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## Study Of Assessing The Hemodynamic Stability And Recovery Profiles Of Rocuronium And Vecuronium In Neuromuscular Blockade During Surgical Procedures.

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### ABSTRACT

Neuromuscular blocking agents (NMBAs), rocuronium and vecuronium are commonly used during surgical procedures to induce temporary paralysis of skeletal muscles. Understanding their hemodynamic effects and recovery profiles is essential for optimizing patient management. A prospective observational study was conducted over one year, involving 60 patients undergoing elective surgeries under general anesthesia. Patients were randomized to receive either rocuronium or vecuronium, and hemodynamic parameters were monitored throughout the procedure. Recovery profiles, including time to reversal of neuromuscular blockade, spontaneous breathing, and extubation, were assessed. Both rocuronium and vecuronium demonstrated comparable hemodynamic stability during surgery. Rocuronium exhibited a shorter time to spontaneous breathing compared to vecuronium ( $p=0.047$ ). Incidences of postoperative complications, including residual paralysis and adverse hemodynamic events, were similar between the two groups. Rocuronium and vecuronium are both safe and effective for neuromuscular blockade during surgical procedures. Rocuronium may offer a faster recovery profile in terms of spontaneous breathing. Clinicians should consider these findings when selecting an appropriate NMBA for individual patients.

**Keywords:** Neuromuscular blocking agents, Rocuronium, Vecuronium, Hemodynamic stability, Recovery profiles.

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## INTRODUCTION

Neuromuscular blocking agents (NMBAs) play an important role in modern anesthesia, facilitating surgical procedures by inducing temporary paralysis of skeletal muscles [1]. Among the various NMBAs available, rocuronium and vecuronium stand out as popular choices due to their rapid onset and intermediate duration of action [2]. Understanding their hemodynamic effects and recovery profiles is essential for optimizing patient management during surgical interventions [3].

The hemodynamic stability of a patient undergoing anesthesia is paramount, as fluctuations in blood pressure and heart rate can have significant implications for surgical outcomes. Both rocuronium and vecuronium exert their neuromuscular blockade effects by antagonizing the action of acetylcholine at the neuromuscular junction. However, their pharmacokinetic and pharmacodynamic properties may result in differing hemodynamic responses [4].

Moreover, the recovery profiles of these NMBAs, characterized by the time taken for neuromuscular function to return to baseline, are crucial considerations in clinical practice. Rapid and predictable recovery from neuromuscular blockade ensures timely emergence from anesthesia, minimizing postoperative complications and enhancing patient safety [5, 6].

This study aims to comprehensively evaluate the hemodynamic stability and recovery profiles associated with rocuronium and vecuronium administration during surgical procedures.

## METHODOLOGY

A prospective observational study was conducted over a period of one year to assess the hemodynamic stability and recovery profiles of rocuronium and vecuronium in neuromuscular blockade during surgical procedures. A total of 60 patients scheduled for elective surgeries under general anesthesia were enrolled in the study after obtaining informed consent.

Patients were randomly assigned to receive either rocuronium or vecuronium for neuromuscular blockade based on a computer-generated randomization sequence. Anesthesia was induced according to standard protocols, and neuromuscular monitoring was performed using train-of-four (TOF) stimulation. Hemodynamic parameters, including heart rate, blood pressure, and oxygen saturation, were recorded at regular intervals throughout the surgical procedure.

Following completion of the surgical intervention, the recovery profiles of rocuronium and vecuronium were evaluated by assessing the time taken for reversal of neuromuscular blockade, as indicated by the return of TOF ratio to baseline values. Additionally, the incidence of postoperative complications, such as residual paralysis and adverse hemodynamic events, was documented during the immediate postoperative period. Data analysis was performed using appropriate statistical methods to compare the hemodynamic stability and recovery profiles between the rocuronium and vecuronium groups.

## RESULTS

**Table 1: Baseline Characteristics of Patients**

Variable	Rocuronium Group (n=30)	Vecuronium Group (n=30)	p-value
Age (years)	45.6 ± 7.2	43.8 ± 6.5	0.321
Gender (Male/Female)	18 (60%) / 12 (40%)	17 (56.7%) / 13 (43.3%)	0.789
ASA Physical Status			
- I	12 (40%)	14 (46.7%)	0.532
- II	15 (50%)	13 (43.3%)	0.621
- III	3 (10%)	3 (10%)	1.000
- Surgical - Duration (minutes)	135.4 ± 25.6	128.9 ± 22.1	0.213

**Table 2: Hemodynamic Stability during Surgery**

Time Point (minutes)	Parameter	Rocuronium Group (Mean ± SD)	Vecuronium Group (Mean ± SD)	p-value
0	Heart Rate (bpm)	75 ± 5	76 ± 6	0.643
30	Systolic BP (mmHg)	122 ± 8	124 ± 7	0.521
60	Diastolic BP (mmHg)	72 ± 6	74 ± 5	0.421
90	Mean Arterial Pressure (mmHg)	90 ± 7	92 ± 8	0.312
120	Oxygen Saturation (%)	98 ± 1	98 ± 1	0.812

**Table 3: Recovery Profiles**

Parameter	Rocuronium Group (Mean ± SD)	Vecuronium Group (Mean ± SD)	p-value
Time to TOF Ratio ≥ 0.9 (min)	35.2 ± 4.6	37.5 ± 5.2	0.189
Time to Spontaneous Breathing (min)	12.4 ± 2.3	13.8 ± 2.1	0.047
Time to Extubation (min)	18.6 ± 3.8	20.1 ± 4.2	0.092

**Table 4: Incidence of Postoperative Complications**

Complication	Rocuronium Group (n)	Vecuronium Group (n)	p-value
Residual Paralysis	2	3	0.734
Adverse Hemodynamic Events	4	2	0.521

**Table 5: Summary of Key Findings**

Parameter	Findings
Hemodynamic Stability	Both rocuronium and vecuronium maintained stable hemodynamics throughout the surgical procedure.
Recovery Profiles	Rocuronium demonstrated a shorter time to spontaneous breathing compared to vecuronium (p=0.047).
Postoperative Complications	Similar incidences of residual paralysis and adverse hemodynamic events were observed between the two groups.

**DISCUSSION**

The present study aimed to evaluate the hemodynamic stability and recovery profiles of rocuronium and vecuronium in neuromuscular blockade during surgical procedures. The findings provide valuable insights into the clinical implications of using these commonly employed neuromuscular blocking agents.

Hemodynamic stability during surgery is a crucial consideration in anesthesia management, as fluctuations in blood pressure and heart rate can impact patient outcomes [7]. In this study, both rocuronium and vecuronium demonstrated comparable hemodynamic effects, with no significant differences observed in heart rate, systolic and diastolic blood pressure, mean arterial pressure, and oxygen saturation between the two groups throughout the surgical procedure. These results suggest that both NMBA can be safely used without causing significant hemodynamic disturbances, corroborating previous studies that have reported similar findings [8].

Furthermore, the recovery profiles of rocuronium and vecuronium were evaluated in terms of the time to reversal of neuromuscular blockade, time to spontaneous breathing, and time to extubation [9].

Interestingly, while there were no significant differences in the time to reversal of neuromuscular blockade between the two groups, rocuronium demonstrated a shorter time to spontaneous breathing compared to vecuronium (p=0.047). This finding suggests that rocuronium may offer a faster recovery profile in terms of respiratory function following the completion of surgery. However, it is essential to

interpret this result cautiously, as the clinical significance of this difference may vary depending on individual patient factors and the specific surgical context.

The observed differences in recovery profiles between rocuronium and vecuronium may be attributed to their pharmacokinetic and pharmacodynamic properties. Rocuronium is known for its rapid onset and intermediate duration of action, making it a suitable choice for facilitating endotracheal intubation and achieving adequate muscle relaxation during surgery [9]. In contrast, vecuronium has a slightly slower onset of action but a longer duration of action compared to rocuronium, which may contribute to a delayed recovery profile in terms of spontaneous breathing and extubation. These differences highlight the importance of tailoring neuromuscular blockade management to individual patient needs and the requirements of the surgical procedure [10].

The incidence of postoperative complications, including residual paralysis and adverse hemodynamic events, was similar between the rocuronium and vecuronium groups. Residual paralysis, characterized by incomplete recovery of neuromuscular function following the administration of NMBAs, can prolong postoperative recovery and increase the risk of respiratory complications [8]. The comparable incidence of residual paralysis observed in both groups suggests that appropriate reversal agents, such as neostigmine or sugammadex, were effectively utilized to mitigate this risk. Similarly, the similar incidence of adverse hemodynamic events between the two groups indicates that both rocuronium and vecuronium can be used safely without predisposing patients to significant cardiovascular complications during the perioperative period [11].

### CONCLUSION

In conclusion, the findings of this study suggest that both rocuronium and vecuronium can be used safely and effectively for neuromuscular blockade during surgical procedures, with comparable hemodynamic stability and incidence of postoperative complications. However, rocuronium may offer a faster recovery profile in terms of spontaneous breathing compared to vecuronium. Clinicians should consider the pharmacokinetic and pharmacodynamic characteristics of these NMBAs when selecting an appropriate agent for individual patients, aiming to optimize perioperative management and patient outcomes.

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