lymphocytes. The ophthalmic examination showed visual acuity of hand movement and high intraocular pressure in the left eye. There were conjunctival hyperemia and corneal edema with 7 mm\texttimes{}5 mm of full-thickness infiltration at the nasal side of the cornea and heavy gray deposits in the corresponding inner part. Marked fibrinous reaction and pupil occlusion were noticed in the anterior chamber. By B-scan ultrasonography, severe vitreous opacity and posterior vitreous detachment were observed, but no retinal detachment was detected. Therefore, the patient was diagnosed as having mycotic endophthalmitis associated with corneal ulcer and secondary glaucoma.

Vitrectomy was performed during which the anterior chamber was irrigated, and the fibrinous membrane across the pupil was removed. The previously implanted intraocular lens was found to be well located. Fundus examination showed marked whitish cotton-wood vitreous exudation, and the optic disc was significantly swollen. Because of incomplete dilation of the pupil and corneal opacity, the peripheral retina and ciliary body were not visible. Intravitreal injections of amphotericin B (5 \(\mu\)g) and fluconazole (200 \(\mu\)g) were given as a result of the previous findings of fungal hyphae in the anterior chamber exudate smears. Intravenous amphotericin B, fluconazole and gatifloxacin were also administered, as well as eye drops containing fluconazole, natamycin and levofloxacin.

The excised vitreous body was subjected to further examination. Samples were inoculated onto blood agar medium and enrichment medium for bacterial recovery, and the cultures were incubated at 37\(^\circ\)C. Bacteria began to grow on both media 3 days after inoculation and were identified as Streptococcus intermedius using a MicroScan Autoscan-4 system (Siemens Healthcare Diagnostic Inc., Newark, DE).

The most common pathogenic germs of mycotic endophthalmitis are Candida, Fusarium and Aspergillus fumigatus. As a dematiaceous fungus, Phialophora verrucosa (Medlar, 1915) has not been reported to cause endophthalmitis. Herein, we report a case of endophthalmitis induced by P. verrucosa and Streptococcus intermedius.

**Keywords** endophthalmitis, Phialophora verrucosa, Streptococcus intermedius

### Introduction

The most common pathogenic agents of mycotic endophthalmitis are members of the genera Candida and Fusarium, as well as Aspergillus fumigatus. As a dematiaceous fungus, Phialophora verrucosa has rarely been reported as the cause of this infection. Therefore, we describe a case of endophthalmitis due to P. verrucosa and Streptococcus intermedius.

### Case report

A 50-year-old man was struck by a piece of wood in his left eye and lost his vision in the eye in February 2008. As a result of the diagnoses of penetrating corneal injury, traumatic cataract and secondary glaucoma, the patient received cataract extraction combined with intraocular lens implantation at a local hospital. Before surgery, the corneal wound self-sealed. His postoperative uncorrected visual acuity was 0.3. Three months later, the patient complained of vision loss with slight eye pain, which was resolved at the local hospital. In July 2008 the same symptoms recurred and as a result of the observation of a large number of hyphae in a smear of anterior chamber exudates, the patient was diagnosed as having mycotic endophthalmitis. He was treated by injection of amphotericin B into the vitreous cavity but as this had no effect, he was referred to our institution.

The patient’s vital signs were normal on admission and no abnormalities were found in the right eye. The white blood cell count was 11.2 \(\times\) 10\(^9\) with 78.8% neutrophils, and 15.5% lymphocytes. The ophthalmic examination showed visual acuity of hand movement and high intraocular pressure in the left eye. There were conjunctival hyperemia and corneal edema with 7 mm \(\times\) 5 mm of full-thickness infiltration at the nasal side of the cornea and heavy gray deposits in the corresponding inner part. Marked fibrinous reaction and pupil occlusion were noticed in the anterior chamber. By B-scan ultrasonography, severe vitreous opacity and posterior vitreous detachment were observed, but no retinal detachment was detected. Therefore, the patient was diagnosed as having mycotic endophthalmitis associated with corneal ulcer and secondary glaucoma.

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The excised vitreous body was subjected to further examination. Samples were inoculated onto blood agar medium and enrichment medium for bacterial recovery, and the cultures were incubated at 37\(^\circ\)C. Bacteria began to grow on both media 3 days after inoculation and were identified as Streptococcus intermedius using a MicroScan Autoscan-4 system (Siemens Healthcare Diagnostic Inc., Newark, DE).
USA) on day 5. The intraocular inflammation was significantly reduced by injecting ciprofloxacin (200 μg) and tobramycin (200 μg) into the vitreous cavity. To assess the presence of fungi, samples were inoculated onto Sabouraud medium and incubated at 27°C. Fungal hyphae were observed 4 days after inoculation and microculture was performed. Since the colony was olive-gray and wool-like with a flat edge and high center, it was judged to be a dematiaceous fungus (Fig. 1). After the microculture, a Medan-stained smear was prepared and microscopically examined at a magnification of ×400. Cur- or gourd-shaped conidiogenous cells were observed, which were single phialides at the side or end of the mycelium with collar-like structures. Partly endogenous phialospores were wrapped by mucus accumulation and collected at the end of phialide. Single-celled conidia were also present which were oval to slightly kidney-shaped and hyaline to pale brown (1–2 μm × 3–4 μm; Fig. 2). Therefore, the fungus was considered to be *P. verrucosa*, which was subsequently confirmed by the Medical Mycology Laboratory of Peking University First Hospital (Beijing, China). The sequence data were submitted to GenBank (accession number: BankIt1362932 BankIt1362932 HM542480).

At 2 weeks after surgery, the drug sensitivity test results confirmed that effective antibiotics were used in the treatment of this patient (Table 1). At 20 days, uncorrected visual acuity allowed for the counting of fingers at 20 cm and intraocular pressure was 23 mmHg in the left eye. In the cornea, the edema had almost faded away, the epithelium was healed, and the full-thickness infiltration at the nasal part had become much smaller. The anterior chamber exudates disappeared, and the retina and great vessels turned clear. The corrected visual acuity kept improving and reached 0.2 at 3 months after vitrectomy. At 5 months, however, visual acuity reduced to hand movement at 30 cm due to recurrent endophthalmitis. Hypopyon developed in the anterior chamber and B-scan examination showed significant vitreous opacity. Continuing treatment was suggested, but the patient insisted on evisceration of ocular contents due to severe eye pain. After further discussion with the patient and his family, evisceration was performed on 1 January 2009. *P. verrucosa* was cultured from the samples of the enucleated eye globe. Brown hyphae were found in samples by histopathological examination (Fig. 3). The patient recovered well after surgery, and no infection recurred.

**Discussion**

Mycotic endophthalmitis usually occurs in eyes as the result of trauma or endo-ocular surgery, as well as by dissemination of the etiologic agents through the blood. Although its incidence rate is low, the damage to eye is severe. Delayed diagnosis and treatment may result in blindness, orbital cellulitis and sometimes may threaten life. Combination of vitrectomy and intravitreal anti-fungal drug injection appears to be most effective means of treating this disease. Endophthalmitis can be divided into endogenous and exogenous categories. *Candida* spp. and *A. fumigatus* are the most common agents of endogenous endophthalmitis [1] whereas *Aspergillus, Scedosporium* and *Fusarium* are the filamentous fungi frequently involved in post-traumatic ophthalmitis [2–5]. Endophthalmitis caused by dematiaceous fungi is relatively rare, with only a few cases reported in the literature [6–9], while trauma [7] and ocular surgery [8,9] are the primary etiological factors contributing to the infections. Lieb et al. [10] described a case of fungal

![Fig. 1](https://example.com/fig1.png)  
**Fig. 1** A *Phialophora verrucosa* colony.

![Fig. 2](https://example.com/fig2.png)  
**Fig. 2** Microculture of *Phialophora verrucosa* by Medan staining (×400).
endophthalmitis caused by *Phialophora richardsiae*. In this report, we introduced the first case of *P. verrucosa* endophthalmitis. *P. verrucosa* is widely distributed in nature as a plant saprophyte and in cultures forms rapid growing wool-like, olive-gray, high-centered and flat-edged colonies [11]. This genus may act as a primary pathogen causing infections of skin and hypoderm, as one of the etiologic agents of chromoblastomycosis [12], whereas in the ocular infection this fungus acts as an opportunist. Wilson et al. [13] first reported that it could cause corneal ulcers and Banitt et al. [14] described a case of corneal ulcer caused by *P. verrucosa*, *Candida tropicalis*, and *Propionibacterium acnes* in an eye which had sustained trauma as a result of a scratch by a branch which finally led to the globe being eviscerated.

Sometimes the etiological factors contributing to endophthalmitis are complex and difficult to determine. In this case, we noted on the first visit of the patient to our institution that there were heavy gray deposits in the cornea at the point where a piece of wood had penetrated the eye. Therefore, this injury was suspected to be the major factor in the late-onset endophthalmitis. Cataract surgery like that which the patient had received seldom causes corneal ulcers. *S. intermedius*, which is non-β-hemolytic, may have pre-existed in the conjunctival sac or pharynx nasalis, moved through the corneal wound into the eye, and formed a mixed infection with *P. verrucosa*.

Management for this case was timely with vitrectomy, anterior chamber irrigation, and vitreous cavity puncture injection. The infection was initially controlled by systemic and topical use of anti-fungal agents. Fluconazole combined with amphotericin B may be of benefit in the treatment of endophthalmitis [15,16].

Endophthalmitis does not always occur immediately after trauma [3,10] which may be related to the immune status of the patient, treatment, and/or properties of the pathogen. Therefore, the diagnosis and therapeutic treatment of endophthalmitis rely heavily on the laboratory examination of samples from the infection. In this case, *P. verrucosa* in the eye wound grew slowly and caused endophthalmitis 3 months after trauma. Although there was a resolution of symptoms after vitrectomy and drug treatment, a relapse occurred because *P. verrucosa* did not respond to the antifungal therapy as reported by Mandell et al. [17] and the eye globe was finally enucleated when the patient gave up further treatment.

**Conclusion**

Timely treatment is required for endophthalmitis, and laboratory studies are vital to prevent possible mixed infections. In cases of endophthalmitis caused by dematiaceous fungi like *P. verrucosa*, a prolonged course of antibiotics is suggested, and periodic inspection is important to prevent recurrence of the disease. Psychological counseling is also necessary for patients to comply with the treatment.

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