Pain and Decreased Vision in a Teenager

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Corneal ulcer, infectious keratitis, hypopyon, infiltrate

A 14-year-old girl presents with pain and decreased vision in the right eye of 1 day's duration. She is now unable to open the eye because of extreme pain and photosensitivity. The affected eye is tearing profusely and is producing mucoid discharge. The patient removed her contact lenses and put contact lens wetting solution in the eye, but the symptoms persisted. She put her contact lenses back in, which made the eye feel slightly better. However, by evening, her eyesight was very blurred and the eye was light sensitive, and she again removed her contact lenses. Upon waking this morning, she was unable to open the right eye because of extreme pain and light sensitivity and had very poor vision.

Her medical history is significant for myopia, which was detected at age 8 years. She started wearing soft, disposable contact lenses at the age of 12 years. She now wears these contact lenses exclusively and does not own a pair of glasses. She states that she frequently sleeps while wearing her contact lenses and showers and swims with them on. When she removes her contact lenses, she stores them in a cleaning solution overnight. Although the contact lenses are intended to be disposed of every 2 weeks, she frequently uses them longer. She has had one to two episodes of "pink eye" during the past 2 years but did not seek medical attention, and the condition resolved spontaneously in a day or two. She is up to date with her immunizations. A review of systems is negative. She currently is taking no medications.

Upon examination, the patient appears alert and in obvious distress. She is cupping her right eye with her hand and is tearing profusely. Testing the vision in the affected eye is difficult because of the patient's discomfort. She is only able to count fingers with the right eye and has 20/20 vision in the left eye with use of her contact lens. A significant amount of mucopurulent discharge from the right eye is noted. The right upper lid is swollen and mildly erythematous. Upon opening the eye, the conjunctiva is noted to be very erythematous with mild chemosis. The cornea reveals a white, soupy lesion centrally with indistinct edges measuring approximately 5 by 5 mm (Figure). Fluorescein staining

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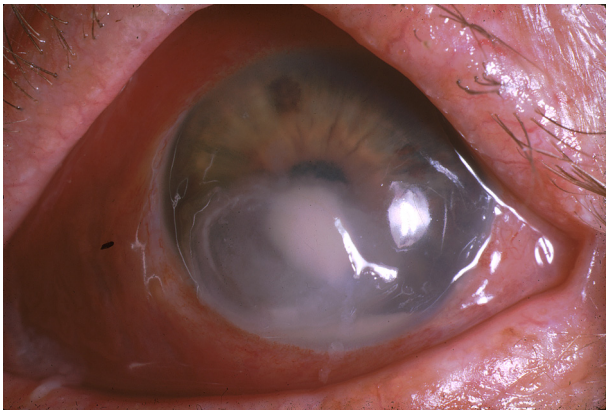
FIGURE. White, soupy infiltrate on the cornea with a layered hypopyon in the anterior chamber inferiorly. This figure appears in color online at www.jpedhc.org.



reveals an epithelial defect overlying the lesion. The anterior chamber reveals layered pus (hypopyon) inferiorly that measured 2.5 mm in height. The iris and lens are not well visualized but appear to be grossly normal. Examination of the fundus is not possible because of the infiltrate overlying the pupil and the severe photophobia. The left eye is completely normal, and findings of the systemic examination are unremarkable.

The patient is sent to an ophthalmologist immediately for further management. The ophthalmologist diagnoses a bacterial corneal ulcer. A gram stain of scrapings from the ulcer reveals numerous white blood cells and gram-negative rods. Topical antibiotics (fortified tobramycin and moxifloxacin) and cycloplegic eye drops are prescribed and the patient begins to use them immediately. The cultures eventually grow Pseudomonas species. The patient responds to the treatment and the corneal ulcer heals during the next 2 weeks. However, she is left with a central corneal scar and very poor vision that is not correctable with glasses. She currently is considering a corneal transplant to improve her vision.

DISCUSSION

A corneal ulcer is defined as an inflammation and necrosis of the corneal stroma with an overlying epithelial defect. The term "corneal ulcer" often is used synonymously with infectious keratitis, because infection is the usual etiology of this condition. Infectious keratitis most commonly occurs as a result of bacteria, although fungal and amoebic keratitis also can occur (Green, Apel, & Stapleton, 2008; Varaprasathan et al., 2004). The infectious organism usually gains access to the corneal stroma via a defect in the epithelium. Once a corneal ulcer develops, it can spread rapidly because the cornea lacks blood vessels and cannot easily mount a protective immune response. The presence of the infectious organisms in the corneal stroma eventually causes an influx of leukocytes from the conjunctival blood vessels, as well as the tear film. The leukocytes and bacteria produce proteolytic enzymes that destroy corneal tissue. The inflammation and proteolysis also result in the deposition of irregular scar tissue that blocks and/or scatters light passing through it. Because normal vision is dependent on the uninterrupted passage of light through the cornea, even minor ulcers in the visual axis can affect vision permanently.

The most common source of infectious keratitis in the United States is contact lenses (Ibrahim, Boase, & Cree, 2009; Mah-Sadorra et al., 2005) for various reasons. The cornea lacks blood vessels and gets its oxygen from the atmosphere and from the tear film when the eyes are open and from the blood vessels of the lids when the eyes are closed. The use of contact lenses decreases the amount of oxygen available to the eye, especially at night, which makes the corneal epithelium unhealthy and more prone to an infectious assault. In addition, bacteria adhere to contact lenses and to contact lens cases over time and can form a biofilm that often is impermeable to cleaning agents (Szczotka-Flynn et al., 2009). Bacteria remain active in this biofilm and can cause infections when the opportunity becomes available.

Swimming and showering in contact lenses is an important risk factor. The amount of chlorine in the water is insufficient to completely kill the infectious organisms, and they adhere to contact lenses if the water enters the eye. Finally, the disinfecting solutions used for contact lenses have evolved from hydrogen peroxide-based solutions that were very effective but inconvenient to no-rub multipurpose solutions that are very easy to use but are not as effective (Carnt et al., 2009). Children who wear contact lenses are at particular risk because they do not understand the risks and may not follow basic hygienic practices such as washing their hands before touching their lenses.

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The most frequent organisms causing infectious keratitis as a result of contact lens use are gram-positive cocci such as Staphylococcus and gram-negative rods such as Pseudomonas and Serratia (Ibrahim et al., 2009). The gram-negative organisms are more of a concern because they can cause tremendous liquefaction and necrosis of the corneal stroma and also cause a massive immune response. The result is an ulcer that classically is described as "soupy" because of its pea soup–like appearance. The condition is associated with significant inflammation of the iris, which results in leukocytes being released from the iris vessels. The