CASE REPORT

Rocuronium-Induced Anaphylactic Shock during Elective Septoplasty: A Case Report

Nitendra Raj Bajracharya[1], Saurav Shrestha[1], Shova Dangol[1], Rabi Paudel[1], Pushkar Bishwokarma[1], Surendra Man Shrestha[1]

[1] Department of Anesthesiology, Nepal Armed Police Force Hospital, Balambu, Kathmandu, Nepal

Corresponding Author:
Dr. Nitendra Raj Bajracharya
Department of Anesthesiology
Nepal Armed Police Force Hospital
Balambu, Kathmandu, Nepal.
Email: ntnbajra@gmail.com

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Abstract

Introduction: Perioperative anaphylaxis is a rare but potentially fatal complication during anesthesia. Rocuronium, a commonly used neuromuscular blocking agent, is a leading cause of intraoperative anaphylaxis. Early recognition and prompt management are crucial to reduce morbidity and mortality in an anaesthetized patient.

Case presentation: We report a case of 14-year-old female with Hashimoto's thyroiditis and dissociative disorder undergoing elective septoplasty for right antrochoanal polyp. Following induction with midazolam, fentanyl, propofol, rocuronium, and the patient developed grade III anaphylaxis characterized by severe hypotension, tachycardia, generalized rash, lip swelling, and increased airway pressure immediately after endotracheal intubation. Rocuronium was suspected as the trigger. Immediate management with intravenous epinephrine boluses (300 µg ×2), fluid resuscitation (2 liters normal saline), hydrocortisone and initiation of an epinephrine infusion (0.1 µg/kg/min) was done and surgery was postponed. The patient was transferred to the intensive care unit (ICU) for close monitoring. Epinephrine infusion was tapered off and she was successfully extubated the next day, and discharged to the ward on the third day without neurological or respiratory sequelae.

Conclusions: This case emphasizes on the critical importance of early recognition of rocuronium-induced anaphylaxis, rapid administration of epinephrine and aggressive supportive care. Despite the incidence of such reactions remains low, the high fatality rate necessitates preparedness during anesthesia.

Keywords: *anaphylaxis; neuromuscular blocking agent; perioperative complication; resuscitation; rocuronium.*

Introduction

Perioperative anaphylaxis is a rare but catastrophic complication of general anesthesia, occurring in response to medication administered during induction and maintainence.[1] It manifests as potentially life-threatening respiratory and/or cardiovascular compromise, and may occur without classical cutaneous signs or overt shock.[2] Though rare, perioperative anaphylaxis is a life-threatening condition and its reported incidence is 1 in 300 to 400 to 1 in 20,000 surgical procedures and its mortality

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rate ranging from 3–9%.[3-5] Anoxic brain injury is the most important morbidity occurring in about 2% of the patients affected by anaphylaxis.[6]

One of the diagnostic dilemmas is to identify the causative agent of anaphylaxis as multiple drugs are co-administered during induction of anesthesia.[7] A nondepolarizing neuromuscular blocking agent used for muscle relaxation especially during endotracheal intubation, can cause hypersensitivity reactions. This article provides an overview of anaphylactic reaction; risk factors; and the pathophysiology, presentation, diagnosis, treatment, and nursing implications associated with rocuronium-induced anaphylaxis. Life-threatening anaphylaxis can be immunoglobulin E–mediated or non–immunoglobulin E-mediated and usually occurs after the first dose. Anaphylaxis can present with hypotension and bronchospasm; cutaneal symptoms, such as erythema, may not be obvious. Diagnosis is initially presumptive and may require a transesophageal echocardiogram to rule out other causes of hypotension (eg, pulmonary embolus After antibiotics, muscle relaxants are known to cause severe perioperative anaphylaxis.[8] Among which, rocuronium is the most common culprit which is frequently used during induction. The risk per exposure of Rocuronium-induced anaphylaxis lies between 0.04% and 0.004%.[7]

We report a case of grade III anaphylaxis following intubation using rocuronium, highlighting diagnostic and management challenges.

Case Report

Patient Profile

A 14-year-old female, (weight: 45 kg, height: 154 cm, BMI: 19kg/m^2) with medical history of dissociative disorder taking sertraline and Hashimoto's thyroiditis taking thyroxine, with no prior drug allergy was scheduled for elective septoplasty for right antrochoanal polyp.

Preoperative Course

Pre anesthetic checkup was done a day before and advised for continuation of the medications. The patient was shifted to the preoperative room on procedure day. Intravenous cannulation was performed in the left hand using an 18G cannula. The patient was transferred to the operating room, where American Society of Anesthesiologists (ASA) standard monitors were attached. Preoperative vital signs were as follows: blood pressure (BP) 110/60 mmHg, heart rate (HR) 84 bpm, SpO_2 99% on room air, and respiratory rate 14/min.

Induction and Intubation

Intravenous Ringer's Lactate was initiated and 100% oxygen was administered. Anesthesia was induced with intravenous midazolam 2 mg, fentanyl 100 µg, and propofol 110 mg in a titrated dose to achieve loss of the eyelid reflex. Rocuronium 50 mg was administered for muscle relaxation. Intubation was accomplished using a 6 mm internal diameter flexo-metallic endotracheal tube, secured at 18 cm. Ventilator settings included a tidal volume of 350 ml, respiratory rate of 12/min, an inspiratory-to-expiratory (I:E) ratio of 1:2 and a PEEP of 5 cm H_2O. Maintenance was done with sevoflurane 2% with 2 liters/minute of O_2.

Intraoperative Events

Following intubation, the patient's BP dropped to 64/35 mm of Hg with Mean Arterial Pressure (MAP) of 45 mmHg and HR rose to 134 bpm. Phenylephrine 100µg was administered 3 times with no response. Physical examination revealed generalized blanchable erythematous rash, lips swelling and warm peripheries. There was increased peak airway pressure up to 28 cm of water. On auscultation, there was decreased bilateral air entry with no added sounds. SpO_2 was 100% and ETCO2 was 37 mm of Hg. There was persistent tachycardia of 130 beats per minute with persistent hypotension of 68/44 mm of Hg. Sevoflurane was turned off.

Anaphylaxis Diagnosis and Management

Hence, diagnosis of anaphylactic shock secondary to rocuronium was made. Subsequently, intravenous epinephrine 300 µg was given, another venous access with 18G cannula was opened and 2 liters of normal saline was given simultaneously. BP rose to 74/46mm of Hg with HR of 154 bpm. Second bolus of epinephrine 300 µg was given. Intravenous hydrocortisone 100mg was administered. Arterial line was secured in her right radial artery with 20G cannula under ultrasound guidance. BP increased to 100/64 mm of Hg following which epinephrine infusion was started at 0.1 µg/kg/min. Peak pressure dropped to 18 cm of water. Arterial Blood Gas (ABG) was obtained which revealed pH of 7.31, $PaCO_2$ 45.6 mm of Hg, HCO_3 22.2 mmol/L, PaO_2 507 mm of Hg with lactate of 2.3 mmol/L. A central line was inserted in the right jugular vein under ultrasonographic guidance. Foley's catheterization was done.

Airway was inspected using a video laryngoscope which showed no features of airway edema. Cuff leak test was done which was positive and flexo-metallic tube was exchanged with polyvinyl chloride (PVC) tube using tube exchanger. Lung ultrasound was normal with A-profile.

On the background of refractory hypotension, tachycardia, and rash, with normal breath sounds, diagnosis of grade III anaphylaxis was made. Surgery was deferred and the patient was shifted intubated to the ICU.

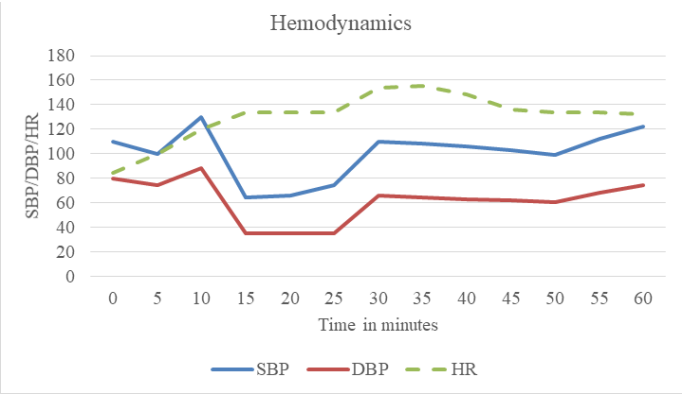

Figure 1: Patient's Intraoperative Hemodynamics SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, HR: Heart Rate

ICU management

Close monitoring was done in the ICU. Infusion of epinephrine was continued for the next 24 hours. Boluses of fentanyl 50µg were given to maintain sedation. Glasgow Coma Scale (GCS) was E4M6VT with stable hemodynamics. Epinephrine infusion was tapered off in the morning of the next day and the patient was successfully extubated. The patient was transferred to the ward on the third day.

Discussion

Perioperative anaphylaxis is a rare but potentially life-threatening emergency that requires rapid recognition and intervention. In this case, the sudden onset of hypotension, tachycardia, lip swelling, generalized rash, and increased airway pressure immediately after rocuronium administration was highly suggestive of a severe anaphylactic reaction, classified as grade III.

Neuromuscular blocking agents (NMBAs) are among the most frequent causes of perioperative anaphylaxis, and rocuronium is particularly associated with such reactions due to its quaternary ammonium ion structure, which acts as a potent allergenic determinant.[5] The incidence of rocuronium-induced anaphylaxis has been reported to range between 1 in 2,500 and 1 in 65,000 anesthetic exposures.[7] Compared to other NMBAs such as cisatracurium or vecuronium, rocuronium has a higher reported risk for hypersensitivity reactions.[4] Sadlier et al reported that rocuronium was responsible for 56% of cases of NMBA anaphylaxis, succinylcholine 21%, and vecuronium 11%.[1]

Diagnosis is often clinical, especially in intraoperative settings where confirmatory tests are not immediately available. Characteristic features include cardiovascular collapse, bronchospasm, and mucocutaneous signs, though any of these may be absent.[2] In our case, the presence of refractory hypotension, persistent tachycardia, lip and skin changes, and elevated airway pressures despite stable oxygenation supported the diagnosis of anaphylaxis.

Epinephrine remains the first-line treatment and is critical for reversing the pathophysiological changes of anaphylaxis, including vasodilation, capillary leakage, and bronchospasm.[1] In this patient, intravenous epinephrine boluses followed by an infusion, along with corticosteroids and fluid resuscitation, effectively stabilized the hemodynamics. McDonnell et al reported that use of sugammadex in rocuronium induced anaphylaxis may have potential therapeutic value.[10] However, such events are so rare that conducting clinical trials is not feasible.[10]

Additional measures such as establishing arterial and central venous access, securing the airway, and bedside imaging enabled real-time monitoring and guided therapy. Though not performed in this case, measurement of serum tryptase and later skin testing are recommended to confirm the diagnosis and identify the offending agent.[3,5]

This case demonstrates the importance of high clinical suspicion, immediate administration of epinephrine, and aggressive supportive care in suspected rocuronium-induced anaphylaxis. Although the incidence is low, the potential for rapid deterioration and death necessitates a well-prepared anesthesia team with access to emergency protocols and drugs.[3,6]

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Author's Contribution and ORCID iDs

Dr. Nitendra Raj Bajracharya
Conceptualization, Draft manuscript, Manuscript Review & Editing
: https://orcid.org/0009-0006-2446-0492

Dr. Saurav Shrestha
Manuscript Review & Editing, Supervision
: https://orcid.org/0009-0002-2764-0952

Dr. Shova Dangol
Conceptualization, Editing
: https://orcid.org/0009-0004-6574-3531

Dr. Rabi Paudel
Manuscript writing
: https://orcid.org/0009-0005-3580-4708

Dr. Pushkar Bishwokarma
Manuscript Review

: https://orcid.org/0009-0008-0288-9241

Dr. Surendra Man Shrestha
Conceptualization, Review

: https://orcid.org/0009-0006-0117-0281

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Bios

Dr. Nitendra Raj Bajracharya, consultant anaesthesiologist at Nepal APF Hospital, completed MD Anaesthesiology from MMC, TUTH, IOM in 2025 secouring first position. Winner of SAN thesis grant and SANCON ASPA 2025 oral presentation, his research focuses on perioperative care, airway management, pain, critical care, and regional anesthesia.

Email: ntnbajra@gmail.com

Dr. Saurav Shrestha is a consultant anaesthesiologist at Nepal APF Hospital, Balambu, Kathmandu, Nepal. He completed his MD Anaesthesiology from NAMS. His research areas include perioperative care, airway management, pain medicine, critical care medicine and regional anesthesia.

Email: apfsaurav@gmail.com

Dr. Shova Dangol is an Assistant professor at Nepal APF Hospital, Balambu, Kathmandu, Nepal. She completed her MD Anaesthesiology from Kathmandu University. Her professional focus includes perioperative care, airway management, pain medicine, critical care medicine and regional anesthesia.

Email: dnglshova@gmail.com

Dr. Rabi Paudel is a consultant anaesthesiologist at Nepal APF Hospital, Balambu, Kathmandu, Nepal. He completed his MD Anaesthesiology from MMC, TUTH, IOM. His areas of interest include perioperative care, airway management, pain medicine, critical care medicine and regional anesthesia.

Email: paudelravee@gmail.com

Dr. Pushkar Bishwokarma consultant anaesthesiologist at Nepal APF Hospital, completed MD Anaesthesiology from MMC, TUTH, IOM. Winner of SAN thesis grant and SANCON 2023 poster presentation, his interests include perioperative care, airway management, pain medicine, critical care, and regional anesthesia.

Email: dr.pushkarbishwokarma@gmail.com

Dr. Surendra Man Shrestha is an Associate Professor at Armed Police Force Hospital, Balambu, Kathmandu, Nepal. He completed MD Anaesthesiology from NAMS. His areas of interest include perioperative care, airway management, pain medicine, critical care medicine and regional anesthesia.

Email: doc_sms@yahoo.com