

Acanthamoeba Keratitis: Contact Lens and Non-contact Lens Characteristics

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Abstract

Purpose: To identify potential differences in time to diagnosis and final visual outcome between contact lens and non-contact lens users with Acanthamoeba keratitis.

Background: Prior studies have shown early diagnosis and therapy to be related to outcome but have not analyzed differences among patients with and without contact lenses.

Methods: A retrospective analysis of 11 consecutive cases (involving 13 eyes) of Acanthamoeba keratitis diagnosed at one institution over a three year period.

Results: Mean time to diagnosis was significantly longer in non-contact lens patients versus contact lens patients (mean 5.8 vs. 3.3 weeks). Fifty percent of non-contact lens patients had a poor outcome (visual acuity worse than 20/40 or penetrating keratoplasty) versus 14% of contact lens patients.

Conclusion: Patients without contact lenses were diagnosed later and had a worse visual outcome than contact lens patients with Acanthamoeba keratitis. All patients with unresponsive microbial keratitis, even those without contact lens use, should be worked up for Acanthamoeba.

Introduction

Acanthamoeba keratitis is a potentially blinding corneal infection which is often misdiagnosed. Originally associated with trauma with vegetative matter and exposure to contaminated water, Acanthamoeba keratitis has in recent literature been most closely linked to soft contact lens use,¹⁻³ although it can occur even in the absence of contact lenses.⁴

Since the first medical cure of Acanthamoeba keratitis in 1985,⁵ medical therapy has evolved to include neomycin, imidazole antifungals, propamidine isethionate (Brolene, May & Baker, Dagenham, United Kingdom), and polyhexamethylene biguanide (PHMB or Baquacil, Imperial Chemical Industries, Wilmington, Delaware),^{6,7} with penetrating keratoplasty reserved for recalcitrant infection.⁸

Recent studies have shown encouraging cure rates while emphasizing the impact of early diagnosis and therapy on final visual outcome.⁹⁻¹¹

With recent literature focusing on soft contact lens use as the major risk factor for Acanthamoeba keratitis, eye care providers may be slower to diagnose Acanthamoeba in patients with hard or rigid gas permeable (RGP) lenses or in patients without lenses. To examine this hypothesis we conducted a retrospective review of all cases of Acanthamoeba keratitis diagnosed at our institution over a three year period to identify salient differences in presentation and outcome among these populations.

Subjects and Methods

The medical records of 11 consecutive patients (involving 13 eyes) with culture-positive or histologically proven Acanthamoeba keratitis at the Massachusetts Eye & Ear Infirmary from 1990 to 1994 were retrospectively reviewed. Data were collected regarding initial signs and symptoms, contact lens wear, method of diagnosis, time to diagnosis, treatment, and final visual outcome (Table 1). There were seven female and four male patients. Mean patient age was 31.5 years (range: 14 - 56 years) with a mean follow-up of 15.3 months (range: 7 - 37 months).

Corneal scrapings were obtained on every patient and Gram, Giemsa, and Calcofluor white stains were performed. Cultures on Sabouraud's medium, meat broth, chocolate and blood agar, and agar with E. coli overlay were performed. Contact lenses, cases, and solutions were cultured when available. Corneal biopsy was necessary to make the diagnosis in two cases.

All patients were treated with propamidine isethionate (Brolene) and neomycin/polymyxin B/bacitracin (Neosporin) drops, initially every hour and

slowly tapered. Beginning in 1993, PHMB was added to this regimen. Seven patients received topical steroids (typically prednisolone acetate 1%) during the course of their treatment, usually before the diagnosis of Acanthamoeba was made. One patient received oral ketoconazole and topical clotrimazole as adjunctive therapy.

Penetrating keratoplasty was performed in one eye for visual rehabilitation and in three eyes for progressive disease. Subsequent enucleation was necessary in one case following scleral extension, multiple kerotoplasties, and a resultant blind, painful eye.

A two-tailed student's t-test was performed to compare the time to diagnosis in the contact lens versus the non-contact lens populations.

Results

Risk Factors

Sixty-four percent of cases (7 of 11) were contact lens-related. Both bilateral cases involved contact lenses. A risk factor for Acanthamoeba other than contact lens use was identified in 91% of all cases and in 100% of cases not involving contact lenses. Contaminated water (e.g. lake water, sea water) or tap water exposure was the most common risk factor, present in 64% of cases. Other risk factors included trauma (e.g. being poked by a tree branch), poor lens hygiene, and herpes simplex keratitis (see Table 1).

Signs and Symptoms

Radial keratoneuritis, which has been described as the most specific sign for Acanthamoeba, was present in only 45% of cases. A ring infiltrate eventually formed in 91% of cases but was usually absent on presentation.

Less specific signs for Acanthamoeba were more commonly present. Severe ocular pain (typically disproportionate to the degree of keratitis) was the presenting complaint in 91% of patients. Limbitis or anterior stromal infiltrates were present in all cases, and epithelial defects or central ulcers were present in the majority of cases. There were no significant differences in signs or symptoms upon presentation between the contact lens and non-contact lens patients.

Accuracy and Method of Diagnosis

The diagnosis of Acanthamoeba was made correctly initially in only one case (9%). Herpes simplex virus was the primary diagnosis in 55% of cases. Diagnosis was by calcofluor white stain in 64%, culture of contact lenses in 18%, and corneal biopsy in 18% of cases.

Time to Diagnosis and Outcome

Early diagnosis (defined as within one month of symptoms) lead to visual acuity better than or equal to 20/40 in 83% of cases (5 of 6) after medical therapy alone. When time to diagnosis exceeded one month, visual acuity was worse than 20/40 in 80% of cases (4 of 5). All cases diagnosed early were treated successfully medically. Conversely, all cases requiring penetrating keratoplasty or enucleation were diagnosed more than one month after initial symptoms.

Contact Lens versus Non-contact Lens Patients: Differences in Time to Diagnosis and Outcome

Mean time to diagnosis was 5.8 weeks (range: 4 - 8 weeks) in non-contact lens patients versus 3.3 weeks (range: 1 - 5 weeks) in contact lens patients; the longer time to diagnosis in non-contact lens cases was significant ($t = -2.67$; $p = 0.038$). Early diagnosis was made in 86% of contact lens patients (6 of 7) but in only 25% of non-contact lens patients (1 of 4).

Fifty percent of non-contact lens patients (2 of 4) had a poor outcome (defined as visual acuity worse than 20/40 or penetrating keratoplasty) compared to 14% of contact lens patients (1 of 7). Two of three patients requiring penetrating keratoplasty did not wear contact lenses. Both contact lens cases with a poor outcome involved RGP or hard lenses rather than soft contact lenses.

The use of steroids in either the contact lens or non-contact lens groups was not found to relate to either time to diagnosis and final visual outcome.

Discussion

In our series, non-contact lens patients with *Acanthamoeba* keratitis had a worse outcome than contact lens patients. Fifty percent of non-contact lens patients had a final visual acuity worse than 20/40 or required penetrating keratoplasty, versus only 14% of contact lens patients. We attribute the worse outcome in non-contact lens patients to diagnostic delay in this group compared to contact lens patients. In our series, mean time from initial symptoms to diagnosis was almost twice as long in non-contact lens patients compared to contact lens patients (5.8 vs. 3.3 weeks); this difference was significant ($p=.038$).

Because there was no significant difference in presenting signs or symptoms between the contact lens and non-contact lens patients, we believe the diagnostic delay is due to clinicians' decreased suspicion in non-contact lens patients. Before the widespread use of contact lenses, *Acanthamoeba* was an even rarer corneal pathogen than it is today. Recent reports, while correctly emphasizing contact lens use as the major risk factor for *Acanthamoeba*, may have had the unintentional effect of de-emphasizing historically recognized risk factors such as contaminated water exposure or vegetative trauma, which may cause *Acanthamoeba* in non-contact lens patients.

Early diagnosis in our series (within one month of symptoms) was associated with improved outcome, confirming earlier studies.⁹⁻¹¹ Eighty-three percent of cases diagnosed early had a final visual acuity better than or equal to 20/40, compared to twenty percent of cases diagnosed after one month. All cases diagnosed early were treated successfully medically; conversely, all cases requiring surgery (either penetrating keratoplasty or enucleation) were diagnosed after one month.

Two recent large series of *Acanthamoeba* keratitis emphasized the impact of time to diagnosis on final visual outcome, but did not compare contact lens versus non-contact lens cases in either time to diagnosis or final visual outcome.⁹⁻¹¹ Further studies involving a larger number of patients will be necessary to confirm our suggestive findings.

Non-contact lens wearers comprised 36% of our cases, a higher proportion than the 15% reported in the literature.² A predisposing risk factor other than contact lens use was present in all but one patient and in all non-contact lens patients; the most common risk factor was contaminated or tap water exposure.

Previous investigators have reported a stromal ring infiltrate as suggestive of *Acanthamoeba* keratitis³ and radial keratoneuritis as pathognomonic.¹² Although one or both of these signs was present in all but two of our cases, the initial diagnosis was incorrect in all but one case, reflecting the need for increased clinical recognition of these signs and the risk factors for this disease.

Steroid use was unrelated to final visual outcome in our series. Investigators remain divided on the appropriate use of topical corticosteroids in the treatment of *Acanthamoeba* keratitis. Part of the corneal reaction to *Acanthamoeba* may be immunologically-mediated and thus steroid responsive,¹³ and steroids have been shown in vitro to inhibit the conversion of *Acanthamoeba* trophozoites into the more medically-resistant cyst form.¹⁴ Conversely, steroids may have a

detrimental effect on anti-microbial drug efficacy and wound healing.¹⁴ Further research on this topic is necessary.

Surprisingly, the contact lens-related cases with poor visual outcomes involved hard or RGP contact lenses rather than soft lenses; prior studies have found greater adherence of *Acanthamoeba* to soft contact lenses compared to hard lenses.¹⁵ Importantly, both cases involving hard or RGP lenses also involved tap water rinses, which are still allowed on many package inserts despite previous warnings.¹⁶ Manufacturers and clinicians must warn patients that it is unsafe to rinse or store any type of contact lens in tap water because of the risk of *Acanthamoeba* infection.

We hope this study increases clinicians' suspicion of *Acanthamoeba* keratitis in non-contact lens wearers. All patients with unresponsive microbial keratitis, even non-contact lens wearers, should be fully investigated for *Acanthamoeba*, including specific cultures, stains, and corneal biopsy, where necessary. The recognition of signs such as a stromal ring infiltrate and radial keratoneuritis in the presence of a suggestive history should be emphasized, as early diagnosis and prompt therapy improves final visual outcome.

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