



Letter

Intraoperative anaphylaxis to bacitracin during scleral buckle surgery

A 63-year-old man with a history of retinal detachment in the right eye repaired by scleral buckle presented with decreased peripheral vision in the left eye and was found to have a macula-sparing retinal detachment in the left eye, for which urgent repair by scleral buckle was recommended. The patient did not take any routine outpatient medications. Preoperative evaluation revealed no history of anesthetic complications, and he denied any drug allergies. He did not receive any preoperative prophylactic antibiotics. General anesthesia was induced using midazolam, propofol, fentanyl, lidocaine, and sevoflurane (through endotracheal tube with an air-oxygen mixture) and was maintained with sevoflurane, propofol, fentanyl, and rocuronium.

The surgical team proceeded with placement of scleral buckle, which was soaked in bacitracin solution (150 U/mL) before insertion. During placement, the patient experienced a severe drop of arterial blood pressure (50/30 mm Hg), oxygen saturation (to 85%), and end-tidal carbon dioxide concentration (to 12 mm Hg). Physical examination revealed wheezing, mottled extremities, and urticarial rash. Surgery was halted, and the patient received intravenous epinephrine (total dose, 2.4 mg), diphenhydramine (50 mg), and hydrocortisone (100 mg), which achieved hemodynamic stability within 30 minutes. The previously placed scleral buckle was then explanted and replaced with a new scleral buckle soaked in betadine solution rather than bacitracin. After successful retinal detachment repair, the patient was transferred to the surgical intensive care unit for recovery and was extubated approximately 2 to 3 hours later. His initial tryptase level, measured within 3 hours of symptom onset, was 74.6 $\mu\text{g/L}$ (reference range, $\leq 10.9 \mu\text{g/L}$), consistent with diagnosis of anaphylaxis. Ten hours after symptom onset, the tryptase level decreased to 24.9 $\mu\text{g/L}$. He was discharged within 24 hours of surgery with no other complications during his admission.

Six weeks after discharge, the patient underwent a thorough outpatient evaluation. Medical record review revealed that the scleral buckle used to repair the previous retinal detachment in his right eye 6 months earlier had also been soaked in bacitracin and placed without complications. The patient reported that he had used bacitracin ointment on multiple occasions in the past without incident. The results of prick and intradermal skin testing to fentanyl, propofol, and rocuronium, based on published nonirritant concentrations,¹ were all negative. Repeat tryptase level was normal (10.7 $\mu\text{g/L}$). He returned 2 weeks later to complete testing to lidocaine and bacitracin. He had a positive reaction to prick testing with bacitracin with good controls (histamine, 8/40 mm; negative control, 3/5 mm; bacitracin, 12/55 mm). To confirm this was not an irritant reaction, bacitracin skin testing was also performed on 2 healthy controls with negative results. Table 1 summarizes the drug

concentrations used for testing. The recommendation was for the patient to completely avoid bacitracin in the future.

Approximately 1 week after allergy evaluation was completed, the patient returned to the operating room for pars plana vitrectomy with epiretinal membrane peel in the left eye. Surgery was completed uneventfully, demonstrating complete tolerability to anesthesia with propofol, midazolam, and fentanyl.

The rapid onset of hemodynamic shock, hypoxia, decreased end-tidal carbon dioxide, bronchoconstriction, urticaria, and elevated tryptase level in this case was consistent with intraoperative anaphylaxis. Although relatively uncommon (incidence of 1 in 3,500–20,000 cases), intraoperative anaphylaxis has a 9% mortality,² and prompt treatment with epinephrine is key to successful outcomes. Identification of the causative agent is crucial to avoid reexposure. However, in the intraoperative setting, identification of the offending drug is challenging, mostly because the induction of general anesthesia often involves several drugs administered simultaneously. Antibiotics are the most common causative agent identified in intraoperative anaphylaxis.³ Most of the time these antibiotics are given intravenously, but topically and intracamerally administered substances must also be considered.⁴ Confirmation of an episode of anaphylaxis can be accomplished with an elevated tryptase level, which is seen in IgE-mediated intraoperative hypersensitivity reactions and indicates mast cell activation.² In this case, the tryptase level was noted to be elevated postoperatively, supporting the clinical diagnosis of anaphylaxis. The tryptase level was rechecked during follow-up to ensure normalization and to evaluate for disorders that could be linked to idiopathic anaphylaxis, such as mast cell disorders. Using a stepwise approach, we were able to identify bacitracin as the causative agent.

Bacitracin is commonly used by medical professionals for the care of wounds, as well as intraoperatively for irrigation or soaking implants. Since the 1970s, many centers have adopted the practice of soaking scleral buckling elements in antibiotics, such as bacitracin, given work that demonstrated a decrease in buckle infections with antimicrobial prophylaxis.⁵ At our institution, scleral buckles are routinely soaked in bacitracin before placement for infection prophylaxis. Multiple cases of contact dermatitis and anaphylaxis to bacitracin ointment have been reported,⁶ but there are only a few cases of anaphylaxis to bacitracin solution used for irrigation.

Cases of intraoperative anaphylaxis attributable to bacitracin injection are rare, with a total of 12 cases reported to date.^{7–9} Increased exposure of the general population to bacitracin through over-the-counter topical ointments may lead to increased sensitization and risk for severe allergic reaction on reexposure. If history of prior reaction to topical bacitracin is described, an alternative medication should be considered to avoid the risk of intraoperative anaphylaxis. However, from the cases of anaphylaxis

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Table 1
Concentrations of Drugs Used for Drug Allergy Skin Testing

Drug	Skin prick testing	Intradermal testing
Fentanyl	50 µg/mL	5 µg/mL
Propofol	10 mg/mL	2 mg/mL
Rocuronium	10 mg/mL	0.1 mg/mL
Bacitracin	150 U/mL	Not performed

to bacitracin injection described in the literature, less than 50% of the patients reported a prior reaction to topical bacitracin.^{7–9}

We recommend avoidance of bacitracin for soaking implants or irrigation of wounds in patients who have had a prior reaction (topical or systemic) to the drug. If bacitracin must be used and the nature of prior reaction is uncertain, the patient should be referred to an allergist for formal evaluation before surgery. As an alternative, newer literature suggests that soaking buckling elements in povidone iodine solution is an effective method for prophylaxis of buckle infections.¹⁰ Although povidine iodine itself may be the causative agent of an allergic reaction in some patients, for patients with known antibiotic allergies, this may be an acceptable alternative for infection prophylaxis.

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References

- [1] Mertes PM, Aimone-Gastin I, Guéant-Rodriguez RM, et al. Hypersensitivity reactions to neuromuscular blocking agents. *Curr Pharm Des.* 2008;14:2809–2825.
- [2] Galvão VR, Giavina-Bianchi P, Castells M. Perioperative anaphylaxis. *Curr Allergy Asthma Rep.* 2014;14:452.
- [3] Kuhlen JL Jr, Camargo CA Jr, Balekian DS, et al. Antibiotics are the most commonly identified cause of perioperative hypersensitivity reactions. *J Allergy Clin Immunol Pract.* 2016;4:697–704.
- [4] Moisseiev E, Levinger E. Anaphylactic reaction following intracameral cefuroxime injection during cataract surgery. *J Cataract Refract Surg.* 2013;39:1432–1434.
- [5] Buettner H, Goldstein BG, Anhalt JP. Infection prophylaxis with silastic sponge explants in retinal detachment surgery. *Dev Ophthalmol.* 1981;2:71–76.
- [6] Jacob SE, James WD. From road rash to top allergen in a flash: bacitracin. *Dermatol Surg.* 2004;30(4, pt 1):521–524.
- [7] Freiler JF, Steel KE, Hagan LL, Rathkopf MM, Roman-Gonzalez J. Intraoperative anaphylaxis to bacitracin during pacemaker change and laser lead extraction. *Ann Allergy Asthma Immunol.* 2005;95:389–393.
- [8] Damm S. Intraoperative anaphylaxis associated with bacitracin irrigation. *Am J Health Syst Pharm.* 2011;68:323–327.
- [9] Greenberg SB, Deshur M, Khavkin Y, Karaikovic E, Vender J. Successful resuscitation of a patient who developed cardiac arrest from pulsed saline bacitracin lavage during thoracic laminectomy and fusion. *J Clin Anesth.* 2008;20:294–296.
- [10] Shimada H, Nakashizuka H, Hattori T, et al. Prophylaxis for acute scleral buckle infection using 0.25 % povidone-iodine ocular surface irrigation during surgery. *Int Ophthalmol.* 2014;34:211–216.