Letters

OBSERVATION

Multidrug-Resistant *Pseudomonas aeruginosa* Keratitis Associated With Artificial Tear Use

Corneal ulcers are typically associated with contact lens use, trauma, or chronic ocular surface disease and may cause irreversible blindness. The US Centers for Disease Control and Prevention (CDC) recently reported multidrug-resistant (MDR) *Pseudomonas aeruginosa* infections may be associated with use of EzriCare artificial tears after patients using this product developed MDR keratitis.[1] We report a case of severe MDR *P aeruginosa* keratitis after EzriCare artificial tear use, with cultures of the corneal infiltrate and the patient's EzriCare drops identifying the same strain of MDR *P aeruginosa*.

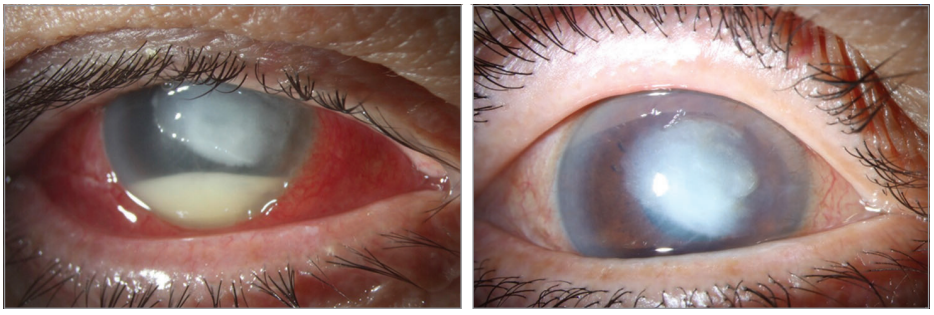
A 72-year-old man presented with 1 day of right eye pain and decreased vision. His medical history included coronary artery disease, diabetes, and chronic obstructive pulmonary disease. He endorsed contact lens use but denied sleeping in them or overuse. He denied previous ocular surgeries, trauma, or exposure to vegetation but reported use of EzriCare artificial tears for dryness. His best-corrected visual acuity was hand motion in the right eye and 20/20 in the left. Intraocular pressures were 29 mm Hg in the right eye and 14 mm Hg in the left. Examination demonstrated right eye conjunctival hyperemia, 6 × 5-mm corneal infiltrate with overlying epithelial defect, and 2-mm hypopyon (**Figure 1**A). Ultrasonography results were normal without membranes or vitritis.

Given the concern for MDR infection due to the use of EzriCare drops and the recent CDC warning, treatment was initiated with topical fortified vancomycin, fortified tobramycin, and trimethoprim-polymyxin drops every hour while awake. His infiltrate and EzriCare artificial tears were both cultured (**Figure 2**). The corneal culture was positive for *P aeruginosa* with high resistance to fluoroquinolones; aminoglycosides, including amikacin and tobramycin; and cephalosporins, with moderate carbapenem resistance (minimum inhibitory concentration = 4). The EzriCare drop culture was also positive for *P aeruginosa* resistant to fluoroquinolones, aminoglycosides, and cephalosporins with higher carbapenem resistance (minimum inhibitory concentration = 8). Based on bacterial sensitivities, the patient continued trimethoprim-polymyxin every hour and switched to imipenem-cilastatin every 2 hours, as this antibiotic class had the lowest resistance of those tested. To date, he is undergoing treatment with close monitoring, as he had persistent infection and vision loss at his last follow-up (Figure 1B).

Microbial keratitis is a leading cause of blindness. *P aeruginosa* is a common pathogen, especially in people who use contact lenses. MDR *P aeruginosa* has been increasingly reported, leading to treatment challenges and worse outcomes compared to drug-sensitive infections.[2] Risk factors for MDR *P aeruginosa* include lubricant ointment use, compromised ocular surface, and bandage contact lenses.[2] Contaminations may also cause severe infections. Contaminated trypan blue has led to endophthalmitis, and contaminated steroid and glaucoma drops and contact lens solutions have been associated with infectious keratitis.[3-5] Artificial tears have not yet been associated with keratitis, although contamination has been reported.[4]

Artificial tears are used to relieve dry eye symptoms and improve corneal epithelial healing. It is rare for keratitis to be specifically associated with contaminated artificial tears, although 1 case of *Streptococcus mitis* keratitis was attributed to a patient with rheumatoid arthritis biting the tops of her artificial tears bottles.[6] The CDC recently reported that 55 patients in 12 states developed MDR *P aeruginosa* keratitis potentially associated with EzriCare artificial tear use with outcomes including permanent blindness, hospitalization, and death due to systemic infection.[1] The CDC reports that 10 different brands of artificial tears have been implicated, and some patients used multiple brands. Seven cases of MDR *P aeruginosa* keratitis have been found at Bascom Palmer Eye Institute, although only this case is associated specifically with EzriCare drops.

Figure 1. Ocular Examination at Presentation and Follow-up



A, Diffuse conjunctival hyperemia and a large central corneal infiltrate with an overlying epithelial defect accompanied by a hypopyon at presentation. B, Corneal infiltrate remained at 1-month follow-up but was consolidating with improvement in the overlying epithelial defect and resolution of the hypopyon.

Figure 2. EzriCare Artificial Tear Drops and Cultures

A EzriCare artificial tear packaging

B Cultures of drops and various locations within the bottle tested positive for *P aeruginosa*

The patient's EzriCare drops as well as the cap, rim, and tip of the bottle were cultured, and all were found to be positive for multidrug-resistant *P aeruginosa*. Blood agar of these locations demonstrated heavy growth and an undulating border and β-hemolytic activity consistent with *P aeruginosa*. Contamination of the drops may have occurred due to a preexisting multidrug-resistant infection in this patient but is less likely given the reported nationwide outbreak.

This report highlights MDR *P aeruginosa* keratitis identified on simultaneous cultures of the patient's corneal infiltrate and EzriCare artificial tears. We aim to raise awareness about this vision-threatening contamination and emphasize the importance of culturing corneal infiltrates as well as contact lenses, cases, and drop bottles to identify and eliminate potentially blinding sources of infection. Concern for contamination ideally should lead to prompt reporting to the CDC and US Food and Drug Administration.

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Published Online: March 22, 2023. doi:10.1001/jamaophthalmol.2023.1109

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank the patient for granting permission to publish this information.

Additional Information: Drs Shoji and Gutkind are co-first authors.

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