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Case Report: Ocular Toxocariasis: A Report of Three Cases from the Mississippi Delta

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Abstract. Ocular toxocariasis can be vision threatening, and is commonly reported from tropical or subtropical regions. Knowledge of clinical manifestations from the United States, particularly in underserved areas such as the American South, is lacking. We report three cases of ocular toxocariasis in individuals from the Mississippi Delta, a rural community with prevalent poverty. Visual acuity was severely affected in two of the three cases. Increased awareness of ocular toxocariasis, which may have under-recognized frequency, will contribute to prompt diagnosis and treatment, which will ultimately improve patient health in the region.

INTRODUCTION

Toxocariasis is caused by larvae of *Toxocara canis*, or *Toxocara cati*, intestinal nematodes infecting dogs and cats, respectively. Toxocariasis is more commonly found in tropical and subtropical regions.[1] Infection in the definitive hosts is acquired via ingestion of larvated eggs in the soil or of incidental hosts, such as birds or rodents, infected with the larval stage of the parasite.[2] Humans acquire *Toxocara* larva migrans disease by accidental ingestion of larvated eggs. *Toxocara* larvae may migrate through the body, causing visceral larva migrans (VLM), neural larva migrans, and ocular toxocariasis, or ocular larva migrans (OLM).[3] Visceral larva migrans is characterized by fever, hepatomegaly, respiratory symptoms, and eosinophilia, although infection may be asymptomatic.[4] By contrast, OLM is vision threatening,[5,6] often accompanying VLM, although isolated OLM without visceral involvement occurs.

In the United States, recent studies have shown a 5% *Toxocara* antibody seroprevalence in the general population.[7] Most studies to date in the United States have evaluated epidemiologic aspects of toxocariasis based on *Toxocara* antibody seroprevalence, but knowledge of clinical manifestation frequency, particularly in underserved and understudied populations such as the American South, is lacking. Here, we report three cases of OLM in individuals from Mississippi, specifically from the Mississippi Delta.

CASE REPORTS

Case 1. A 25-year-old, non-Hispanic, Caucasian female presented with a 6-month history of floaters and worsening vision in her right eye. Her ocular symptoms were accompanied by headache, nausea, malaise, and palpitations. She had lived in the state of Mississippi for the entire life, and had no pets or recent travel.

Ophthalmologic examination of the right eye revealed visual acuity of 20/70 and normal intraocular pressure. Anterior-segment examination showed a posterior subcapsular cataract. Posterior-segment examination showed a large focal granulomatous chorioretinitis along the supratemporal arcade with vitritis (Figure 1A), with inferior snowbanking (accumulation of vitreous exudates), macular striae, and small retinal membranes. No larvae were visualized. The left eye was normal (Figure 1B). Laboratory evaluation for antinuclear antibody, angiotensin-converting enzyme (ACE), syphilis, Lyme, *Toxoplasma*, Rocky Mountain spotted fever, and human leukocyte antigen-B51, and *Toxocara* antibody testing by ELISA was negative. Magnetic resonance imaging of the brain and orbits showed no abnormalities. Empiric intravitreal clindamycin injection was administered for possible *Toxoplasma* chorioretinitis without improvement. Pars plana vitrectomy for vitreous biopsy and cataract extraction with intraocular lens placement, as well as corticosteroid injection to control the inflammation, were performed. Topical ophthalmic corticosteroid therapy was also initiated. *Toxocara* ELISA performed on a vitreous sample was positive. The patient was then referred to an infectious disease specialist to rule out VLM.

On further evaluation, physical examination was benign. Her laboratory tests indicated white blood cell count of 8.7 × 109/L with 2.1% eosinophils, and liver transaminases were normal. Electrocardiogram and echocardiogram were normal. Computed tomography of the chest, abdomen, and pelvis revealed small mesenteric lymphadenopathy and a normal chest. Given the negative ACE and chest X-ray, and as she was Caucasian, sarcoidosis was considered to be a less likely diagnosis. A diagnosis of OLM was made based on the positive vitreous antibody and the characteristic findings of a focal elevated lesion consistent with choroidal granuloma in the posterior pole of the right eye and vitritis. She was treated with oral albendazole (400 mg twice daily for 2 weeks) and continued on ophthalmic corticosteroid drops. She developed elevated intraocular pressures requiring placement of an aqueous tube shunt as well as cystoid macular edema, which severely compromised her visual acuity. Three years later, her visual acuity permits counting fingers at 3 feet, without improvement on pinhole examination. She continues topical corticosteroid treatments.

Case 2. A 22-year-old, non-Hispanic, Caucasian male presented with poor vision in his right eye. The patient

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reported he was told that he had a "tumor" behind the right eye at age 5 years, which left him nearly blind in that eye. The patient denied eye pain and headaches. He had been a lifelong resident of the Mississippi state, and stray dogs were common in the area in which he was raised. There was no recent travel.

Ophthalmologic examination revealed a visual acuity that permitted detection of hand motion in the right eye and 20/20 with correction in the left eye. Intraocular pressures were normal in both eyes. Anterior-segment examination was normal bilaterally. Posterior-segment examination of the right eye showed a white-yellow, subretinal vermiform lesion elevating peripapillary retina consistent with granulomas supratemporal to the optic disc (Figure 2A). The retinal pigment epithelium was atrophied, and retinal striae were observed extending from the optic disc to the fovea. No larvae were visualized. The left eye examination was normal (Figure 2B). Based on the fundoscopic examination that showed characteristic lesion consistent with granulomas, a clinical diagnosis of OLM was made. The treating ophthalmologists considered that the findings were consistent with OLM but not with other conditions that are accompanied by granulomas in the eyes based on the characteristic focal elevated granulomas of the posterior pole and a pigmented crescentic or vermiform shape within the elevated granuloma or scar (Figure 2), which is highly suggestive of a dead larva.

Because the infection was determined to be only ocular, and not active, no intervention was performed. Further examinations to evaluate for sarcoid, syphilis, *Mycobacterium tuberculosis*, toxoplasmosis, and toxocariasis were not conducted as the patient was lost to follow-up.

Case 3. A 5-year-old, non-Hispanic, Caucasian male who lived in the Mississippi Delta presented with blurred vision in the left eye. The patient had no pets, but did have contact with neighborhood dogs. The patient had no travel history.

Ophthalmologic examination showed an uncorrected visual acuity of 20/30 in the right eye and 20/150 in the left eye that improved to 20/80 with pinhole examination. Intraocular pressures were normal in both eyes. The anterior-segment examination was normal in both eyes. Fundus examination of the right eye was normal (Figure 3A). Posterior-segment examination of the left eye revealed an area of increased pigmentation in the superior peripapillary retina extending into the posterior pole. A fibrotic band and an epimacular membrane causing substantial distortion of the macula (Figure 3B) were observed. In addition, a pigmented lesion was observed in the far peripheral temporal retina (Figure 3C). There were no larvae visualized. ELISA testing for antibody to *Toxoplasma* and *Toxocara* on serum yielded negative results. A clinical diagnosis of OLM was made based on the ophthalmologic examination that showed a characteristic peripheral raised lesion consistent with a *Toxocara* granuloma. The patient was observed without intervention, and the visual acuity of the left eye improved to 20/40 and 20/25 with correction 6 months and 2 years later, respectively.

After 5 years of follow-up, the patient had an episode of a brain abscess requiring craniotomy and prolonged intravenous antibiotic therapy. Abscess culture yielded a *Peptostreptococcus* species, although the patient had received antibiotics before culture was obtained. Repeat ELISA serology for *Toxocara* remained negative, and further immunologic workup was negative (HIV testing, quantitative immunoglobulins, and T-cell subsets).

Eight years later, the patient had severe progressive left eye retinal detachment, requiring barrier laser photocoagulation. One year after the laser treatment, his visual acuity in the left eye was 20/20 with correction.

DISCUSSION

We report one highly probable and two likely cases, including one pediatric, of OLM from the Mississippi Delta, a rural community with prevalent poverty. According to the U.S. Census Bureau, 20.8% of people in Mississippi were living in poverty in 2014–2016, which reflects the highest rates in the United States.[8] Moreover, because clinical care in this region is scarce,[9] it is likely that more people suffer from this disease without proper diagnosis and care. This case series illustrates the fact that *Toxocara* OLM still occurs in the American South, leading to loss of visual acuity and potential blindness in affected individuals.

Recent studies demonstrate higher risk for *Toxocara* seropositivity in rural regions, where sanitation is poor and the burden of stray animals is high.[10] Indeed, the odds for *Toxocara* seropositivity are 80–90% higher for those living in poverty than for those with incomes greater than the poverty level.[7,10] Visual acuity was severely affected in two of the three cases in our case series from just such a poverty-affected region. Such loss of visual acuity resulting from *Toxocara* leads to long-term reduced productivity for those visually impaired persons, contributing further to the cycle of disadvantage.

Ocular larva migrans can manifest in three distinct clinical forms: focal granuloma of the posterior pole (as seen in the first and second cases) in 25–50% of patients; peripheral granuloma (as seen in the third case, Figure 3) in approximately 50% of patients; and diffuse endophthalmitis in less than 25% of cases. In focal granulomas of the posterior pole or the periphery of the fundus, a pigmented crescentic or vermiform shape within the granuloma or scar (Figure 2) is highly suggestive of a dead larva.[11]

These cases highlight the difficulty in obtaining a diagnosis of *Toxocara* OLM. Although positive serology may be suggestive of infection, many apparently healthy individuals express detectable serum *Toxocara* antibody titers. Although one study has shown 45% of patients with clinically diagnosed OLM having antibody titers of 1:32 or greater,[3] serum antibodies are not always present in OLM.[5,12] Previous reports suggest that elevation of vitreous fluid antibodies, particularly in the absence of correspondingly elevated serum antibody titers, as seen in case 1, is highly suggestive of toxocariasis. However, data for such interpretations of results are derived from a small number of cases. Because of the highly invasive nature of ocular sample collection for testing, diagnosis remains largely based on clinical and ophthalmologic findings.[5,13–15] Prompt referral to experienced ophthalmologists is essential in the context of suspected *Toxocara* OLM because of the compromise of vision.[16] Parallel evaluation by infectious disease specialists to rule out other possible diagnoses is also indicated.

These cases do not necessarily provide examples of optimal treatment. Additional clinical evaluation may have been useful to exclude other possible causes for the disease processes for the second case, and the antihelminthic treatment given to the patient in case 1 may not have been indicated. Studies have shown the efficacy of albendazole and corticosteroid therapy in improving intraocular inflammation

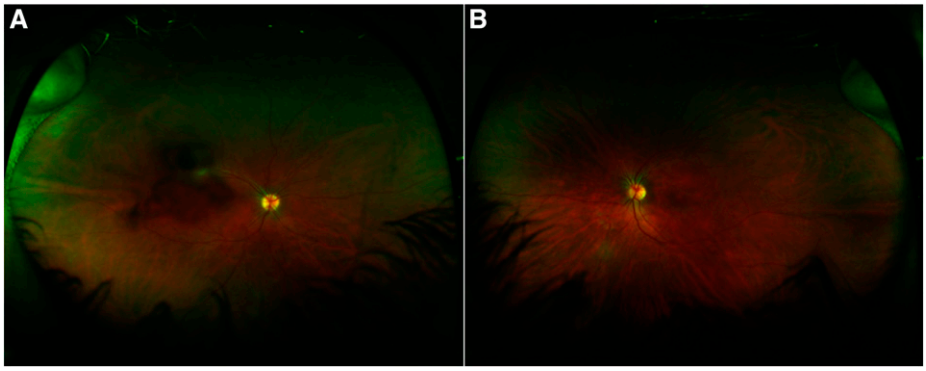

FIGURE 1. Case 1: A 25-year-old woman with floaters in the right eye. (**A**) The ultra-widefield fundus photograph shows a large focal granuloma along the superotemporal arcade with vitritis in the right eye. Inferior peripheral granuloma, macular striae, and small retinal membranes were identified but not clearly seen in the photograph. (**B**) The fundus photo of the left eye is unremarkable.

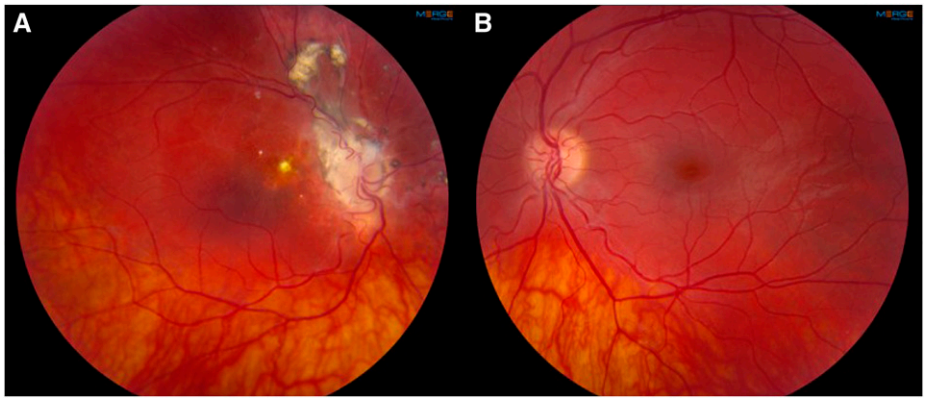

FIGURE 2. Case 2: A 22-year-old man with a history of poor vision in the right eye. (**A**) The standard-field fundus photograph shows large white-yellow, posterior pole granulomas superotemporal to the optic disc. Retinal striae from the disc to the fovea were identified but are not clearly seen in the photograph. (**B**) The fundus photo of the left eye is unremarkable.

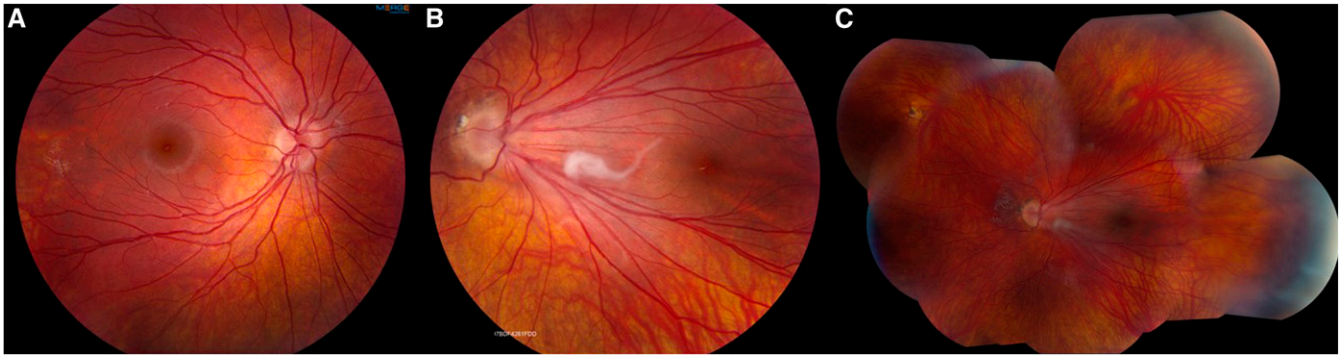

FIGURE 3. Case 3: A 5-year-old boy with blurry vision OS. (**A**) The fundus photo of the right eye is unremarkable. (**B**) The standard-field fundus photograph shows straightening of the retinal vessels, with temporal dragging of the macular in the left eye. There is a large fibrous band over the macula. (**C**) Granulomatous lesion in the far peripheral temporal retina may be appreciated in the montage.

and preventing recurrences, but current recommendations do not support the use of antihelminthic therapy in quiescent disease. Most ophthalmologists see *Toxocara*-infected patients in whom the helminth has long since expired in the choroid or subretinal space, typically in the absence of active systemic toxocariasis or VLM. For these reasons, there may be little role for antihelminthics in these patients. On the other hand, anti-inflammatory therapy is generally accepted as a part of routine treatment for *Toxocara* OLM, particularly when signs of inflammation are evident, and corticosteroids alone are used to control the intraocular inflammation.[16]

A recent survey of pediatricians has shown providers have limited awareness of toxocariasis.[17] Patients may also delay seeking medical help (cases 1 and 2). These cases highlight the need for increased awareness of human toxocariasis in areas of potentially higher risk (poverty, rural, and limited clinical care) in the American South. Increased awareness of such neglected diseases and their perhaps under-recognized

frequency will contribute to prompt diagnosis and treatment, which will ultimately improve patient health in this region.

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