A 42-year-old man experienced abrupt reduction of vision in the left eye and had vitreous opacity and hypopyon on initial examination. He underwent an emergency vitrectomy and phacoemulsification with posterior capsulectomy, followed by a 2-week course of intravenous fluconazole and antibiotics. The final visual acuity was 20/20 OS. Amoebas, together with polymorphonuclear cells, were observed on examination of specimens of the aqueous humor and vitreous fluid obtained during the surgery. *Staphylococcus epidermidis* was also cultured from the vitreous fluid. The amoebas had a crescent-shaped periphery of the cytoplasm and ambiguous nuclei. Ultrastructurally, the cytoplasm was surrounded by a thick electron-dense coating. The early vitrectomy and combined use of antibiotics and antifungals might have led to the good visual outcome in this patient.


**Endogenous Amoebic Endophthalmitis**

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Endogenous endophthalmitis, a sight-threatening disease with a rapid course, is caused by fungi or bacteria transmitted from an infectious source via the blood circulation. This is the first report of endogenous endophthalmitis caused by a non-pathogenic free-living amoeba.

A 42-year-old man noticed blurred vision in the left eye in the morning, which deteriorated to light perception by evening. He visited our emergency department after midnight. The best-corrected visual acuity was 20/15 OD and light perception in the left eye. The intraocular pressure was 12 mm Hg OD and 17 mm Hg OS. The right eye was unremarkable. The left eye showed ciliary hyperemia and had massive cells with hypopyon in the anterior chamber (Figure 1A). Fibrin membranes were deposited on the lens surface. The fundus was invisible. Ultrasonography disclosed diffuse vitreous opacity in the left eye (Figure 1B). Computed tomography of the head disclosed neither intraocular foreign body nor paranasal sinusitis. He did not have a fever. Five days earlier, the patient had experienced pain in his right molar teeth and visited a dentist. An oral antibiotic and an analgesic had been prescribed for suppuration of the teeth. He was a painter and enjoyed recreational diving in the ocean once a month.

With a diagnosis of endogenous endophthalmitis probably of fungal origin, the patient underwent an emergency phacoemulsification and vitrectomy in the left eye. For cytological examinations and culture, the aqueous humor and the vitreous fluid were aspirated with a blunt-tipped needle attached to a 1-mL syringe. After the removal of vitreous opacity, the fundus appeared normal except for white retinal lesions around the optic disc (Figure 1C). Posterior capsulectomy was made by a vitreous cutter, with preservation of the peripheral capsule for possible secondary intraocular lens implantation in the future. Vitrectomy was performed with balanced salt solution plus containing 0.1 mg/mL gentamicin sulfate and 0.2% fluconazole.

After the surgery, the patient was given a 2-week course of intravenous flucona-
zole (400 mg/d) and panipenem/betamipron (1 g/d). The retinal lesions subsided, and the visual acuity recovered to 20/20 OS with +10 diopters.

Blood tests disclosed nothing abnormal except for a moderate increase in white blood cell count to 850,000/µL (8500/µL) with 0.52 neutrophils, 0.36 lymphocytes, 0.03 eosinophils, and 0.08 monocytes. The C-reactive protein level was 0.3 mg/dL, and erythrocyte sedimentation rate was 6 mm/h. The blood glucose level was within the normal range. After a week, the white blood cell count decreased to 580,000/µL (5800/µL) and the C-reactive protein level became 0. Chest x-ray films were normal. Examinations by an internist and a urologist found no abnormalities in the gastrointestinal and urinary tracts. Abdominal ultrasonography revealed no abscess in the liver and biliary system. Severe periodontitis with caries in the left upper second and third molar teeth was diagnosed after the patient was referred to a dentist (Figure 1D). No amoebas were found in oral lavage 1 week after the surgery.

Many amoebas were found together with polymorphonuclear cells on cytological specimens of the aqueous humor and the vitreous fluid. Amoebas about 4 times as large as polymorphonuclear cells had ambiguous nuclei in the cytoplasm (Figure 2A). The periphery of the amoebic cytoplasm that stained positive with periodic acid–Schiff was crescent-shaped (Figure 2B). Sediments of the vitrectomy fluid were collected by centrifugation and observed by electron microscopy (Figure 3). Amoebas with thick electron-dense materials surrounding the cytoplasm were found together with polymorphonuclear cells. *Staphylococcus epidermidis* was isolated by a culture of the vitreous fluid. No fungi were cultured.

**COMMENT**

Cytological and ultrastructural features of organisms detected in the aqueous humor and the vitreous fluid of the patient were consistent with those of amoebas. The patient had neither keratitis nor corneal wounds, excluding the possibility of exogenous endophthalmitis. The rapid deterioration of vision and hypopyon with vitreous opacity are typical of endophthalmitis. It should be noted that a moderate increase in white blood cell count with no in-
crease in eosinophils was the only abnormal finding on blood testing.

The only infectious source from which amoebas could have derived was the oral cavity, in which severe periodontitis and caries were found. Amoebas may have been obtained from the sea water when the patient was diving. Dental procedures, severe periodontitis, and caries have been known to be a source for bacterial and fungal endophthalmitis.\textsuperscript{3,4} Amoebas such as \textit{Entamoeba gingivalis} are shown to reside in the oral cavity, especially in patients with dental and periodontal diseases.\textsuperscript{5} In this case, amoebas in the oral cavity entered the bloodstream from periodontal lesions and were transmitted to the left eye. Amoebas were not detected in the oral cavity because the dental examination occurred after a 1-week course of intravenous antibiotics and antifungals. We could not identify the species of amoeba in this patient. The most probable source of infection was \textit{E. gingivalis}, although it has not been associated with invasiveness.

Free-living amoebas are known to cause granulomatous or necrotizing lesions in the central nervous system.\textsuperscript{6,7} \textit{Acanthamoeba}, \textit{Naegleria}, \textit{Leptomyxid}, and \textit{Balamuthia} are species that have been identified in such lesions. Amoebas are found in vasculitic and perivasculitic lesions of meningoencephalitis. At a primary infectious site such as the nasal cavity, the skin, or the lung, amoebas enter the blood circulation and are rapidly transmitted throughout the central nervous system. In our patient, retinal white lesions were found around the optic disc after the removal of vitreous opacity. Amoebas traveling in the bloodstream would develop vasculitic lesions in the retina and the choroid and then extend into the vitreous fluid and the anterior chamber, leading to endophthalmitis.

In this case, \textit{S. epidermidis} was also cultured from the vitreous fluid, indicating its coinfection with amoebas. Bacterial coinfection with \textit{Acanthamoeba} species is a frequent finding in keratitis.\textsuperscript{2,8} A mixed infection

\textbf{Figure 2.} A, Vitreous sediments showing amoebas with ambiguous nuclei, about 4 times as large as polymorphonuclear cells (hematoxylin-eosin, original magnification $\times$100). B, Aqueous aspirates showing amoebas with the positive periphery, sometimes in a crescent shape. Bar=50 µm (periodic acid-Schiff, original magnification $\times$100).

\textbf{Figure 3.} Electron micrograph of vitrectomy sediments, showing an amoeba with a thick electron-dense coating, together with polymorphonuclear cells. Bar=2 µm.
of bacteria with a large number of amoebas could also have contributed to the abrupt development of endogenous endophthalmitis in this patient.

The rapid invasion of amoebas into the vitreous fluid and aqueous humor in this patient is in marked contrast with the chronic and slow-growing amoebic infection of the cornea. This may be attributable to anatomical differences in the tissues and also to the difference in routes of infection. An abrupt course is also common in amoebic meningencephalitis. It should be noted that the patient was not in an immunocompromised condition, such as with diabetes mellitus or drug abuse. Amoebic meningencephalitis can occur in healthy patients.

The patient recovered his vision after the emergency vitrectomy with irrigation containing antibiotic and antifungal agents. The white retinal lesions around the optic disc also disappeared after a 2-week course of the combined use of antibiotic and antifungal agents. In contrast with the difficulty in managing an Acanthamoeba corneal infection, this positive outcome to antifungal treatment might be attributable to the retinal vascular supply and preceding vitrectomy. Cytological examinations of the aqueous and vitreous are important in the detection of unusual causes of endogenous endophthalmitis, such as amoebas.

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