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CASE REPORT PERIOPERATIVE ANAPHYLAXIS

Early detection and management of perioperative anaphylactic shock during laparotomy for adenomyosis and oophorectomy: a case report

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ABSTRACT

Perioperative anaphylactic shock is a rare but life-threatening medical emergency that requires prompt recognition and immediate intervention. The incidence, though uncommon, carries significant morbidity and mortality if not managed swiftly. Identifying high-risk patients is often challenging, as reactions may occur even without a prior history of allergies.

A 33-years-old female patient diagnosed with adenomyosis and endometriosis with pelvic adhesions, undergoing adenomyosis resection and oophorectomy via laparotomy. The patient had no prior history of drug or food allergies. General anaesthesia was induced using fentanyl, propofol, atracurium, and maintained with sevoflurane. Shortly after administration of prophylactic antibiotics, the patient developed a sudden drop in oxygen saturation, elevated peak inspiratory pressure, severe hypotension, tachycardia, bronchospasm, and angioedema. A clinical diagnosis of anaphylactic shock was made. Immediate resuscitation was initiated with intravenous fluids, subcutaneous epinephrine, intravenous methylprednisolone, and antihistamines. Following treatment, the patient's hemodynamic status improved and facial oedema gradually resolved. Postoperative management was conducted in the intensive care unit with mechanical ventilation and continuous sedation, followed by successful extubation within 24 hours. The patient was discharged without complications on 3rd postoperative day.

Early recognition and vigilance for perioperative anaphylaxis, even in patients without prior allergic history, are crucial. Prompt, coordinated multidisciplinary management, supported by thorough preoperative evaluation, availability of emergency medications, and meticulous perioperative monitoring, is essential to optimize patient safety and outcomes.

Keywords: Adenomyosis; Anaphylactic Shock; General Anesthesia; Oophorectomy; Perioperative; Allergic Reaction

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1. INTRODUCTION

Anaphylactic shock represents the extreme end of the clinical spectrum of allergic reactions, where rapid and accurate medical intervention can mean the difference between life and death. This condition can occur within seconds or minutes after exposure to an allergen, which may include food, medications, blood transfusion

components, or insect stings. This exaggerated immunologic response leads to the massive release of inflammatory mediators such as histamine, cytokines, and prostaglandins from mast cells and basophils.[1]

In medical practice – particularly in the perioperative setting – awareness of the early signs of anaphylactic shock, such as erythema, pruritus, urticaria, angioedema, progressive bronchospasm, and hypotension, provides vital clues that can prompt rapid diagnosis and appropriate treatment. The pathophysiological process involves not only the immune system, but also the cardiovascular, gastrointestinal, and dermatologic systems, resulting in a complex symptomatology that demands heightened clinical vigilance.

The anaesthetic triad agents play a central role in surgical practice, ensuring the patient remains in a state of amnesia, analgesia, and optimal muscle relaxation. Hypnotics such as propofol provide amnesia, opioids like fentanyl deliver analgesia, and neuromuscular blockers such as rocuronium induce muscle relaxation. A deep understanding of the pharmacology of these agents, as well as their potential interactions with various organ systems, is essential for anaesthesiologists to deliver safe and effective care.

Precision in drug selection and dosing, knowledge of the patient's medical history, and the ability to recognize early signs of adverse reactions are all critical aspects of anaesthetic management. With the increasing prevalence of allergies and reported cases of anaphylaxis in recent decades, the role of anaesthesiology in identifying and avoiding triggering agents has become more crucial than ever.

Aggressive management strategies in the face of perioperative anaphylactic shock must be driven by speed and efficiency. Identifying and discontinuing the source of the allergen as quickly as possible is the first and most essential step. This must be followed immediately by intravascular administration of epinephrine, often alongside fluid resuscitation, airway management, and adjunctive medications such as antihistamines and corticosteroids.

This management extends beyond the acute phase, encompassing post-anaphylaxis monitoring, handling of biphasic reactions, and implementation of a comprehensive follow-up plan. These steps include reassessment of potential allergens, patient and family education on allergy and anaphylaxis, and the development of preventive protocols to reduce the risk of recurrence in future procedures.

2. CASE REPORT

A 33-year-old female presented with a lower abdominal mass, dysmenorrhea, and hypomenorrhea. The patient was diagnosed with adenomyosis and endometriosis with pelvic adhesions. The planned surgical intervention included resection of the adenomyosis and bilateral oophorectomy via laparotomy. Preoperative evaluation revealed no prior history of allergies to drugs or food, and no comorbid conditions. The patient denied symptoms such as nausea, vomiting, cough, or dyspnoea.

Physical examination the patient was alert with a Glasgow Coma Scale score of E4M6V5. Vital signs were within normal limits: blood pressure 128/78 mmHg, heart rate 88 beats/min, respiratory rate 20 breaths/min, oxygen saturation 98% room air, and body temperature 36.7°C. Conjunctivae were non-anaemic and sclerae were anicteric. Chest examination revealed symmetric chest expansion with clear breath sounds and no wheezing or rales. Cardiac auscultation revealed normal S1 and S2 without murmurs or gallops. Abdominal exam revealed a lower abdominal mass approximately the size of a duck egg; bowel sounds were normal. The extremities were warm with a capillary refill time of less than two seconds and no oedema. Preoperative laboratory showed: haemoglobin 12.7 g/dL, haematocrit 38.7%, leukocyte count 5,920/mm^3, platelet count 259,000/mm^3, PT 13.5 seconds, INR 0.97, APTT 41.1 seconds. Electrolytes were within normal limits (Na^+ 138 mmol/L, K^+ 4.2 mmol/L), random blood glucose was 87 mg/dL. Renal and liver function tests were normal (urea 23.3 mg/dL, creatinine 0.71 mg/dL, SGOT 15 U/L, SGPT 8 U/L). ECG showed normal sinus rhythm.

The patient was classified as ASA Physical Status II, and general anaesthesia was planned. Preoperative measures included continued fasting 6 hours prior the procedure, vital sign monitoring, IV access placement, infusion of Ringer's lactate at 100 cc/hour, blood preparation, and planning for postoperative care in a general ward.

On the day of the scheduled procedure, patient entered the operating room with stable vital signs: GCS E4M6V5, BP 132/83 mmHg, HR 89 beats/min, RR 20 breaths/min, SpO_2 99% on room air, temperature 36.7°C. After standard monitoring was initiated and anaesthesia preparation was completed, anaesthesia induction was performed with fentanyl 100 mcg, propofol 100 mg, and atracurium 25 mg. Endotracheal intubation was performed using direct laryngoscope and 7.0 mm ETT was placed, the patient was connected to a ventilator in volume control mode (tidal volume 400 cc, respiratory rate 12/min, PEEP 5, I:E 1:2), achieving tidal volume of 392 – 412 cc and minute ventilation 4.7 – 5.2 L/min, with a peak inspiratory pressure of 16 – 17 cmH_2O. Maintenance of anaesthesia was achieved with sevoflurane 1 – 2 vol% and oxygen fraction (FiO_2) 50%.

Prophylactic antibiotic cefazolin 2 g IV was administered.

3. DISCUSSION

Table 1: Ring and Messmer Severity Scale of clinical presentation of hypersensitivity[2]

Grade	Clinical Presentation
I	Mucocutaneous symptoms like generalized erythema and sever urticaria, either with or without angioedema
II	Mucocutaneous signs, moderate hypotension, tachycardia, or both, with or without mild gastrointestinal symptoms or bronchospasm, are examples of moderate multivisceral signs
III	Life-threatening mono- or multivisceral symptoms include severe hypotension, tachycardia or bradycardia with or without cardiac arrhythmia, mucocutaneous symptoms, severe bronchospasm, or gastrointestinal symptoms
IV	Cardiac arrest

Fifteen minutes after prophylactic antibiotic was administered an acute increase in peak airway pressure to 26 cmH_2O was observed, along with a drop in tidal volume to 280 – 310 cc and oxygen desaturation to 78%. The patient developed tachycardia 121 beats/min and severe hypotension 30/10 mmHg. Generalized erythema appeared on the arms, with facial and oropharyngeal oedema, including tongue swelling.

Emergency management including administration of 500 cc crystalloid bolus, intravenous epinephrine (1 cc of 1:10,000), methylprednisolone 125 mg IV, and diphenhydramine 20 mg IV. The Oxygen fraction (FiO2) on ventilator was increased to 100%, and manual ventilation was initiated. Clinical and hemodynamic monitoring continued closely. In five minutes after the intial management, the patient's condition improved: blood pressure rose to 110/82 mmHg, heart rate decreased to 92 beats/min, and oxygen saturation improved to 98%. The patient was reconnected to the ventilator with restored tidal and minute volumes appropriate for ideal body weight. Facial swelling and erythema gradually subsided.

Intraoperatively, blood loss was approximately 300 cc, and the patient received a total of 1500 cc of crystalloid. The patient was transferred to the intensive care unit (ICU) for postoperative monitoring due to persistent oropharyngeal oedema, and endotracheal tube (ETT) retention was maintained.

Supportive therapy in the ICU included fentanyl infusion at 20 mcg/hour for analgesia and midazolam at 2 mg/hour for sedation. Continuous monitoring of vital signs, drain output, and urinary output was performed. After 24 hours, oropharyngeal angioedema resolved, allowing for safe extubation. The patient was subsequently transferred to the general ward and discharged on postoperative day three.

3.1. Preoperative Management

Anaesthetic management in patients with a history of allergies requires special attention, as abnormal immune responses can lead to serious complications during and after surgical procedures. Early identification and understanding of a patient's allergic history are fundamental steps in planning a safe and effective anaesthetic approach.[1,2]

The first step in preoperative management is obtaining a detailed medical history. This includes eliciting information regarding allergies to anaesthetic agents and commonly used drugs in anaesthesia practice, such as opioids, local anaesthetics, and induction or maintenance agents.[3] It is also crucial to document the type of allergic reactions experienced, such as rash, anaphylaxis, or other systemic manifestations.[4]

Following history-taking, the next step is to assess the risk of an allergic reaction. If the patient has a documented history of allergy to general anaesthesia, alternative anaesthetic strategies — such as regional anaesthesia — may be considered when feasible.[5]

Patient education on the risk of allergic reactions and the importance of disclosing all known allergies to the medical team is key.[6] Patients should be informed about potential substitutes and prevention strategies. It is also essential to communicate the severity of anaphylaxis and the importance of carrying a medical record listing known allergies.[7]

3.2. Perioperative Anaphylaxis

Perioperative anaphylaxis may present with rapid-onset skin rash, urticaria, erythema, angioedema, gastrointestinal symptoms (nausea, vomiting, diarrhea), respiratory symptoms (rhino conjunctivitis, bronchospasm), tachycardia, and hypotension.[8]

Cutaneous signs, which are present in over 90% of anaphylaxis cases, are less frequently observed during surgery due to patient draping and anaesthesia, making diagnosis more difficult.[9]

The two main causes of mortality in anaphylaxis are laryngeal angioedema and cardiovascular collapse. Under general anaesthesia, patients cannot report classic allergic symptoms such as hoarseness, dysphagia, dizziness, or blurred vision. Diagnosis must rely on clinical severity and timing.[1,10]

According to a French study, cutaneous symptoms were present in 70.24% of IgE-mediated reactions and 95.34% of non-IgE-mediated reactions. Cardiovascular collapse occurred in 54.90% of IgE-mediated and 10.57% of non-IgE-mediated reactions.[10] Perioperative hypersensitivity usually occurs within minutes after anaesthetic induction.[2,11]

The Ring and Messmer classification is frequently used to grade the clinical severity of reactions, although it does not account for underlying pathophysiological mechanisms.[12] Grade I–II reactions may still be IgE-mediated but are usually less severe and not life-threatening. Grade III–IV reactions, often labelled as anaphylaxis, are life-threatening and typically IgE-mediated.

3.2.3. Management of Perioperative Anaphylaxis

Management involves immediate stabilization and identification of the causative agent to prevent recurrence and avoid inappropriate labelling of drug allergies.[6,7] The Ring and Messmer scale helps guide emergency response based on clinical severity. Key emergency steps include:[2,12]

- Discontinuation of the suspected triggering agent (e.g., stopping antibiotic infusion)
- Temporary reduction or interruption of anaesthesia depth
- Use of Trendelenburg position or leg elevation depending on clinical context
- Immediate call for assistance

3.2.3.1. Airway Management

If not already secured, the airway should be immediately protected, especially following neuromuscular blocker (NMBA) administration. Oxygen should be delivered via face mask if under regional anaesthesia. Airway protection is mandatory in unconscious patients.[1,6]

3.2.3.2. Fluid Management

Large-volume intravenous fluids should be administered promptly to counteract massive peripheral vasodilation and capillary leakage. Up to 73% of blood volume may shift to the interstitial space within 15 minutes. Crystalloids are the first-line fluid recommended by international guidelines, at volumes up to 30 mL/kg (Australia) or 20 mL/kg (France), repeatable as needed.[7,10] The primary goal is to maintain mean arterial pressure (MAP) above 60 mmHg to preserve cerebral and cardiac perfusion.[2]

3.2.3.3. Epinephrine Administration

Epinephrine remains the first-line treatment for anaphylaxis. In the perioperative setting, intravenous administration is preferred due to faster onset. Proper dosing is critical, as both underdosing and overdosing carry risks (e.g., arrhythmias). IV bolus doses of 100–200 µg can be repeated every 1–2 minutes as needed. Infusions may begin at 0.05 µg/kg/min and be titrated to 0.1–0.5 µg/kg/min.[4,7,8] For severe Grade III reactions, initial boluses of 50–100 µg may be used depending on clinical status. Cardio pulmonary resuscitation is recommended when systolic blood pressure drops below 50 mmHg.[12] Epinephrine is typically effective in reducing bronchoconstriction through its beta-2 agonist effects when administered to restore cardiovascular stability.[1,4]

3.2.3.4. Adjunct Therapies

Rapid-acting selective beta-2 agonists such as terbutaline or salbutamol are essential for the treatment of persistent bronchial spasm. These agents can be administered via nebulization (four puffs, repeated every 15 – 30 minutes as needed, up to 10 puffs) or, when available, via metered-dose inhalers at a dose of 5 – 10 mg/hour.[4,6]

Intravenous glucocorticoids, such as methylprednisolone, remain a cornerstone of therapy due to their significant anti-inflammatory effects. In cases of acute bronchial spasm, their benefit on pulmonary mechanics develops slowly and may take 4 – 6 hours to become clinically evident.[1,4]

Alternative vasopressors, such as norepinephrine, metaraminol, and vasopressin, as well as agents like glucagon, should only be used in refractory hypotension after adequate dosing of epinephrine and fluid replacement have been provided.[6,7,9] Norepinephrine infusions are recommended at starting rates of 0.05 – 0.1 µg/kg/min, titratable up to 0.1 – 0.5 µg/kg/min as needed.[7]

Arginine vasopressin (AVP) has been proposed as a last-resort rescue therapy. When administered 10 – 40 minutes after the onset of anaphylaxis, AVP has been

shown to stabilize circulation even in the absence of response to catecholamines, phenylephrine, or both.[6,7] The vasoconstrictive effect of AVP is mediated through non-adrenergic vascular V1 receptors, particularly in situations where adrenergic receptor desensitization is suspected to contribute to chronic allergic hypotension. Vasopressin may be administered as a bolus (1 – 2 IU; 0.03 IU/kg) followed by a continuous infusion of 2 IU/hour, with dosing not to exceed 0.04 IU/min.[6,7]

Patients who are chronically treated with beta-blockers are typically recommended to receive glucagon as part of the management strategy. However, this recommendation should be reevaluated, as there is limited high-quality evidence supporting the clinical efficacy of glucagon in this setting.[4,9]

3.2.4. Postoperative Management

A comprehensive allergy work-up and clear communication with anaesthesia and surgical teams are essential for identifying the causative agent and planning future care.[3,6] Patients must receive written documentation of the perioperative event, including drug exposure avoidance recommendations.

Postoperative assessment should aim to:[3,4,6]

- Confirm whether anaphylaxis occurred or establish differential diagnoses
- Identify the underlying mechanism and causative agent
- Recommend safe drug alternatives if IgE-mediated allergy is confirmed
- Provide patients with a complete medical explanation and written guidance for future anaesthetics

Case Summary

The case of perioperative anaphylactic shock in a patient with adenomyosis and endometriosis undergoing laparotomy for resection and oophorectomy illustrates the importance of preoperative assessment, rapid recognition, and comprehensive management of anaphylaxis.[1,2,5] Despite no prior allergy history, intraoperative exposure to certain agents can provoke first-time anaphylactic reactions.

In this patient, symptoms such as bronchospasm, angioedema, tachycardia, and hypotension developed within five minutes. Preventive and response strategies include thorough preoperative allergy risk evaluation, preparation of intraoperative antiallergic medications, and close hemodynamic monitoring postoperatively.[6,10]

Strong communication between the surgical and postoperative care teams is highly recommended to maintain vigilance for ongoing allergic reactions and prevent complications that may lead to multi-organ failure and fatal outcomes.[11,12]

4. CONCLUSION

The occurrence of perioperative anaphylactic shock in patients with adenomyosis and endometriosis highlights the importance of thorough preoperative assessment and prompt, comprehensive management. Despite the absence of a known allergy history, anaphylactic reactions can occur following first-time exposure to certain drugs. Symptoms such as bronchospasm and hypotension typically appear within five minutes. To prevent similar events, key strategies include allergy risk assessment, preparation of antiallergic medications, and postoperative hemodynamic monitoring. Effective communication between the surgical and postoperative care teams is strongly recommended to maintain vigilance for allergic reactions and subsequent complications.

5. Ethical Considerations

Informed consent was obtained from the patient for the publication of this case report. All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its subsequent amendments.

6. Conflict of Interest

The authors declare no conflicts of interest.

7. Authors contribution

GIO: Conceptualization, Clinical data collection, Writing – original draft.
APL: Supervision, review and editing, guidance in study design.
IFD: Supervision, Manuscript validation, Final approval of manuscript.

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