Keratitis can lead to severe visual disability and requires prompt diagnosis and treatment. Injury to the corneal surface and stroma allows invasion of normal flora as well as organisms harbored by foreign bodies. However, there are a select group of microbial pathogens that can penetrate intact corneal epithelium, Acanthamoeba is felt to be in this class of insidious pathogens.

Contact lens wear is an established risk factor for infectious keratitis. All types of contact lenses can cause infection, with extended wear soft lenses conferring greater risk than daily wear hard or soft lenses. Corneal changes from contact lens use include an induced hypoxic and hypercapnic state promoting epithelial cell desquamation and allowing microbial invasion. Contact lenses also induce dry eye and corneal hypesthesia. Overnight rigid gas permeable lens use for orthokeratology has also been associated with bacterial keratitis. Recently, the competition for more comfortable and more consumer friendly contact lens solutions have been identified as playing a key role in the increase in atypical causes of microbial keratitis including Fusarium (B&L MoistureLoc) and Acanthamoeba (AMO Complete MoisturePlus).

**Diagnostic Techniques**

Routine culture of corneal infections is not the usual practice in the community. A small peripheral ulcer may be treated empirically, but a large, purulent, central ulcer that extends to the middle to deep stroma should be cultured prior to treatment. In addition, ulcers that are clinically suspicious for fungal, mycobacterial, or amoebic infections or are unresponsive to initial broad spectrum antibiotics warrant cultures. Topical anesthesia with proparacaine hydrochloride is preferred since it has fewer antibacterial properties than other topical anesthetics. A sterile platinum spatula is used to scrape the leading edge as well as the base of the ulcer, while carefully avoiding contamination from the lids and lashes.

In cases of deep stromal suppuration that is not readily accessible or a progressive microbial keratitis unresponsive to therapy, a corneal biopsy may be warranted. A round 2mm to 3mm sterile, disposable skin punch is used to incise the anterior corneal stroma and lamellar dissection is performed with a surgical blade. The specimen is then ground in a mortar with trypticase soy broth and plated on media.

Acanthamoeba keratitis is a rare opportunistic infection that affects approximately 1.2 to 3.0 cases per million. Acanthamoeba are ubiquitous protozoa that exist in 2 forms: trophozoites (the active form) and cysts (the inactive form). Under unfavorable conditions, trophozoites transform into cysts that are resistant to extremes of temperature, pH, and desiccation. Cysts are notoriously difficult to kill and this is one reason why this infection is so difficult to eradicate. Only one class of medications is known to have cystocidal activity, the biguanides.
The initial report of Acanthamoeba keratitis was in 1975 in a patient who sustained eye trauma outdoors. This was followed by an epidemic of infections in soft contact lens wearers in the late 1980s, largely attributed to home-made saline. Besides all types of contact lenses, additional risk factors include ocular trauma, corneal transplantation, and exposure to infected lake water, sea water, hot tubs, tap water, or saliva. Recently, an alarming increase in the rate of Acanthamoeba keratitis has been observed prompting the CDC to investigate possible etiologies. This has concluded in the first association being the contact lens solution, AMO Complete MoisturePlus, which has been voluntarily pulled from the market by its manufacturer. The CDC is continuing its search into other possible connections for reasons into the increase.

Acanthamoeba infection presents with similar nonspecific symptoms as bacterial and viral keratitis. Pain that is out-of-proportion to clinical findings is characteristic, but not universal. Early corneal infection manifests as epithelial involvement, including elevated epithelial lines that may appear as dendritic, punctuate epithelial erosions, microcysts, and epithelial haze (FIGURE 1). Stromal findings, which occur later, include single or multiple stromal infiltrates and nummular keratitis. Ring infiltrates or satellite lesions usually suggest advanced disease (FIGURE 2). Tropism of the Acanthamoeba organism for corneal nerves causes radial keratoneuritis, the reason for the extreme pain (FIGURE 3).

Diagnosis is typically delayed for a number of reasons. Early infections are commonly treated as bacterial or herpetic keratitis. The disease can also be confused with fungal keratitis. Delay in diagnosis makes it more difficult to treat since the infection becomes more deeply seated.

Treatment of Acanthamoeba keratitis is long, involves toxic medications, and may be unsuccessful in curing the infection if the infection involves the posterior cornea. A combination of topical anti-amoebic agents, including biguanides (eg, PHMB and chlorhexidine), diamides (eg, propamidine) and aminoglycosides (eg, neomycin) are typically used. Of these, only the biguanides are active against the cystic form of the disease. None of these medications are available commercially in the United States and they must be compounded by a specialty pharmacy before use. Medications must be used for months starting at hourly intervals and tapered as the clinical situation improves. The use of topical steroids is controversial. It clearly improves patient comfort, but may potentiate the infection by conversion of the cyst to trophozoites.
1. Remove and return any AMO Complete MoisturePlus Solution from offices/places of work.

2. Advise all patients, and especially contact lens wearers, of the association of ACA with the contact lens solution, AMO Complete MoisturePlus Solution so they may dispose of remaining solutions.

3. Recommend that all contact lens wearers rub their lenses with an alternate cleaning solution and avoid the 'no rub' technique advocated by manufacturers.

4. Although suspicion should be kept high due to the increased risk of ACA keratitis, bacterial infectious keratitis is still the most common etiology and should remain on top of the list of differential diagnoses.

5. Be on the lookout for the early signs of ACA keratitis and use vital dyes (fluorescein, lissamine green, rose bengal) to help differentiate these lesions from those caused by herpes simplex keratitis.

6. With cases of acute keratitis, unless it is of an abnormal appearance, larger than 2mm in size, moderate to deep stromal melting, or is central or paracentral, treatment should begin with intensive application of a topical broad spectrum antibiotic(s).

7. If the keratitis does not respond, or has any of the above unusual characteristics, corneal scrapings for vital stains (Gram, Geimsa, etc) and cultures should be obtained to identify the pathogen. Confocal microscopy can aid in the diagnosis of ACA.

8. For any contact lens patient with a suspected infection, contact lenses, cases, and cleaning solutions should be collected for culturing.

9. Steroids should be used with caution in the above concerning situations, and preferably only if the organism has been identified, and the patient is clinically responding to the treatment.

10. Early diagnosis is the key to improved outcomes so consider earlier referral to a specialist than usual.

11. Treatment involves extended and frequent dosing of at least one of the cystocidal biguanides (PHMB 0.02% and/or chlorhexidine 0.02%), and at least one other agent - neomycin, propamidine, and/or clotrimazole, for weeks to months. In addition, the treating clinician may consider judicious use of oral itraconazole as an adjunct to topical therapy.

References


