Case report

Pseudozyma aphidis endophthalmitis post-cataract operation: Case discussion and management

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ABSTRACT

Purpose: To present a case of fungal endophthalmitis with a novel organism and our management.
Observations: A 46 year old male presented with delayed-onset acute endophthalmitis 6 weeks after routine phacoemulsification and intraocular lens implantation. Initial treatment with intravitreal antibiotics did not improve his condition. With repeated vitreal taps, the causative organism was eventually identified as a fungus, *Pseudozyma aphidis*. Treatment with oral and intravitreal voriconazole, as well as pars plana vitrectomy, led to resolution of the endophthalmitis and recovery of vision to 20/25.
Conclusions and importance: Fungal endophthalmitis is a rare, potentially blinding complication of cataract surgery. We report our approach to this previously unreported organism, that led to an excellent visual outcome. There are no specific guidelines for fungal endophthalmitis. The management approach has to be tailored to the clinical response and emerging laboratory data from the microbiologist. Identification of the organism will require specialist laboratory references that may not be available in all hospitals. Ophthalmologists must work closely with microbiologists in order to ensure an optimal outcome.

1. Introduction

Endophthalmitis is a rare, potentially sight threatening complication post intraocular surgery, with a reported incidence of 0.04–0.2%.[1–3,13,17] Amongst the causative organisms of endophthalmitis, fungi account for about 3–8% of reported cases, depending on geographic variation, with *Candida*, *Aspergillus* and *Fusarium* species being the more common fungal isolates.[5–7,13,14] Rare fungal isolates are becoming increasingly recognised as a cause for ocular mycoses due to the ubiquity of fungi in nature, as well as increasingly sophisticated molecular diagnostic techniques.[6,10] In this paper, we present the first reported case of post cataract-surgery endophthalmitis from *Pseudozyma aphidis*.

2. Case report

A 46-year-old New Zealand European male underwent cataract extraction for persistent appositional closure despite patent peripheral iridotomies. Surgery was routine with standard aseptic precautions; a toric intraocular lens was inserted; intra-cameral cefuroxime was administered at the end of the procedure. Day-one visual acuity was 20/30 unaided with a normal slit lamp examination and no wound leak. He

had routine follow-up at 4 weeks' post-operation. He presented to the acute eye clinic 6 weeks post-operatively with a one-day history of a painful, red right eye with reduced vision.

On examination, visual acuity was 20/40. He had diffuse conjunctival injection and was noted to have grade 4 + inflammation in his anterior chamber with < 1 mm hypopyon, as well as 1 + vitreous cells on slit lamp examination. Intraocular pressures were 13 mmHg bilaterally. Fundus examination appeared normal with no retinal lesions. An initial diagnosis of an acute post-operative endophthalmitis was made.

An anterior chamber and a vitreous tap was performed under sterile conditions with Betadine solution used with aseptic techniques. He received intravitreal injections of Vancomycin 1mg/0.1 ml and Ceftazidine 2.25mg/0.1 ml, a five-day oral course of moxifloxacin 400 mg, and topical dexamethasone drops hourly. Initial follow up post treatment showed reduced hypopyon, pain and injection over the first few days. The anterior chamber tap showed moderate polymorphs but no organisms, and was reported culture negative. Topical dexamethasone was weaned to every 2 h as his anterior chamber inflammation improved to 2 + cells.

On review 10-days post intravitreal-injection, he was noted to have increased anterior chamber cells up to 4 + and trace hypopyon again. A
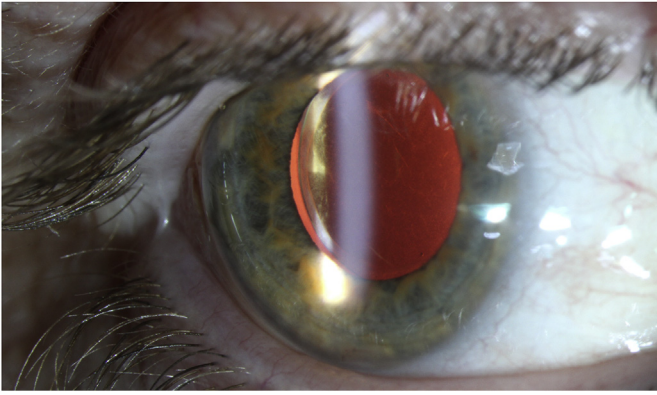
Fig. 1. Posterior capsular plaque evident on dilated examination.

Fig. 3. Organisms with Gram stain from culture plate.

white plaque was noted on the posterior capsule at the three o'clock position (see Fig. 1). Fundus examination and OCT confirmed optic nerve head and macular oedema. A low-grade P Acnes type endophthalmitis was clinically suspected.

A vitreo-retinal consult was obtained with recommendations for a 5-day course of further treatment with intravitreal Vancomycin 1mg/0.1 ml and Ceftazidine 2.25mg/0.1 ml. He also received subconjunctival Dexamethasone and started on Prednisolone 1% hourly.

The next day, the patient underwent another anterior chamber tap prior to his repeat course of intravitreal antibiotics. The Gram stain of the aspirate demonstrated oblong Gram-variable structures (see Fig. 2). During the fourth day of his 5-day course, the Microbiology department reported a light growth of yeast. Our lab also reported scanty growth of *Propiobacterium acnes* in one of the three growth cultures from the samples taken. Due to the prolonged incubation period of the culture and growth in only one plate out of three cultured, this was presumed to be a contaminant. Additionally, the Gram-positive organisms seen in the initial aspirate Gram stain did not resemble *P. acnes*.

The yeast colonies on blood agar were white and wrinkled. Microscopically, it appeared as fusiform budding yeast. The isolate was identified as *P. aphidis* using the MALDI biotyper (Brucker Daltonics, Bremen, Germany) with a score of 1.7. In addition, the national mycology reference laboratory (LabPLUS) also identified it as *P. aphidis* using phenotypic methods. It was described as a flat cream-coloured yeast, going slightly pink with age. Gram stain of the isolates demonstrated oblong Gram-positive structures (Fig. 3). It grew a 'dirty pink' colour on Candid CHROM agar, and there was growth at 27 °C and 37 °C. Urea and nitrate were positive, and esculin was negative.
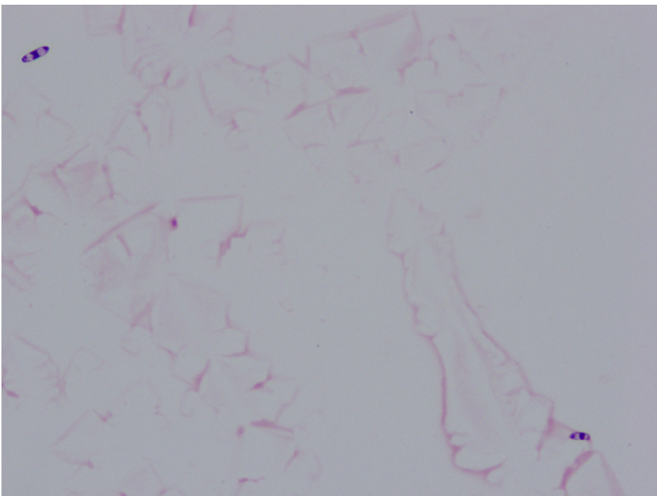
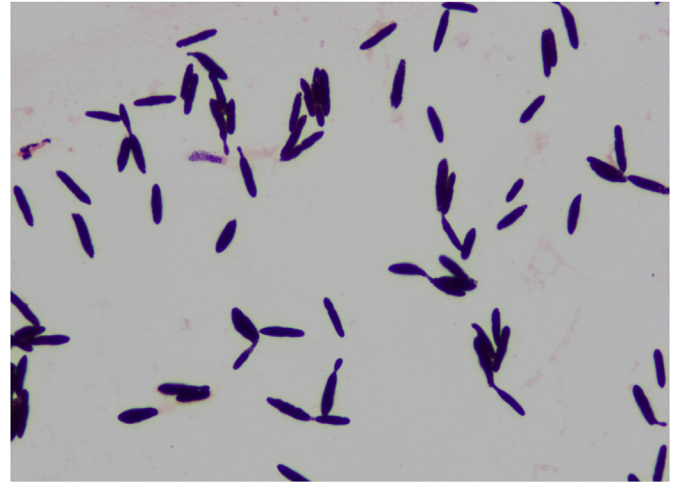Identification was confirmed using the key in "The Yeasts: A Taxonomic Study (4th Ed) by Kurtzman C., Fell JW". Susceptibilities to fluconazole (MIC = 4.0 mg/L), voriconazole (MIC = 0.06 mg/L), and amphotericin (MIC = 1.0 mg/L) were done using Sensititre Y10 panels.

With this information, the patient was then commenced on oral voriconazole 200 mg twice a day on advice from our Infectious Diseases consultant. He was also reviewed by the medical team and found not to have any pre-existing endogenous or exogenous fungal infections or other medical co-morbidities.

The patient did not have much appreciable improvement over the next 2 weeks. He had ongoing disc swelling and further developed central macular oedema. The decision was made to undergo a pars plana vitrectomy, vitreous biopsy, posterior capsulotomy, and intravitreal voriconazole 0.05mg/0.1 ml. During the procedure, the patient had a small retinal tear from an infusion line, requiring endolaser and an SF$_6$ gas fill. The vitreous aspirate examined on this occasion had occasional polymorphs and no organisms seen on microscopy and was culture negative as well.

Post operatively he continued to have prednisolone drops and oral voriconazole at 200 mg twice a day. His anterior chamber cells slowly decreased, with gradual resolution of his macular and disc oedema, and complete resolution recorded at 3 months after initial presentation. The final visual acuity was 20/25.

3. Discussion

Pseudozyma aphidis (Fig. 4) is an environmental yeast belonging in the *Ustilaginomycetes* class, and is commonly isolated from leaves,

Fig. 2. Organisms on initial Gram stain.

Fig. 4. *Pseudozyma aphidis*. Image from A Herb et al. [10].

flowers, and soil.[8,10] It is thought to have low pathogenicity but has been implicated in a few cases of invasive infection in humans, most of whom were immunocompromised.[8–11] First described as a possible human pathogen in 2008, *P. aphidis* had since been the primary pathogen in 8 cases of human infection.[8–11] Due to the rare occurrence of this pathogen in human infections, this species cannot be identified using commercial systems that are available in routine laboratories.[8] To our knowledge, this is the first reported episode of ocular infection involving *P. aphidis* in medical literature.

The typical presentation of post-surgical fungal endophthalmitis is that of indolent inflammation with relatively mild symptoms, but with findings of fibrinopurulent anterior chamber reaction, corneal opacities or a localized reaction at the intraocular lens.[3,4,7,13] Substantial corneal involvement can occur, with keratitis, oedema, and exudates portending poorer outcomes if present.[3,4,13] Posterior chamber inflammation with vitreous snowballs and opacities are also a feature.[3,4,7,13] Examination findings tend to become evident after several weeks, as they are sometimes masked by topical corticosteroids.[4,5] Nevertheless, post-surgical fungal endophthalmitis can also manifest acutely and patients had been recorded to present anywhere between 3 and 50 days after surgery but can present up to 210 days later.[3,6,7,13,14] This was evident in our patient, who had a delayed presentation at 6 weeks post cataract surgery with features of acute endophthalmitis: namely a painful eye, reduced vision; an anterior chamber hypopyon with vitreal cells on examination.

Most patients present with visual acuities ranging from 20/80 on the Snellen chart to light perception only.[3,4,13,14] Initial presenting visual acuities have not been an independent predictor of final visual outcomes.[13]

Post-surgical fungal endophthalmitis managed aggressively tends to have a better final visual acuity outcome compared to endophthalmitis caused by open globe trauma or external ocular infections.[14] Nevertheless, outcome of fungal endophthalmitis tend to be poor, including serious visual impairment, permanent vision loss and other complications which may require enucleation.[3,13,14]

Sources of exogenous post-surgical fungal endophthalmitis are varied, including but not limited to: intraocular lenses, contaminated irrigation fluids, hospital ventilation or construction activities.[6–8,13] In this case, we were unable to find any predisposing causes to account for his endophthalmitis. Potential colonization during the surgery or post-operative self-inoculation could have occurred. This does raise the possibility that the isolate of *p. aphidis* could be a contaminant rather than an infective pathogen. However, factors mitigating against this point include the clear clinical abnormality, the unusual looking organisms seen in the aspirate Gram stain (Fig. 2), and the lack of other pathogens isolated (except for very scanty growth of *P. acnes* on one occasion after prolonged incubation, and in only one of three growth cultures). *P. Acnes* was thought to be the likely culprit initially, especially with the initial response to treatment followed by a relapse, but mitigating against this was the response to oral voriconazole after vitrectomy. We surmise that the vitrectomy would have had the effect of reducing the organism load in the vitreous.

As fungal endophthalmitis is quite rare, guidelines for treatment in this case were limited. The European Society of Cataract and Refractive Surgeon (ESCRS) guidelines provide a general approach to undifferentiated endophthalmitis and treatment for bacterial causes but no specific recommendation on management of fungal endophthalmitis.[1] The Infectious Diseases Society of America (IDSA) suggest amphotericin B for *Candida* sp and voriconazole for *Aspergillus* species, but there were no recommendations from *Pseudozyma* species.[12]

In treating our patient, we consulted previous literature on previous human infection with *P. aphidis* and laboratory susceptibility data, with the assumption that the treatment modality of choice will provide adequate concentration of the correct antifungal into infected tissue to achieve therapeutic levels. Previous literature had shown isolates of *P.*

aphidis with low MIC (mg/L) to voriconazole (0.03–0.06 mg/L), amphotericin B (0.03–0.25 mg/L), and itraconzole (0.03–0.25 mg/L).[8,9,15–18] A high MIC was noted with fluconazole (4- > 64 mg/L), caspofugin (4- > 32 mg/L) and flucytosine (> 32 mg/L).[8,9,15–18] This was reasonably consistent with the MIC values in our local laboratory: voriconazole (MIC = 0.06 mg/L), amphotericin (1.0 mg/L), and fluconazole (4.0 mg/L).

Amphotericin B is mainly used to treat candida endophthalmitis, and previous research has shown poor penetration of the drug from systemic administration.[12,14,15,18] Treatment of endophthalmitis therefore requires intravitreal injections, however amphotericin B had previously been known to cause retinal necrosis.[14,16,18] Doses of between 20 μg and 100 μg had been administered intravitreally without toxicity, although typically administered doses ranges from 5 to 10 μg.[12,16] It is important to note that doses of intravitreal amphotericin B for management of fungal endophthalmitis are not standardised, and usually dependant on the clinical response.[14]

Voriconazole was predominantly used to treat an outbreak of Fusarium contact lens keratitis in 2005, and as a result, many studies have been done on the distribution of the drug with human rather than animal models.[12,15] Voriconazole is known to have excellent oral bioavailability and intraocular penetration.[12,14,15] Intraocular concentration after two doses of 400 mg oral voriconzole can achieve up to 38% of plasma levels 3 h post administration (0.81 ± 0.31 μg/mL) which is equivalent to MIC of 0.81 ± 0.31 mg/L.[8,12,15,16,18] Intravitreal injection of voriconazole has been shown to be safe, with concentrations of < 250 μg/ml showing no toxicity to retinal pigment epithelial cells in vitro.[12,14,16] Common side effects present in third of patients are reversible photopsia and blurring of vision.[14–16,18]

Pars plana vitrectomy is recommended treatment for sight threatening endophthalmitis with vitritis.[1,2,4,12] A vitrectomy allows for removal of infected vitreous that would normally not respond to systemic antifungal agents, and also decreases the overall burden of the pathogenic organism, as well as providing culture material to guide treatment.[1,4,12] Vitrectomies are usually combined with administration of intravitreal antifungal agents; however, it is important to note that the half-life of antifungal agents administered post vitrectomy will be shorter, and that multiple treatments may be required.[1,4,12] Previous research had showed eyes that have undergone vitrectomies tend to have better final visual outcome.[13] In our case, a vitrectomy was performed as the patient had ongoing deterioration in spite of oral voriconzole, and we did not want to delay treatment. The vitrectomy also allowed us the opportunity to obtain samples and to exclude other causative organisms.

4. Summary and conclusion

In summary, our patient had a delayed presentation at 6-weeks with acute symptoms and signs of endophthalmitis following routine cataract surgery. This was initially clinically suspected to be a low grade bacterial endophthalmitis, but later found to be caused by *P. aphidis*. The endophthalmitis responded well to oral and intravitreal voriconazole, pars plana vitrectomy and capsulotomy. This resulted in definitive treatment and excellent final visual acuity.

There exist guidelines for bacterial endophthalmitis but none that are specific for fungal endophthalmitis. The approach to infective postoperative endophthalmitis remains similar in fungal cases but management has to be tailored to clinical response and emerging laboratory data from the microbiologist.

Identification of the organism will require specialist laboratory references that may not be available in all hospitals. Ophthalmologists must work closely with microbiologists in order to ensure an optimal outcome.

Patient consent

Consent to publish the case report was obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Conflicts of interest

The authors have no financial disclosures to declare.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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