

Onset of Action, Clinical Duration, and Recovery Index of Rocuronium: A Comparison with Atracurium

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ABSTRACT

Background: Neuromuscular blocking agent (NMB) is a very essential adjuvant to general anesthesia. Atracurium besylate (benzenesulfonate NMB) and rocuronium bromide (aminosteroidal NMB) are commonly used non-depolarizing muscle relaxants in Tripoli hospitals, Libya. This study aimed at evaluating onset of action, clinical duration, recovery time conditions, and any possible side effects of two neuromuscular blockers widely used in operation at Tripoli hospitals, Libya. **Methods:** A total of 112 patients underwent elective general or orthopedic surgery were randomly included in this study. All cases were assessed for the use of muscle relaxant (onset of action, clinical duration, spontaneous recovery, and any possible side effects). Brief information about the study, the subject information and the type of surgery was taken and recorded in specific form before starting the operation. **Results:** We demonstrated that the percentage use of atracurium in operation was 27.6% [Median dose 40.35mg] in compare to rocuronium 72.4% [Median dose 35.18mg]. The main onset of action of atracurium was found to be 68.75 ± 11.2 sec, in compare to rocuronium onset of action 64.40 ± 8.6 sec. Further, the main duration of action of rocuronium was 33.57 ± 3 min, while in atracurium, the duration was 35.45 ± 5 min. The recovery index was 11.3 ± 2 min in atracurium group, while it was 9.2 ± 1 min in rocuronium group. There were no side effects noticed with the use of both muscle relaxants during operation. **Conclusion:** Rocuronium has a rapid onset of action with shorter clinical duration compared with atracurium. Moreover, the recovery index was significantly shorter in rocuronium than atracurium, with no side effect have been reported in this study with the use of both agents.

Keywords: Atracurium – Rocuronium – Anesthesia – Muscle Relaxant.

INTRODUCTION

Muscle relaxant is a drug that affects skeletal muscle function and decreases the muscle tone. It may be used to relief symptoms such as muscle spasms, hyperreflexia, and pain. The term 'muscle relaxant' is frequently used to indicate two main therapeutic groups: neuromuscular blockers and spasmolytics. Neuromuscular blockers (NMB) became a vital part as adjuvant to general anesthesia [1].

NMB act by interfering with transmission at the neuromuscular end plate and have no central nervous system (CNS) effects. They are often administered during surgical procedures and in intensive care and emergency medicine to cause temporary paralysis.

Spasmolytics, known as centrally acting muscle relaxants, are used to relieve musculoskeletal pain and spasms in many of neurological diseases [2].

The supreme neuromuscular blocker should have the subsequent features: fast onset, short duration, absence of cardiovascular effects (tachycardia, hypotension secondary to histamine release), and predictable action time. However, there is still no ideal neuromuscular blocker and, among those available for clinical use, all of them have advantages and drawbacks [3].

This study aimed at evaluating onset, clinical duration, and recovery time conditions of two neuromuscular blockers widely used in Tripoli hospitals, Libya.

METHODOLOGY

This is an observational study was conducted on patients underwent surgery in governmental hospitals in Tripoli, Libya. A total of 112 patients were included in this study. After the clinical research ethical committee approval and the written consent of parents undertaken, all cases were assessed for the use of two commonly used muscle relaxant atracurium and rocuronium during operation. Data collected includes; NMB dose, onset of action, clinical duration, recovery Index, and adverse effects (if any). Brief information about the study, the subject information and the type of operation was taken and recorded in specific form. The selected subjects are within the age range of 18 to 70 years old, not pregnant and informed on the study objectives, methodology and possible inconveniences. Exclusion criteria included patients having major hepatic, renal, cardiovascular, pulmonary and neuromuscular diseases. Morbid obese, pregnant and patients under anticonvulsant, calcium channel blockers, B-blockers, steroids, frusemide, or aminoglycoside therapy were also excluded.

Data were presented as mean \pm SD. Comparing the use of muscle relaxant with the type of operation were made using SPSS software. The intragroup changes were tested by paired student t-test, and *P* value <0.05 was considered significant.

RESULTS

The demographic and clinical data of the subjects in this study are as shown in Figure 1 and 2 respectively. A total of 112 patients were included in this study. 58% of patients were males, while 42% of patients were female. The study subjects were predominated by Libyans in both genders. The main age of male was 30.6 ± 3 year old, while the main age of female patients was 34.4 ± 2 year old (Figure 1). There were 44.6% patients were undergo orthopedic operation, while 55.4% were surgical operation (Figure 2).

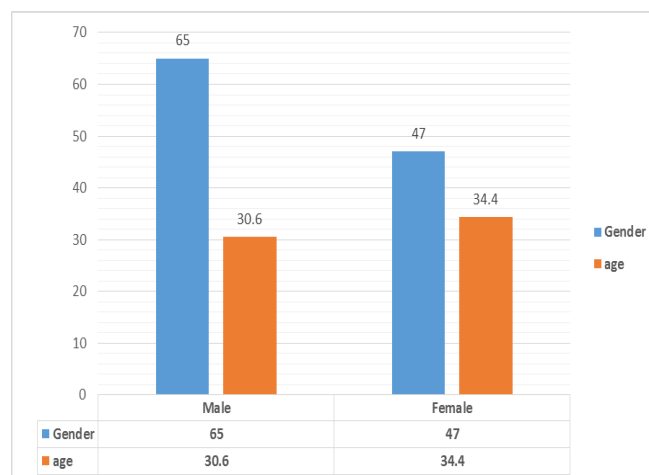


Figure1 Demographic data distribution

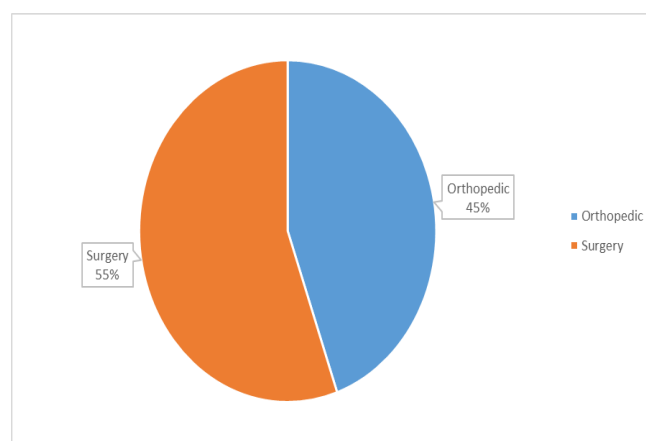


Figure 2 Operation type assessed during the study

Table 1 depicted the percentage use of atracurium in the operation were 27.6% in compare to rocuronium 72.4%. Most of atracurium usages were during orthopedic operation. Moreover, atracurium has been given to patients with median dose 35.18 ± 2 mg twice during operations, in compare to rocuronium 40.35 ± 1 mg twice during operation (Table 1).

Table 1 Difference in dose and frequency of use between atracurium and rocuronium.

Type of muscle relaxant	Frequency of use per total (n=112)	Dose mg Mean \pm SEM	Frequency during operation
Atracurium	27.6%	35.18 ± 2	Twice
Rocuronium	72.4%	40.35 ± 1	Twice

The onset of action, the clinical duration, and the spontaneous recovery index of neuromuscular blocking agents were shown in (Table 2). The main onset of effect of atracurium was found to be 68.75±11.2 sec, in compare to rocuronium onset of effect 64.40±8.6 sec. The clinical duration of action of rocuronium was 33.57±3 min, while the main duration of action of atracurium was 35.45±5 min. The recovery index was 11.3±2 min in atracurium group, while it was 9.2±1 min in rocuronium group. Further, there were no intraoperative skin reaction, bronchospasm, O₂ desaturation, or hypotension in both groups.

Table 1: Difference in onset of action, clinical duration, and recovery index between atracurium and rocuronium.

Time	Atracurium	Rocuronium	P value
Onset of action (sec)	68.75±11.2	64.40±8.6	P<0.021
Clinical duration (min)	35.45±5	33.57±3	P<0.023
Recovery index (min)	11.3±2	9.2±1	P<0.001

P value calculated by t-test analysis

DISCUSSION

Skeletal muscle relaxation can be produced by group of drugs known as neuromuscular blocking agents. Neuromuscular blocking agents such as atracurium, pancuronium, vecuronium, and rocuronium are widely used clinically during general anesthesia to simplify endotracheal intubation and to afford skeletal muscle relaxation during surgery [4]. This study aimed at evaluating the use of two commonly used muscle relaxant, atracurium and rocuronium during operation. Different doses, onsets, duration of actions, and any possible side effects of these drugs were also assessed and detected.

The results of this study showed that atracurium has been used less frequently than rocuronium. Most of atracurium usage was during orthopedic operation. Further, both of atracurium and rocuronium have been administrated twice during the operation period, the first dose requires intravenously for intubation and the second dose is needed for maintenance.

Rocuronium had insignificantly shorter onset time than atracurium (64.40±8.6sec versus 68.75±11.2sec) and this rapid onset of rocuronium has also been reported previously by Levy et al [5]. The rapid onset of action of rocuronium has also been documented by Omer et al [6] who found that rocuronium had 70.6±18.2 onset of action. On the other hand, Zhou et al [7] demonstrated less rapid onset after 0.6 mg/kg rocuronium (141±65sec). Our result in the current study also reported that rocuronium had insignificant shorter duration of action than atracurium (33.57±3 min versus 35.45±5 min) and this finding is consistent with Omera et al [6] who concluded that rocuronium has a rapid onset of action with good intubating and excellent cardiovascular stability. The short duration of action of rocuronium was also demonstrated by Zhou et al [7] and Bock et al [8] who reported prolongation of the duration of action by sevoflurane.

The spontaneous recovery index of patients after operation was significantly shorter in rocuronium than atracurium (9.2±1 min versus 11.3±2 min). Previous study reported that the recovery index after a single dose of rocuronium was extended during sevoflurane as compared with isoflurane or propofol [9].

Lastly, there were no evidences of any substantial clinical cardiovascular changes in both groups, and this is consistent with other prviously reported data observed no dose-related changes in heart rate and blood pressure after rocuronium [5]. Schultz et al also reported a lack of cardiovascular responses throughout a wide clinical dose range of rocuronium [10].

CONCLUSION

In conclusion, our data demonstrated that rocuronium is a rapid and widely used agent comparing to atracurium. Additionally, the onset of action, clinical duration, and recovery index of rocuronium was much better compared to atracurium. However, both agents are safely administered to patients as they did not show any possible side effects.

DISCLOSURE STATEMENT

Authors declared that there is no conflict of interest concerning this manuscript.

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