Safety of photorefractive keratectomy after Acanthamoeba keratitis

Segurança da ceratectomia fotorrefrativa após ceratite por Acanthamoeba

Elisa Moya Kazmarek[1], Jade Pinto de Queiroz Guerra[2], Paula Virginia Brom dos Santos Soares[1], Pablo Felipe Rodrigues[3], Paula Kataguiri[3], Bernardo Kaplan Moscovici[2]

[1] Department of Ophthalmology, Irmandade da Santa Casa de Misericórdia de São Paulo, São Paulo, SP, Brazil.
[2] Department of Ophthalmology, Hospital Oftalmológico Visão Laser, Santos, SP, Brazil.
[3] Department of Ophthalmology and Visual Sciences, Universidade Federal de São Paulo, São Paulo, SP, Brazil.

How to cite:
Kazmarek EM, Guerra JP, Soares PV, Rodrigues PF, Kataguiri P, Moscovici BK. Safety of photorefractive keratectomy after Acanthamoeba keratitis. Rev Bras Oftalmol. 2025;84:e0019.

doi:
https://doi.org/10.37039/1982.8551.20250019

Keywords:
Acanthamoeba; Acanthamoeba keratitis; Amebiasis; Eye infections; Photorefractive keratectomy; Postoperative period

Descritores:
Acanthamoeba; Ceratite por acanthamoeba; Amebíase; Infecções oculares; Ceratectomia fotorrefrativa; Período pós-operatório

ABSTRACT

This case report presents a patient who underwent photorefractive keratectomy 13 years after Acanthamoeba infection. The patient experienced prolonged difficulties in epithelialization during the postoperative period, leading to suspicion of reactivation. This case underscores the complexity and challenges in managing patients with a history of photorefractive keratectomy and ocular infections, particularly in cases involving Acanthamoeba. Understanding such cases is crucial for optimizing treatment strategies and achieving favorable outcomes.

RESUMO

Este relato de caso apresenta uma paciente que foi submetida à ceratectomia fotorrefrativa 13 anos após uma infecção por Acanthamoeba. A epitelização no pós-operatório foi mais lenta do que o esperado, levando à suspeita de reativação. Este caso destaca a complexidade e os desafios no manejo de pacientes com histórico de ceratectomia fotorrefrativa e infecções oculares, especialmente em casos envolvendo Acanthamoeba. Compreender tais casos é crucial para otimizar estratégias de tratamento e atingir resultados favoráveis.

Received on:
Apr 15, 2025

Accepted on:
Jan 3, 2025

Corresponding author:
Bernardo Kaplan Moscovici
Rua Cayowwa, 854, apto. 82
Zip code: 05018001 – São Paulo, SP, Brazil
E-mail: bernardokaplan@yahoo.com.br

Institution:
Irmandade da Santa Casa de Misericórdia de São Paulo, São Paulo, SP, Brazil.

Conflict of interest:
no conflict of interest.

Financial support:
no financial support for this work.

INTRODUCTION

Acanthamoeba keratitis is a rare but potentially devastating condition that presents more frequently in contact lens wearers. Two of the eight known Acanthamoeba species, *Acanthamoeba castellanii* and *Acanthamoeba polyphaga*, are responsible for most infections.[1] These free-living protozoa are often isolated in soil, water collections, central air conditioning systems, sewage, atmospheric air samples, dust, hospital equipment, and various animals.[2,3]

The main clinical features are central ulcer, diffuse stromal infiltrate, and ring infiltrate.[4] Pain is often disproportionate to clinical findings. Culture is the gold standard when suspected, but confocal microscopy and polymerase chain reaction (PCR) can be used if available. A corneal biopsy may be performed if the culture is negative, or the lesion is intrastromal with intact epithelium. Confocal microscopy has the advantage of being a non-invasive examination and presenting results more quickly than culture, but it is examiner-dependent. The sensitivity of confocal microscopy is approximately 69%, and the specificity is about 97% if the examiners are experienced, while they are 59 and 92%, respectively, if the observers are inexperienced.[5]

One of the main challenges in treating this infection is the resistance of the cysts, which can survive for more than 20 years, leading to late recurrences.[6] Several factors can act as triggers for these recurrences, such as the use of topical corticosteroids.[7]

There are no precise guidelines on the time elapsed after an Acanthamoeba infection that would make an ocular surgical intervention safe. Still, there are reports with good results with a two-year interval between treatment and laser in situ keratomileuses (LASIK).[8-16]

This study was approved by the Ethics Committee of Irmandade da Santa Casa de Misericórdia de São Paulo (CAAE 77847424.0.0000.5479).

CASE REPORT

A 38-year-old female who had been followed up in private practice for 10 years showed interest in the possibility of refractive surgery. She wore rigid gas-permeable contact lenses due to corneal irregularity secondary to bilateral Acanthamoeba keratitis, probably due to incorrect storage of soft contact lenses with saline solution. This infection occurred in 2010, was confirmed by culture and was adequately treated with 0.02% biguanide for 1 year. However, she had corneal haze in both eyes after treatment. In 2015, her doctor searched for cysts with in vivo confocal microscopy (IVCM), and no cysts were found. There was an improvement in haze, but decreased bilateral corneal sensitivity and irregularity in the curvature of the right eye (OD) remained (Figures 1A and 1B). The cycloplegic refraction of the OD was -3.50 S, with a visual acuity (VA) of 20/50; OS refraction was -4.25 S -1.00 C at 140º, with VA of 20/25. The patient achieved 20/20 vision in both eyes with rigid contact lenses but was afraid of using contact lenses after the acanthamoeba infection.

The patient underwent a photorefractive keratectomy (PRK) with total static correction in both eyes on January 9, 2022, without intercurrences using Schwind Amaris 1050RS (Schwind, Kleinostheim, Germany). In the OD, topo-guided surgery was decided due to low VA and high-order corneal aberrations.

On the 6th postoperative day, there was a central irregularity in the biomicroscopy of the OD (Figure 2A). The cornea of the OS was completely epithelialized. There was no hyperemia in both eyes, and the patient denied pain. On the 7th postoperative day, uncorrected VA was 20/60 in the OD and 20/25 in the OS. Biomicroscopy showed central de-epithelialization in OD (Figure 2B). Topical corticosteroids were discontinued, replacing the combined eye drops of moxifloxacin (5.45 mg/mL) with dexamethasone (1.10 mg/mL) with only moxifloxacin 5.45 mg/mL

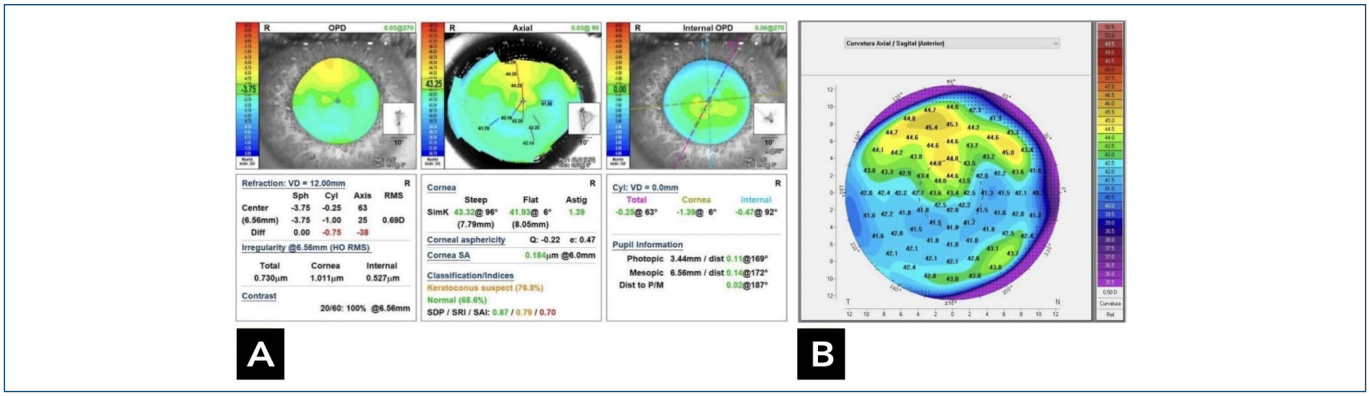

Figure 1. Figure 1A: OPD scan before surgery. Figure 1B: Pentacam sagittal curvature map before surgery demonstrates irregularity in the curvature of the right eye (OD).

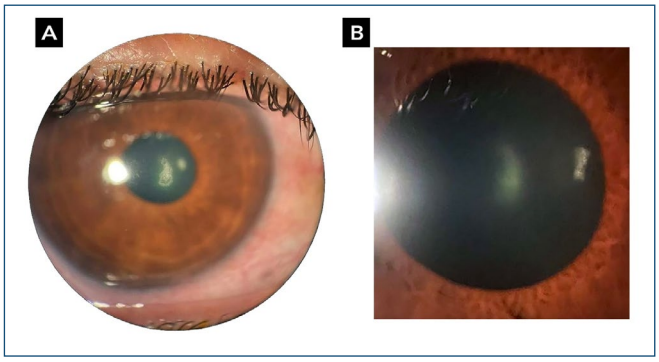

Figure 2. Figure 2A: Biomicroscopy of the 6th postoperative day showed central corneal lesion. Figure 2B: On the 7th postoperative day biomicroscopy examination showed central de-epithelialization in OD.

associated with preservative-free lubricating eye drops. On the 9th postoperative day, IVCM was requested, revealing an inflammatory or scarring aspect (Figures 3A and 3B) and absence of structures suggestive of Acanthamoeba or fungi (Figures 3A, 3B, 3E and 3F), with decreased nerve density in the subbasal nervous plexus (Figures 3C and 3D). On this day, the patient maintained the VA of the 7th day, reporting sensitivity to light in the OD, associated with redness. The OD presented hyperemia 1/4+, with disorganized epithelium in the central region, and the OS showed no alterations.

Despite IVCM results and due to clinical history and delayed wound healing accompanied by an increase in conjunctival hyperemia and complaints of pain, biguanide eye drops at a concentration of 0.02% every 6 hours was initiated. Doxycycline was also prescribed orally at 100 mg every 12 hours for 14 days, along with 2 g of vitamin C daily to improve re-epithelialization. On the 13th postoperative day, the patient reported improved VA (OD 20/40 and OS: 20/30). On biomicroscopy, there was no hyperemia in the OD, the lesion was healed and slightly elevated in the pericentral region, with an intraocular pressure of 12 mmHg. The diagnostic hypothesis of Acanthamoeba recurrence or difficulty in epithelialization was still possible. The corneal improved in January 2023, with a UCVA of 20/20 in the OD and 20/25 in the OS. The corneal curvature pattern also showed improvement compared to preoperative measurements (Figure 4).

The patient had to return to his city of origin and continued monitoring with a cornea specialist, who, after a month of treatment with biguanide 6/6 hours, regressed every fortnight for another month.

The OD also presented discrete opacities on the surface outside the visual axis, and the OS had no alterations. After 6 months, another confocal microscopy was performed, and no cysts were found (Figures 5).

DISCUSSION

In this case, the patient had the main risk factor for Acanthamoeba corneal infection: the incorrect use of contact lenses. Using saline solution for lens cleaning instead of a solution specifically designed for this purpose

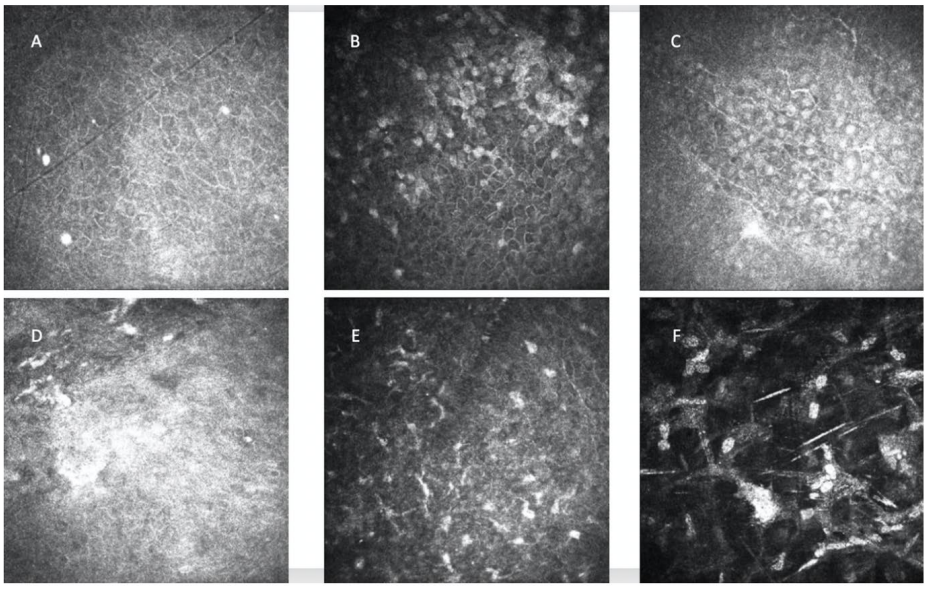

Figure 3. Corneal confocal microscopy (IVCM) examination on the 9th postoperative day. 3A and 3B: Inflammatory cells in the basal epithelium layer. No presence of acanthamoeba cysts. 3C and 3D: Decreased nerve density in the subbasal nerve plexus. 3E and 3F: Anterior and posterior stroma showed no evidence of acanthamoeba cysts.

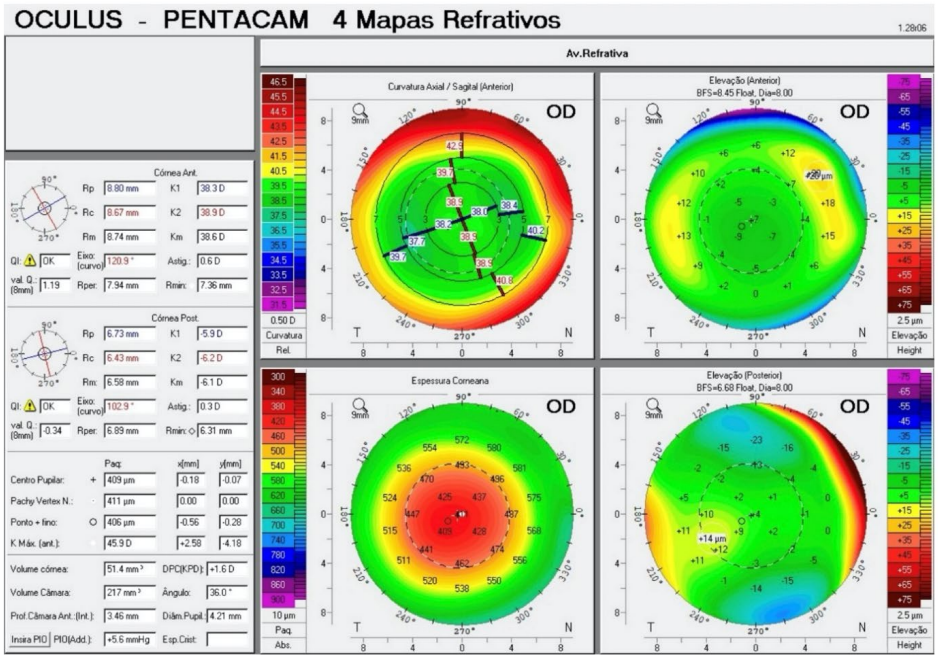

Figure 4. Pentacam after surgery.

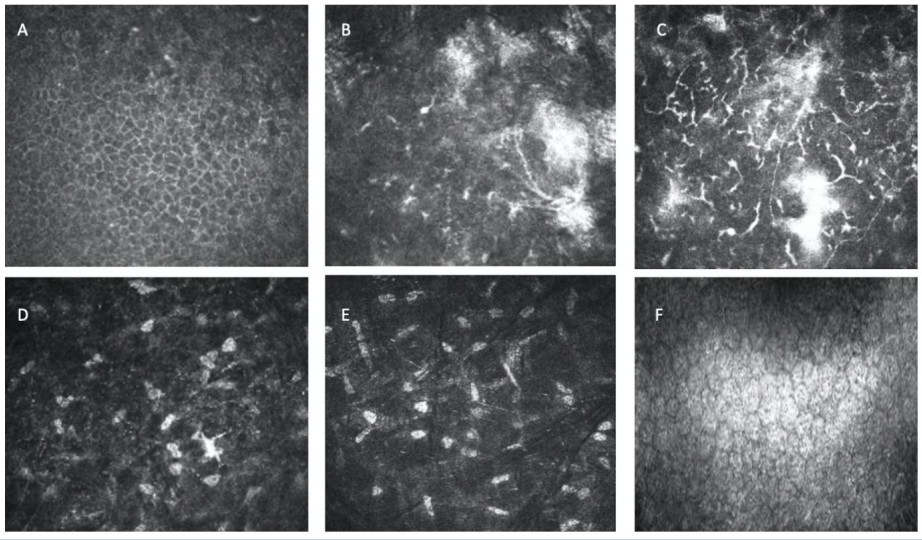

Figure 5. Corneal confocal microscopy (IVCM) after 6 months. 5A: Normal corneal epithelium. 5B and 5C: Subbasal nerve plexus and anterior stroma show less corneal nerve density and presence of inflammatory cells (post PRK). 5D and 5E: Normal posterior stroma. 5F: Endothelium with preserved structure and normal endothelium cell density.

is also a significant factor. Although not all multipurpose solutions are effective in disinfecting the lens, two-step solutions with hydrogen peroxide, such as Titmus H2O2, have been shown to be effective in combating trophozoites and cysts of *A. castellanii*, *A. hatchetti*, and *A. lenticulata*.[9]

The patient's age and gender also align more with the profile of those with Acanthamoeba keratitis. Compared to those diagnosed with fungal and bacterial ulcers, they tend to be younger (38 ± 16 years; fungi: 43 ± 16 years; bacteria: 50 ±18 years), and the percentage of women affected is higher.[10]

Another etiology of keratitis that can be very similar to Acanthamoeba is herpes simplex virus. In the report by Singh et al.,[11] a patient with a history of contact lens use presented with ring infiltrate, severe pain, and photophobia and was treated with chlorhexidine and biguanide. In the absence of improvement with treatment and no cysts identified in exams, the investigation proceeded, and the correct diagnosis of herpetic keratitis was obtained.

Although the patient in this case was adequately treated when she presented with bilateral Acanthamoeba keratitis and remained asymptomatic for many years, it is not possible to rule out the possibility of cystic resistance. Negative confocal microscopy does not exclude the possibility since it often presents false-negative microscopy.[5] The healing process may also have altered the regenerative capacity of the epithelium due to the decrease in nerve density (observed on confocal microscopy), even in the absence of active infection. Even so, given the severity of Acanthamoeba keratitis and the good response to the therapeutic test, we chose to perform the treatment with biguanide. We were unable to confirm whether the Acanthamoeba infection was reactivated. However, due to the severity of a possible infection, we considered it wise to maintain the treatment, even with a more conservative dosage, as corneal culture would probably be definitive in this condition. Still, the patient was extremely reluctant to perform culture due to the improvement of the condition with a therapeutic test with biguanide.

Based on the final VA after photorefractive keratectomy, the OD had a better result than the OS even with a slower healing process, probably due to the topo-guided procedure's performance. This result was guaranteed by continuous follow-up and early treatment of the alterations presented.

In some studies, surgeons performed PTK with mitomycin 0.02% in the early stages of Acanthamoeba keratitis resistant to topical therapy. Despite the success of PTK in these reports, topical therapy is still the gold standard for treating this infection. Nevertheless, since no reports in the literature describe PRK after Acanthamoeba infection, this report shows a tendency towards safety in performing PRK after late infection.[12,16]

There are some reports of Acanthamoeba keratitis after LASIK; all of them had contact with water, mainly tap water, to wash their faces. Our patient did not have any contact with tap water or similar sources of infection.[15]

Patients with a previous history of Acanthamoeba keratitis should follow up with frequent postoperative visits, paying attention to any changes in biomicroscopy or reported symptoms, regardless of the time elapsed since infection. Reports in the literature show the absence of reactivation in patients with a history of Acanthamoeba keratitis after 3 to 6 months of surgery[8,13]. However, there is a lack of studies on the optimal follow-up for these patients. Early treatment is critical to the final outcome of surgery, and topography-guided refractive surgery can lead to a better outcome in corneas with irregularities.

REFERENCES

1. Carnt N, Minassian DC, Dart JK. Acanthamoeba keratitis risk factors for daily wear contact lens users: a case-control study. Ophthalmology. 2023;130(1):48-55.
2. Martinez AJ, Visvesvara GS. Free-living amphizoic and opportunistic amebas. Brain Pathol. 1997;7:583-98.
3. Schuster FL, Visvesvara GS. Free-living amoebae as opportunistic and non-opportunistic pathogens of humans and animals. Int J Parasitol. 2004;34:1001-27.
4. Sun X, Zhang Y, Li R, Wang Z, Luo S, Gao M, et al. Acanthamoeba keratitis: clinical characteristics and management. Ophthalmology. 2006;113(3):412-6.
5. Muller RT. Utilização da microscopia confocal in vivo no diagnóstico de ceratites micóticas e por Acanthamoeba, na observação do dano e no processo de regeneração neuronal em ceratites infecciosas [tese]. São Pualo: Universidade Federal de São Paulo; 2021.
6. Sriram R, Shoff M, Booton G, Fuerst P, Visvesvara GS. Survival of Acanthamoeba cysts after desiccation for more than 20 years. J Clin Microbiol. 2008;46(12):4045-8.
7. Patel DV, McGhee CN. Presumed late recurrence of Acanthamoeba keratitis exacerbated by exposure to topical corticosteroids. Oman J Ophthalmol. 2013;6(Suppl 1):S40-2.
8. Lim L, Wei RH. Laser in situ keratomileusis treatment for myopia after Acanthamoeba keratitis. Eye Contact Lens. 2004;30(2):103-4.
9. Hiti K, Walochnik J, Haller-Schober EM, Faschinger C, Aspöck H. Viability of Acanthamoeba after exposure to a multipurpose disinfecting contact lens solution and two hydrogen peroxide systems. Br J Ophthalmol. 2002;86(2):144-6.
10. Mascarenhas J, Lalitha P, Prajna NV, Srinivasan M, Das M, D'Silva SS, et al. Acanthamoeba, fungal, and bacterial keratitis: a comparison of risk factors and clinical features. Am J Ophthalmol. 2014;157(1):56-62.
11. Singh RB, Batta P. Herpes simplex virus keratitis mimicking Acanthamoeba keratitis: a clinicopathological correlation. BMJ Case Rep. 2018;2018:bcr2018226100.
12. Kandori M, Inoue T, Shimabukuro M, Hayashi H, Hori Y, Maeda N, et al. Four cases of Acanthamoeba keratitis treated with phototherapeutic keratectomy. Cornea. 2010;29(10):1199-202.
13. Lipshiz I, Man O, Varssano D, Lazar M, Loewenstein A. Laser in situ Keratomileusis following Acanthamoeba keratitis. J Refract Surg. 2000;16(2 Suppl):S251-2.
14. Lu NJ, Kang Q, Dhubhghaill SN. Acanthamoeba Keratitis after corneal refractive surgery: a case series and literature review. J Refract Surg Case Reports. 2022;2(2):e32-e37.
15. Lipshiz I, Man O, Varssano D, Lazar M, Loewenstein A. Laser in situ Keratomileusis following Acanthamoeba keratitis. J Refract Surg. 2000;16(2 Suppl):S251-2.
16. Ardjomand N, Daas L, Walochnik J, Kaiser K, Anticic M, Seitz B, El-Shabrawi Y. Excimer-laser and mitomycin C 0.02% to treatment acanthamoeba keratitis. Invest Ophthalmol Vis Sci. 2019;60(9):842.