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## Bipolaris keratitis following photorefractive keratectomy: Case report

Lojain AlBathi, Rawan AlShabeeb\*

King Khaled Eye Specialist Hospital, Cornea and External Diseases Division, Saudi Arabia

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## ABSTRACT

**INTRODUCTION:** Fungal keratitis is an uncommon condition that can occur after ocular surgery or trauma to the eye. Some cases have been reported after corneal refractive surgery. Most cases of keratitis following refractive surgery are due to gram-positive bacteria. However, there are a few reports in the literature of fungal and protozoal infections.

**CASE PRESENTATION:** A 29-year-old healthy male developed fungal keratitis Five days following photorefractive keratectomy.

**CLINICAL FINDINGS AND INVESTIGATIONS:** The patient was admitted to the hospital, corneal scraping was performed and sent for staining and routine cultures. A corneal swab was also performed and sent for polymerase chain reaction (PCR). On day 10 post-admission, the fungal culture was positive for *Bipolaris*.

**INTERVENTION AND OUTCOME:** Intensive topical antifungal drops were started initially then tapered when clinical improvement was evident. The patient had good final outcome with preservation of good vision and free of symptoms six months following the infection.

**RELEVANCE AND IMPACT:** Fungal keratitis following corneal refractive surgery is rare. However, it is an infection that can potentially lead to poor outcomes if appropriate management is delayed. Therefore, a high index of suspicion is required especially when multiple risk factors is present.

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## 1. Introduction

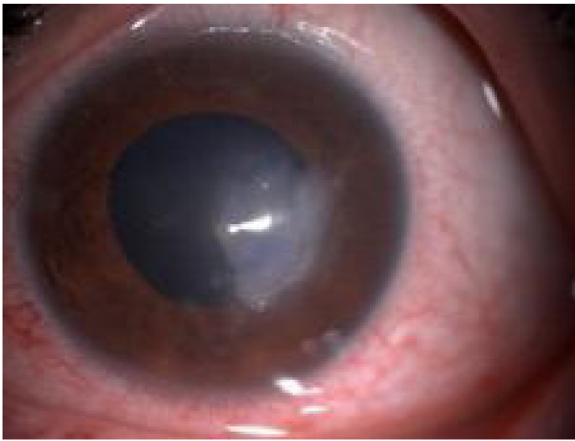
Fungal keratitis can be caused post-surgically or following injuries to the eye by vegetable matter, animal contact, and chronic usage of topical steroids [1]. Many fungal species can result in Fungal Keratitis including *Aspergillus flavus* and *fumigatus*, *Acremonium*, *Fusarium*, *Candida*, *Alternaria*, and *Curvularia* [2]. *Fusarium* is the most commonly implicated fungus [2]. The pathophysiological mechanisms underlying fungal keratitis include traumatic contact with the eye including surgical incisions. This leads to the implantation of the fungi directly into the cornea where it gradually proliferates in the corneal stroma [2]. The incidence of fungal keratitis following refractive surgery is quite low compared to bacterial and viral keratitis [3]. We present a case of fungal keratitis following photorefractive keratectomy that was managed successfully with antifungal medications. This case report has been reported in line with the SCARE Criteria [4].

## 2. Case presentation

A 29-year-old healthy male, presented to the ophthalmology emergency room of King Khaled Eye Specialist Hospital complain-

ing of redness and pain in the left eye. The patient had undergone photorefractive keratectomy (PRK) 5 days before presentation in private clinic in Riyadh, Saudi Arabia. The patient is not using any systemic medications and not known to have allergy. Ophthalmic examination of the right eye was unremarkable and the left eye had 20/40 vision with normal intraocular pressure. The cornea of the left eye had multiple central and paracentral infiltrates with feathery margins and an overlying 3 × 6 mm corneal epithelial defect. The conjunctiva was injected with 2+ cells in the anterior chamber (Fig. 1). The patient was admitted, and corneal scraping was performed and sent for staining and routine cultures. A corneal swab was also performed and sent for polymerase chain reaction (PCR). The patient was started on fortified ceftazidime (50 mg/mL) and cefazoline (50 mg/mL) drops every 1 hour alternating around the clock. The cultures came back positive for a fungus. The patient was started on topical drops of Amphotericin b (1.5 mg/mL) and voriconazole (1%) every 1 hour alternating around the clock. Fortified antibiotics were discontinued. On day 10 post-admission, the fungal culture was positive for *Bipolaris*. On day 12 post-admission, the patient symptoms were improving, and the infiltrates were less dense, hence the antifungals were tapered. On day 22 post-admission, the corneal epithelial defect healed, and the infiltrates were scarring with minimal corneal edema in the same area. The patient was then discharged in a good condition. Three weeks later, the patient was started on topical prednisolone acetate 1% twice daily. The patient was followed in the same institute and seen every

\* Corresponding author at: Cornea and External Diseases and Refractive Surgery King Khalid Eye Specialist Hospital, P. O. Box 7191, Riyadh, 11462, Saudi Arabia.  
E-mail address: [alshabeeb.rawan@gmail.com](mailto:alshabeeb.rawan@gmail.com) (R. AlShabeeb).



**Fig. 1.** Left eye on presentation showing a paracentral infiltrate with surrounding edema.



**Fig. 2.** Left eye at follow up visit, showing a corneal scar with complete resolution of the infection 3 months later.

3–4 weeks in outpatient ophthalmology clinic. At 6 months, the patient was symptomatically free and reported improvement of vision. Vision in the left eye was 20/20 and the left cornea had a paracentral temporal 2 × 2 mm scar (Fig. 2).

### 3. Discussion

Infectious keratitis has been reported following surface ablation procedures. In the two largest studies with the largest sample sizes reported incidences of infectious keratitis of 0.02% and 0.20% after laser epithelial keratomileusis and PRK, respectively [5,6]. One study reported that the incidence after surface ablation was six times higher. The higher incidence may be due to the large epithelial defect and the extended use of soft contact lenses. The incidence during the first week is higher with PRK (72%) compared to LASIK (62%), this is consistent with the causes mentioned previously [6]. Although the incidence is quite low, the most commonly implicated microbes are gram-positive bacteria [7].

The published incidence of post-LASIK infectious keratitis ranges from 0 to 1.5%. [3,8]. Risk factors associated with the development of infection include a history of prior corneal surgery, blepharitis, dry eye, epithelial defects, contamination at the time of refractive surgery, delayed postoperative corneal re-epithelialization, topical corticosteroid use, and frequent exposure to the healthcare environment [9,10]. The most commonly implicated fungal organisms in post-refractive keratitis includes: *Aspergillus*, *Candida*, *Fusarium*, and *Curvularia* [11]. An ASCRS sur-

vey identified *Fusarium*, *Aspergillus*, *Scedosporium*, and *Curvularia* to be the common filamentous fungal causative organisms implicated in keratitis after refractive surgeries, accounting for up to 9% of the fungal keratitis cases. According to the survey, *Candida* accounted for 5% of the total cases [3].

There were two reported cases of fungal keratitis post-PRK [12,13]. The first case was a young female two weeks after undergoing PRK who presented with a fulminating fungal keratitis that was managed with topical and systemic antibiotics and antifungals [12]. However, the case progressed over 5 days and the patient underwent therapeutic keratoplasty. Culture results were positive for *Fusarium solani*. The infection recurred in the graft and the patient had to undergo a second keratoplasty. The infection was eradicated 6 months later [12]. The other case of fungal keratitis post-PRK involved a 35 years old male with negative cultures for bacterial or fungal keratitis, however a histopathologic examination of specimens indicated fungal hyphae [13]. This case resulted in poor outcomes due to the delay in diagnosis and treatment [13]. In the current case the patient had multiple risk factors to develop infectious keratitis which includes corneal epithelial defect, contact lens use after surgery and steroid drops which is routinely used following refractive surgery. In addition, the standard practices of maintaining an aseptic operating room environment may vary slightly depending on the institution and clinical situation. Since the procedure was done in another institute, contamination at the time of the procedure might be the source of the infection. One cause of fungal keratitis is an infection from the *Bipolaris* genus. Amongst the *Bipolaris* fungi, the most commonly implicated species include *hawaiiensis*, *paperdorfori*, and *australiensis*. The highest incidence of mycotic keratitis due to *Bipolaris* is *Bipolaris hawaiiensis*, followed by *Bipolaris specifera* [14]. The lowest incidence was observed for *Bipolaris australiensis*, which caused an infection in Australia, and another in India [14]. Although the exact incidence and prevalence of fungal keratitis due to *Bipolaris* remains unknown, an epidemiologic study of fungal keratitis reported 5.3% (22 of 411 cases) of all the cases were positive for *bipolaris* [15].

It is essential to start the medical treatment as early as possible to avoid dire complications and preserve vision. Natamycin preparations have the advantage of being the sole commercially available medication for topical administration. Other options for treating fungal keratitis (based on the specific fungi), include Amphotericin B, Imidazole, Econazole, Ketoconazole, Fluconazole, Miconazole, and Terbinafine. Some newer treatment modalities include cross-linking of the corneal collagen and surgical debridement of the cornea. In refractory cases, surgical resection of the affected areas of the cornea may be warranted [16].

Management of fungal keratitis is challenging. In cases that are positive for *Bipolaris*, the treatment options are quite limited because the fungus is highly resistant to amphotericin B [14]. However, Itraconazole is quite effective in *Bipolaris* infections and is frequently prescribed. Topical Natamycin and Ketoconazole may also be appropriate [14]. Our patient was treated with topical Amphotericin B and Voriconazole. Once the infiltrate scarred and no recurrence was observed, the topical antifungals were discontinued. The patient was followed every 4 weeks and remains in good condition with an excellent outcome.

### 4. Conclusion

Fungal keratitis following corneal refractive surgery is rare. However, it is an infection that can potentially lead to poor outcomes if appropriate management is delayed. Therefore, a high index of suspicion is required especially when multiple risk factors is present.

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**Ethical approval**

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**Consent**

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**Author's contribution**

Lojain AlBathi: literature review, manuscript writing.  
Rawan AlShabeeb: Patient care, manuscript writing.

**Registration of research studies**

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