Acanthamoeba keratitis

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SUMMARY We report on four patients seen during the past two years who had *acanthamoeba* keratitis. One is described in detail. We believe that *acanthamoebic* eye infection is not rare. An immunofluorescent technique for localisation of amoebae and cysts is described. Our patients' response to propamidine and dibromopropamidine therapy was complicated by problems of toxicity.

Although the first report of the devastating eye infection that can occur with *Acanthamoeba* species was described as long ago as 1974,¹ only scattered publications have appeared since then,²⁻¹⁶ and reports in British journals of cases originating in this country have been few.^{2-5 15} Several papers have appeared recently in American journals which serve to highlight certain clinical features of the infection and a frequently unsatisfactory outcome, whether medical or surgical treatment or both are given. It is our impression that *acanthamoeba* keratitis is by no means uncommon. We report here that we have seen four patients in the past two years in whom this diagnosis was eventually confirmed. One of them is considered in detail, with a description of an immunofluorescent technique for localisation of amoebae and cysts.

Case report

A 31-year-old man was first referred in November 1984 for further management of a refractory left herpes simplex stromal keratitis. At that time he had a visual acuity of 6/24 in this eye and an extensive stromal opacity with a 1.5 mm central indolent ulcer. He was on prednisolone 1% eyedrops four times a day. He had also had a dendritic ulcer in the right eye some years earlier, which had healed uneventfully, with no visual deficit or further problems to date.

He had first presented with a dendritic ulcer in the left eye in August 1984; and this had healed with antiviral therapy, but a disciform keratitis ensued. In October 1984 he was noted to have a ring infiltrate. At this stage, while on a visit to the United States, he developed a fresh corneal abscess and hypopyon. Although cultures were negative, a presumptive

diagnosis of bacterial keratitis was made, and his eye settled on topical systemic antibiotics.

His eye gradually deteriorated during December 1984, and his visual acuity fell to 6/60. He was noted to have a variable indolent epithelial defect. Treatment at this stage consisted of prednisolone eyedrops 0.3-1%, acyclovir eye ointment five times a day, gentamicin (Genticin) eyedrops four times a day and atropine eyedrops twice a day. By January 1985 he had developed stromal thinning beneath the central indolent ulcer and a bandage contact lens was fitted. Two months later the central infiltrate had extended but a clear periphery was maintained. The cornea had epithelialised by May 1985 while use of the bandage lens continued, though the eye remained inflamed, and visual acuity was hand movements. In summary, therefore, this man had had a nine-month history of a chronic stromal keratitis following a dendritic ulcer, with an indolent ulcer which was perhaps compatible with herpes simplex keratitis but was remarkably recalcitrant.

It had been impossible to quieten the eye with steroids, as is usually the case in patients with herpetic stromal keratitis. As he was experiencing very protracted pain and disability an 8 mm therapeutic penetrating keratoplasty was carried out in June 1985. At surgery it was found that the aqueous was markedly viscous, which accords with a case described by Hirst *et al.*¹¹ The corneal disc was sent for histological and microbiological examination. Within 36 hours of culture on *Escherichia coli* seeded nutrient free agar, *acanthamoeba* trophozoites were identified on the plate. Subsequent periodic acid Schiff (PAS) staining of the corneal sections revealed multiple *acanthamoeba* cysts in the stroma (Fig. 1). These cysts were also identified by an immunofluorescent technique as follows.

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Fig. 1 *Acanthamoeba* cysts in corneal disc. Periodic acid Schiff stain.

IMMUNOFLUORESCENT LOCALISATION OF AMOEBAE AND CYSTS

Wax-embedded sections of the corneal disc were dewaxed and brought to 50% ethanol. After they had been dried and rinsed with waterproof marker, a 1/50 dilution of rabbit anti-*Acanthamoeba* serum¹⁷ in phosphate buffered saline (PBS) was layered on the sections. They were held at room temperature for 30 minutes in a moist box. After two 10-minute washes in PBS, fluorescein-conjugated sheep antirabbit Ig serum was added at a dilution of 1/50 and further held for 30 minutes. Two further washes in PBS were followed by a five-minute exposure to 1/10 000 Evans blue and a final five-minute PBS wash. After being mounted under a cover slip in pH 7.1 glycerol mountant (Difco), the sections were examined under a Neofluor $\times 25$ objective with incident blue light in a Zeiss fluorescent microscope. Cysts and amoebic trophozoites fluoresced yellow-green.

TREATMENT

Postoperatively he was treated with chloramphenicol eyedrops qds, dexamethasone eyedrops qds, acyclovir eye ointment qds, cyclopentolate eyedrops bd, Brolene eyedrops qds, and Brolene eye ointment nocte. Brolene is the trade name for a preparation containing propamidine and dibromopropamidine which is widely available in chemists without prescription. He did well initially, maintaining a clear corneal graft for several months. In September 1985 some loose suture loops occurred which were removed. His treatment at this time was prednisolone eyedrops qds, acyclovir eye ointment

tds, Brolene eyedrops qds, and Brolene eye ointment nocte. In October 1985 he was noted to have epithelial thickening and irregularity over the graft and it was felt that these changes were due to Brolene toxicity. Brolene therapy was therefore reduced and stopped over a 10-day period. However, when seen the following week he was noted to have an epithelial defect, an active anterior chamber, keratic precipitates over graft and host, and a small hypopyon. This was thought to represent a recurrence of *acanthamoeba* in the graft. Brolene therapy was restarted at two-hourly intervals. Within a few days his eye had quietened down considerably, and the epithelial defect had regressed. Since then he has had further epithelial defects. His visual acuity has varied between 6/18 and 6/60 postoperatively, and this limitation is mainly due to a posterior subcapsular cataract. Current therapy is prednisolone eyedrops qds and Brolene eyedrops qds.

Discussion

Acanthamoeba are free-living amoebae found in the soil, water, and air. The trophozoites are uninucleate, have small spiky acanthopodia, and move slowly on a broad front.¹⁸ There is a resistant cystic stage characterised by angular double-walled cysts. In outdoor air it has been found that an average of one amoebic cyst of any species was found in 9.1 m³ of air and one cyst of *Acanthamoeba castellanii* in 18.2 m³.¹⁹ Since 1974 this ubiquitous organism has been implicated as the causative agent in some cases of chronic stromal keratitis. Two groups of patients

seem to be particularly at risk of developing acanthamoeba keratitis. The first are individuals who have otherwise normal, immunocompetent eyes who receive some form of ocular insult as from trauma or the wearing of a contact lens that brings the organism directly to the compromised ocular surface. Secondly, there are those who are already under treatment for herpetic and possibly other stromal keratitis; they may have been on topical steroids for prolonged periods which allow the opportunistic acanthamoeba infection to occur.

In the past two years our department has been involved in the diagnosis of four patients with acanthamoeba keratitis; this suggests that it is not a rare condition. Three of these patients first had chronic herpetic keratitis, whereas the fourth appears to have developed acanthamoeba keratitis as a result of ocular trauma from a tennis ball that had been lying in a manured rose bed.

In most of the cases reported so far the diagnosis was made following a therapeutic keratoplasty, and three were made as a result of enucleation. However, the recent report of a cure for the condition by medical means¹⁵ indicated that early diagnosis may now lead to prospects of an early cure, with avoidance of the morbidity and pain that are such frequent features of the condition and a better prognosis than has been obtained hitherto. It is our view that the diagnosis should be earnestly sought early on in all patients with refractory stromal keratitis. Attempts should be made to identify acanthamoeba by corneal scrapings, microscopy, and culture. Acanthamoeba infections seem particularly likely if there has been soft contact lens wear,¹⁴ herpes simplex keratitis, contact with dirty water, a variable epithelial defect, uveitis, hypopyon, a ring infiltrate,¹⁶ corneal thinning, descemetocele formation, or excessive ocular pain.

Somewhat surprisingly, a retrospective histological review of 756 cases of penetrating keratoplasty corneal sections collected between 1960 and 1975 revealed no cases of acanthamoeba infection.²⁰ However, another recent retrospective analysis of 300 specimens collected between 1974 and 1983 revealed definite evidence of acanthamoeba infection in two.¹³ Although these figures suggest that the condition is rare, the increasing number of reports testifies otherwise. This may be because of increased awareness and diagnosis or because of a real increase in incidence related to greater use of soft contact lenses and more liberal use of topical corticosteroids.

Wright *et al.* recently reported the first medical cure of acanthamoeba keratitis using a combination of Brolene and neomycin.¹⁵ It is interesting that our patient remained well while on Brolene therapy until signs of toxicity developed; when he stopped these

drugs, there was probably a recurrence of the acanthamoeba keratitis. This presumed flare-up, which was not proved by culture, settled rapidly on restarting Brolene therapy. His recurrent epithelial defects may represent further problems of toxicity, perhaps compounded by neomycin or partially treated recurrent disease. Thus, while Brolene offers prospects for an early cure, there are still unanswered questions as to the appropriate frequency and duration of treatment. These answers may be forthcoming with increased awareness and diagnosis of acanthamoeba ocular disease.

We are indebted to colleagues from Moorfields Eye Hospital (R J Cooling), Truro (C K Jones), Northampton (A J Atkinson), and Charing Cross Hospital (P Kinnear), who referred these patients. Mrs Julie Lawrence typed the manuscript.

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Accepted for publication 16 September 1986.