Atypical contact lens-related keratitis

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Series on Literature Reviews of Topics in Contact Lens Research
Contact lens wear has repeatedly been identified as a risk factor for the development of microbial keratitis. In the United States, most cases of microbial keratitis have bacterial origins. Clinical management and treatment of bacterial keratitis is well defined and is generally very effective in resolving the infection without significant visual loss. However, other microbes can also cause corneal infection. Eye care providers must be mindful of the possibility of an atypical origin when diagnosing and managing corneal infection.

An outbreak of *Fusarium* keratitis associated with contact lens solution in late 2005-early 2006 focused the attention of the eye care community on fungal eye infections. The most prevalent risk factor for fungal keratitis is still ocular trauma (particularly trauma involving vegetative material), but contact lens wear is becoming a measurable risk factor as well. In early stages, fungal keratitis can closely resemble bacterial keratitis, and bacterial co-infection may be present in up to 30 percent of cases. Thus, it is reasonable to treat early lesions with broad-spectrum antibiotics. However, patients with corneal lesions need to be followed carefully, and management should be adjusted if expected resolution is not noted. Topical antifungals are typically used as first-line treatment agents. Systemic antifungals are also used in persistent corneal disease. Surgical management (debridement, keratoplasty) may be needed in up to 27 percent of cases.

*Acanthamoeba* keratitis has been strongly associated with contact lens wear since the CDC issued 2 reports on the condition in the late 1980s. The organism can exist in 2 forms: the active trophozoite and the environmentally resistant cyst. *Acanthamoeba* species are abundant in the environment and can be found in tap water, seawater, air, soil, dust, vegetables, and animal wastes. The organism can survive on the biofilm present in water distribution systems, but can also actively digest corneal tissue. *Acanthamoeba* keratitis is not a reportable disease in the United States, so the true incidence is not known. Studies have suggested that the incidence may range from 1.65-14.3 cases/million contact lens wearers annually. (The highest incidence was associated with contamination of a municipal water supply due to flooding.) Early signs of *Acanthamoeba* keratitis may be non-specific and can include epithelial irregularity (which can take on a dendriform appearance), limbal hyperemia, and perineural infiltrates. Pain that is out of proportion to clinical findings may be present. Later in the course of the disease, the classic ring infiltrate may be noted. Laboratory testing (direct observation of corneal scrapings, biopsies, and cultures) have been used in the diagnosis of *Acanthamoeba* keratitis. Newer diagnostic techniques include direct in vivo evaluation of the cornea using tandem scanning focal microscopy and amplification of the organisms’ DNA by polymerase chain reaction. Topical amoebicidal agents are frequently used as the first line of treatment. As with fungal keratitis, surgical intervention may be necessary to eradicate the organisms.

Community-acquired methicillin-resistant *Staph aureus* (MSRA) soft tissue infections have become more common in recent years. A recent prospective study by Moran and his colleagues found that the prevalence of MSRA was approximately 59 percent in patients
presenting to 11 university-affiliated emergency departments during August of 2004. The prevalence of MSRA ocular infections has not yet been established; reports have estimated the prevalence to be anywhere from 3 percent (Shanmuganathan, 2005) to 74 percent (Fukada, 2002). Studies published to date are primarily case reports or relatively small case series. Conjunctivitis is the most common manifestation of MSRA ocular infection, although keratitis has also been reported. Contact lens wear does not appear to be a significant risk factor for the development of MSRA ocular infection. Chloramphenicol appears to be effective against most cases of MSRA, but is not routinely used in the United States due to potential risks of aplastic anemia. Vancomycin has also been shown to be effective in treating ocular MSRA, although some resistance has been reported in non-ocular MSRA infections.

References


Khor and his colleagues performed a nationwide chart review of all cases of culture-proven fungal keratitis in contact lens wearers diagnosed between March of 2005 and May of 2006. This case series describes 66 patients (68 eyes) who were diagnosed with Fusarium keratitis during this time period. Age and gender of patients, laterality, contact lens type, contact lens solutions, contact lens hygiene practices, visual acuity at presentation, and final visual acuity are summarized. Patients ranged in age from 13 to 44 years, 65/66 wore soft lenses, 42 patients used ReNu with MoistureLoc. Interestingly, 81.8 percent reported less-than-ideal hygiene practices (overnight wear of daily wear lenses, infrequent replacement of lenses). Final visual outcomes ranged from 20/20 to 20/80, and 5 eyes required corneal transplants.


When the Centers for Disease Control and Prevention (CDC) began to receive reports of fungal keratitis associated with hydrogel contact wear, an epidemiological investigation was quickly launched to determine a potential cause (or causes) for the outbreak. This paper summarizes the exhaustive case-control study undertaken by the CDC and describes 164 cases of Fusarium keratitis diagnosed between June 1, 2005, and June 30, 2006. Demographic and clinical characteristics of the cases are described. Cases were reported in 33 states and 1 U.S. territory. Patients ranged in age from 12 to 83 (median age 41). Surgical intervention was performed or planned in 55 cases. The study identified a strong association between the use of ReNu with MoistureLoc and the development of Fusarium keratitis. The organism was not, however, recovered from the factory, warehouse, solution filtrate or unopened solution bottles.

This paper provides a detailed clinical description of the characteristics of fungal corneal infections, describes management strategies for the treatment of fungal keratitis, and summarizes literature related to the condition. The paper presents no new findings, but provides a comprehensive review of mycotic keratitis. The study’s text describes findings from previous work; a table summarizing this information would have been welcome. The paper does include a table that summarizes medical therapeutic options.


Ocular trauma has repeatedly been identified as the major risk factor for the development of fungal keratitis. This retrospective case review describes an increase in the percentage of fungal corneal infections associated with non-therapeutic contact lens wear. Soft contact lens wear was associated with 23.3 percent of the cases of *Fusarium* keratitis diagnosed in 2004 and with 47.7 percent of the cases diagnosed in 2005. The authors suggest that contact lens wear may be an emerging risk factor in the development of *Fusarium* keratitis.


Bacterial co-infection is not uncommon in fungal keratitis. This retrospective study identified polymicrobial infection in 20 percent of 152 cases of fungal keratitis. Bacterial co-infection was more common in yeast keratitis compared to filamentous keratitis.


This major review traces the history of *Acanthamoeba* keratitis from the first reports of the condition in 1973 through the late 1990s. Clinical features, laboratory diagnostic techniques, and treatment options are described in detail. Literature related to *Acanthamoeba* keratitis is reviewed and summarized. No new findings are presented here, but the paper provides a comprehensive overview of the condition, and the extensive reference list will guide interested persons in further investigations of various aspects of the disease.


This experimental study demonstrated variations in the attachment of *Acanthamoeba* to contact lenses made of different materials and under various conditions (worn lenses, unworn lenses, and biofilm-coated lenses). Etafilcon A, lotrafilcon A, and galyfilcon A lenses were tested. *Acanthamoeba* demonstrated significantly higher attachment to lotrafilcon A (a first-generation silicone hydrogel material) compared to either etafilcon A or galyfilcon A (a second-generation silicone hydrogel material). Clinical relevance of these findings have not yet been demonstrated, but certainly warrant further study.

This study identifies an increase the incidence of Acanthamoeba keratitis in the Chicago area during the past 5 years. From June 1, 2003 to November 30, 2005, 40 cases were identified. During a similar time period several years earlier (June 1, 2000 to November 30, 2002), only 6 cases were diagnosed. The authors also noted an increased rate of infection in the “collar” counties (specifically Will and DuPage counties) compared to Cook County. They hypothesize that increased distance from water treatment facilities to more remote-end users may be associated with an increased risk of infection. Because contact lens use is so strongly associated with Acanthamoeba keratitis, further studies should attempt to quantify contact lens wear in various study populations. Estimates of the annualized incidence of Acanthamoeba keratitis currently vary widely, so it is difficult to detect an actual increase in incidence given the small number of cases reported. Nonetheless, this study opens the door for future work in this area.


This retrospective case review evaluated the role of tandem scanning confocal microscopy (TSCM) in the diagnosis of Acanthamoeba keratitis. A total of 63 cases were included. TSCM identified Acanthamoeba cysts/trophozoites in 54 cases (90 percent). Cultures of corneal tissue or contact lens cases were performed in 35 cases and yielded positive results in 9 cases (26 percent). Six patients in whom TSCM revealed evidence of Acanthamoeba infection also underwent corneal biopsies; 2 of the biopsies were positive for Acanthamoeba. One case was positive on culture, but negative on TSCM. The authors conclude that TSCM may be able to provide reliable diagnostic information rapidly and non-invasively in cases of suspected Acanthamoeba keratitis.


A retrospective review of culture-positive external ocular Staphylococcal infections revealed 548 cases during a 44-month period. Of these, only 17 were MSRA-positive (3 percent). Conjunctivitis was the most common presentation of MSRA ocular infection. All of the MSRA isolates were sensitive to chloramphenicol. All patients with MSRA ocular infection had a history of ocular surface disease, malignancy, or debilitating medical illness. Contact lens use was not associated with any of the cases reported in this series.