Inpatient Ophthalmology Consultation for Fungemia: Prevalence of Ocular Involvement and Necessity of Funduscopic Screening

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• PURPOSE: To determine the generalizability of recent data assessing the necessity of ophthalmic consultation for fungemic patients, we examined the prevalence, microbial profile, and treatment of fungal chorioretinitis and endophthalmitis among patients with positive fungal cultures referred for ophthalmologic consultation at a tertiary care medical center.

• DESIGN: Retrospective cross-sectional study.

• METHODS: All inpatient ophthalmology consultations from Wills Eye Hospital at Thomas Jefferson University between January 1, 2006 and December 31, 2012 were retrospectively reviewed and cross-referenced to a microbiologic database of positive fungal blood cultures. This included 227 adult consecutive inpatients with positive fungal blood cultures (n = 215) or suspected fungemia (n = 12). Clinical data were extracted from records held by the microbiology laboratory and inpatient records. Patients were deemed to have ocular fungal involvement if dilated fundus examination demonstrated evidence of chorioretinitis or endophthalmitis.

• RESULTS: Two hundred and twenty-seven consultations were requested to evaluate patients for ocular manifestations of fungemia. Eleven patients (4.8%, 95% CI 2.4%–8.5%) were diagnosed with fungal chorioretinitis or endophthalmitis. Of these 11 patients, 5 had visual symptoms, 2 were asymptomatic, and 4 were unable to communicate. A total of 5 patients (2.2%) received intravitreal injections following funduscopic screening. An additional 11 patients (4.8%) had nonspecific fundus lesions considered to be inconsistent with ocular fungal involvement. The most common fungal species identified were *Candida albicans* (n = 85), *Candida glabrata* (n = 63), and *Candida parapsilosis* (n = 44).

• CONCLUSIONS: The current study found a low rate of disseminated ocular involvement in patients with positive fungal cultures referred for ophthalmologic consultation. However, 2 patients with ocular fungal involvement denied visual symptoms and over half of affected patients were asymptomatic or unable to communicate. As the presence and severity of ocular involvement in fungemic patients may dictate the mode and duration of antifungal treatment, funduscopic screenings may still have an important role. (Am J Ophthalmol 2015;160(5): 1078–1083. © 2015 by Elsevier Inc. All rights reserved.)

FUNGAL CHORIORETINITIS AND ENDOPHTHALMITIS have the potential to cause devastating vision loss. In the setting of fungemia, dissemination of fungal organisms can occur in the eye via hematogenous seeding of small retinal and choroidal capillaries. Localized ocular fungal proliferation can then lead to focal or multifocal inflammation, abscess formation, and vitreous seeding causing frank endophthalmitis. Importantly, early recognition and prompt treatment of these entities have been associated with improved visual outcomes. Patients with a history of diabetes, indwelling lines/catheters, hyperalimentation, or immunocompromise are at increased risk for fungal bloodstream infections.[1–3] Early studies in a variety of clinical settings not necessarily applicable to the modern tertiary care hospital demonstrated that patients with fungemia developed ocular involvement from 10%–45% of cases. These fairly high rates justified routine screening of inpatients for ocular involvement. However, over the past 2 decades there has been a trend toward decreasing prevalence of ocular involvement.[4–10] The significant decline in the prevalence of ocular involvement for patients with fungemia over the past decade is presumably due to advances in antifungal therapy, prophylactic systemic antifungal treatment in cases with high clinical suspicion, and prompt treatment once positive cultures are identified.

More recent data suggest that the prevalence of endogenous ocular fungal infections is much lower than previous reports,[8,9,11] raising the question of whether inpatient funduscopic screening is necessary. These recent studies found that less than 1% of pediatric and adult inpatients with fungemia had findings consistent with fungal chorioretinitis or endophthalmitis requiring treatment with intravitreal injections, beyond systemic

Accepted for publication Jul 24, 2015.

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0002-9394/$36.00
http://dx.doi.org/10.1016/j.ajo.2015.07.033

antifungals.[8,12] The purpose of this study is to determine the generalizability of these findings by describing the microbial profile of fungal chorioretinitis and endophthalmitis at our tertiary care center and examining the impact of ophthalmologic consultation on inpatient management.

METHODS

WILLS EYE HOSPITAL AND THOMAS JEFFERSON UNIVERSITY Institutional Review Board committee approval was obtained prior to initiation of the study. For this retrospective cross-sectional study, we performed a review of 227 patient charts with documented evidence of fungemia (based on at least 1 positive blood culture or the primary medical team's clinical suspicion of fungemia) who were evaluated by the Ophthalmology service at Wills to rule out ocular involvement from January 1, 2006 to December 31, 2012. This review period included patients examined and included in an earlier report.[13] The Ophthalmology service is routinely consulted to evaluate patients for ocular involvement in patients with positive fungal blood cultures or suspicion of fungemia. Of note, not all patients with positive fungal blood cultures are screened, as ophthalmology consult requests are made at the discretion of the primary treatment team. Charts for study inclusion were screened by cross-referencing a microbiologic database of positive fungal cultures and archived Wills ophthalmology consultations from the referenced time frame.

All inpatient consults were requested by the primary treatment team and performed by a resident physician who obtained a history, measured near visual acuity, and performed bilateral dilated indirect ophthalmoscopy. Within 24 hours of the resident evaluation, the patients had another dilated ophthalmoscopic examination performed by an attending physician. The examining attending's history and examination were used for analysis if there were differences noted between physician documentation.

Data abstracted from inpatient charts included date of examination, patient demographics, clinical history, ability to verbalize visual symptoms, visual acuity, ophthalmic examination findings, culture site, time since last positive culture, and treatment course. If multiple consults for the same patient were requested during a single admission, only data from the first consult were included for analysis. If consults were requested for the same patient across multiple admissions, data from both consults were included.

For the purposes of the current study, ocular fungal involvement, or a "positive" examination, encompassed the diagnoses of chorioretinitis or endophthalmitis, based on established criteria.[11] Chorioretinitis was defined as deep, white/yellow choroidal and/or retinal infiltrates not associated with vitreous cells or "fluff balls." Endophthalmitis was defined as vitreous extension of chorioretinal infiltrates, associated with vitritis or "fluff balls." Nonspecific findings that did not lend to making a diagnosis of fungal chorioretinitis or endophthalmitis, or a "nonspecific" examination, included cotton-wool spots, intraretinal hemorrhages, white-centered hemorrhages (Roth spots), and exudates without characteristics consistent with chorioretinitis or vitreous involvement. Patients with positive and nonspecific examinations underwent serial dilated fundus evaluations at a frequency dictated by the attending physician.

TABLE 1. Fungemia Risk Factors of Patients With and Without Ocular Fungal Involvement in the Setting of Positive Fungal Blood Cultures or Suspected Fungemia

	With Ocular Fungal Involvement (N = 11)	
Risk Factor	N	Percentage
Indwelling lines	9	81.82%
Recent major surgery	6	54.55%
Hyperalimentation	7	63.64%
Diabetes	6	54.55%
Immunosuppression	3	27.27%
Intravenous drug use	1	9.09%
	Without Ocular Fungal Involvement (N = 216)	
Risk Factor	N	Percentage
Indwelling lines	135	62.50%
Recent major surgery	130	60.19%
Hyperalimentation	98	45.37%
Diabetes	48	22.22%
Immunosuppression	81	37.50%
Intravenous drug use	6	2.78%

N = number of patients.

RESULTS

OVER THE 6-YEAR STUDY PERIOD, 227 ADULT INPATIENT consultation requests were made to rule out ocular fungal involvement in the setting of positive fungal blood cultures. Fifty-three percent of the patients were male and 47% were female. Mean patient age was 57.1 years (range 18–94 years). Fungal culture and speciation results were available for 215 patients (94.7%), while data regarding antifungal use were available for 222 patients (97.8%). Two hundred and five of the total 227 patients (90.3%) in the current study had at least 1 of the following risk factors for disseminated fungus: indwelling line, recent major surgery, immunosuppression (eg, cancer chemotherapy, long-term broad-spectrum antibiotics, steroids, bone marrow transplant), diabetes, hyperalimentation, or recreational intravenous drug use. Nearly half of all patients (49.78%) had 3 or more risk factors (Table 1).