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Phaeoacremonium iranianum - a new corneal pathogen

Xiaona Liu[1], Xiuhai Lu[2], Juanjuan Zheng[1], Shujuan Liu[1] and Man Li[1*]

Abstract

Background *Phaeoacremonium* is typically found in the environment and can cause diseases in woody plants. It is rarely responsible for infections in humans.

Case presentation In this report, we present a case of corneal infection caused by *Phaeoacremonium iranianum*. Caused a fan-shaped grayish-white ulcer measuring approximately 4 mm×3 mm inferior nasal cornea. The ulcer appeared relatively dry, with noticeable swelling and cloudiness in the surrounding cornea. The visual acuity after infection was 0.25. We started an aggressive antifungal therapy. Our antifungal susceptibility testing revealed the Minimum Inhibitory Concentration of anifengin was 4 μg/ml, Micafengin and carpofungin exceeding 8 μg/ml, fluorocytosine was 32 μg/ml, posaconazole was 1 μg/ml, voriconazole was 0.5 μg/ml, itraconazole was 2 μg/ml, fluconazole was 64 μg/ml, and amphotericin was 0.05 μg/ml. The patient underwent keratectomy combined with antifungal therapy. A month later, the conjunctiva of the right eye was congested, and a 4*4 mm corneal opacity was visible inferior nasal cornea, with local obvious thinning and a little keratic precipitates on the inner skin, and the infection has been controlled.

Conclusions We detail the progression and treatment of this infection to contribute to the clinical understanding and management of such cases.

Keywords *Phaeoacremonium Iranianum*, Keratitis, Fungus

Introduction

Corneal ulceration is a major cause of monocular blindness second to cataracts in developing countries [1]. Currently, fungal keratitis is emerging as a common etiology for severe sightthreatening ocular diseases [2]. Moreover, fungal keratitis has a longer healing time and leads to five times more corneal perforations, which makes it a much more severe condition [3]. The most common species causing fungal keratitis have been identified to be *Fusarium*, *Aspergillus*, and *Curvularia* among filamentous fungi and *Candida* among the yeast groups [4]. The occurrence of *Phaeoacremonium* infections in humans has increased over the past two decades, and although most cases have been ascribed to known species, several unknown species have also been recorded [5]. *Phaeoacremonium* fungi are widely distributed in the environment, particularly in soil, wood, and other plant matter. At present, 29 species of *Phaeoacremonium* have been reported [6]. *Phaeoacremonium parasiticum* was the first species of *Phaeoacremonium* reported to cause phaeohyphomycosis in humans [7]. Subsequently, *P. rubrigenum*, *P. parasiticum*, and *P. inflatipes* have been reported from phaeohyphomycosis cases [8–10]. Most reported

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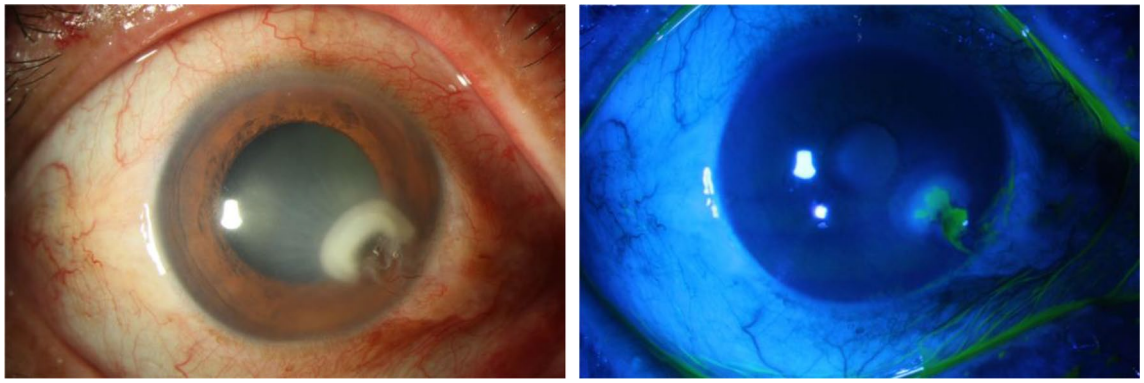


Fig. 1 A round yellowish-white infiltrate with well defined margins at 4 o'clock midperipheral cornea. An 4 mm×3 mm ulcer in the center of the invasion, limbal neovascularization, with an impending perforation and radiating Descemet's membrane folds

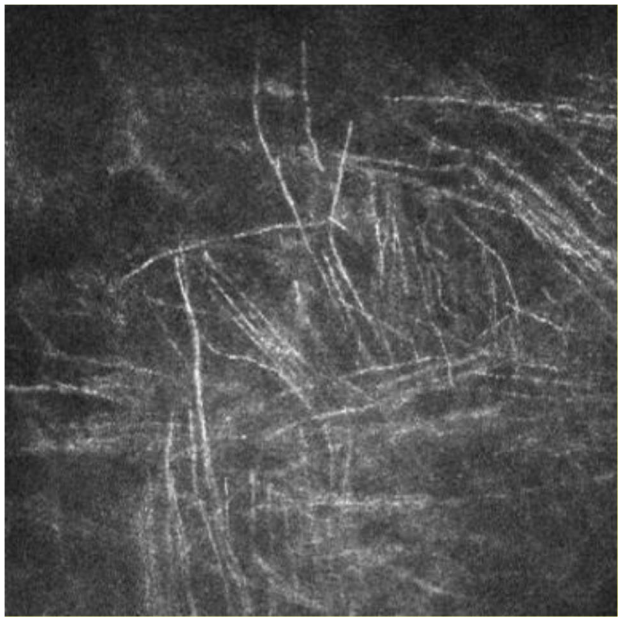


Fig. 2 Microscopy revealed a significant presence of mycelium-like structures and inflammatory cells extending from the focal area of the right cornea to the middle layer (mesocortex)

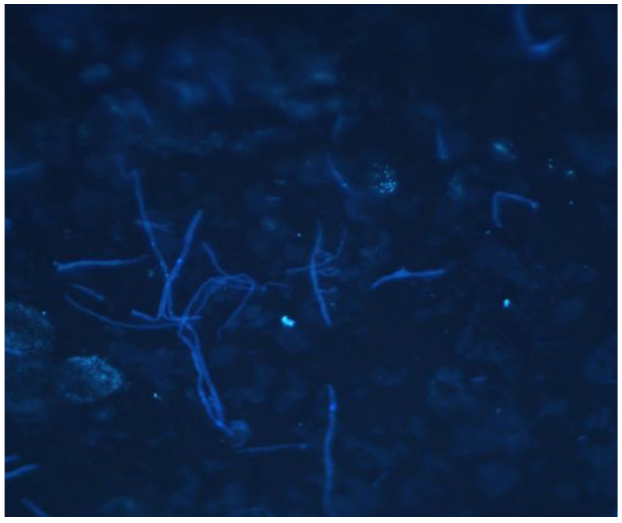


Fig. 3 Corneal scraping displayed numerous branching hyphae. (Fluorescence staining, magnification ×400)

Phaeoacremonium cases have involved subcutaneous abscesses, cysts, or chronic or acute osteoarthritis in immunocompetent or immunocompromised patients; these cases were often initiated by traumatic inoculation [9]. An overview of the various cases documented as being caused by the species newly described (*P. alvesii*, *P. amstelodamense*, *P. griseorubrum*, *P. krajdenii*, and *P. tardicrescens*) shows an infection pattern consistent with that of *P. parasiticum* [5]. But *Phaeoacremonium iranianum* reports are lacking.

Case report

A 66-year-old man patient attended our hospital on July 4, 2019 with complaints of blurred vision and pain in the right eye. History revealed that his right eye was scratched with a leaf. He had been using tobramycin and dexamethasone eye ointment, but his symptoms had not improved. Upon examination, his right eye had a visual acuity of 0.25, and intraocular pressure measured 8mmHg. There was no redness or swelling in the right eyelid, but the nasal conjunctiva appeared congested. A round yellowish-white infiltrate with well defined margins at 4 o'clock midperipheral cornea. An 4 mm×3 mm ulcer in the center of the invasion, limbal neovascularization, with an impending perforation and radiating Descemet's membrane folds.(see Fig. 1). The anterior chamber was moderate depth with no hypopyon. Confocal microscopy revealed a significant presence of mycelium-like structures and inflammatory cells extending from the focal area of the right cornea into the middle layer (see Fig. 2). Corneal scraping demonstrated numerous branched hyphae (see Fig. 3). The clinical diagnosis was fungal keratitis (right eye). Treatment was initiated with natamycin eye drops (hourly), fluconazole eye drops (every half hour), levofloxacin eye drops (six times a

day), sodium bromfenac eye drops (twice a day), atropine eye gel (once a day), and oral terbinafine tablets (0.25 g daily). The patient returned two days later, reporting relief from right eye discomfort. However, a follow-up ophthalmic examination revealed worsening corneal infiltration(see Fig. 4), and the patient declined hospitalization but continued the prescribed medication. Four days later, fungal colonies were detected in laboratory culture, suspected to be *Fusarium* based on lactophenol cotton blue staining and fluorescence staining (see Fig. 5). Ten days later, a re-examination using confocal microscopy showed a significant presence of mycelium-like structures in the deep stromal layer and the corneal endothelium(see Fig. 6). Due to ineffective drug treatment and deep lesion infiltration see Fig. 7, the patient was advised to undergo corneal transplantation, which he refused. Nineteen days later, the fungus strain isolated from a corneal scrape was identified as *Phaeoacremonium iranianum*(see Fig. 8). Antifungal susceptibility testing revealed the Minimum Inhibitory Concentration (MIC) of anifengin was 4 μg/ml, Micafengin and carpofungin exceeding 8 μg/ml, fluorocytosine was 32 μg/ml, posaconazole was 1 μg/ml, voriconazole was 0.5 μg/ml, itraconazole was 2 μg/ml, fluconazole was 64 μg/ml, and amphotericin was 0.05 μg/ml. Keratectomy of the right eye was performed 21 days later. After surface anesthesia, a 45° knife was used to make a corneal incision 1 mm along the edge of the ulcer, and a small amount of necrotic corneal tissue was removed along the incision. The corneal stroma layer was slightly cloudy and the descemet membrane was observed, and the lesion infiltrated deeply, so the resection was stopped, and keratoplasty was recommended for the patient within a limited time. After surgery, apply ofloxacin eye ointment to cover eyes. However, the patient declined keratoplasty and was discharged with a medication regimen, including natamycin eye drops (hourly), gatifloxacin eye drops (four times a day), diclofenac sodium eye drops (four times a day), ofloxacin eye ointment (once before bedtime), and voriconazole eye drops (10 mg/ml, hourly). One month later, The conjunctiva of the right eye was congested, and a 4*4 mm corneal opacity was visible inferior nasal cornea, with local obvious thinning and mild keratic precipitates see Fig. 9. Continue using voriconazole eye drops(Q2h), the infection was contained.

We conducted both macroscopic and microscopic examinations of the pathogenic strain isolated from the excised cornea. The front side of the colony displayed a brownish color with a fluffy or wooly texture, while the back side appeared dark brown on the PDA plate (refer to Fig. 5a). The hyphae were initially hyaline but later turned brown, with some developing rough walls. Phialides were brown, possessed thick walls, and were slender, tapering slightly toward the tip, measuring 15–50 μm in length. They often proliferated and featured small, funnel-shaped collarettes(refer to Fig. 5b). Conidia, frequently forming clusters, were hyaline, thin-walled, cylindrical to sausage-shaped, measuring 3–6 × 1–2 μm, and expanded over time(refer to Fig. 5c). Notably, numerous circling structures were commonly observed in small cultures on slides (see Fig. 5d).

Discussion

Phaeoacremonium fungi are widely distributed in the environment, particularly in soil, wood, and other plant matter [11]. At present, 29 species of *Phaeoacremonium* have been reported [6]. *Phaeoacremonium parasiticum* was the first species of *Phaeoacremonium* reported to cause phaeohyphomycosis in humans [7]. Subsequently, *P. rubrigenum*, *P. parasiticum*, and *P. inflatipes* have been reported from phaeohyphomycosis cases [8–10]. Most reported *Phaeoacremonium* cases have involved subcutaneous abscesses, cysts, or chronic or acute osteoarthritis in immunocompetent or immunocompromised patients; these cases were often initiated by traumatic inoculation [9]. An overview of the various cases documented as being caused by the species newly described (*P. alvesii*, *P. amstelodamense*, *P. griseorubrum*, *P. krajdenii*, and *P. tardicrescens*) shows an infection pattern consistent with that of *P. parasiticum* [5].

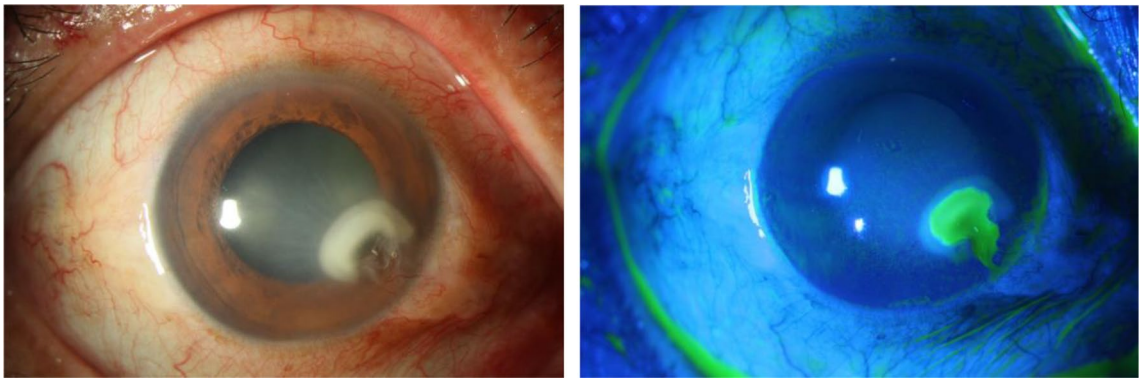


Fig. 4 Two days later, a follow-up ophthalmic examination revealed worsening corneal infiltration

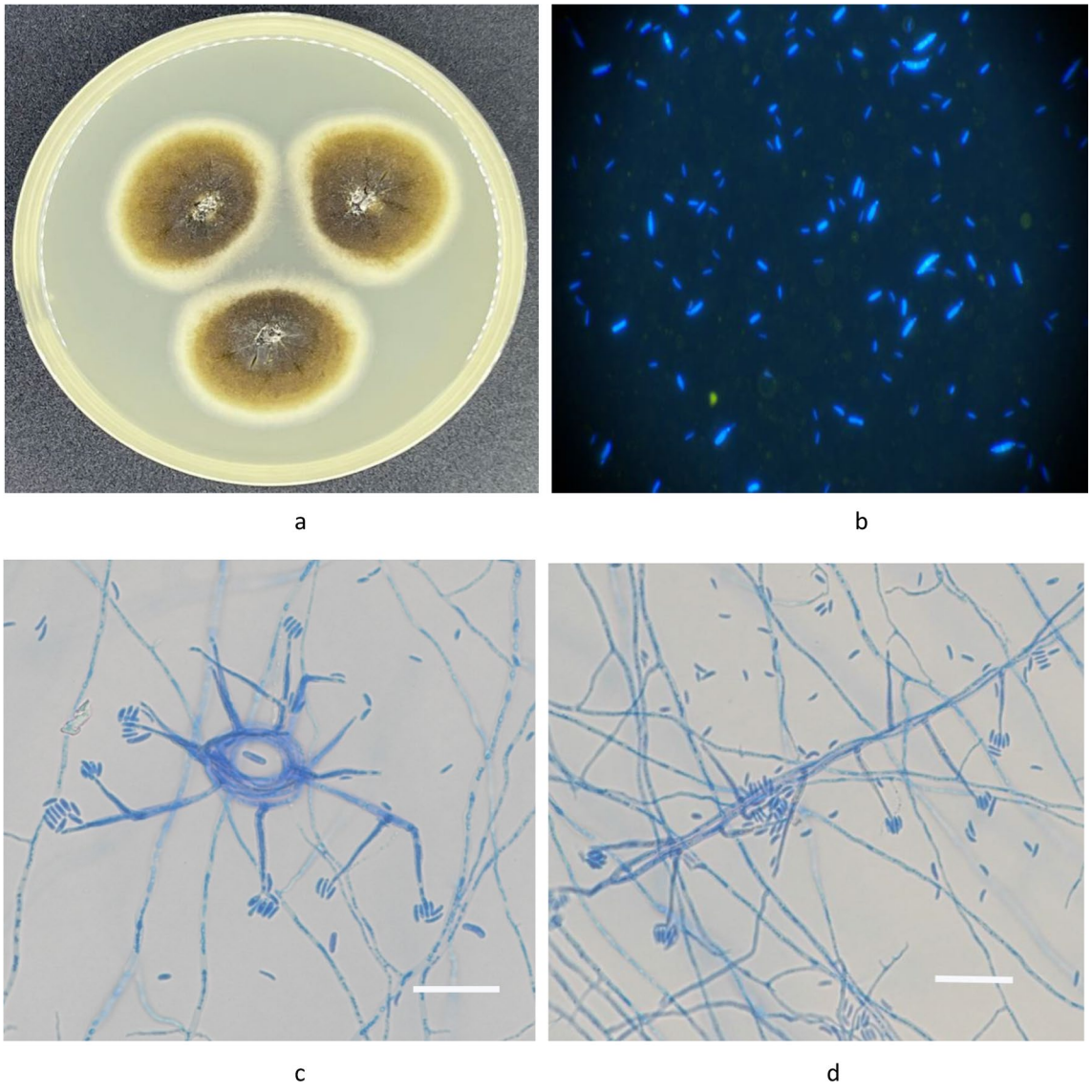


Fig. 5 (**a**) *P. iranianum* colony on Potato Dextrose Agar (PDA) medium plates after 9 days of incubation at 28 °C, (**b**) along with conidia from the original plate, stained with fluorescence (magnification ×400). (**c**,**d**) Microscopic morphology of *P. iranianum* on slide culture stained with cotton blue (magnification ×400, scale bar = 20 µm)

The morphology of *Phaeoacremonium* genus is intermediate between *Acremonium* and *Phialophora* genus and all are pathogens implicated in opportunistic infections [7]. Cultures of *Phaeoacremonium* grow slowly, lanose with radially folded. Culture on Sabouraud's dextrose agar (SDA) at 37℃ produced growth of colonies that were initially glabrous, off-white and then went on to become velvety grayish–brown on aging [12]. The conidiogenous cells were subhyaline to pale brown. *Phaeoacremonium* show medium brown hyphae, which become pale brown to hyaline and verruculose. The phialides have a funnel-shaped collarette and show a wide variety of diverse forms, including ellipsoidal, obovate, cylindrical, or allantoid (sausage-like) [5]. Morphologically, *Phaeoacremonium* is morphologically similar to *Acremonium*, and the two can easily be confused by inexperienced clinical microbiologists. *Phaeoacremonium* is different mainly because of its darkly pigmented colonies and the conspicuous collarettes of its conidiogenous cells [10]. Elena Petrovi´c was the first to report *Phaeoacremonium iranianum*. The developed fungal colonies were brownish on PDA, reverse darker brown; circular shaped with an entire edge; and with aerial, opaque, and cottony mycelium and branched septate hyphae. The isolate produced hyaline, unseptate, and ovoid conidia. An average conidia body length was (oblong-ellipsoidal) 4.5 × 1.5 µm [13].

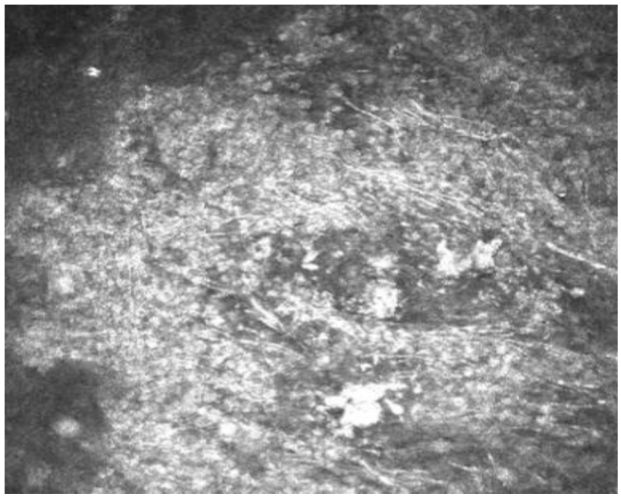


Fig. 6 A significant presence of mycelium-like structures in the deep stromal layer and the corneal endothelium

There is no standardized treatment for these rare fungal infections. Massa H's research indicated that amphotericin B, voriconazole, and posaconazole exhibited low MIC values and proved to be effective in treatment [14]. Tummidi S suggested that surgical wound excision can be combined with systemic Itraconazole therapy for several months. Antifungals such as amphotericin, fluconazole, posaconazole, ketoconazole, terbinafine, and 5-fluorocytosine (5FC) may be for patients with severe disease, poor response or hepatic toxicity to itraconazole [15–17]. According to Badali H, voriconazole, posaconazole, and isavuconazole are active against *Phaeoacremonium*. In contrast, all isolates were resistant to itraconazole and fluconazole. The geometric mean MIC of amphotericin B in the present study was 0.4 g/ml, suggesting that this drug may have a significant role in the management of *Phaeoacremonium* infections [16]. There is a documented case of *Phaeoacremonium parasiticum* endophthalmitis where enucleation was avoided through a treatment regimen involving intravitreal antibiotics, amphotericin, and oral voriconazole, resulting in the patient's vision stabilizing at 6/18 [18].

To the best of our knowledge, there have been no prior reports of eye infections caused by *Phaeoacremonium Iranianum*. Our cultures exhibited the typical characteristics of *Phaeoacremonium*, with curly growth in a water-based medium. Antifungal susceptibility testing revealed anifengin at 4 μg/ml, Micafengin and carpofungin exceeding 8 μg/ml, fluorocytosine at 32 μg/ml, posaconazole at 1 μg/ml, voriconazole at 0.5 μg/ml, itraconazole at 2 μg/ml, fluconazole at 64 μg/ml, and amphotericin at 0.05 μg/ml. In this case, keratectomy combined with natamycin and voriconazole yielded positive results.

Conclusions

Clinicians should be alert to this newly identified corneal pathogen that can cause keratitis. It can cause relatively dry, off-white corneal ulcers. It is sensitive to natamycin and voriconazole in our case. Identify the strain and administer according to the drug sensitivity result is crucial for achieving the best prognosis. In severe cases, a combination of surgical procedures may be necessary, including potential corneal transplantation.

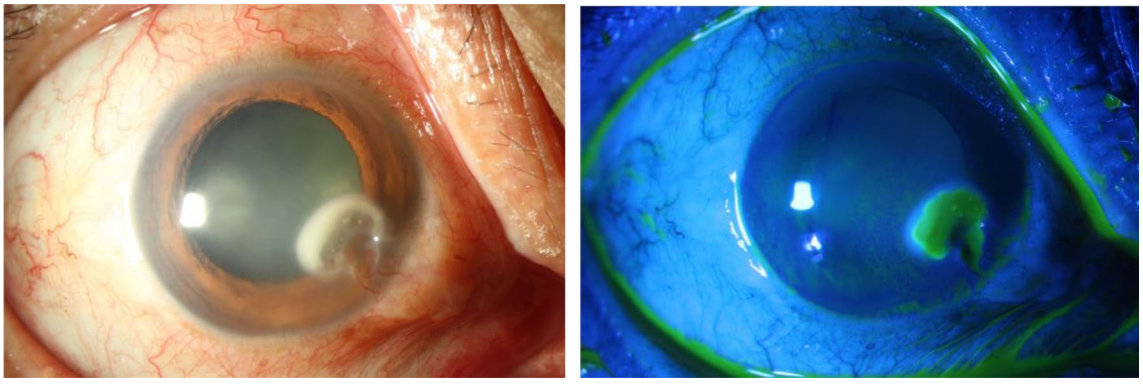
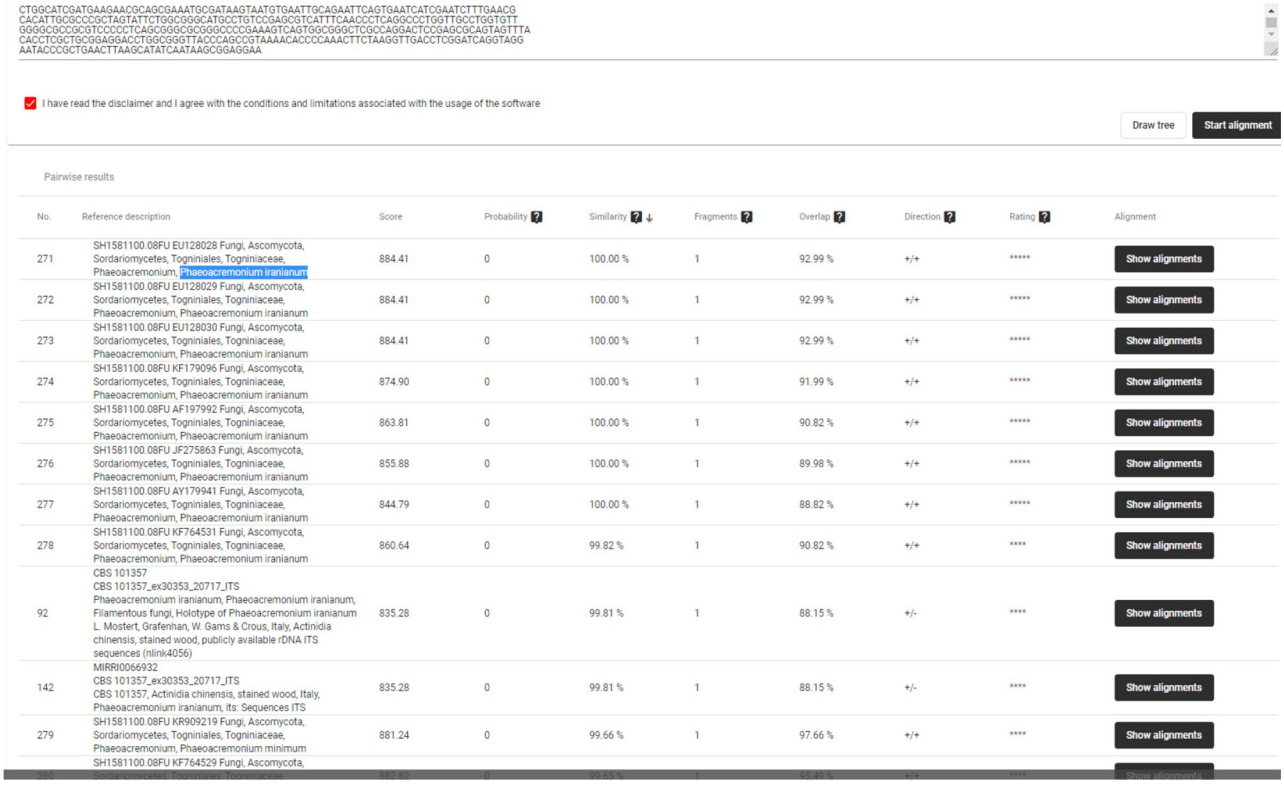


Fig. 7 Deep lesion infiltration



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CACCTGGCTGCGGAGGACCTGGCGGGGTTACCCAGCCGTAAAACACCCCAAACTTCTAAGGTTGACCTCGGATCAGGTAGG
AATACCCGCTGAACTTAAGCATATCAATAAGCGGAGGAA

I have read the disclaimer and I agree with the conditions and limitations associated with the usage of the software

Draw tree | Start alignment

Pairwise results

No.	Reference description	Score	Probability	Similarity	Fragments	Overlap	Direction	Rating	Alignment
271	SH1581100.08FU EU128028 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	884.41	0	100.00 %	1	92.99 %	+/+	*****	Show alignments
272	SH1581100.08FU EU128029 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	884.41	0	100.00 %	1	92.99 %	+/+	*****	Show alignments
273	SH1581100.08FU EU128030 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	884.41	0	100.00 %	1	92.99 %	+/+	*****	Show alignments
274	SH1581100.08FU KF179096 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	874.90	0	100.00 %	1	91.99 %	+/+	*****	Show alignments
275	SH1581100.08FU AF197992 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	863.81	0	100.00 %	1	90.82 %	+/+	*****	Show alignments
276	SH1581100.08FU JF275863 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	855.88	0	100.00 %	1	89.98 %	+/+	*****	Show alignments
277	SH1581100.08FU AY179941 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	844.79	0	100.00 %	1	88.82 %	+/+	*****	Show alignments
278	SH1581100.08FU KF764531 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium iranianum	860.64	0	99.82 %	1	90.82 %	+/+	****	Show alignments
92	CBS 101357 CBS 101357_ex30353_20717_ITS Phaeoacremonium iranianum, Phaeoacremonium iranianum, Filamentous fungi, Holotype of Phaeoacremonium iranianum L. Mostert, Grafenhan, W. Gams & Crous, Italy, Actinidia chinensis, stained wood, publicly available rDNA ITS sequences (nlink4056)	835.28	0	99.81 %	1	88.15 %	+/-	****	Show alignments
142	MIRI0066932 CBS 101357_ex30353_20717_ITS CBS 101357, Actinidia chinensis, stained wood, Italy, Phaeoacremonium iranianum, its: Sequences ITS	835.28	0	99.81 %	1	88.15 %	+/-	****	Show alignments
279	SH1581100.08FU KR909219 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae, Phaeoacremonium, Phaeoacremonium minimum	881.24	0	99.66 %	1	97.66 %	+/+	****	Show alignments
280	SH1581100.08FU KF764529 Fungi, Ascomycota, Sordariomycetes, Togniniales, Togniniaceae	882.82	0	99.65 %	1	95.49 %	+/+	****	Show alignments

Fig. 8 The sequencing result was *Phaeoacremonium iranianum*

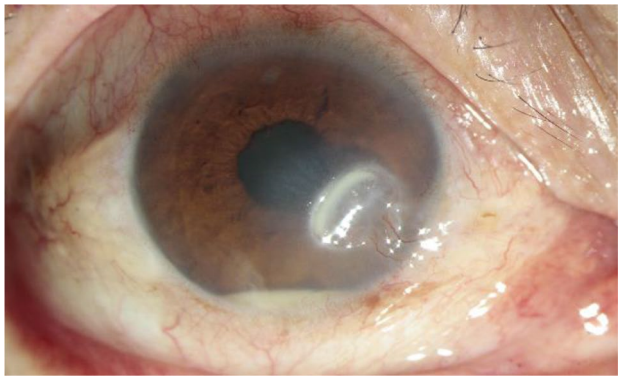

Fig. 9 A 4*4 mm corneal opacity was visible inferior nasal cornea

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12886-025-04064-1.

Supplementary Material 1

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"Not applicable" in this section.

Author contributions
Xiaona Liu and Man Li were major contributor in writing the manuscript. Xiuhai Lu, Juanjuan Zheng and Shujuan Liu analyzed and interpreted the result regarding the disease. All authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
"Not applicable" in this section.

Ethical statement
The authors confirm that this material is original and has not been published in whole or in part elsewhere; that the manuscript is not currently being considered for publication in another journal; and that all authors have been personally and actively involved in substantive work leading to the manuscript, and will hold themselves jointly and individually responsible for its content.

Consent for publication
The patient has given written informed consent for their personal or clinical details along with any identifying images to be published in this study.

Competing interests
The authors declare no competing interests.

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References

1. Whitcher JP, Srinivasan M, Upadhyay MP. Corneal blindness: a global perspective. Bull World Health Organ. 2001;79(3):214–21.
2. Priyadarshini SR, Soni T, Sahu SK, et al. Acremonium keratitis: risk factors, clinical characteristics, management, and outcome in 65 cases. Indian J Ophthalmol. 2022;70(10):3522–7.
3. Prajna NV, Srinivasan M, Lalitha P, et al. Differences in clinical outcomes in keratitis due to fungus and bacteria. JAMA Ophthalmol. 2013;131(8):1088–9.
4. Garg P, Roy A, Roy S. Update on fungal keratitis. Curr Opin Ophthalmol. 2016;27(4):333–9.
5. Mostert L, Groenewald JZ, Summerbell RC, et al. Species of phaeoacremonium associated with infections in humans and environmental reservoirs in infected Woody plants. J Clin Microbiol. 2005;43(4):1752–67.
6. Essakhi S, Mugnai L, Crous PW, Groenewald JZ, Surico G. Molecular and phenotypic characterisation of novel phaeoacremonium species isolated from Esca diseased grapevines. Persoonia. 2008;21:119–34.
7. Ajello L, Georg LK, Steigbigel RT, Wang CJ. A case of phaeohyphomycosis caused by a new species of phialophora. Mycologia. 1974;66(3):490–8.
8. Crous PW, Gams W, Van Wyk MJW. aPS. Phaeoacremonium gen. Nov. Associated with wilt and decline diseases of Woody hosts and human infections. Mycologia. 1996;88:786–96.
9. Padhye AA, Davis MS, Baer D, Reddick A, Sinha KK, Ott J. Phaeohyphomycosis caused by phaeoacremonium inflatipes. J Clin Microbiol. 1998;36(9):2763–5.
10. Guarro J, Alves SH, Gené J, et al. Two cases of subcutaneous infection due to phaeoacremonium spp. J Clin Microbiol. 2003;41(3):1332–6.
11. Mulcahy H, Chew FS. Phaeoacremonium parasiticum myositis: A case report with imaging findings. Radiol Case Rep. 2011;6(2):485.
12. Sandhu J, Kohli JK, Gupta SK, Gupta V. Case report: plantar cyst caused by phaeoacremonium inflatipes in an immunocompetent male, resolving with combination potassium iodide and Itraconazole therapy. Am J Trop Med Hyg. 2022;107(1):113–6.
13. Petrović E, Vrandečić K, Ćosić J, Kanižai Šarić G, Godena S. First Report of Phaeoacremonium iranianum Causing Olive Twig and Branch Dieback. Plants (Basel). 2022. 11(24).
14. Massa H, Riat A, Panos GD. First report of a new corneal pathogen: phaeoacremonium parasiticum. Eur J Clin Microbiol Infect Dis. 2020;39(12):2477–80.
15. Ogawa MM, Galante NZ, Godoy P, et al. Treatment of subcutaneous phaeohyphomycosis and prospective follow-up of 17 kidney transplant recipients. J Am Acad Dermatol. 2009;61(6):977–85.
16. Badali H, Khodavaisy S, Fakhim H, de Hoog GS, Meis JF, Chowdhary A. Vitro susceptibility profiles of eight antifungal drugs against clinical and environmental strains of phaeoacremonium. Antimicrob Agents Chemother. 2015;59(12):7818–22.
17. Monaganti S, Santos CA, Markwardt A, Pence MA, Brennan DC. Pulmonary phaeohyphomycosis caused by phaeoacremonium in a kidney transplant recipient: successful treatment with posaconazole. Case Rep Med. 2014. 2014: 902818.
18. Huynh TK, Lee LR, Ellis D. Late-onset post-traumatic phaeoacremonium parasiticum endophthalmitis. Clin Exp Ophthalmol. 2007;35(4):366–8.

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