Phacoemulsification Tunnel Keratitis: A report of 2 cases with different outcomes

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Background: Phacoemulsification tunnel wound keratitis can occur, with various aetiologies. This condition is difficult to treat and often leads to poor visual outcome.
Method: Case report
Results: A 66 year-old diabetic male (Patient 1) and a 68 year-old non-diabetic female (Patient 2) were treated for presumed fungal keratitis at their phacoemulsification tunnel wound sites. They had previously undergone uneventful phacoemulsification through temporal corneal incisions around 4-5 months prior to presentation. Both had prolonged post-operative inflammation which did not respond to topical steroids. Topical and oral antifungals were started after the appearance of suspicious fungal infection stigmata including fern-like infiltrates with fluffy edges and satellite lesions. Patient 1 needed a penetrating keratoplasty, and intracameral voriconazole was given when his condition did not resolve. His best-corrected visual acuity at last review was light perception, as compared to 6/60 at first presentation. Patient 2 was given intrastromal amphotericin B. Her condition improved with best corrected visual acuity being 6/60, compared to 1/60 on presentation.
Conclusion: We should have a high index of suspicion of fungal infections in patients with prolonged inflammation post-phacoemulsification which do not respond to steroids. Early diagnosis and treatment is important because complications of fungal keratitis often result in poor visual prognosis.
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Introduction

During phacoemulsification, a 3-step self-sealing main incision wound is often made either through the sclera, limbus or cornea.[1] Infection involving this phacoemulsification tunnel wound can occur, often presenting as scleritis or keratitis, and can result in poor visual outcome.[2] This is due to the space created when the wound is not well-constructed, leading to poor wound apposition.[3] Other than keratitis,

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endophthalmitis has also been reported with clear corneal incisions having a greater risk of developing post-operative endophthalmitis when compared to scleral incisions.[4] We report 2 cases of phacoemulsification tunnel keratitis, with different outcomes for each one.

Case 1

A 66 year-old poorly controlled diabetic male was referred from a secondary centre for persistent right eye anterior chamber inflammation for 5 months, which did not respond to topical steroids. He had earlier undergone uneventful phacoemulsification via a temporal corneal wound, but developed redness and pain 6 weeks post-operatively while using topical steroids. His visual acuity was 6/60 unaided, 6/18 pinhole when he presented to our centre. On examination, fern-like infiltrates were seen at the inner part of the temporal phacoemulsification main tunnel, which also had fluffy edges and irregular margins (Figure 1). Granulomatous keratic precipitates and anterior chamber cells were also present. Intraocular pressure was 24mmHg in that eye. Fundus examination showed moderate non-proliferative diabetic retinopathy. B-scan ultrasonography showed no evidence of loculations which suggest vitreous inflammation.

He was diagnosed as having fungal keratitis, based on the clinical findings. Topical natamycin 5% hourly, topical voriconazole 1% hourly, oral fluconazole 200mg daily, and topical moxifloxacin 2-hourly were given, as well as anti-glaucoma drops which included topical brimonidine 0.1% tds, topical timolol 0.5% bd, topical dorzolamide 2% tds, and topical latanoprost 0.005% once per night. His topical steroids were discontinued. However, his condition did not improve. Right eye penetrating keratoplasty was performed after 3 weeks of antifungal therapy. Post-penetrating keratoplasty, he again developed persistent inflammation and high intraocular pressure. Intracameral voriconazole 1% (with cefuroxime) was given twice (1 week apart) and intracameral amphotericin B (with moxifloxacin) was given once (1 week after the 2nd voriconazole) after the penetrating keratoplasty, which helped to resolve the infection. However, his final visual outcome remained poor, with only perception to light vision. Corneal scraping for Gram stain, potassium hydroxide preparation and culture media was negative for bacterial or fungal infection. Polymerase chain reaction (PCR) for aqueous humor was also negative for fungal aetiology.

Case 2

A 68-year old non-diabetic female underwent phacoemulsification via a temporal corneal incision in her right eye. She initially had a suture abscess, which was removed 6 weeks post-operatively, but then was referred to our centre for persistent anterior chamber inflammation 4 months later which did not respond to topical steroids. Her best corrected visual acuity then was 1/60. On examination, there were anterior stromal infiltrates at the phacoemulsification tunnel site with poorly defined margins, fluffy edges, satellite lesions, and anterior chamber inflammation (Figure 2). There were no keratic precipitates. Intraocular pressure and fundus examination were otherwise normal.

She was diagnosed with right eye fungal keratitis, with the diagnosis being made clinically. Corneal scraping was negative for fungal infection. Topical amphotericin B 0.15% hourly, topical fluconazole 0.2% hourly, topical moxifloxacin 2-hourly and oral fluconazole 200mg daily were given. Intrastromal amphotericin B was also given. Her condition improved with best-corrected visual acuity becoming 6/60.

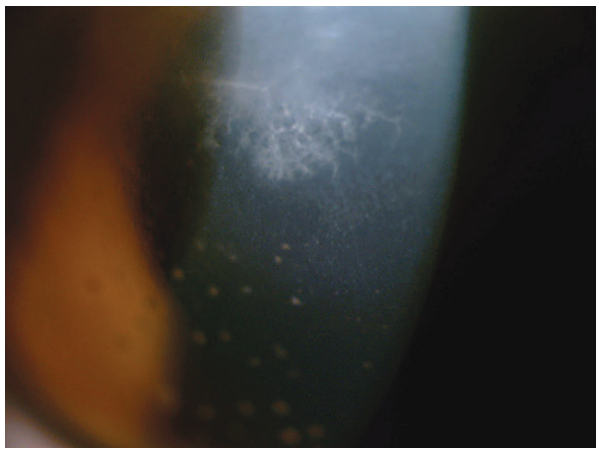

Figure 1a: Anterior segment photograph of right eye (Patient 1) showing stromal infiltrate at the inner part of temporal main wound tunnel, with irregular margins, fluffy edges and fern-like pattern, 5 months after uneventful phacoemulsification.

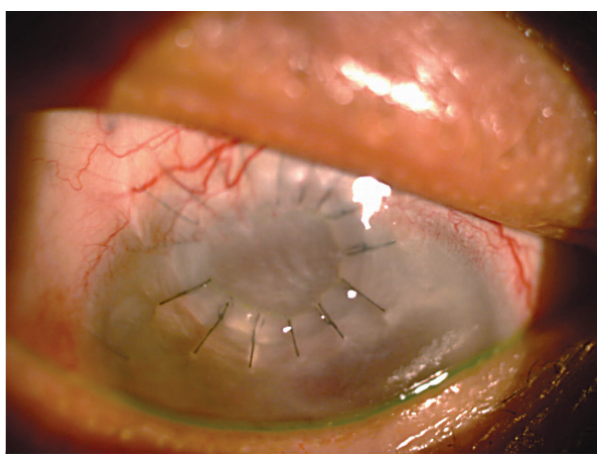

Figure 1b: Anterior segment photograph of right eye (Patient 1) post-penetrating keratoplasty and intracameral voriconazole.

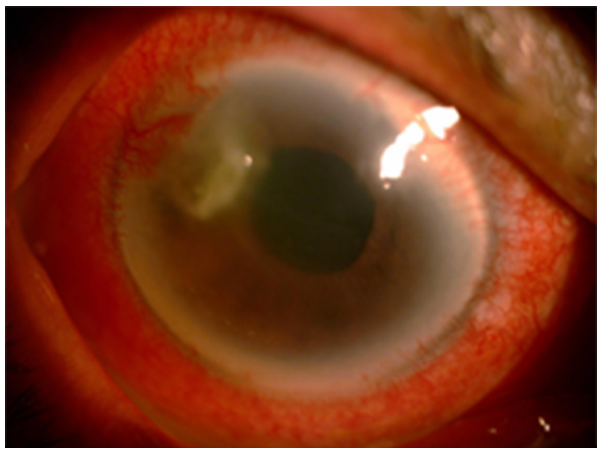

Figure 2a: Anterior segment photograph of right eye (Patient 2) showing stromal infiltrate at the phacoemulsification tunnel main wound temporally with clinical suspicion of fungal aetiology, 4 months after uneventful phacoemulsification.

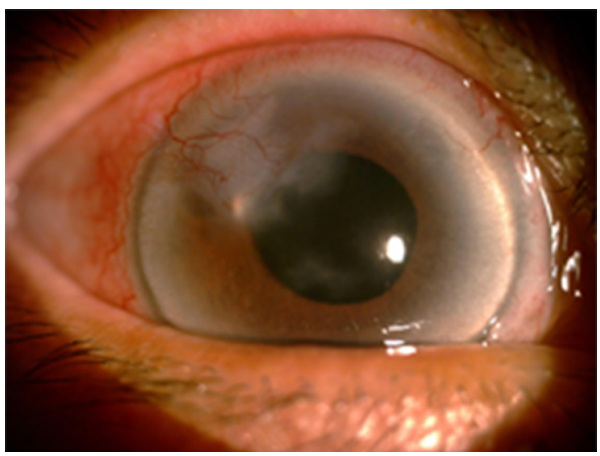

Figure 2b: Anterior segment photograph of right eye (Patient 2) following resolution of infection.

Discussion

Phacoemulsification tunnel fungal keratitis remains a diagnostic and therapeutic challenge. Both our patients had histories of uneventful phacoemulsification through corneal wounds, but then presented with keratitis later. Both were initially treated with prolonged topical steroids. The diagnoses of fungal keratitis were made clinically in both cases. In both cases, there was no history of trauma, contact lens use, foreign body or chemical injury prior which could be potential risk factors for infection post-operatively.

There are various aetiologies of fungal keratitis post-phacoemulsification surgery. These include common organisms such as *Aspergillus sp., Candida sp.* and *Fusarium sp.,* which can be refractory.[2] Other less common fungi include

Alternaria,[5] Scedosporium apiospermum,[6] Beauveria alba,[7] and Cladopialophora carrionii,[8] which had been reported following uneventful phacoemulsification surgery as well.

We were unable to isolate fungal organisms from microbiological investigations in both cases. Polymerase chain reaction (PCR) has been reported to provide high sensitivity and specificity in detecting most fungi.[9] Our negative PCR results suggested one of two possibilities, either a fungal species was difficult to detect, or this was a rare incidence of failure to detect fungi by PCR. We were unable to perform antifungal susceptibility testing due to the negative results.

Our decision to start antifungal treatment was based upon clinical diagnoses of presumed fungal keratitis. The exact source of infection was unknown in both cases, whether from the eyelid and conjunctiva, contaminated surgical instruments, or breach in aseptic technique. The selection of antifungals was challenging in both cases, due to the unknown aetiology. There has been reported improvement in fungal tunnel infection with the use of topical and oral voriconazole.[10] Some other studies have also suggested the benefit of intrastromal voriconazole in the treatment of recalcitrant fungal keratitis.[11] Both patients had intrastromal injections of amphotericin B. Patient 1 also had intracameral injection of voriconazole in view of the deep-seated infection.

Diabetes mellitus is a significant risk factor for fungal keratitis at the phacoemulsification tunnel.[12] Other predisposing factors include underlying immunosuppression, prolonged use of topical steroids, and loose sutures.[13] Despite being on voriconazole, Patient 1's condition worsened, which suggested other potential factors, such as poorly controlled diabetes, or a more virulent type of fungal species. For medical management, both our patients required a combination of topical, systemic and intraocular antifungals. Medical management alone was sufficient to prevent the spread of infection in Patient 2. In both cases, we managed to prevent complications such as endophthalmitis, however the outcome was different in each patient.

Conclusion

We should have a high index of suspicion of fungal infections in patients with prolonged inflammation post-phacoemulsification which do not respond to steroids. Early diagnosis and treatment is important because complications of fungal keratitis often result in poor visual prognosis.

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