ORIGINAL RESEARCH

Comparison of different doses of atracurium for quality of muscle relaxation during modified rapid sequence induction in emergency laparotomy

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Received: 20 February, 2023 Accepted: 23 March, 2023

ABSTRACT

Background and Aims: Rapid sequence induction (RSI) using succinylcholine or rocuronium is the method of choice when a laparotomy under general anesthesia is to be performed on an emergency or nonfasting patient. It is possible to achieve satisfactory intubating circumstances rapidly with increased dosages of atracurium. The primary focus of our investigation was comparing two higher doses of atracurium to achieve desirable intubating conditions for RSI without the need for a priming dose. The secondary objective was to assess if there was a connection between the length of time it took for patients' muscles to relax following intubation and their hemodynamic responses.**Methods:**Fifty patients were enrolled, with half assigned to Group A1 (atracurium dose of 0.75 mg/kg) and the other half to Group A2 (atracurium dose of 1 mg/kg). Within one minute, the patient was premedicated, induced with propofol 2 2.5 mg/kg and atracurium injections, and intubated. After documenting the intubation scenario and neuromuscular monitoring using train of four (TOF) data, a post-tetanic count and hemodynamics were acquired. Statistical analysis was performed using the Chi-square test and the Student's t test.**Results:**When comparing groups A1 (55.23 9.0 min) and A2 (74.3 8.9 min), group A2 had significantly longer muscular relaxation times (P 0.001). In conclusion, a high dosage of atracurium (1 mg/ kg) may be used during RSI to establish acceptable intubating circumstances in under a minute. Therefore, atracurium may serve as a replacement medication for RSI.

Key words: Atracurium, muscle relaxation, rapid sequence induction and intubation.

INTRODUCTION

Rapid sequence induction (RSI) is an anesthetic method often used in emergency conditions. Its goal is to minimize the risk of problems such as aspiration and hypoxia. Since succinylcholine and high-dose rocuronium begin working quickly and have few adverse effects, they have replaced older NMBAs as the best options.

However, persons with hyperkalemia, high intracranial pressure (ICP), or high intraocular pressure (IOP) shouldn't take succinylcholine [1,2]. Rocuronium's potential for delayed excretion and long-lasting neuromuscular inhibition makes it a poor choice for patients with renal impairment. [3].

High dosages of atracurium (three to four times the 95% effective dose; ED95) have been shown to provide the same ideal circumstances for endotracheal intubation as those produced by rocuronium. [4].In RSI, the priming approach is often utilized to speed up the intubation procedure. On the other hand, it raises the danger of aspirating stomach contents. Our major motivation for doing this research was to evaluate the effects of two different atracurium dosages under similar intubating settings. The secondary goal was to use neuromuscular monitoring to evaluate muscle relaxation time and compare hemodynamics.

METHOD

Once approval was given by the relevant ethics board. Fifty people who needed an immediate laparotomy were enlisted. All 50 participants provided their written, informed permission. Patients between the ages of 20 and 65 who were classified as ASA physical status II or III and scheduled for emergency laparotomy were considered for inclusion. Patients were not included if they had a history of serious

cardiac illness, a history of metabolic or neuromuscular diseases, a history of medication interactions, or a history of study drug allergy, or if they had a projected difficult airway. Patients were randomly assigned to one of two groups of thirty using a computer-generated random sequence, with group assignment hidden via an opaque sealed envelope approach. Both the study's participants and the anesthesiologist in charge of intubation were kept in the dark.

Group -A1 (treated with 0.75 mg/kg of atracurium; Both Group -A2 (treated with 1 mg/kg of atracurium; ED95 is the effective dosage that lowers muscle twitch by 95% from baseline) and Group -A1 (treated with 0 mg/kg of atracurium) received four times the ED95. Syringes of the same size and form were used for both atracurium doses, and these were then labeled. There was no disruption in the cold chain during the administration of the drug. Prior to going under anesthesia in the operation room, patients had two intravenous cannulae of 18 gauge inserted. Before receiving three minutes of 100% high flow oxygen, patients were given injections of 0.02 mg/kg midazolam and 2 g/kg fentanyl. Group A1 patients had modified RSI with injectable propofol 2-3 mg/kg and atracurium 0.75 mg/ kg, whereas group A2 patients received 1 mg/kg of atracurium. Trained anesthesiologists performed tracheal intubation within 60 seconds of the study medicines being given. Conditions during intubation were appraised by an anesthesiologist who was unaware of the study medication dosage. Patients who had had endotracheal intubation and had bilateral air entrance confirmed subsequently underwent mechanical ventilation using individualized settings. An anesthesiologist who was unaware of which medicine was being studied monitored neuromuscular activity and blood flow.

By positioning the transducer along the ulnar nerve, stimulating the adductor pollicis muscle with 50 mA, and measuring the output at 12-second intervals until all four twitches stopped, we were able to collect train-of-four (TOF) data. There is no consensus on when muscle action should ideally commence, sometime between the moment of acceptance and the instant the post-tetanic count (PTC) reaches zero. once two twitches had occurred, indicating how long the muscle had been relaxed, TOF stimulation was stopped. Supplemental dosages of atracurium were given to keep the patient's muscles relaxed while oxygen, nitrous oxide, and isoflurane were used to keep them completely unconscious. Analgesia was provided by intravenous injections of 1g of paracetamol and 50 mg of tramadol. Every minute for the first 10 minutes following anesthesia induction, and then every 10 minutes until the conclusion of operation, blood pressure, heart rate, and peripheral oxygen saturation were measured.

The study's data were imported into Excel and analyzed using SPSS 19 (IBM Corp., Armonk, NY, USA). Means and standard deviations were computed and the statistical significance of numerical data including age, weight, and neuromuscular monitoring were determined using the Student's t-test. Categories such as gender, ASA physical status, and intubating conditions were compared using the Chi-square test. All quantitative details were provided as either a percentage or a numerical value. The level of statistical significance chosen was P 0.05.

RESULTS

Patients in both groups had similar demographics in terms of age, gender, weight, and ASA physical condition. [Table 1].

Table 1: Patient demographic characteristics

	Group 1(25)	**Group 2 (25)**
Age	36.45±10.2	35.10±5.9
Gender- Male	14	15
Female	11	10
Weight	60.5±5.5	62.7±6.0
ASA status		
II	13	14
III	12	11”

Group A2 had better intubating circumstances with neuromuscular monitoring and took longer for the TOF count to reach two compared to group A1, a difference that was statistically significant (P 0.001) [Table 2].

Table 2: Neuromuscular monitoring data

	Group 1(25)	**Group 2 (25)**
Time till PTC is zero	195.0±15.6	140.1±25.1
Time till TOF is two	55.23±9.0	74.3±8.9

DISCUSSION

We compared two dosages of atracurium (three to four times ED95) to produce rapid sequence intubation (RSI) and favorable intubation circumstances in under a minute. More than half of the patients in group A2 had excellent intubating circumstances without any complications. Since stomach distension from air inflow during conventional bag-and-mask ventilation is a major cause of regurgitation during emergency laparotomies, RSI is the preferred technique of intubation. Aspiration is a serious concern for patients with conditions such intestinal blockage, gastroparesis, full stomach, and pregnancy. [5] The increased risk of stomach aspiration is a clinical restriction of the timing concept and the priming strategy. In certain cases, using rocuronium and atracurium together might have a synergistic or additive effect, resulting in a more rapid start and longer duration of effect.[6]

Once the airway is secured, the patient will no longer be apneic. As a result, succinylcholine and rocuronium, two fast-acting muscle relaxants, are often prescribed for RSI; however, patients with hyperkalaemia, elevated ICP and IOP, and compromised renal and hepatic functions should not take these medications because to their potential for serious side effects. Using atracurium as the only

neuromuscular blocking drug (NMBD) for RSI was a major motivation for our study, given there is a dearth of such reports. Atracurium is well tolerated in individuals with renal and hepatic failure since it is eliminated through the Hofmann pathway and does not contribute to hyperkalemia, increased intracranial pressure, or intraocular pressure. As with succinylcholine, a large dosage of an NMBD will have the same effect as a short dose: it will hasten the beginning. Rapid start of action is achieved by high-dose binding to many nicotinic acetyl-choline receptors. [7,8].

Previous research using a burn population found that 1 mg/kg atracurium resulted in excellent or satisfactory intubating condition in 60% and 40% of patients. [9].But despite not using fast sequence induction of anesthesia, the intubation was completed in under 2 minutes. The larger atracurium dosage considerably sped up the start of effect and lengthened the time it took for the patient to recover on their own. While it's true that the priming strategy may speed up the start of NMBD effects, it also comes with its fair share of risks, including the risk of aspiration, respiratory weakness, and visual abnormalities. That's why we didn't use the priming method. Atracurium was shown to be successful in our investigation in producing excellent intubating circumstances in under a minute, with dosages and grades taken into account in accordance with the work of Chalermkitpanit P et al. [10]. It was also possible to successfully intubate 56.7% of patients at a dosage of 1 mg/kg, indicating that the drug was well tolerated. Patients who received 1 mg/kg of atracurium under general anesthesia were more likely to be graded as having excellent intubating conditions (51.4% vs. 43.6% vs. 26.3%, respectively) whereas patients who received 0.75 mg/kg of atracurium were more likely to be graded as having excellent intubating conditions (43.6%).

Unlike them, we restricted our study to laparotomies done under modified RSI and general anesthesia for urgent situations. Using neuromuscular monitoring, we also examined how long it takes for muscles to relax. The shorter duration until PTC hit zero and the longer duration until TOF count reached two are both indicative of Group A2 having achieved its zenith sooner. Patients with ASA grades II and III undergoing emergency laparotomy were included in our research, and we avoided the priming approach that may increase the risk of aspiration in these circumstances by using a modified RSI for intubation. Studies comparing this method to intubating under high rocuronium doses and determining the time it takes for the patient to recover spontaneously are needed for the future.

CONCLUSION

When other medicines are contraindicated, atracurium at a dosage of 1 mg/kg allows for safe intubating circumstances in 1 minute for RSI crises.

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