

CASE REPORT

Anaphylactic reaction to tranexamic acid in an adolescent undergoing posterior spinal fusion

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Keywords

anaphylaxis; antifibrinolytic agents; tranexamic acid; scoliosis; spinal fusion; pediatrics

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Section Editor: David Polaner

Accepted 8 February 2017

doi:10.1111/pan.13141

Summary

Tranexamic acid is an anti-fibrinolytic agent frequently used in pediatric surgery. Common side effects include nausea, flushing, and headache, but in rare instances, it may produce anaphylaxis; with only one previously reported case in a 72-year-old man. We report a case of a delayed anaphylactic reaction in a pediatric patient undergoing posterior spine fusion; and discuss the intraoperative management of the acute event, immunologic confirmation, and subsequent anesthetic approach.

Case report

A 15-year-old male, 50.8 kg, 150 cm, with neuromuscular scoliosis (Cobb angle 53°), severe mixed central and obstructive sleep apnea (apnea–hypopnea index of 83 per hour), and global developmental delay, was scheduled for T2–pelvis posterior spinal fusion. The patient had been previously administered anesthetics without complications, and there was no family history of anesthetic complications.

After inhalational induction and administration of fentanyl, propofol, and rocuronium for intubation, a total intravenous anesthetic (TIVA) was administered consisting of ketamine ($5 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$), propofol ($200 \text{ } \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$), and remifentanyl ($0.2 \text{ } \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$). Tranexamic acid (bolus $5 \text{ mg} \cdot \text{kg}^{-1}$ and infusion $5 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$) and cefazolin ($20 \text{ mg} \cdot \text{kg}^{-1}$) were also given. Two hours and 30 min into surgery in a latex-free environment, the patient suddenly became hypotensive (systolic blood pressure 50–60s), tachycardic (heart rate 120–130s), with no change in endtidal carbon dioxide, capnography tracing, or peak inspiratory pressures.

Neuromonitoring signals were also decreased. At the time, estimated blood loss was 100 ml, and 1800 ml of crystalloid, and 250 ml of albumin had been administered. Suspecting hypovolemia vs air embolism vs anaphylaxis, initial treatment included fluid and ephedrine boluses, while an arterial blood gas and point of care hematocrit was drawn. With no improvement and suspecting an erroneous hematocrit level of 35, one unit of packed red blood cells was given and subsequently all infusions were stopped. Inspection of the patient's upper extremities revealed erythema. Suspecting an anaphylactic reaction, the patient was treated, following the Pedi Crisis Checklist (1), with epinephrine (four boluses of 10 μg), ranitidine (50 mg), diphenhydramine (50 mg), and hydrocortisone (100 mg), with improvement in vital signs and return of neuromonitoring signals to baseline. Meanwhile, the patient was closed up urgently and transported to the pediatric intensive care unit. The initial tryptase level was $28 \text{ ng} \cdot \text{ml}^{-1}$, 75 min after the intraoperative episode (normal value: $<11.5 \text{ ng} \cdot \text{ml}^{-1}$); 3 and 4 days later, levels were $9.8 \text{ ng} \cdot \text{ml}^{-1}$ and $9.6 \text{ ng} \cdot \text{ml}^{-1}$, respectively, highly suggestive of an anaphylactic

reaction. IgE and histamine levels were not drawn. Immunology recommended an Anesthesia Allergy Panel skin prick testing 6–8 weeks after the event to prevent false negative results. The patient was discharged home, at his neurological baseline. Skin testing was performed to evaluate for IgE-mediated hypersensitivity. Agent dilution was 100 mg·mL⁻¹ (1 : 1) for skin prick testing and 10 mg·mL⁻¹ (1 : 10) for intradermal testing. Testing revealed he had a positive (3+) reaction to tranexamic acid upon intradermal injection, which was equivalent to the positive histamine control. Other agents including benzylpenicilloyl polylysine, penicillin G, ketamine, fentanyl, rocuronium, propofol, ampicillin, and cefazolin were tested and were negative on both skin prick and intradermal testing.

The patient returned for completion of his posterior spinal fusion due to persistent back pain. His anesthetic consisted of TIVA with propofol and remifentanyl, administration of alfentanil and propofol for intubation, and cefazolin for antibiotic prophylaxis. No anti-fibrinolytic agent was used. The patient remained hemodynamically stable, and his postoperative course was unremarkable.

Discussion

The first reported case of anaphylaxis to tranexamic acid involved a 72-year-old man, who underwent coronary artery bypass graft surgery. His anaphylactic shock occurred shortly after receiving a bolus of tranexamic acid (2). Our patient presented a delayed anaphylactic reaction, which has been described for other medications (3), but not for tranexamic acid. The pathophysiology for delayed anaphylaxis, in general, remains unclear. Other adverse reactions include bullous and fixed-drug reactions, pruritus, urticaria, and angioedema after tranexamic acid administration (4). These, however, are rare. While the utility of tranexamic acid has expanded, it is important to be aware of the possibility of an anaphylactic reaction with its use.

References

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Several key learning points arise from this case.

- While antibiotics, neuromuscular blocking agents, and latex constitute the most likely triggers for intraoperative anaphylactic reactions, anesthesiologists must remain vigilant of the possibility of an anaphylactic reaction with administration of any medication.
 - Diagnostic criteria for anaphylaxis can include acute onset involvement of the skin and/or mucosa, along with respiratory compromise, hypotension, or symptoms of end-organ dysfunction (5). However, not all symptoms may be present. In our patient, the lack of respiratory compromise delayed the diagnosis.
 - Utilization of the Pedi Crisis Checklist (1) was crucial in providing organized and succinct management guidelines during the event.
- A multi-disciplinary coordinated approach to caring for a patient experiencing an anaphylactic reaction is critical for patient safety.
- The anesthesiologist typically recognizes the signs and symptoms of anaphylaxis, initiates treatment, and keeps open lines of communication intraoperatively. Our case exemplifies how working cohesively and in coordination allowed for the best outcome for this patient.

Ethics approval

Mother provided consent for publication.

Funding

The study received no external funding.

Disclosures

The authors report no conflict of interest.