

## Acanthamoeba keratitis in patients wearing scleral contact lenses

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### ARTICLE INFO

#### Keywords:

Acanthamoeba keratitis  
Scleral lens  
Care systems  
Corneal infection  
Contact lens

### ABSTRACT

**Purpose:** To report a series of cases of Acanthamoeba keratitis (AK) in scleral lens wearers with keratoconus to determine whether this type of contact lens presents a greater risk for development of infection. **Methods:** This study reports three patients who wore scleral contact lenses to correct keratoconus and developed AK. The diagnoses of AK were established based on cultures of the cornea, scleral contact lenses, and contact lens paraphernalia. This study investigated the risk factors for infections. **Results:** The possible risks for AK in scleral contact lens wearers are hypoxic changes in the corneal epithelium because of the large diameter and minimal tear exchange, use of large amounts of saline solution necessary for scleral lens fitting, storing the scleral lens overnight in saline solution rather than contact lens multipurpose solutions, not rubbing the contact lens during cleaning, and the space between the cornea and the back surface of the scleral lens that might serve as a fluid reservoir and environment for Acanthamoeba multiplication. Two patients responded well to medical treatment of AK; one is still being treated. **Conclusions:** The recommendations for use and care of scleral contact lenses should be emphasized, especially regarding use of sterile saline (preferably single use), attention to rubbing the lens during cleaning, cleaning of the plunger, and overnight storage in fresh contact lens multipurpose solutions without topping off the lens solution in the case.

### 1. Introduction

Scleral contact lens wear has become an increasingly popular method for improving vision in patients with high or irregular astigmatism due to keratoconus, [1] pellucid marginal degeneration [2], keratoglobus, [3] refractive surgery complications [4], and post-keratoplasty astigmatism, [5] among others. The scleral contact lens also has been used as a liquid bandage in ocular surface disorders such as dry eye [6].

Scleral lenses are large-diameter lenses that rest over the sclera. These lenses are fitted to not touch the cornea by creating a space between the cornea and the lens filled with sterile saline solution. No reports have been published about infectious complications in patients wearing scleral contact lens except for one case of Acanthamoeba keratitis (AK) [7].

Acanthamoeba, a ubiquitous free-living amoeba, causes a severe, often sight-threatening, keratitis [8]. Soft contact lens wear carries a higher risk of infection than rigid gas-permeable (RGP) contact lens wear, but surprisingly many cases of AK have been reported in RGP orthokeratology lenses worn overnight [9–29]. Poor contact lens hygiene and exposure to contaminated solutions and water are generally important risk factors in the development of AK [30]. This study

describes three cases of AK in scleral lens wearers with keratoconus to determine if this type of contact lens is at greater risk for AK.

### 2. Case reports

Case 1 was that of an 8-year-old boy who wore scleral contact lenses for keratoconus for 2 months. Pain, photophobia, tearing, and low visual acuity developed in the right eye for 4 weeks beginning in June 2016. The patient normally wore the scleral lenses for 10 h daily and had no exposure to a swimming pool, sauna, the ocean or a lake or bath and shower. The mother fit the lenses on the child's eyes using a commercially available preservative-free saline solution packaged in a 500-ml bottle that was stored at room temperature. The lenses were cleaned after each wearing before being placed into the eyes with a contact lens multipurpose solution without rubbing of the lenses. The lenses were stored overnight in saline solution. Slit-lamp examination revealed multiple stromal corneal infiltrates in varying sizes and depths and two areas of keratoneuritis (Fig. 1). The patient underwent examination under anesthesia to facilitate collection of corneal scraping samples to culture onto blood, chocolate, Sabouraud and soy agars and thioglycollate liquid medium and brain and heart infusion and for multiple Gram, Giemsa, and Calcofluor White (Sigma-Aldrich) stains.

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<https://doi.org/10.1016/j.clae.2017.12.004>

Received 11 January 2017; Received in revised form 17 October 2017; Accepted 1 December 2017  
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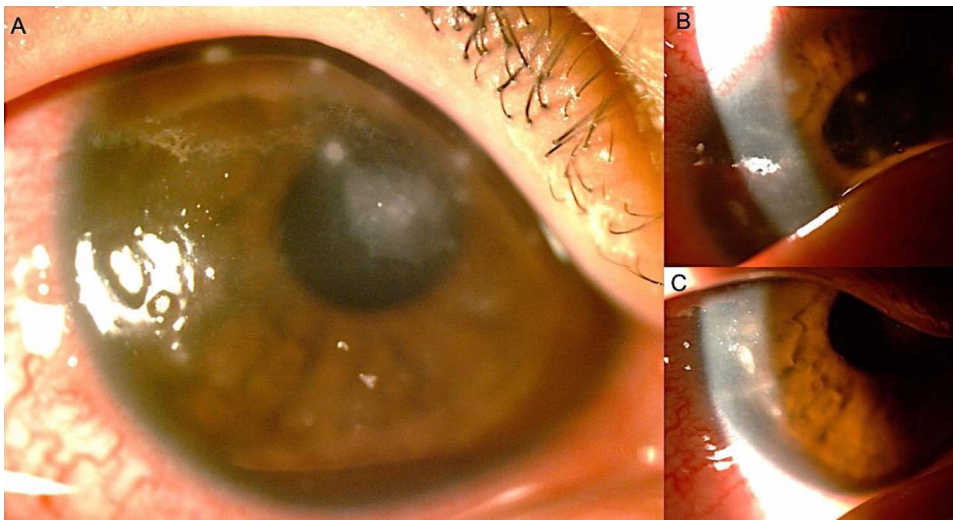


Fig. 1. The patient in case 1 with atypical *Acanthamoeba* corneal infiltrates in the right eye (A) and two typical findings of keratoneuritis (B, C).

The contact lenses, contact lens case, contact lens removal and application plunger, saline solution, and the multipurpose contact lens solution also were cultured. Corneal scrapings were positive for *Acanthamoeba* species (sp) in culture and smears showed double-walled cysts. The contact lenses and contact lenses paraphernalia samples, except for the multipurpose contact lens solution, also were culture-positive for *Acanthamoeba* sp. The patient was treated with a combination of propamidine isethionate 0.1% and polyhexamethylene biguanide (PHMB) 0.02% for 4 months with good infection resolution.

Case 2 was that of a 34-year-old woman who had worn scleral contact lenses for keratoconus for 2 years. Redness, tearing, photophobia, and decreased visual acuity developed in her right eye for 3 weeks starting in August 2016. The patient normally wore the scleral lenses for 15 h daily and had no exposure to a swimming pool, sauna, the ocean, or bath but did shower while wearing the scleral lenses. She fit the lenses using a commercially available preservative-free saline solution packaged in a 500-ml bottle that was stored at room temperature. The lenses were cleaned each time before placement on the eyes with contact lens multipurpose solution without rubbing the lenses. The lenses were stored overnight in fresh multipurpose solution. Slit-lamp examination showed a typical *Acanthamoeba* epithelial dendritiform keratitis (Fig. 2). The same laboratory work-up was performed as described previously for the contact lenses and contact lenses paraphernalia. The laboratory work-up was positive for *Acanthamoeba* sp in all samples, except for the multipurpose solution and the scleral contact lens, but the patient explained that she had cleaned the lenses days before the culturing took place. The patient was treated with a

combination of propamidine isethionate 0.1% and PHMB 0.02% for 3 months with good infection resolution.

Case 3 was that of a 43-year-old man who had worn scleral contact lenses for keratoconus for 2 years. Excruciating pain, tearing, and photophobia in his right eye were the most prominent signs and symptoms for 2 weeks starting in December 2016. The patient normally wore the scleral lenses for 12 h daily and was exposed to potentially contaminated water in a swimming pool and showers while wearing the scleral lenses. A water tank was the source of the water supply in his house. He also fit the lenses using a commercially available preservative-free saline solution packaged in a 500-ml bottle that was stored at room temperature. The lenses were cleaned with a contact lens multipurpose solution without rubbing the lenses. The lenses were stored overnight in contact lens multipurpose solution, but the patient topped off the old solution. Slit-lamp examination showed a typical *Acanthamoeba* stromal ring-shaped infiltrate, with corneal ulcers on the areas of infiltration (Fig. 3). The same laboratory work-up was performed as described previously for the contact lenses and contact lenses paraphernalia. The laboratory work-up was negative for *Acanthamoeba* in the corneal scrape samples and the scleral contact lenses, but the patient was referred to us already using PHMB and he also had cleaned the lenses in the day of the culturing. The plunger cultured positive for *Acanthamoeba*. The patient is currently being treated for *Acanthamoeba* with a combination of propamidine isethionate 0.1% and PHMB 0.02% with good response.

In all cases, the *Acanthamoeba* species could not be determined but all were classified into group two of Pussard & Pons, by the cysts

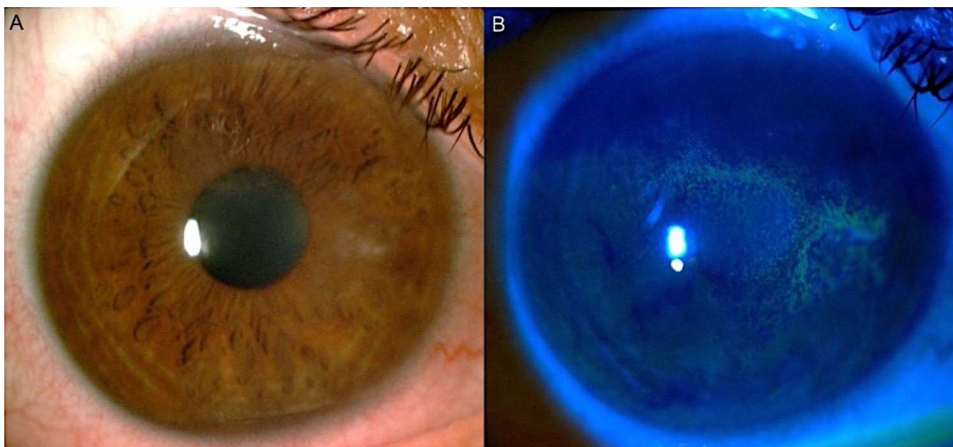


Fig. 2. The patient in case 2 with a characteristic *Acanthamoeba* epithelial dendritiform keratitis (A), better seen with cobalt blue light (B). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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