups and the calculated p value was >0.05 which suggests no statistically significant difference in mean oxygen saturation values in both the groups.

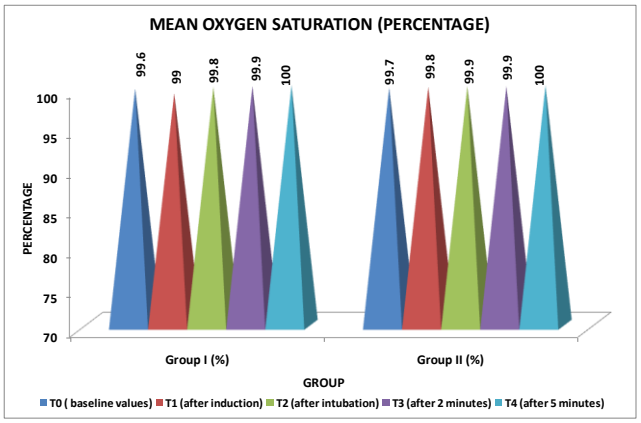

Figure 3: Mean Oxygen Saturation (%)

5. Discussion

This study was conducted to compare the haemodynamic effects after administration of Succinylcholine 1.5mg/kg or Rocuronium Bromide 0.9mg/kg, in adult patients undergoing elective surgical procedure.

In the present study we observed the mean heart rate and mean blood pressure at:

- Baseline values (T0)
- After induction (T1)

- Immediately after intubation (T2)
- 2 minutes after intubation (T3)
- 5 minutes after intubation (T4)

There were significant change in HR and MAP compared to baseline after administration of Succinylcholine in group I ($p<0.01$) and group II Rocuronium ($p<0.01$). The probable mechanism being its vagolytic action.[3,4]

We did observe an increase in HR and MAP immediately after intubation (T2) in group I and II. This was found to be statistically significant (p value<0.01) in all two groups. Increase in HR and MAP after intubation till 5 minutes (T0-T4) in group I and group II (p value >0.05) was found not statistically significant.

The findings of increase in HR & MAP in all two study groups just after intubation is due to stress response of laryngoscopy and intubation.

The findings in our study is consistent with the following studies:

McCoy E P, Maddineni VR et al found no significant changes in haemodynamic parameters after Rocuronium Bromide.[5]
Shukla A, Dubey KP et al also concluded that Rocuronium is devoid of significant haemodynamic changes.[6]

Wierda JM et al found that Rocuronium resulted in limited increase in heart rate without measureable rise in MAP probably because of its weak vagolytic effect.[7]

Robertson EN et al concluded that Rocuronium causes a mild rise in heart rate.

Levy FH, Davis G, Duggon J et al concluded that there is no increase in plasma histamine levels after raid intravenous bolus of Rocuronium using doses up to 1.2 mg/kg (4 x ED_{95}).[8]

Booij LDHJ et al observed no sign of histamine release with Rocuronium Bromide.

6. Conclusions

In conclusion, the study demonstrated that in **haemodynamic effects**, both groups showed a **significant increase** in **heart rate (HR)** and **mean arterial pressure (MAP)** immediately following intubation (at **T2**) due to the **stress response** of laryngoscopy and intubation (**$p < 0.01$**). However, these haemodynamic changes were transient, with **no significant differences** observed at **2 minutes (T3)** and **5 minutes (T4)** post-intubation (**$p > 0.05$**), indicating that the initial rise in HR and MAP normalized over time in both groups.

Overall, both **Succinylcholine** and **Rocuronium** were effective for securing the airway with transient haemodynamic changes observed were primarily attributed to the intubation process rather than the neuromuscular blocking agents themselves.

References

[1] Mallampati SR. Airway management. In: Barash PG, Cullen BF, Stoelting RK, eds. Clinical Anesthesia. Philadelphia, Pa: Lippincott-Raven; 1997:573-594.
[2] Nitschman P, Oberkogler W, Hertsig M, Schwarz S. Comparison of hemodynamic effects of Rocuronium Bromide with those of Vecuronium Bromide in patients undergoing CABG surgery. Eur. J. Anaesth. 1994;11:113-115.
[3] Pharmacology and Physiology in Anaesthetic Practice: Stoelting 4th Ed. Pg.No: 240.
[4] McCoy EP, Venkat R, Elliott P, Rajinder K, Carson IW, Cooper RA. Haemodynamic effects of Rocuronium during fentanyl anaesthesia: comparison with Vecuronium. Can J Anaesthesia 1993;40(8):703-8.
[5] McCoy EP, Maddineni VR, Elliot P, Mirakhur RK, Carson IW, Cooper RA. Haemodynamic effects of Rocuronium during fentanyl anaesthesia: comparison with Vecuronium. Can J Anaesth 1993;40(8):703-08.
[6] Shukla A, Dubey KP, Sharma MSN. Comparative evaluation of haemodynamic effects and intubating conditions after the administration of org 9426 (rocuronium) and Succinylcholine. Indian J Anaesth 2004;48 (6):476-479.
[7] Wierda JMKH, Schuringa M, van den Broek L. Cardiovascular effects of an intubating dose of Rocuronium 0.6 mg kg-1 in anaesthetized patients, paralysed with Vecuronium. Br J Anaesth 1997;78(5):586-587.
[8] Levy JH, Davis GK, Duggan J, Szlam F. Determination of the hemodynamics and histamine release of rocuronium (Org 9426) when administered in increased doses under N2O/O2-sufentanil anesthesia. Anesth Analg. 1994 Feb;78(2):318-21.