ACANTHAMOEBA KERATITIS: A REVIEW

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SAMENVATTING

Acanthamoeba keratitis wordt veroorzaakt door protozoa en is gekenmerkt door een geprotraheerd verloop. Alle patiënten met een therapie resistente keratitis, zelfs niet-contactlensdragers, zouden grondig onderzocht moeten worden op de aanwezigheid van Acanthamoeben, d.m.v. specifieke culturen, histopathologische kleuringen en -indien nodig- cornea biopsie. Het samengaan van klinische tekenen zoals excessieve pijn, een radiale keratoneunitis en in een latere fase een stromaal ring infiltraat, met een suggestieve anamnese (contactlenzen, vervuild water), is belangrijk bij het stellen van een vroegtijdige diagnose. Dankzij een betere klinische detectie en dus ook een vroegtijdiger diagnose, slaagt men er steeds vaker in om de infectie onder controle te krijgen met combinatie therapie van polyhexamethyleen biguanide of chloorhexidine met propamidine en antibiotica. Men bekomt betere resultaten qua visuele prognose en de behoefte aan therapeutische cornea transplantatie vermindert.

SUMMARY

Acanthamoeba keratitis is caused by protozoa and characterised by a protacted course. All patients presenting with a therapy-resistant keratitis, even non-contact lens wearers, should be examined for the presence of Acanthamoeba by means of specific cultures, histopathological stainings and -if necessary- a corneal biopsy. The combination of clinical signs, such as excessive pain, a radial keratoneuritis and in a later phase a stromal ring infiltrate, together with a suggestive history (contact lenses, polluted water) is an important factor fot the early diagnosis. Because of improved clinical detection and earlier diagnosis, the infection can often be controlled with a combination therapy of polyhexamethylene biguanide or chlorhexidine with propamidine and neomycine. This results in a better visual prognosis and a decreased need for therapeutic keratoplasty.

RESUME

La kératite par Acanthamoeba est provoquée par des protozoaires et caracterisée par une évolution chronique. Tous les patients présentant une kératite résistante à une thérapie médicale, même ceux qui ne portent pas de lentilles de contact, doivent être examinés pour la présence possible d'Acanthamoebes par des cultures microbiennes, des colorations histopathologiques spécifiques et -si nécessaire- par une biopsie de la cornée. Des symptômes cliniques comme une douleur excessive, une kératonévrite radiaire et plus tard une infiltration annulaire stromale, combinés avec une anamnèse suggestive (lentilles de contact, eau polluée) sont importants pour un diagnostic précoce. Grâce à une meilleure détection clinique et un diagnostic plus rapide, on parvient plus fréquemment à contrôler l'infection par une thérapie combinée de polyhexamethylène biguanide ou chlorohexidine avec propamidine et néomycine. Ceci permet d'obtenir de meilleurs résultats visuels et de réduire le nombre de kératoplasties thérapeutiques.

KEY WORDS

Acanthamoeba, keratitis, epidemiology, histopathology, diagnosis, treatment, review

MOTS CLÉS

kératite amibienne, épidémiologie, histopathologie, diagnostic, thérapie, revue

INTRODUCTION

Acanthamoeba keratitis has only been known as a clinical entity fot twenty years, with the first clinical case report published in 1974

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(16,27). Until 1959 Acanthamoeba species were considered harmless amoebas, free living in water and soil. Culbertson et al. were the first to demonstrate the pathogenicity of Acanthamoeba by inducing fatal experimental infections in mice and ape. Since 1985 there has been a clear increase in the incidence of the disease. The first case report of an Acanthamoeba keratitis in Belgium also appeared in 1985 (11), followed by others in 1989 (26). The name Acanthamoeba comes from the Greek, where "acantho" means curled, referring to the thin spidershaped pseudopodia of the trophozoites. Amoebas are classified under the protozoa. Within the order of the amoebas, there are the genera of the Balamuthia, Naegleria and Acanthamoeba, which are all three human pathogens (25). Naegleria, especially N. fowleri, causes Primary Amoebic Meningo-encephalitis (PAM), a fulminant acute meningo-encephalitis, leading to death in 3-7 days after exposure. Recently a non-Acanthamoeba keratitis, caused by Naegleria was reported (7). Acanthamoeba can also cause a Granulomatous Amoebic Encephalitis (GAE) and especially the more frequent Acanthamoeba keratitis. For the moment there are more than 35 species known (based on cyst morphology, on immunofluorescense with antibodies and on iso-enzyme structure), among which five possible causative agents for Acanthamoeba keratitis: A. castellani, A. polyphaga, A. hatchetti, A. culbertsoni and A. rhysodes. Three years ago a new corneal pathogen was added: A. griffini, a species previously not associated with keratitis (20).

EPIDEMILOGY

Acanthamoeba are widespread in nature. They are found in all kinds of water, such as rivers, lakes, fresh water, sea water, tap water, bottled water, swimming pools, hot water baths, but also in dust, mud, air-conditioning shafts, dialysis units, human and animal faeces, and in contact lenses, contact lens cases and desinfection fluid. Acanthamoeba are found most frequently in thermal water, heated swimming pools and during the warmest months of the year. In spite of this ubiquitous nature, the number of cases of Acanthamoeba keratitis is rather low (in 1990 only 250 cases were reported to the Centre for Disease Control in Atlanta) (10). This low incidence can be explained in two ways: either Acanthamoeba are weak pathogens or the corneal epithelium forms -under normal circumstances- an adequate barrier to the invasion. The first case report dates from 1974, but little is known about the exact incidence of Acanthamoeba keratitis before 1970. A number of retrospective studies was carried out to get a better understanding about the epidemiology of this disease. Ashton et al. (1) re-investigated 756 histopathological cases of keratitis or corneal ulceration, taken from files collected over a fifteen year period (1960-1975): in the whole series they found no single example of amoebic infection in the cornea or anterior segment. Kelly et al (17) reinvestigated histological slides of 197 corneas from the period 1955-1970 with new staining techniques, such as the calcofluor white colouring. Files from patients with the clinical diagnosis of a corneal ring infiltrate, herpes simplex keratitis, infectious keratitis or keratitis of unknown origin were selected: there was not a single missed diagnosis of Acanthamoeba keratitis. This supports (but doesn't prove) the hypothesis that Acanthamoeba keratitis is a new clinical entity since 1974. Two other retrospective studies of 172 cases excised between 1972 and 1978 (23) and 3000 cases excised between 1974 and 1983 (5) respectively found one and two misdiagnosed cases. The reason for the sudden increase in cases since 1985 is not clear, but there are a number of hypotheses. It could be that previous cases were underdiagnosed, but the above cited studies have proven that this is rather unlikely. The increase could also be due to a better knowledge of the clinical and morphological characteristics of the disease. There is also the possibility of a real increase in the incidence of the disease with as obvious cause the increase of contact lens wearers in the last 10-15 years. An alternative possibility is the change in the use of contact lens desinfection fluids, especially for disposable contact lenses, were the use of chlorine based desinfection to which Acanthamoeba are resistant, might be a possible etiologic factor (14). The high number of contact lens wearers within the patient population is obvious: in some studies this percentage goes up to 92% (8) or even 100% (14) of all cases. All kinds of contact lenses are involved: soft lenses (both daily

Fig. 1 Empty double-walled cysts with wrinkled ectocyst and smooth rounded endocyst (PAS.H)

and extended wear, disposable and non disposable), hard lenses and even gas permeable lenses. Disposable lenses are not a solution: a study even showed a relative risk for daily wear disposable lenses of 49.45 compared to the normal soft contact lenses (30). This increased risk was almost completely associated with the lack of desinfection or the use of desinfection fluids based on chlorine in combination with tap water. The main risk factors for Acanthamoeba keratitis are wearing contact lenses, non-sterile contact lens rinsing, omitted or chlorine based disinfection, and swimming with contact lenses (31). Previous corneal trauma and exposure to contaminated substances will also leed to a higher infection risk.

PATHOGENESIS

The life cycle of the Acanthamoeba consists of two forms: trophozoites and cysts. Trophozoites are the proliferating, active form. They have an irregular shape (size: 20 to 40 μm, species dependent) and pseudopodia. They feed on bacteria, like E. coli and other gram negative enterococci (which could explain why a bacterial contamination favours the infection process). The trophozoites proliferate through mitosis. In adverse circumstances (dehydration, lack of food, contact with toxic substances) these trophozoites turn into cysts, which are the resistant, resting form of the parasite. They are surrounded by a typical double walled envelop. The outer wall, the exocyst, is wrinkled, while the inner wall, the endocyst, is smooth *(Fig 1).* The morphology and size (12 to 20 μm) are species dependent. The cysts contain a fine granular cytoplasm and a nucleus with a bull's eye nucleolus (11). The cysts reverse to trophozoites when the environmental factors are favourable again. The precise mechanism for Acanthamoeba keratitis is unclear, but it is related to a number of factors such as a previous epithelial trauma, virulence of the micro organism, size of the inoculum (on the contact lens, in the desinfection fluid, in the contaminated water), capability of the parasite to adhere to the cornea and duration of the exposure (3). Research has shown that the characteristics of the cornea itself also have an influence on the probability of the infection, since in experiments with Acanthamoeba castellani only the corneal epithelium of humans and pigs allowed binding of trophozoites (28). The infection causes a destruction of the corneal epithelium and stroma, followed by an infiltration of inflammatory

Fig. 2 Clinical picture of Acanthamoeba keratitis: marked ciliary injection and an atypical, ill-defined corneal lesion

cells and eventually formation of a descemetocoele and corneal perforation. Limbitis and scleritis are frequent (15). The scleral inflammation in Acanthamoeba sclerokeratitis can either be caused by an immunological reaction secondary to a primary corneal infection or by a direct infection of the sclera by micro-organisms from the cornea (6).

CLINICAL PRESENTATION

Variability is the most striking fact in the clinical picture of patients presenting with Acanthamoeba keratitis. The course of the disease is always protracted, with remissions and exacerbations (4,11). In order to facilitate an early detection (and in that way a better therapy), it is important for the clinician to keep this characteristic in mind, a fortiori when the above mentioned risk factors and patient history are present. An Acanthamoeba keratitis usually starts as an unilateral red eye with epiphora, foreign body sensation, pain and photophobia. The first signs can be non-specific *(Fig 2)* and present as micro-erosions or epithelial irregularities and opacities. However, in some cases the epithelium is completely intact. One of the first signs of an Acanthamoeba keratitis is often a pseudo-dendritic epithelial lesion. In this stage the picture strongly resembles a viral keratitis (herpes simplex or zoster). The corneal sensitivity can be decreased, which obscures the differential diagnosis with herpes simplex even more. In a further stage of the disease (or sometimes simultaneously) there are a number of stromal abnormalities: nummular infiltrates (as seen in adenovirus infections) and radial keratoneuritis. This keratoneuritis is characterised by linear, radial, branching infiltrates of the parasite along the corneal nerves into the anterior stroma. There is a positive Tyndall and the anterior chamber inflammation can lead to a hypopion in 39% of all cases (24). A ring-shaped stromal infiltrate is characteristic of advanced infection and is nearly pathognomonic for Acanthamoeba keratitis *(Fig 3)*. This arcuate or ring-like infiltrate is the result of polymorphonuclear leukocyte infiltration generated by chemotaxis after antigen-antibody precipitation (22). Eventually the keratitis can give rise to necrotic zones in the stroma, with the formation of a Descemetocoele and a corneal perforation. In the majority of cases the infection is mainly li-

Fig. 3 Clinical picture of Acanthamoeba keratitis showing a pathognomonic ring infiltrate, an oedematous stroma and endothelial precipitates

Fig. 4 Calcofluor white staining showing a fluorescent cyst

mited to the cornea, but sometimes there is scleral involvement presenting as scleral nodules and inflammation. Besides that there are two other striking clinical symptoms: an excruciating pain which is not always in relation to the clinical findings and a remarkable lack of corneal neovascularisation in spite of the chronic course and severity of the inflammation (19).

DIAGNOSIS

Based on the above mentioned clinical characteristics in combination with one or more riskfactors, one can make the probable diagnosis of Acanthamoeba keratitis. There are a number of laboratory techniques to confirm this diagnosis: bacteriological (smears or cultures) and eventually histopathological. If the smears or initial cultures are negative or if only the stroma is involved (with an intact epithelium) a corneal biopsy is needed to obtain infected tissue. Recently the ability of PCR-analysis on corneal epithelial and tear samples to confirm the clinical diagnosis of Acanthamoeba keratitis was examined. PCR turned out to be a more sensitive diagnostic test than culture and could be particularly useful to confirm the clinical diagnosis in culture-negative cases (21). In this study there were no false positive tests neither with the tear nor epithelial samples. Of course the cost of PCR has to be taken into account when considering this alternative.

A. Bacteriological

- smear

The smear is fixated with 37% formaldehyde and several staining techniques can be used. A Giemsa or Gram staining can mask Acanthamoeba as leukocytes, macrophages and other mononuclear cells. A PAS staining stains the cyst wall red. These routine stainings can easily miss the diagnosis if there is no clinical suspicion of the disease. The calcofluor white staining is a specific staining method for Acanthamoeba: calcofluor white is a chemofluorescent staining, used in a 1:1 mixture of calcofluor white 0,1% and Evans blue 0,1% (17). After staining, the slides are examined by fluorescence microscopy *(Fig 4)*. But again: these specific staining methods will only be used if the clinician gives a clear indication of the suspected diagnosis. In centres where the necessary material is available, one can also use immunofluorescent antibodies to perform species differentiation.

- culture

It is suggested to culture not only material from the infected cornea, but also from the contact lenses, the preservation liquid and the contact lens holder. The prelevated material is then plated out on a 1.5% non-nutrient agar covered with E. coli (Acanthamoeba consume bacteriae). Contrary to the routine procedure it is not necessary to rub the material over the agar, but it is sufficient to just touch the surface. In order to avoid dehydration the plates are sealed with tape and then go into the oven at 37°C for at least 2 weeks. If no suitable plates are available, one can use a transport solution (like Page's salt solution) in order to make sure that the trophozoites survive the transport. Cultures are considered to be positive when amoebic migration tracks are seen (sometimes as early as after 2 or 3 days) or when trophozoites are seen under the microscope (14). Both the smears and the cultures have a sensitivity of 65%.

B. Histopathological

Even though Acanthamoebas initially provoke a superficial involvement, there will eventually also be a deeper stromal invasion and cyst formation. This is probably the reason why the corneal smear turns out negative if taken some time after the initial symptoms and why a corneal biopsy is needed at that point to obtain Acanthamoeba from the deeper stroma. The specimen can be stained with H.E., PAS, Grocott and calcofluor white. The cyst morphology as such is insufficient to determine the species identification, hence immunofluorescence with antibodies is needed (11). Cysts and trophozoites are found in the ulcerative zone and in the surrounding unaffected stroma. In some cases one can even find cysts at the level of Descemet's membrane *(Fig 5)*. Trophozoites can be recognised by their irregular shape (size: 20 to 40 μm, species dependent) and pseudopodia. Around the living material (cysts and trophozoites) there is practically no reaction, while there is an intense cellular reaction around the necrotic material. Contrary to most chronic inflamma-

Fig. 5 Empty cycts with shrunken cytoplasm in the deep stroma near Descemet's membrane in an area of little inflammation (PAS.H)

tions, Acanthamoeba infections show little or no neovascularisation of the corneal stroma, neither clinical nor histopathological. The exact reason for this lack of neovascularisation is not known, but it could be caused by an insufficient immunogenicity of the Acanthamoeba, failing to generate the whole inflammatory cascade leading to a vascular ingrowth (19). According to Garner et al. the corneal involvement can be divided into four stages (10). Stage 1 is that of the initial infection: the parasite invades through the epithelium, without inducing a significant inflammatory reaction. One finds trophozoites and cysts in the stroma without surrounding leukocyte infiltration. A similar situation occurs with certain other parasite infections (like microfilaria) where the degenerating organisms provoke most of the inflammatory answer. Depletion of keratocytes occurs in stage 2 and is seen throughout the entire thickness of the stroma, but mostly in the anterior part. The disappearance of the keratocytes is probably due to the fact that they undergo phagocytosis by the trophozoites. Stage 3 is the phase of the inflammatory answer with invasion of an acute inflammatory cell infiltrate, consisting mainly of polymorphonuclear cells and macrophages *(Fig 6)*. A constant fact is the small number of lymphocytes, which can be explained by the lack of stromal neovascularisation, which causes a decreased input of the relatively immobile lymphocytes through the vascular vessels. The latest stage, stage 4, is characterised by stromal necrosis with thinning of the stroma. This lysis of the stroma can be attributed to the release of enzymes by the polymorphonuclear cells. There are probably additional factors, like secretion of collagenolytic enzymes by Acanthamoeba trophozoites, since the lysis also occurs when there is minimal inflammatory cell infiltration. If there is scleral involvement, the inflammation is mainly granulomatous, with histopathological characteristics comparable to those seen in granulomatous amoeba encephalitis (GAE) (6). The slides show multiple lymphocytes, plasmacells, histiocytes and multinuclear giant cells in combination with necrotising granulomata associated with amoebic cysts and trophozoites *(Fig 7 & 8).*

DIFFERENTIAL DIAGNOSIS

Since the recent literature strongly emphasises the increased risk for Acanthamoeba keratitis in patients with soft contact lenses, there is a possibilty that this differential diagnosis is neglected in patients with hard or gas permeable contact lenses or in patients not wearing contact lenses. In England a big multicentric study of 243 patients (259 eyes) showed that the mean time to diagnosis was significantly higher in the group of patients without contact lenses versus those wearing contact lenses, whereas there were no significant differences in the initial symptoms with which both groups presented (31). This indicates that the ophthalmologist is less suspicious of this possible diagnosis, if the patient is not wearing contact lenses. Next to this delay in diagnosis, the group without contact lenses also needed more therapeutic keratoplasty procedures and had a worse outcome, probably due to the delayed diagnosis. The most common initial diagnosis is that of an (atypical, ill defined) keratoconjunctivitis or a viral (herpes simplex) keratitis (2). The most important differential diagnosis is herpetic keratitis. The presence of (pseudo)-dendrites and a decreased corneal sensitivity can be very misleading and a therapy with Zovirax™ is often initiated. On the other hand the marked pain sensation (often in discrepancy with the clinical symptoms) is more consistent with Acanthamoeba keratitis. Other possible differential diagnoses are: a fungal keratitis or keratitis caused by Mycobacteria, a toxic keratopathy caused by abuse of local anaesthetics or other eye drops and an infectious crystalline keratopathy (11). Occasionally the first symptoms are attributed to an epithelial trauma.

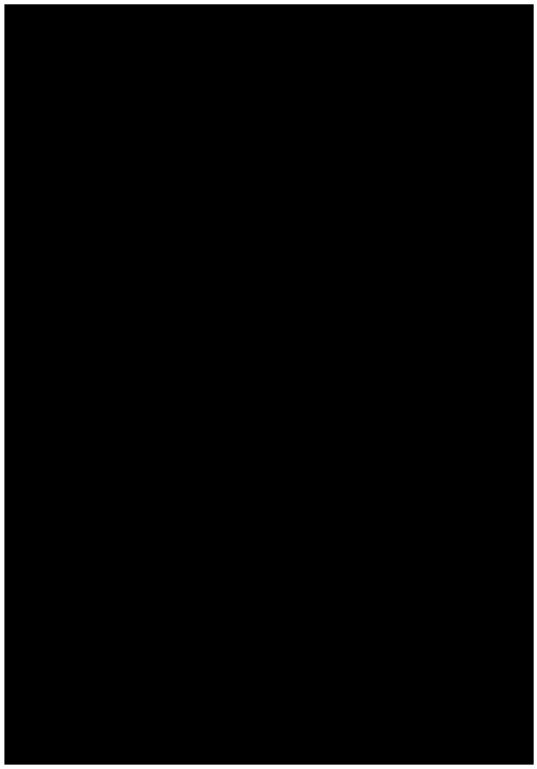

Fig. 6 Multiple empty cysts in the mid and deep stroma with much inflammation (E: epithelium, D: Descemet's membrane) (PAS.H)

TREATMENT

If the diagnosis is made in an early stage of the disease, a medical therapy can often be successful. If the infection is diagnosed in a later stage or appears to be resistant to all topical therapy, a therapeutic keratoplasty may be indicated.

A. MEDICAL

Few drugs are of proven efficacy in the treatment of Acanthamoeba. The cysts in particular are very resistant to most eye drops components in a concentration that is still safe for the cornea. The most recent recommendations for the medical treatment of Acanthamoeba keratitis emphasize the crucial importance of an early diagnosis for the success of a topical treatment. When the disease spreads, the Acanthamoeba invade the deeper layers of the stroma, which seriously limits the efficacy of topical treatment. There are several classes of drugs active towards Acanthamoeba (22). The most effective ones are the cationic antiseptics: chlorohexidine and polyhexamethylene biguanide (PHMB) 0.02%. The clinically used topical solutions have a concentration that is a hunderdfold higher than the MCC (minimal cysticidal concentration) and there is only a limited epithelial toxicity. There seems to be an additive effect between chlorohexidine and PHMB. Next to that, there are the aromatic diamides of which

Fig. 7 & 8 Amoebic sclerokeratitis (PAS.HE)

propamidine isethionate (Brolene™) is the most commonly used. These diamides are usually well tolerated, but prolonged use can lead to a (reversible) toxic keratopathy. A third class of drugs are the aminoglycosides (Neomycine™), which may have an additive effect to propamidine and to PHMB. The use of Neomycine™ however frequently leads to toxic or hypersensitivity reactions. There is a consensus concerning the use of the cationic antiseptics, chlorohexidine or PHMB 0.02%, in combination with Brolene™ 0.1% drops. In addition, one can also use Neomycine™ in a triple therapy (13,22). A very intensive application of eye drops (every hour) is needed during 3 days to 1 week (or shorter if there are signs of local toxicity such as superficial punctate keratitis). Afterwards the frequency is reduced to 4-6 applications daily, depending on the clinical answer (8). Long term treatment is essential and the use of chlorohexidine or PHMB is best continued during 4 to 6 months *(table 1)*. The use of topical corticosteroids is still controversial: on one hand they suppress the inflammatory sequels (stromal lysis, vascularisation and scar formation) and the intense pain, but on the other hand they also subdue the cellular mechanisms needed for the restriction of the infectious process. A reduction of the dose of corticosteroids also seems to cause a recurrence in a number of cases, and a prolonged use of this topical drug could also promote the development of a secondary bacterial or fungal keratitis (9). In a retrospective review, Park et al (29) demonstrated that topical corticosteroids were not associated with a higher rate of medical treatment failure in patients with Acanthamoeba keratitis. However, the mean duration of anti-amoebic therapy in the steroid-treated group was significantly longer than that in the non-steroid-treated group. The precise indications for corticosteroids are not yet clear, and it is considered good clinical practice to avoid their use until the diagnosis is confirmed and until the answer to specific anti-amoebic therapy can be evaluated. The use of corticosteroids should be limited to specific indications, such as limbitis, scleritis and uveitis. Non steroidal anti-inflammatory drugs are recommended for pain control (especially Sulindac™ in a dose of 200 mg twice daily would appear to be very effective).

table 1: Therapeutic scheme

THERAPEUTIC SCHEME (according to Lindquist (22))

1. loading dose (first 3 days)

**what:*
-chlorhexidine 0.02% or PHMB 0.02
+
- propamidine isethionate 0.1% (Brolene™)
+/-
- neomycine solution

** how:*
- hourly
- day and night
- during first 3 days
- each drug given at the same interval separated by 5 minutes

2. intensive treatment phase (4-7 days)

**what:*
- same combination

** how:*
- each given every 2h while awake
- each given every 4h at night
- for 4-7 days

3. maintenance phase (minimal 4 months)

** what:*
- chlorhexidine or PHMB alone
- or in conjunction with propamidine

⇒ any drug causing toxicity may be discontinued, as long as chlorhexidine or PHMB therapy is maintained

** how:*
- 3-4 times daily
- minimal 4 months

B. Surgical

There are two major indications for a penetrating keratoplasty (PKP) in Acanthamoeba keratitis: visual rehabilitation (visual loss due to corneal scars resulting from a previous infection) or a therapy resistant infection (therapeutic keratoplasty or greffe à chaud). Once the infection has been controlled with a topical treatment, a penetrating keratoplasty may be indicated to obtain a visual rehabilitation in cases with residual corneal opacities or irregular astigmatism. The prognosis in these "quiet" eyes is usually quite good, in contrast with inflamed eyes which frequently develop rejection, glaucoma and cataract (9). The infection is con-

sidered cured, if there is no more evidence of corneal infiltrates during the first months after the keratoplasty (18). There is an increased risk for multiple rejection episodes, but transplant failure due to these rejections rarely occurs. The anti-amoebic treatment needs to be continued during 6 months postoperatively (cysts can survive during many months and their presence in the peripheral acceptor cornea can not be excluded). Both the timing and the indications for a therapeutic keratoplasty remain controversial. Some authors prefer a surgical intervention in an early phase, when the infection is still limited, others state that a surgical intervention has to be avoided until the medical treatment has been successful (22). There is a growing consensus to treat with topical medication until all organisms are eradicated before performing PKP, which should only be used for visual rehabilitation or when there is an impending or frank corneal perforation, and not to "debulk" an active infection (12). A recurrence of the infection is one of the major complications and also the main reason for transplant failure. A retrospective study conducted on 19 cases of PKP for Acanthamoeba keratitis (9) showed a statistically significant correlation between the chances of a recurrence of the infection and the histopathological proven presence of trophozoites in the excised cornea. If the acceptor cornea showed only cysts, the risk for recurrence and transplant failure was significantly smaller. The recurrence of an infection in the transplanted cornea indicates that an invasion of Acanthamoeba from the perilimbal region is not unusual (10). If there is a scleral involvement a lack of re-epithelialisation can occur after PKP, for which a conjunctival flap operation can be needed. This difficult re-epithelialisation indicates a limbal stem cell dysfunction due to an Acanthamoeba invasion of the limbus (9).

PREVENTION

Wearing contact lenses is considered to be the major risk factor for occurrence of Acanthamoeba keratitis (even if the number of cases is very small in comparison to the large number of people wearing contact lenses). The link between infectious keratitis and wearing contact lenses is undeniable: wearing lenses overnight is a main risk factor. A retrospective study of 320 corneal ulcers occurring between 1992 and 1995 showed some important trends: the number of corneal ulcers in contact lens wearers significantly decreased, while the number of non contact lens associated ulcers remained relatively stable (5). Acanthamoeba are not the main cause of contact lens associated corneal ulcers: number one is still Pseudomonas. But whereas most causes of infection, such as Pseudomonas or Staphylococci, decrease in frequency, the number of Acanthamoeba infections remains stable. These results clearly show that the prevalence of Acanthamoeba keratitis does not decline, indicating that there is a continuing need for information towards the patient about the need for a thorough and adequate contact lens desinfection. One must emphasise the fact that it isn't safe to rinse contact lenses with tap water, or to swim with contact lenses in. Especially these patients wearing soft contact lenses should be cautioned about the importance of adequate desinfection.

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