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Original Research Article

Emerging Pathogens in Fungal Keratitis: Diagnostic Challenges and Management Strategies in Resource-Limited Settings

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Abstract

Fungal keratitis causes significant corneal blindness in tropical regions, primarily from Aspergillus and Fusarium species, with dematiaceous fungi like Curvularia emerging as pathogens following ocular trauma with soil or vegetation. Rare species such as *Fusarium chlamydosporum* and *Aspergillus nidulans* can produce rapidly progressive keratitis. This case series reports three instances of post-traumatic fungal keratitis due to *Curvularia lunata* (58-year-old male, wooden particle injury), *Fusarium chlamydosporum* (54-year-old male, outdoor exposure), and *Aspergillus nidulans* (28-year-old male, concrete trauma), confirmed morphologically via culture. Each responded favourably to topical natamycin combined with oral itraconazole or voriconazole within two weeks, achieving ulcer healing without surgery. These findings from a small case series highlight rare mycotic etiologies, underscore the critical role of clinical expertise, and demonstrate the value of early culture-guided antifungal therapy for trauma-related mycotic corneal ulcers in resource-limited settings.

Keywords: Ocular trauma, corneal blindness, rare mycotic etiologies, topical natamycin.

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Introduction

Fungal keratitis represents a growing global health concern, particularly in tropical regions, where it causes substantial morbidity and economic burden through corneal blindness. [1] While Aspergillus and Fusarium species remain predominant pathogens, dematiaceous hyphomycetes like Curvularia have emerged as significant opportunistic causes following ocular trauma with soil or plant matter.

Curvularia lunata, a soil saprophyte prevalent in tropics, infrequently causes human keratitis but has been documented in corneal ulcers since 1959. It has been implicated in sporadic cases of other ocular infections such as conjunctivitis, dacryocystitis, and endophthalmitis. [2-7]

Fusarium chlamydosporum is a rare but emerging cause of fungal keratitis, presenting with corneal inflammation, pain, photophobia, and possible vision loss. Diagnosis relies on clinical suspicion confirmed by corneal scraping and culture. [8]

The genus Aspergillus comprises six subgenera, 27 sections, and 75 series, placing A. nidulans in section Nidulantes.

This species typically causes systemic infections such as osteomyelitis, endocarditis, and CNS disease, while ocular involvement remains exceptionally rare. [9]

This case series reports three instances of post-traumatic fungal keratitis due to the uncommon

pathogens *Curvularia lunata*, *Fusarium chlamydosporum,* and *Aspergillus nidulans*, highlighting early morphological diagnosis and medical management that achieved ulcer healing without surgery.

Case report 1

A 58-year-old male furniture worker presented with pain, redness, and foreign body sensation in the right eye for five days after sustaining a wooden particle injury at work, with symptoms progressing to painful vision loss. Examination revealed a central RE corneal ulcer measuring 4 × 4 mm, surrounded by a 5 × 5 mm stromal infiltrate with stromal oedema, Descemet membrane folds, and a 1 mm hypopyon without satellite lesions. (Figures 1A & 1B) Visual acuity was markedly reduced with early lens opacities noted, but fundus examination remained normal. Left eye (LE) vision was 6/9 with normal anterior segment findings. The patient denied prior ocular issues, contact lens use, pond water exposure, systemic illness, or prolonged medication use.

Corneal scrapings demonstrated fungal hyphae on Gram, Giemsa, and KOH mounts. Culture on Sabouraud dextrose agar (SDA) at 37°C and 25°C produced dark olive-green to black velvety colonies. Lactophenol cotton blue mounts (LPCB) showed erect, unbranched septate conidiophores with flexuous apices, dark scars, and three septate conidia featuring a swollen subterminal cell, confirming *Curvularia lunata* keratitis. (Figures 2A & 2B)

Treatment included hourly topical natamycin 5%, moxifloxacin, homatropine, timolol, and oral itraconazole 100 mg twice daily for two weeks. By 2 weeks, the ulcer had healed with reduced stromal oedema, resolved hypopyon, and pigment deposition at the site.

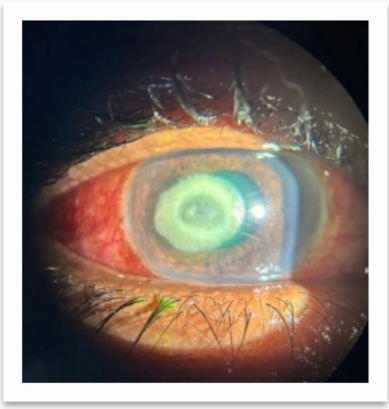
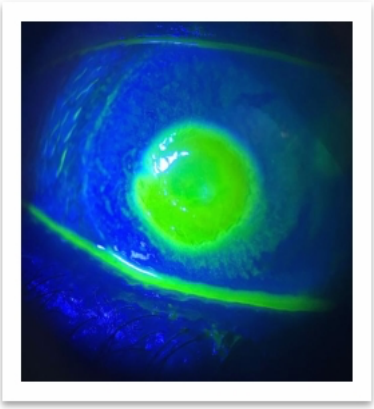
A	B
	
Fluorescein-stained corneal ulcer with stromal infiltrate in the RE	**Fluorescein-stained corneal ulcer with stromal infiltrate in the RE under blue light**

Figure 1:

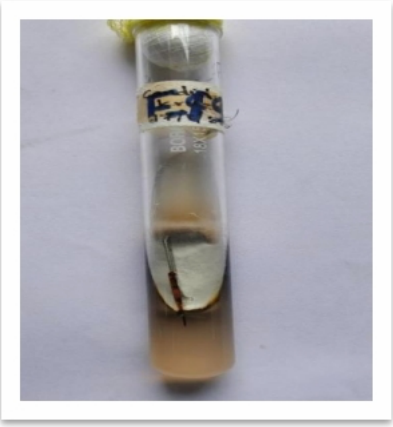
A	B
	
Dark olive-green to black, velvety colonies of the fungal isolate on SDA after seven days	**LPCB mount of 10-day-old SDA colonies revealing large, curved, four-celled conidia with swollen central wall**

Figure 2:

Case report 2

A 54-year-old male presented with redness, watering, and foreign-body sensation in the RE for 3-5 days following suspected foreign body entry while working outdoors. Initial topical treatment by a private practitioner failed to resolve symptoms, with worsening pain. He denied diabetes, hypertension, HIV, ocular trauma, spectacle or contact lens use, and had no significant systemic illness.

On examination, RE visual acuity was counting fingers at one meter, improving slightly to near-indistinct; left eye 6/9. The RE showed upper lid oedema, conjunctival congestion, a 7 x 7 mm central-paracentral epithelial defect with 5 x 5 mm stromal infiltrate, stromal haze, and Descemet's folds (Figures 3A-C). Anterior chamber was normal depth; pupil pharmacologically dilated with atropine. LE had nasal grade II pterygium; anterior/posterior segments otherwise normal. Intraocular pressure was digitally normal bilaterally.

Corneal scrapings revealed fungal hyphae. The isolate grew as flat, cottony, pinkish colonies on SDA (Figure 3D) and LPCB mount showed hyaline hyphae, thick-walled intercalary chlamydospores in chains with sickle-falcate macroconidia (Figures 3E & 3F), confirming *Fusarium chlamydosporum* keratitis.

Treatment included hourly topical natamycin 5%, topical fluoroquinolone TID, atropine 1% BID, and oral fluconazole 150 mg OD. Symptoms resolved during inpatient care. The ulcer nearly healed by two weeks, leaving residual macular opacity and improved vision. The patient was advised medication taper and regular follow-up.

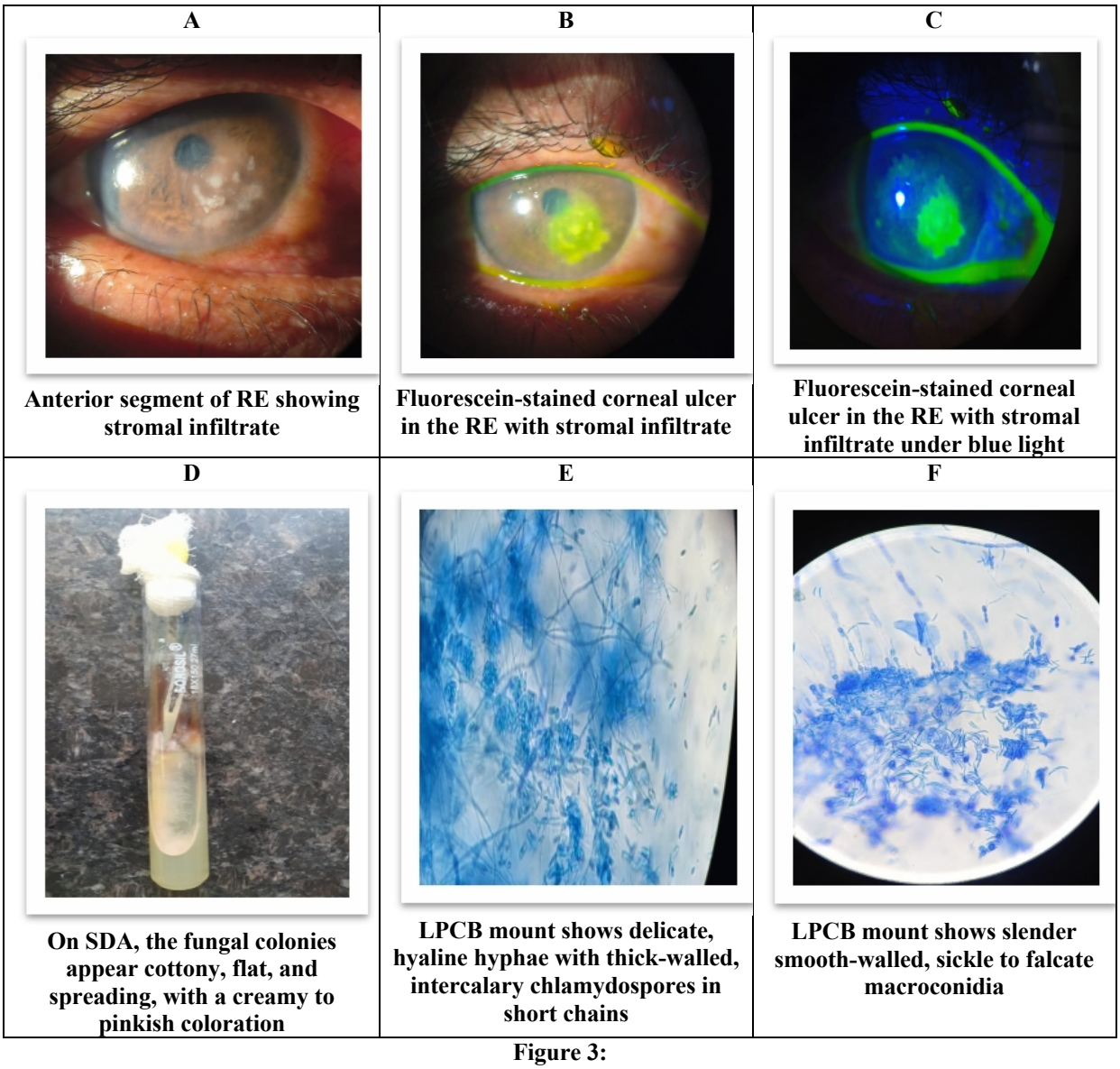


Figure 3:

Case report 3

A 28-year-old male presented to the ophthalmology outpatient department with pain, redness, and diminished vision in the LE for two days after workplace trauma from concrete particles. Examination revealed 6/6 visual acuity in the RE which was unremarkable but only perception of light with inaccurate ray projection in the LE along with upper lid oedema, conjunctival congestion, a 1 × 2 mm paracentral corneal epithelial defect overlying a feathery stromal infiltrate, and a 3 mm hypopyon (Figure 4A and 4B).

No systemic illness, contact lens use, or prior surgery was reported, and corneal sensation and intraocular pressure were normal. Corneal scrapings examined with Gram, Giemsa, and KOH mounts revealed fungal hyphae. Culture on SDA at three days showed white cottony colonies. (Figure 4C) and LPCB mount revealed septate hyaline hyphae, brown-tinged conidiophores with biseriate flask-shaped vesicles, metulae, phialides bearing smooth round green conidia in chains, plus cleistothecia with asci containing red-brown lenticular ascospores amid hyaline Hulle cells after 10 to 14 days (Figure 4D). Similar findings occurred on chocolate and BHI agar. Treatment comprised topical natamycin 5%, moxifloxacin, homide, and timolol, plus oral voriconazole 100 mg twice daily for two weeks. By two weeks, the ulcer improved markedly with reduced stromal oedema, resolved hypopyon, and pigment deposition.

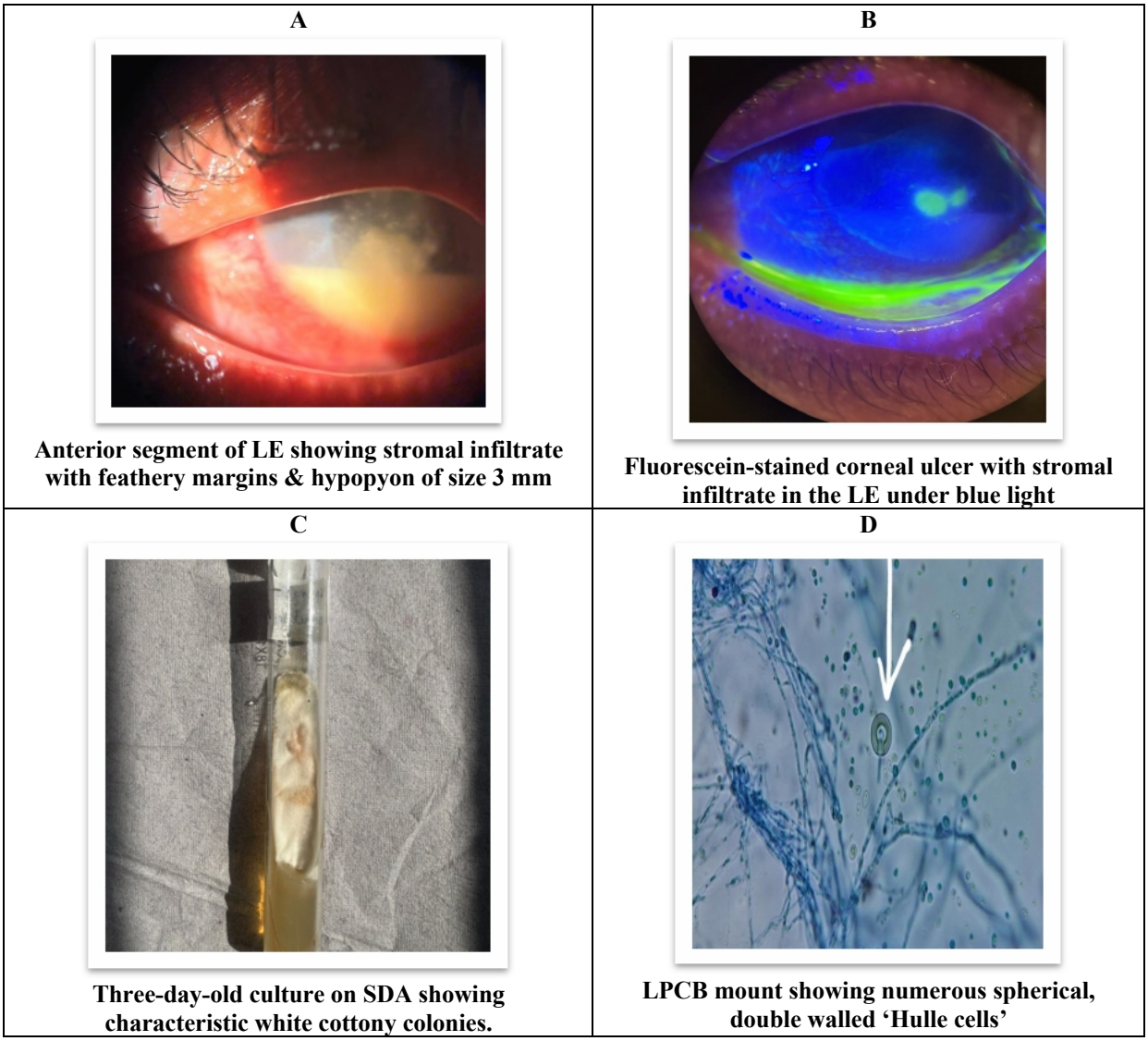


Figure 4:

Discussion

Although relatively uncommon in some regions, fungal keratitis can account for up to 50% of microbial keratitis cases, depending on geographic location. [10,11] Common risk factors include prolonged corticosteroid use, chronic contact lens wear, and ocular trauma involving vegetative matter. [10] Notably, in this study, all three patients

had a history of ocular trauma without any systemic comorbidities such as diabetes mellitus or hypertension. Some studies have noted a higher incidence in agricultural communities and among younger men. [12] In the current study, all three patients worked as outdoor labourers.

According to the limited available literature, fungal culture remains the gold standard for diagnosing fungal keratitis. [13] This case series underscores the value of culture in accurate organism identification. Corneal scrapings from all three patients, along with the colony characteristics on SDA and microscopic features observed in LPCB mounts, confirmed the presence of different fungal isolates.

Management of fungal keratitis involves antifungal therapy. Topical natamycin 5% is only Food and Drug Administration approved topical agent for mycotic keratitis provides broad-spectrum coverage in a dose-dependent manner. [11] Treatment duration is generally longer than for other corneal infections, often extending up to 12 weeks. [13] Other effective antifungals include ketoconazole and itraconazole. In 15–20% of typically severe cases, medical therapy fails and surgical intervention, such as lamellar keratectomy or therapeutic keratoplasty, becomes necessary, underscoring the need for prompt microbiological diagnosis to avert complications. [13,14,15]

In these three cases, medical therapy with topical natamycin and oral antifungals resulted in ulcer healing within two weeks without requiring surgery. Similar cases reported by Rathod et al., [16] Pai et al., [17] Alberto et al., [18] and Todokoro et al., [19] mirror our findings of medical resolution in fungal keratitis using topical/systemic antifungals without surgery.

Conclusion

Fungal keratitis rarely involves healthy, intact corneas, unlike more virulent pathogens, and is frequently diagnosed late. Our clinical evaluations, supported by corneal smear examinations and cultures, confirmed *Curvularia lunata, Fusarium chlamydosporum*, and *Aspergillus nidulans* as the causative agents. The patient showed a favorable response to topical natamycin combined with systemic antifungals (itraconazole or voriconazole), leading to ulcer resolution and an excellent clinical outcome.

This small case series highlights the importance of clinical expertise and the value of early culture-guided therapy for trauma-related mycotic ulcers in resource-limited settings despite variable molecular confirmation. It obviated the need for surgery and prevented corneal blindness. In our resource-limited institute, species identification relied solely on morphological features from cultures on SDA and LPCB mounts, without molecular confirmation via PCR or sequencing. Antifungal susceptibility testing was unavailable, preventing assessment of isolate-specific resistance profiles. Despite these limitations, patients showed favourable responses to topical natamycin and systemic antifungals.

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