

Update on Emerging Infections: News From the Centers for Disease Control and Prevention

Commentators

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Editor's note: This article is part of a regular series on emerging infection from the Centers for Disease Control and Prevention (CDC) and the EMERGENCY ID NET, an emergency department–based and CDC-collaborative surveillance network. Important infectious disease public health information with relevance to emergency physicians is reported. The goal of this series is to advance knowledge about communicable diseases in emergency medicine and foster cooperation between the front line of clinical medicine and public health agencies.

Corneal Infections Associated With Sleeping in Contact Lenses—Six Cases, United States, 2016-2018

[Centers for Disease Control and Prevention. Corneal infections associated with sleeping in contact lenses—six cases, United States, 2016-2018. *MMWR Morb Mortal Wkly Rep.* 2018;67:877-881.]

Contact lenses, when worn and cared for properly, are a safe and effective form of vision correction used by an estimated 45 million Americans. However, contact lens wearers are at risk for contact lens–related eye infections, especially when wearers do not practice proper contact lens wear and care habits. These infections, affecting the cornea and known as microbial keratitis, can lead to serious adverse health outcomes. Because contact lenses are regulated by the Food and Drug Administration (FDA) as medical devices, contact lens–related corneal infections should be reported to the FDA as an adverse event. To illustrate their serious health implications, 6 cases of contact lens–related corneal infection, in which sleeping in lenses was reported as the main risk factor, are presented.

Consequences of infection reported among the identified cases included the need for frequent administration of antibiotic eyedrops, multiple follow-up medical appointments, and permanent eye damage. Health education measures directed toward contact lens wearers should emphasize raising awareness of the risks of sleeping in contact lenses, as well as adherence to all recommendations for the wear and care of contact lenses. Additional measures are needed to educate eye care professionals about the need to report contact lens–related corneal infections to MedWatch, the FDA Safety

Information and Adverse Event Reporting Program (<https://www.fda.gov/MedWatch/>).

Outside of MedWatch, no formal surveillance for contact lens–related corneal infections exists in the United States; in 2010, an estimated 1 million outpatient and emergency department (ED) visits were reported for keratitis of all types.¹ Despite this high estimated annual prevalence, during an 11-year period, only 1,075 instances of contact lens–related corneal infections were reported to the FDA's MedWatch database.² Among the many behaviors that increase the risk for a contact lens–related corneal infection, sleeping in lenses is one of the riskiest and one of the most commonly reported behaviors among adolescent and adult contact lens wearers.³ Approximately one third of contact lens wearers report sleeping or napping in their lenses. Sleeping in lenses, whether inadvertently, occasionally, or as part of a prescribed wearing schedule (ie, extended-wear lenses), increases the risk for contact lens–related eye infections 6- to 8-fold.⁴

In collaboration with the Eye and Contact Lens Association (formerly known as the Contact Lens Association of Ophthalmologists), 6 cases of contact lens–related corneal infections were identified that were diagnosed in the last 2 years in which sleeping in lenses was reported as a risk factor. Patients were evaluated and treated by practicing ophthalmologists in 4 major academic medical centers. Clinical presentation, risk factors, treatment, and outcomes were reviewed.

CASE REPORTS

Case 1

A man aged 34 years with a 17-year history of soft contact lens use was evaluated for left eye redness and blurry vision. He reported sleeping in his contact lenses 3 to 4 nights per week and swimming with contact lenses. He was treated for bacterial and fungal microbial keratitis for 2 months, without improvement. He was evaluated at an academic medical center, where confocal microscopy, a technique that provides serial images of sections through the cornea, revealed findings suggestive of *Acanthamoeba* keratitis. He was treated with topical polyhexamethylene

biguanide and chlorhexidine hourly, which was tapered during 6 months. The infection resolved with final spectacle-corrected visual acuity of 20/40, requiring rigid contact lenses for correction to 20/20.

Case 2

A man aged 59 years wore his soft contact lenses overnight during a 2-day hunting trip and developed eye pain on the third day. He used over-the-counter eyedrops, with minimal response. On initial evaluation, he received a diagnosis of a corneal abrasion and was treated with a bandage contact lens to promote healing, along with tobramycin/dexamethasone drops prescribed 4 times daily. Because of worsening symptoms, his treatment was changed to ofloxacin drops every 2 hours. While in the shower, he wiped his eyes with a towel, heard a popping sound, and felt a painful sensation in his left eye. He was referred to ophthalmology, where a large perforated corneal ulcer was diagnosed. An urgent corneal transplant was performed to reestablish the integrity of the eye, and he was treated with broad-spectrum topical antibiotics postoperatively. He recovered useful vision, which improved to 20/25 after cataract surgery 1 year later.

Case 3

A woman aged 34 years was evaluated for 3 days of sharp right eye pain. She routinely slept in her soft contact lenses and used lenses for longer than the recommended monthly replacement schedule. She reported not seeing an eye care professional in years and refilling her contact lens prescription through an online contact lens retailer for at least 5 years. Examination of the right eye revealed a paracentral 1.5-mm infiltrate with surrounding edema and trace anterior chamber cells. Symptoms and signs were improved the day after treatment with topical moxifloxacin. She was instructed to continue moxifloxacin but failed to return for a 1-week follow-up appointment as instructed.

Case 4

A man aged 57 years was evaluated in the ED for bilateral reduced vision and eye pain. He reported wearing the same soft contact lenses continuously for approximately 2 weeks. He did not disinfect his lenses daily, slept in them regularly, and did not replace them regularly. On examination, uncorrected visual acuity was light perception in the right eye and hand motion in the left eye. The right eye revealed a central corneal infiltrate and perforation of the cornea. The left eye revealed a central infiltrate with 2 infiltrates paracentrally and a hypopyon (leukocytes in the anterior chamber of the eye). He received a diagnosis of bilateral bacterial keratitis. Hourly fortified tobramycin and vancomycin drops were

required for treatment. A corneal transplant was required to save the right eye. The left eye responded to topical therapy with visual acuity of 20/40 and a central stromal scar.

Case 5

An adolescent girl aged 17 years who slept in a soft contact lens purchased without a prescription at a chain store developed a right-sided corneal ulcer; a culture grew *Pseudomonas aeruginosa*. She began receiving fortified tobramycin and vancomycin eyedrops. Her vision was light perception in the right eye, and the cornea showed a central white dense ulcer, stromal infiltrates, and 0.5-mm hypopyon. On follow-up, her vision had improved to 20/100, with pinhole to 20/60. She had a stromal scar with thinning.

Case 6

A man aged 18 years went to the ED with a 3-day history of pain, redness, light sensitivity, and tearing in his left eye. He had a 1-year history of wearing decorative soft contact lenses obtained at a local store without a prescription. He also reported sleeping in his lenses. He was given fluoroquinolone eyedrops in the ED and subsequently was treated at a local eye clinic, at which time bacterial keratitis was suspected. His vision was 20/25 in the right eye and 20/50 in the left. His left eye showed moderate injection with a central ulcer, edema, and moderate inflammatory reaction. Cultures were obtained, and hourly fortified cephalosporin and aminoglycoside drops were prescribed. Follow-up cultures of the patient's eye, his lenses, and lens case each yielded heavy growth of *Klebsiella pneumoniae* and *P aeruginosa*. Ten days later, his symptoms were better; vision in the left eye had improved to 20/25, but a stromal scar remained.

DISCUSSION

This case series of contact lens–related corneal infections highlights the burden these infections place on contact lens wearers and the serious outcomes associated with them. All of the patients required treatment with antibiotic eyedrops, sometimes requiring administration hourly for weeks or months. This finding is consistent with those of a previous analysis of administrative health care data, which indicated that 76% of keratitis patient encounters were associated with an antimicrobial prescription.¹ Some of the patients described in this series sought care in an ED, where it is more costly to receive care.¹ One patient was lost to follow-up care, suggesting possible complete resolution of disease, but also highlighting the challenge of compliance with medical care by patients who might be busy with work, school, or household obligations. Two patients required surgery, and most were left with permanent eye damage or

vision loss. Contact lens wearers are younger on average than nonwearers and bear a burden of disease despite being viewed as healthy.

Examination findings in these patients were indicative of active infection, including stromal opacification, anterior chamber reaction, and hypopyon. Cultures and diagnostic testing identified various organisms, including *P aeruginosa* and *Acanthamoeba* spp, which suggests contamination of contact lenses and supplies with tap water.

In 3 of the 6 cases, contact lenses were purchased without a valid prescription. In one case, they were decorative lenses, which are lenses that alter the appearance of the eye (eg, change the color) but might not improve vision. Decorative lenses, similar to lenses that are prescribed for vision correction, are classified as medical devices. The sale of all contact lenses is regulated and should require a valid prescription from an eye care professional. In the United States, contact lens prescriptions are valid for only 1 to 2 years, depending on the state. Visits with an eye care professional to renew a prescription serve as opportunities for reeducation about safe contact lens wear and care practices.

Sleeping in contact lenses is one of the most frequently reported contact lens risk behaviors and one with a high relative risk for corneal infection.^{3,4} Sleeping in lenses has been shown to be a risk factor regardless of lens material and frequency, with even occasional overnight use conferring risk.^{5,6} Although some contact lenses are approved by the FDA for overnight wear, the increased risk for infection is acknowledged by their classification as a class 3 medical device, which includes medical devices with the greatest risk for harm, such as intraocular lenses and implantable pacemakers. Postmarketing surveillance of drugs and devices is important to the health and safety of the general public. Whereas medical device manufacturers are required to report adverse events, not all adverse events come to the attention of manufacturers.⁷ Patients and physicians can fill this gap.

The findings in this report are subject to at least 3 limitations. First, cases were chosen by practicing ophthalmologists (who can perform eye surgery) and are likely referred cases of contact lens–related eye infections that are more serious and might require surgical intervention. Therefore, the cases presented here are not necessarily representative of the typical contact lens–related eye infection. Second, because this is a case series, there are no definitive statements that can be made in regard to the association of the reported risk factors and the contact lens–related eye infections. Finally, the patients in the cases reported here might have had an innate susceptibility to developing an eye infection; other contact lens wearers with the same habits might be able to sleep in lenses without adverse outcomes.

Cases of contact lens–related infections, such as those described here, should be reported as adverse events to the FDA Safety Information and Adverse Event Reporting Program at <http://www.fda.gov/MedWatch>. The Eye and Contact Lens Association is working to promote contact lens safety for patients by encouraging eye care professionals and patients to voluntarily report contact lens–related eye infections to the FDA. Using the data accumulated in the adverse event reporting program, contact lens stakeholders (industry, regulatory authorities, eye care professionals, and public health) can work together to determine what improvements can be made to contact lenses, care products, manufacturer guidelines, and labeling. Health education measures directed toward contact lens wearers should emphasize raising awareness of the risks of sleeping in contact lenses, as well as adherence to all recommendations for the wear and care of contact lenses.

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The Centers for Disease Control and Prevention (CDC) receives an annual contribution from the Contact Lens Institute to support CDC's Healthy Contact Lens Program. The Contact Lens Institute had no involvement in the drafting or review of this report.

<https://doi.org/10.1016/j.annemergmed.2018.11.025>

REFERENCES

1. Collier SA, Gronostaj MP, MacGurn AK, et al. Estimated burden of keratitis—United States, 2010. *MMWR Morb Mortal Wkly Rep*. 2014;63:1027-1030.
2. Cope JR, Collier SA, Srinivasan K, et al. Contact lens–related corneal infections—United States, 2005–2015. *MMWR Morb Mortal Wkly Rep*. 2016;65:817-820.
3. Cope JR, Collier SA, Nethercut H, et al. Risk behaviors for contact lens–related eye infections among adults and adolescents—United States, 2016. *MMWR Morb Mortal Wkly Rep*. 2017;66:841-845.
4. Dart JK, Radford CF, Minassian D, et al. Risk factors for microbial keratitis with contemporary contact lenses: a case-control study. *Ophthalmology*. 2008;115:1647-1654.e3.
5. Stapleton F, Edwards K, Keay L, et al. Risk factors for moderate and severe microbial keratitis in daily wear contact lens users. *Ophthalmology*. 2012;119:1516-1521.
6. Sauer A, Meyer N, Bourcier T; French Study Group for Contact Lens–Related Microbial Keratitis. Risk factors for contact lens–related microbial keratitis: a case-control multicenter study. *Eye Contact Lens*. 2016;42:158-162.
7. Food and Drug Administration. Mandatory Reporting Requirements: Manufacturers, Importers, and Device User Facilities. 2015. Available at: <https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/PostmarketRequirements/ReportingAdverseEvents/default.htm>. Accessed November 28, 2018.