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Acanthamoeba keratitis: 10-Year study at a tertiary eye care center in Hong Kong

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ABSTRACT

Purpose: To review clinical presentation, investigation results and treatment outcomes of patients with *Acanthamoeba* keratitis (AK) at a tertiary eye care center in Hong Kong.
Methods: A retrospective case review was performed for cases of *Acanthamoeba* keratitis diagnosed at the Prince of Wales Hospital, Hong Kong over a 10-year period.
Results: Fifteen eyes of 13 patients were treated for AK over the study period. 12 out of 13 patients (92.3%) were contact lens wearers. All patients presented with blurred vision and pain, while 9 patients (69.2%) presented with redness of the affected eye. The most common ocular sign was diffuse corneal haze or ground glass appearance of the cornea (69.2%) followed by anterior chamber inflammation (53.8%), ring infiltrate (38.4%), epithelial defect (38.4%), perineural infiltrates (30.7%) and satellite lesions (15.3%). *Acanthamoeba* was detected on corneal scrapings in 4 eyes and on confocal microscopy in 4 eyes. The mean duration of treatment was 140 ± 50.8 days. Surgical intervention was required in two cases due to uncontrolled eye infection and progressive corneal thinning. All patients had improvement in visual acuity after treatment.
Conclusions: Patients with AK exhibited a wide spectrum of clinical characteristics. Improper care and usage of contact lenses is a major risk factor for *Acanthamoeba* keratitis. Diagnosis of AK remained a challenge. Timely diagnosis and appropriate treatment with amoebicidal drugs can improve the outcomes of *Acanthamoeba* keratitis.

1. Introduction

Acanthamoeba keratitis (AK) is a potentially blinding infectious disease of the cornea that is difficult to diagnose and treat. Soft contact lens wear is by far the most common and important risk factor for development of AK with 64–93.3% of cases associated with use of soft contact lens in the developed world [1,2]. In developing countries, the main risk factors are corneal trauma, injury with mud and exposure to contaminated water [3]. The difference in incidence of *Acanthamoeba* keratitis in different parts of the world may be related to prevalence of contact lens use, contamination of domestic water by *Acanthamoeba* and use of different diagnostic techniques for AK [4–6]. Prompt diagnosis of AK remains a challenge to ophthalmologists. It is not uncommon for cases of AK to be misdiagnosed as herpetic keratitis during the initial presentation [7]. In the current study, we reviewed the cases of *Acanthamoeba* keratitis at a tertiary care hospital in Hong Kong over a 10-year-period.

2. Methods

In collaboration with the pharmacy of Prince of Wales Hospital, Hong Kong, we screened out 16 cases with history of use of amoebicidal agents (brolene, polyhexamethylene biguanide (PHMB), chlorexidine and neomycin) between June 2002 and July 2012. Of these, 13 cases had a final diagnosis of *Acanthamoeba* keratitis while the other 3 cases were diagnosed to have *Penicillium* keratitis, autoimmune sclerokeratitis and *Pseudomonas* keratitis, respectively. Subsequently, a retrospective case review of medical records was carried out for 13 cases. The study was approved by the local ethics committee and adhered to the tenets of the Declaration of Helsinki.

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The protocol for diagnosis of AK followed at our hospital included microbiological culture in addition to confocal microscopy. Epithelial specimens were obtained with either a Kimura spatula or sterile number 15 blade, and then plated onto non-nutrient *Escherichia coli* agar for culture in the laboratory. Bacterial and fungal investigations were performed routinely (blood agar, chocolate agar, Sabouraud's agar, and Thioglycollate broth). Confocal microscopy was performed using the laser scanning confocal microscope (Rostock Corneal Module, HRT III RCM, Heidelberg Engineering GmbH, Heidelberg, Germany) in another eye center. Confocal microscopy was considered positive for *Acanthamoeba* if characteristic high contrast round bodies, or doubled-walled structures denoting cysts were observed on the scans as reported previously [8]. Clinical diagnosis was made on the basis of characteristic findings on slit lamp examination (perineural infiltrates, ring infiltrates, satellite lesions), presence of relevant risk factors (contact lens use, history of trauma) and optimal response to amoebicidal therapy.

The studied parameters included demographic data, predisposing factors, clinical features, investigation results, treatment, and outcomes. Patients who presented within 30 days of onset of symptoms were categorized as early presenters while those who presented ≥30 days after onset of symptoms were labeled as late presenters. Likewise, patients were categorized as early treatment group if amoebicidal drugs were commenced within 30 days after onset of symptoms. In the late treatment group, treatment was commenced ≥30 days after onset of symptoms.

3. Results

We reviewed 13 case records of patients with diagnosis of *Acanthamoeba* keratitis over the study period. Two patients had bilateral contact lens-related *Acanthamoeba* keratitis; therefore, overall 15 eyes were included in the analysis.

Of the 13 patients, 9 (69.2%) were female. The mean age of patients was 24.1 ± 8.01 (range 13–38) years. The majority of patients were contact lens wearers (12/13, 92.3%). Among contact lens users, five patients used monthly disposable contact lenses, two patients used fortnightly disposable contact lenses, two patients used overnight orthokeratology contact lenses, one patient used extended wear contact lenses, and one patient used bandage contact lens for bullous keratopathy after a failed corneal graft. The type of contact lens use was not documented in one patient.

Five patients had a history of improper care or use of contact lenses, including washing the contact lens with tap water, use of contact lens in shower, spa or swimming pool and, overnight wear of monthly disposable contact lenses. Two patients had a history of corneal epithelial disease: one had recurrent corneal erosion syndrome secondary to corneal dystrophy, while the other patient had history of treated herpes simplex keratitis.

Data regarding the health seeking behavior of the patients are shown in Table 1. Prior to presentation to our hospital, 5 (38.4%) patients were seen by general practitioners and 9 patients (69.2%) were seen by private ophthalmologists. Of these 9 patients, four patients had visited a general practitioner before visiting a private ophthalmologist. The other three patients were referred from the Accident and Emergency Department. Two patients (15.4%) were referred to our eye center by private ophthalmologists with a presumed diagnosis of *Acanthamoeba* keratitis, while three patients (23.1%) had an initial diagnosis of herpetic keratitis. Other patients were referred with a presumed diagnosis of fungal keratitis, microbial keratitis or epithelial defect. Prior to consultation at our eye center, 6 patients (46.2%) were prescribed topical antibiotics and topical corticosteroids, 4 patients (30.8%) received topical antibiotics alone, and 1 patient (7.69%) was started on amoebicidal therapy.

Table 1
First contact management of patients with *Acanthamoeba* keratitis prior presenting to Prince of Wales Eye Centre.

First contact	*N* (%)
General practitioner	5 (38.4)
Private ophthalmologist	9 (69.2)
Prescribed topical antibiotics by private doctor	10 (76.9)
Prescribed topical steroids by private doctor	6 (46.1)
Initially diagnosed as herpetic keratitis	3 (23.1)
Duration of symptoms before consultation (±standard deviation) (days)	29.1 ± 34.5

All patients presented with blurred vision and pain, while 9 patients (69.2%) presented with redness. Nine patients presented within one month, while 4 patients present later than one month after the onset of symptoms. The most common ocular sign was diffuse corneal haze or ground glass appearance of cornea ($n = 9$, 69.2%), followed by anterior chamber inflammation ($n = 7$, 53.8%), ring infiltrate ($n = 5$, 38.4%), epithelial defect ($n = 5$, 38.4%), perineural infiltrates ($n = 4$, 30.7%) and satellite lesions ($n = 2$, 15.3%). Table 2 shows the presenting ocular signs in patients with AK at early versus late presentation.

The mean delay in commencement of amoebicidal therapy was 27.2 ± 25.7 (range 3–90) days. Three cases had a delay of >60 days and were treated as herpetic keratitis by private ophthalmologists before presentation. Nine of 13 patients were in early treatment group, while four of 13 patients were in late treatment group. The characteristics of the early and the late treatment groups are summarized in Table 3. No significant differences were noted with respect to age, gender and the initial visual acuity between the early treatment group and the late treatment group. There was no statistical difference between the duration of amoebicidal drugs and need for surgery between the two groups (p value 0.376 and 0.743 respectively in Mann–Whitney U test).

Overall, 9 patients (9 out of 15 eyes) received topical corticosteroids. Of these, 4 eyes were receiving corticosteroids before presentation. The overall mean duration of treatment with topical steroids was 58.56 ± 41.68 days (range 1–120 days). Table 4 shows the characteristics and outcome of patients in steroid-treated and non-steroid treated group. The visual acuity at the time of presentation was worse in steroid-treated group compared to non-steroid treated group ($p = 0.012$). However, there was no statistical difference in the final visual acuity between the two groups ($p = 0.367$). Patients in the steroid-treated group required a longer duration of amoebicidal treatment (mean 162 ± 50.89 days, range 95–240) compared to the patients who did not receive steroids (mean 94 days ± 45.24, range 60–182) ($p = 0.012$).

Corneal scraping was performed in 14 out of 15 eyes of which 4 were positive. Corneal scraping was not performed for one patient due to delayed presentation, however, confocal microscopy was positive for *Acanthamoeba* in this case. The microbiological culture results were available in a mean time of 11.8 days (range 8–18 days). In addition to corneal scrapings, contact lens, contact lens case and contact lens solutions were sent for culture in 9 eyes, but only commensals were cultured from these specimens. Confocal microscopy was performed in 8 eyes, of which 4 were positive for *Acanthamoeba* (two cases were culture negative and microbiological culture was not performed for the third case). The remaining 7 eyes were diagnosed to have *Acanthamoeba* keratitis by clinical diagnosis, on the basis of compatible slit lamp findings (perineural infiltrates, ring infiltrates,