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CASE REPORT

ANESTHESIA MANAGEMENT IN A PATIENT WITH ROCURONIUM ALLERGY: A CASE PRESENTATION

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Abstract

Neuromuscular blocking agents (NMBAs) are commonly used in anesthesia but are also leading causes of perioperative anaphylaxis, posing a significant challenge for anesthesiologists.
This case report describes the anesthetic management of a 63-years-old male with a documented allergy to rocuronium undergoing femoro-femoral crossover bypass surgery. Despite negative allergy testing prior to surgery, the procedure was conducted without the use of NMBAs to avoid potential anaphylaxis. Induction and maintenance of the anesthesia were achieved with propofol and remifentanil, ensuring excellent intubation conditions and hemodynamic stability throughout the whole surgery. The patient had an uneventful recovery and was discharged on the third postoperative day. This report highlights the feasibility and safety of an NMBA-free anesthetic approach, particularly for patients with contraindications. It underscores the importance of individualized anesthetic planning and the effective use of alternative techniques to ensure patient's safety and optimal surgical outcomes.

Keywords: *avoiding muscle relaxants; general anesthesia; neuromuscular blocking agent free anesthesia; rocuronium allergy.*

Introduction

During general anesthesia, muscle relaxants are frequently employed to help with intubation, enhance surgical conditions, lessen shivering, guarantee patient's immobility throughout procedures, and consume less oxygen. For many surgical procedures, adequate muscular relaxation is essential because it facilitates the execution of certain operations by surgeons and the management of the patient's airway by anesthesiologists (1,2). Any medication can potentially lead to perioperative anaphylaxis, but neuro muscular blocking agents (NMBAs),

antibiotics, latex and chlorhexidine are the most common causes. Allergic reactions to NMBAs continue to be a significant concern for anesthesiologists, as death can still occur even when the reactions are promptly and effectively managed (3). Muscle relaxants are the primary agents causing intraoperative anaphylaxis. NMBAs account for 50-70% of the allergic reactions during anesthesia. The predominant mechanism for hypersensitivity to NMBs is acute type I allergic reactions, with anaphylaxis being the most severe form (4). After diagnosing anaphylaxis due to NMBAs, it is essential to find safe alternatives for future anesthesia. A patient who has experienced anaphylaxis from one NMBA may also react to other NMBAs due to cross-reactivity. Although drug provocation testing is the standard method for confirming or ruling out allergies, it carries considerable risk (5).

Case Presentation

In this report, we present the medical management of a 63-years-old patient, male, smoker, with a BMI of 22.5 and ASA 3, with a documented allergy to rocuronium happened due to vascular surgery vascular prothesis pp bypass right iliac-femoral, 18 years before. The patient was experiencing pain and numbness in the right leg over the past few weeks, had absent pulses bilaterally in the groin area and was diagnosed with occlusion of the bypass. He underwent vascular surgery crossover femoro-femoral bypass. Despite negative allergy testing before the surgery, the decision was made to proceed without the use of neuromuscular blocking agents, providing excellent conditions for tracheal intubation via intravenously given propofol and remifentanil, and the operation was completed uneventfully and without the need for the use of a muscle relaxant.

The patient was admitted to the Clinic of Thoracic and Vascular Surgery. Because of a documented allergy to rocuronium and “Cafetine”, in order to avoid anaphylaxis, anesthesia management was indicated in accordance with the patient. At first a cardiologist was consulted. The electrocardiogram was normal and showed sinus rhythm, the echocardiogram showed ejection fraction of 65%, compensated for heart valves of the heart with mild changes and arterial doppler showed occlusion of the bypass. With the history of hypertension and thrombosis he was receiving antihypertensive and antiplatelet agent therapy prescribed by cardiologists. The antiplatelet therapy was switched to Low-Molecular-Weight Heparin, 5 days before surgery. Laboratory data and coagulation tests were unremarkable with exception of slightly elevated D-dimers at 1118ng/mL (0-500). Our patient is a smoker (10 cigarettes per day), auscultation revealed bilateral diminished vesicular breath sounds, spirometry showed mild restriction. During the pre-op visit, on the day of surgery, preoperative standard investigations were performed, and all were within normal ranges. The patient was assigned to ASA 3 and Mallampati 1. Informed consent for high-risk surgery was obtained, and the patient continued taking his antihypertensive medications until the morning of surgery. Premedication with Diazepam 5mg was administered the night before and in the morning of the surgery, and the patient fasted overnight. An intravenous saline solution of 1000mL was infused over 8 hours

overnight. He received standard measurement for prophylaxis with corticosteroids and antihistamine according to protocol. Preoperative antibiotic prophylaxis was made with Vancomycin when he started coughing and had difficulty in breathing shortly after antibiotic administration. With a possible diagnosis of allergy reaction, we administered corticosteroids additionally. The planned surgery was not suspended.

In the operating room standard non-invasive monitoring was established, automated non-invasive blood pressure, pulse oximeters, electrocardiograms. and the patient's vital signs remained stable throughout, with baseline pulse rate being 53 beats per minute, blood pressure was 120/80mmHg, and oxygen saturation was 96%. An 18-gauge intravenous needle was inserted, and a 0.9% NaCl solution was initiated. After preoxygenation with 100% oxygen and premedication using 2mg midazolam, induction into general anesthesia for orotracheal intubation (OETT) was achieved with 100mcg fentanyl and 200mg propofol.

After induction, tracheal intubation was performed uneventfully, an 8.0-mm endotracheal tube (ETT) was successfully placed without needing muscle relaxants. After intubation the patient was with 100% saturation on pulls-oximetry and airway pressure up to 18cm H2O. Mechanical ventilation was set on pressure controlled volume guaranteed mode (PCV-VG), tidal volume of 7ml/kg and respiratory rate of 12 per minute, fresh flow rate 2l/min, positive end-expiratory pressure (PEEP) of 5cm H20, inspired oxygen fraction 50%, partial pressure of end tidal Carbone dioxide: 35mm Hg, I:E ratio of 1:2. A 20-gauge needle over the right radial artery for invasive blood pressure monitoring and a central venous catheter into the right internal jugular vein after induction of anesthesia were placed.

Anesthesia was maintained using propofol 7mg/kg/min and remifentanil at 0.3mcg/kg/min. During anesthesia, the antibiotic prophylaxis and antiemetics were administered. Intraoperative fluid management was maintained with adequate intravascular volume status and diuresis, and throughout the surgery the patient remained hemodynamically stable with normal vital signs.

At the conclusion of the procedure, without any complication occurred during 5 hours of anesthesia, the patient was awake and successfully extubated in the operating room with saturation 97%. Early postoperative recovery in the Post Anesthesia Care Unit (PACU) was uneventful. Surgery resulted in a significant improvement in recirculation. The patient was discharged home in stable and good condition after a few days and he didn't admit any problems during a follow-up visit within 1 week of the surgery.

Discussion

Neuromuscular blocking drugs, both depolarizing and nondepolarizing are among the most frequently used medications in anesthesia. However, their use can sometimes result in serious complications. Incomplete recovery from neuromuscular blockers is linked to negative outcomes, including upper airway obstruction, reintubation, atelectasis, pneumonia, extended stays in the post anesthesia care unit (PACU), and reduced patient's satisfaction (6).

On one hand, the use of rocuronium has been on the rise, so it's unsurprising that reports of side effects like anaphylaxis are also increasing. Some authors suspect a high rate of "rocuronium-mediated anaphylaxis" and have recommended careful monitoring of these adverse reactions. On the other hand, many studies have demonstrated successful intubation without neuromuscular blockers. Baillard C. et al. announced that in their institution, the use of muscle relaxants for intubation decreased from 100% to 25% between 1995 and 2000, without any associated complications. Additionally, they want to highlight that neuromuscular blocking agents are the primary drugs responsible for life-threatening events during anesthesia and their use is not always surgically required. We embrace this recommendation, and we believe comprehensive reporting is crucial to better understand the potential risks of rocuronium-related anaphylaxis (7). In one study, administering propofol alone at a dose of 2.5mg/kg for tracheal intubation allowed successful intubation in 19 out of 20 patients and created ideal intubation conditions in 14 out of 20 patients. All these studies demonstrate that intubation can be achieved without the use of neuromuscular blockers when these drugs are contraindicated or when their use is preferable to avoid (8).

Different techniques are available, which can be applied based on the clinical scenario and the anesthetist's expertise. Fentanyl has been shown to reduce the pressor response to laryngoscopy within 5 minutes of administration. Streibel and colleagues designed a double-blind, randomized controlled trial comparing intubation conditions between two groups: one receiving thiopentone, fentanyl and suxamethonium, and the other receiving propofol and fentanyl. The study, involving 25 patients, found no significant difference in intubation conditions between the two groups (9). In one study retrospectively 81 cases of adenotonsillectomy were reviewed. The objective of the study was to investigate what happens when general anesthesia is given without the use of neuromuscular blocking medication. Their findings revealed that using general anesthesia without a neuromuscular blocking agent significantly reduces both the operation time and intraoperative bleeding (10). In one randomized, double-blind study, the intubating conditions after anesthesia induction with propofol, midazolam and fentanyl were compared to those after using propofol, lignocaine and fentanyl. The study concluded that the combination of fentanyl, midazolam and propofol, more consistently provides favorable conditions for intubation compared to the fentanyl, lignocaine and propofol combination. Intubation was successfully achieved in our case in accordance with this study where all patients received the fentanyl, midazolam and propofol combination (11).

NMBAs are among the most frequent triggers of perioperative anaphylaxis. While a positive skin test can aid in identifying NMBAs that may cause a reaction, it remains uncertain whether a negative skin test can reliably ensure the safety of NMBAs when administered systemically. A retrospective cohort study of patients with suspected NMBA-induced anaphylaxis was gathered at Seoul National University Hospital between June 2009 and May 2021. The chemical similarities among NMBAs may play a role in their cross-reactivity in skin tests. Although skin tests have a high negative predictive value for NMBA-induced anaphylaxis, the possibility of recurrent anaphylaxis remains a concern (12). In the current issue of Anesthesiology, from Reddy

et al. a retrospective, observational cohort study conducted across two hospitals, has confirmed that the incidence of anaphylaxis is higher with the use of rocuronium and succinylcholine, compared to atracurium. Our patient was documented with allergy to rocuronium (13). It is crucial to develop and maintain the ability to perform intubation without neuromuscular blocking agents (NMBAs) for certain, though uncommon, clinical scenarios. These include patients with NMBA allergies, those with myotonias or other neuromuscular/ muscular disorders, as well as individuals at high risk for malignant hyperthermia. Additionally, there are surgical situations were avoiding NMBAs is necessary, such as preserving nerve function for intraoperative neuromonitoring (14).

Conclusion

This case highlights the effectiveness and safety of a neuromuscular-blocking agent-free anesthetic approach in managing patients with specific contraindications, such as allergies to rocuronium. The combination of propofol and remifentanil, delivered as continuous infusions, provided sufficient anesthesia depth, hemodynamic stability and optimal conditions for intubation. Importantly, the strategy ensured a smooth postoperative recovery, devoid of complications such as discomfort, hoarseness, or vocal cord sequelae. This case underscores the importance of individualized anesthetic planning and the need for vigilance in balancing patient's safety with procedural requirements because success is not solely dependent on "what we give" but rather on "how effectively we administer it".

References:

1. Cook D, Simons DJ. Neuromuscular Blockade. [Updated 2023 Nov 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan; PMID: 30855885.
2. Peroni DG, Sansotta N, Bernardini R, et al. Muscle relaxants allergy. Int J Immunopathol Pharmacol. 2011 Jul-Sep;24(3 Suppl): S35-46. doi:10.1177/03946320110240s306. PMID: 22014924.
3. Paul Michel Mertes, Gerald W. Volcheck: Anaphylaxis to Neuromuscular-blocking Drugs: All Neuromuscular-blocking Drugs Are Not the Same. Anesthesiology 2015; 122:5–7 doi:10.1097/ALN.0000000000000516.
4. Mertes PM, Aimone-Gastin I, Guéant-Rodriguez RM,et al: . Hypersensitivity reactions to neuromuscular blocking agents. Curr Pharm Des. 2008;14(27):2809-25; doi:10.2174/138161208786369704. PMID: 18991700.
5. Li J, Best OG, Rose MA, Green SL, Fulton RB, Capon MJ, Krupowicz BA, Fernando SL. Assessing cross-reactivity to neuromuscular blocking agents by skin and basophil activation tests in patients with neuromuscular blocking agent anaphylaxis. Br J Anaesth. 2019 Jul;123(1): e144-e150; doi: 10.1016/j.bja.2019.03.001. Epub 2019 Apr 5. PMID: 30961915.

6. Stephan R. Thilen, Wade A. Weigel, Michael M. Todd, et al: 2023 American Society of Anesthesiologists Practice Guidelines for Monitoring and Antagonism of Neuromuscular Blockade: A Report by the American Society of Anesthesiologists Task Force on Neuromuscular Blockade. Anesthesiology 2023; 138:13–41 doi:10.1097/ALN.0000000000004379.
7. C. Baillard, A.M. Korinek, V. Galanton1 et al. Anaphylaxis to rocuronium, BJA: British Journal of Anaesthesia, Volume 88, Issue 4, 1 April 2002, Pages 600–602, doi:10.1093/bja/88.4.600.
8. A. W. Woods, S. Allam, Tracheal intubation without the use of neuromuscular blocking agents, BJA: British Journal of Anaesthesia, Volume 94, Issue 2, February 2005, Pages 150–158, https://doi.org/10.1093/bja/aei006.
9. Striebel HW, Hölzl M, Rieger A, et al. Endotracheale Intubation unter Propofol und Fentanyl [Endotracheal intubation with propofol and fentanyl]. Anaesthesist. 1995 Dec;44(12):809-17. German. doi: 10.1007/s001010050216. PMID: 8594954.
10. Erkan Soylu, Burak Kersin, Pelin Karaaslan, et al: Effect of anesthesia without a neuromuscular blocking agent on intraoperative bleeding in adenotonsillectomy patients, International Journal of Pediatric Otorhinolaryngology, Volume 79, Issue 6,2015, Pages 909-911, ISSN 0165-5876, doi: 10.1016/j.ijporl.2015.04.007.
11. Arora D, Prakash S, Bhartiya V et al: A combination of fentanyl-midazolam-propofol provides better intubating conditions than fentanyl-lignocaine-propofol in the absence of neuromuscular blocking agents. Acta Anaesthesiol Scand. 2006 Sep;50(8):999-1004. doi:10.1111/j.1399-6576.2006.01093.x. PMID: 16923097.
12. Jiung Jeong, Jeong-Eun Yun, Hyun Jee Kim, et al: Neuromuscular blocking agent re-exposure in a retrospective cohort with neuromuscular blocking agent–associated anaphylaxis, Annals of Allergy, Asthma & Immunology, Volume 131, Issue 5, 2023, Pages 637-644.e1, ISSN 1081-1206, doi: 10.1016/j.anai.2023.06.023.
13. Jeffrey I. Reddy, Peter J. Cooke, Johan M. van Schalkwyk, et al: Anaphylaxis Is More Common with Rocuronium and Succinylcholine than with Atracurium. Anesthesiology 2015; 122:39–45, doi:10.1097/ALN.0000000000000512.
14. Rodney G, Raju P, Belford I. Should neuromuscular blocking agents always be used? Response to Br J Anaesth 2018; 120: 1150-3. Br J Anaesth. 2019 Jan;122(1): e8-e9. doi: 10.1016/j.bja.2018.09.013. Epub 2018 Oct 25. PMID: 30579422.