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# Naegleria Amebic Keratitis (Corneal Abscess) in the Use of Color Cosmetic Soft Contact Lens Wear: A Case Report

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**Running Title** Naegleria Amebic Keratitis in Color Cosmetic Soft Contact Lens Wear



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## ABSTRACT

Amebic keratitis is a rare but serious corneal infection that is occasionally seen in contact lens wearers. In the early stages, the disease may be mistaken for bacterial keratitis due to corneal inflammation and a reduced visual field, which can delay diagnosis and treatment. In this case report, we present a young female who exhibited symptoms of a corneal ulcer associated with contact lens use and was initially treated for bacterial keratitis. Upon further evaluation, the diagnosis of Naegleria amebic keratitis was confirmed.

## Introduction

Free-living amoeba is a type of eukaryotic organism that lives in soil and freshwater worldwide [1]. Of the more than 100 species of free-living amoeba, several species belonging to the genus Acanthamoeba, Balamuthia, B. mandrillaris, and only one species of Naegleria, Naegleria fowleri, are known to cause infections of the central nervous system in humans and other animals [2].

Although free-living amoebae, Acanthamoeba species and Balamuthia mandrillaris, cause devastating diseases in humans that can lead to death [2, 3]. Acanthamoeba is also a cause of sight-threatening infections. Acanthamoeba, Naegleria, and Balamuthia are the most important FLA. These cause a variety of severe complications of the eye and central nervous system. Acanthamoeba and Naegleria keratitis are also seen mainly in people who wear contact lenses. It can also cause an acute, fulminant infection of the central nervous system, primary amebic meningoencephalitis, in otherwise healthy children and young adults who engage in aquatic activities in freshwater [4, 5].

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If water containing the amoeba gets into the nose and brain, it can cause an infection called primary amebic meningoencephalitis (PAM), which typically affects fewer than 10 people a year in the United States. Almost all of those who get PAM die from it. Between 1962 and 2023, 164 cases of PAM were reported in the United States. Only four people survived. Early symptoms of PAM can include headache, fever, nausea, and vomiting. PAM progresses rapidly. Most people with PAM die within 1 to 18 days of the onset of symptoms. It usually leads to coma and death after 5 days. As PAM progresses, symptoms can include neck stiffness, confusion, lack of attention to people and surroundings, loss of balance, and hallucinations. Brain infections caused by Naegleria fowleri usually occur after swimming or diving in a lake, river, or other freshwater body of water during the summer months. Infections often occur when the weather is warm for a long time, resulting in higher water temperatures and lower water levels. People cannot get Naegleria infection by swallowing water containing the amoeba. They also cannot get the infection from another person or pass it on to others [6].

Free-living amoebae of the genera Acanthamoeba, Balamuthia, Naegleria, and Sapinia were identified in a study as rare causes of infectious diseases in humans, reported annually in more than 10,000 soft contact lens wearers worldwide. Both Acanthamoeba and Naegleria fowleri are distributed worldwide; they are commonly found in freshwater and have even been isolated from tap water, air conditioning systems, and poorly maintained swimming pools [7].

In another study, one case was a 48-year-old male patient with a history of trauma to his eye 10 days prior. The patient complained of eye redness and purulent discharge. A slit-lamp examination of the eye revealed a central corneal ulcer with peripheral infiltration extending into the deep stroma. The corneal scraping sample taken from the patient was cultured on a non-nutritious agar plate (NNA). Amoebae were evaluated according to morphological evaluation criteria. It was investigated by PCR method and confirmed by DNA sequence analysis. Although no bacterial or fungal growth was detected in the routine microbiological evaluation of the corneal scraping sample that was cultured, amoeba growth was detected positively in the NNA culture. In conclusion, corneal infections due to free-living amoebae can occur, especially in poor hygiene [8].

## Case Presentation

A 20-year-old female patient with a history of wearing soft colored contact lenses (which, according to the patient, she had purchased from a cosmetic store) presented to the Cornea Clinic of Al-Zahra Eye Center in Zahedan with severe eye pain, redness, sensitivity to light, and tearing. During the initial examination, a corneal ulcer was observed.

About two days after wearing the lenses, the patient presented to a general ophthalmologist with the above symptoms and was diagnosed with a bacterial corneal ulcer and treated with routine antibiotics (ciprofloxacin).

After 72 hours, due to lack of response to initial treatment and worsening of symptoms, the patient was referred to a specialized eye center. The patient's visual acuity was 1/10 (one tenth) at the time of presentation, and she was unable to open her eyelids completely. An inflammatory focus was observed around the center of the cornea during examination of the right eye, which did not stain with fluorescein, and a diagnosis of corneal abscess was made. A smear and culture of microbial secretions were prepared from the right eye, and routine treatment for bacterial corneal ulcers with topical fortified vancomycin and ceftazidime was initiated. The patient was considered a candidate for focal debridement and smear preparation from the wound site. Debridement and sample collection were performed in the operating room using a 25-gauge insulin needle on the corneal surface at the site of the abscess, with minimal damage to the corneal tissue.

In a laboratory examination by an academic pathologist, Naegleria amoebae were confirmed in the collected sample. A ring-shaped corneal lesion around the central area is characteristic of amoebic keratitis and is rarely seen in bacterial keratitis, highlighting the need to consider amoebic infection [9] (Figure 1).

After the diagnosis of amoebic keratitis, treatment with polyhexamethylene biguanide (PHMB) 0.04% was initiated. The initial loading dose was one drop every 10 minutes for one hour, followed by one drop every three hours. As signs of improvement were observed, the dosing frequency was gradually reduced. The symptoms decreased progressively within a week. Two days after the inflammation subsided and the patient's vision improved, PHMB drops were discontinued. After one month, the corneal wound had healed, and the patient's vision returned to the normal range (10/10). Currently, the patient has no visual impairment during monthly follow-ups [Figure 2].

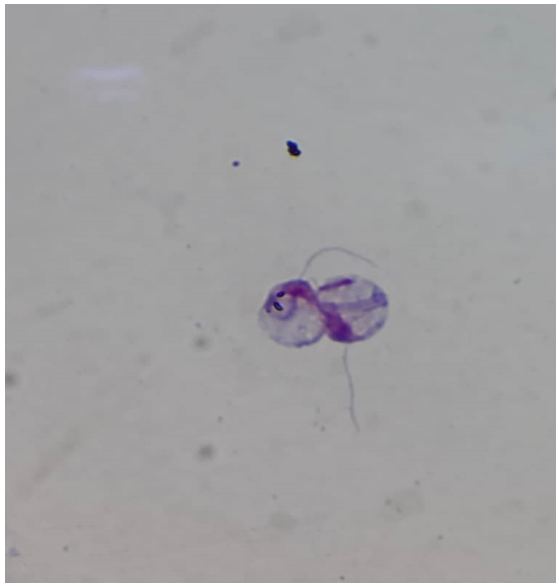

**Fig. 1.** Laboratory examination of Naegleria. Microscopic image of Naegleria from the patient's cornea, showing trophozoites and circular cysts typical of amoebic keratitis.

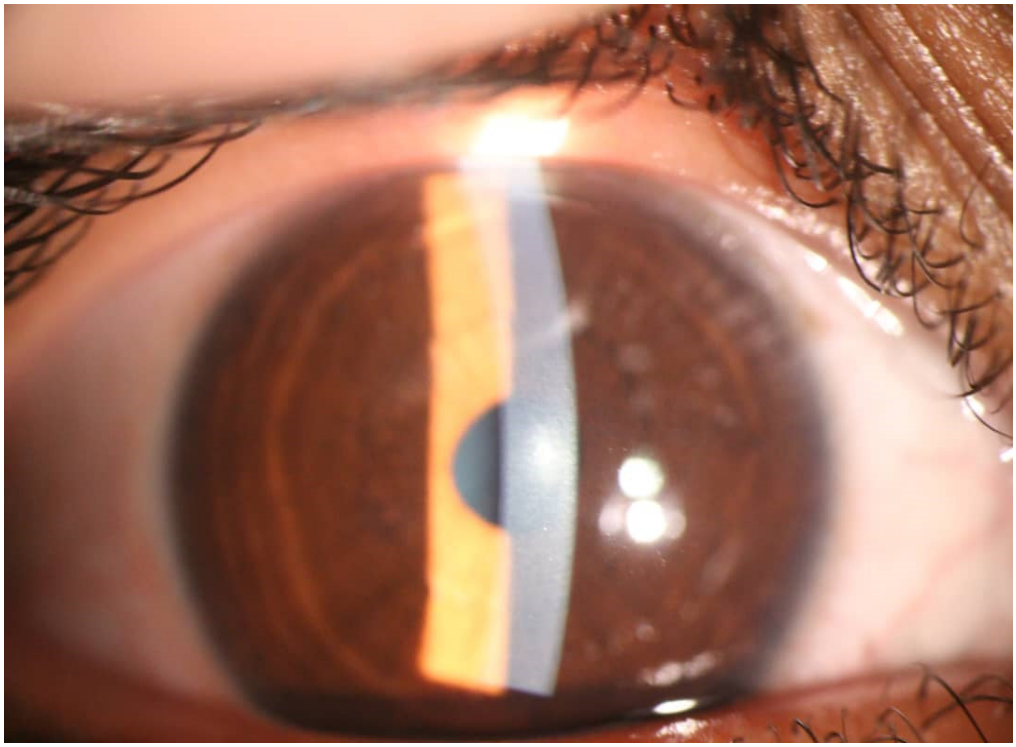

**Fig. 2.** Patient's cornea a few days after anti-amoebic treatment, showing reduced inflammation and healing of necrotic areas.

## Discussion

Microbial keratitis is an acute corneal infection caused by bacteria, fungi, viruses, or amoebas. Failure to promptly eliminate the infectious agent can result in severe ocular complications, corneal scarring, and vision loss. Infectious keratitis rarely occurs in a normal eye, although the ocular surface is constantly exposed to environmental microbes. A number of host defense mechanisms protect the eye from microbial infection. The eyelids and corneal epithelium provide a physical barrier to the entry of infection into the eye. Of all the eye's defense mechanisms, a healthy corneal epithelium is the most important for preventing

infectious keratitis. Therefore, factors that disrupt the corneal epithelial barrier—such as abrasion, physical or chemical trauma, and microabrasions caused by contact lens use—are considered significant risk factors for infectious keratitis, which can sometimes lead to blindness and vision loss (less than one-tenth of vision) [10, 11].

In cases of refractory corneal ulcers, prompt and appropriate referral is also important. Other infectious agents such as fungi, viruses, and, more rarely, amoebas should be considered. The use of appropriate diagnostic techniques such as smear and culture, confocal microscopy, and polymerase chain reaction (PCR) can help to quickly identify this disease [12]. Additionally, educating lens wearers about hygiene and the regular replacement of lens care solutions can be key in controlling this condition.

In this case report, comparison with other patients or healthy individuals was not feasible, limiting a full assessment of disease severity and progression. Diagnosis of amoebic keratitis requires advanced microscopy, specific staining, and specialized cultures, which are not widely available, potentially causing diagnostic delays or errors.

Educational interventions targeting users of colored contact lenses regarding eye hygiene and awareness of potential risks can help prevent the development of keratitis. Studies focusing on the identification of different Naegleria genotypes and their resistance to anti-amoebic drugs may introduce new therapeutic approaches. Evaluating long-term outcomes, such as disease duration, visual impairment, and the need for corneal transplantation, can play a crucial role in improving treatment strategies and patient follow-up.

## Conclusion

This case was observed for the first time in the geographical region of southeastern Iran, involving Naegleria amoebic keratitis, which has not been previously reported in the medical literature in Iran. A noteworthy aspect of this case is the occurrence of a corneal abscess. Given that pharmacological treatments may not always be available, topical polyhexamethylene biguanide (PHMB) is considered a suitable treatment option and may ultimately contribute to effective management.

## Ethical Considerations

The patient provided written informed consent for the publication of medical information and accompanying images after receiving a comprehensive explanation of the objectives of this report. The patient's identity has been fully anonymized, and no identifiable information is included in any part of this article. This research was approved by Zahedan University of Medical Sciences under the ethics code IR.ZAUMS.REC.1404.065.

### Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

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### Conflict of Interests

The authors have no personal or financial conflicts of interest in the writing and publication of this report.

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