Dengue fever is a mosquito-borne infection caused by a flavivirus. I describe the ocular findings observed in two patients infected with dengue virus who presented with acute onset of loss of vision preceded by febrile illness, malaise, generalized fatigue headache, and maculopapular rash. Ophthalmologic evaluation in each patient revealed a normal anterior segment. Vitreous cells were noted in one patient. Ophthalmoscopy revealed multiple foci of retinochoroiditis, vasculitis, cotton-wool spots, and retinal hemorrhages. The healing of the lesion showed discrete atrophic and pigmented retinochoroiditic scars. Fluorescein angiography displayed early hypofluorescence and late hyperfluorescence suggestive of leakage. The healed scars showed late staining. The serologic testing showed elevated IgG antibodies, and one had high IgM antibodies to dengue virus. Ocular findings of dengue fever consist of multifocal areas of retinochoroiditis and may lead to loss of vision. In Saudi Arabia, dengue fever should be considered in the differential diagnosis of multifocal chorioretinal lesions and retinal vasculitis.
sented with a history of seeing floaters and a decrease in vision in both eyes of a 5-day duration. The ocular findings were preceded by symptoms of fever, malaise, headache, arthralgias, and skin rash 1 week earlier. On eye examination, the patient was found to have a visual acuity of 20/100 in the right eye and 20/40 in the left eye. Biomicroscopy of both eyes revealed no cells and no flare. The pupils were regular and reactive and the lens in each eye was clear. The vitreous showed minimal cells in both eyes. Ophthalmoscopy of the right eye revealed multifocal areas of chorioretinitis with retinal vasculitis, cotton-wool spots, and flame-shaped hemorrhages. The left eye showed similar findings of foci of multifocal chorioretinitis with retinal hemorrhages and retinal vasculitis (Figures 1a and 1b). The fundus fluorescein angiography showed areas of early blockage of the dye and late leakage. Laboratory investigations for syphilis, toxoplasma, rubella, brucella, rickettsia, and herpes were all made. The purified protein derivative (PPD) test was negative and chest x-ray was also negative. Renal and liver function tests were normal. The patient had leukopenia and thrombocytopenia. Serologic antibody titers for dengue virus showed high titers of IgM antibodies to dengue virus. The diagnosis of dengue chorioretinitis was made, and the patient was given oral nonsteroidal anti-inflammatory drugs for his joint pain. The patient had a complete resolution of his ocular lesions and showed areas of pigmented scars that were nummular in shape, and his visual acuity 6 weeks after the onset of disease was 20/50 in the right eye and 20/25 in the left eye.

CASE 2
A 43-year-old male from Jeddah, Saudi Arabia, pre-
sented with a history of blurring of vision of both eyes of 1-week duration. The patient gave a history of fever, malaise, generalized fatigue, and joint pain of a 2-week duration. The onset of his ocular findings occurred 1 week after the fever. On eye examination, the patient was found to have a visual acuity of 20/30 in the right eye and 20/40 in the left eye. Tension was 15 mm Hg in the right eye and 18 mm Hg in the left eye. Biomicroscopy of both eyes revealed normal eyelids and conjunctiva. The cornea was clear with no keratic precipitates. The anterior chamber showed no cells or flare. The pupils were regular and reactive, and the lens was clear in each eye. Ophthalmoscopy of both eyes showed no vitreous cells. Both eyes showed multiple foci of nummular retinochoroiditis with healed vasculitis and cystoid macular edema in the left eye. Laboratory investigations showed a normal complete blood cell count (CBC) differential and sedimentation rate. The quantiferon test was negative (4 IU/mL). The PPD was negative, and the chest x-ray and CT scan of the chest were within normal limits. Antinuclear antibodies, angiotensin converting enzyme, and rapid plasma reagin were all negative. Dengue virus IgG antibodies showed a 4-fold increase in the titer, and IgM antibodies to dengue virus were negative. The patient had thrombocytopenia. No treatment was rendered and the patient had spontaneous resolution of the retinochoroiditis with residual nummular retinochoroiditic scars in both eyes (Figures 2a and 2b). The patient’s visual acuity 2 months later was 20/20 in the right eye and 20/30 in the left eye.

DISCUSSION
Flaviviruses are icosahedral nucleocapsids surrounded by an envelope and a single-stranded, positive-polarity RNA genome. The virus measures 40 to 50 nm in diameter. There are 4 serotypes of dengue virus that cause a wide spectrum of clinical disease ranging from asymptomatic infection to dengue hemorrhagic fever. The most common clinical manifestation is dengue fever, while dengue hemorrhagic fever occurs in a minority of patients and is characterized by the leakage of plasma from blood vessels and hypotensive shock. Plasma leakage is the most serious complication of dengue infection. Dengue virus appears to infect the endothelial cells of the blood vessels and lead to change in vascular permeability. Dengue fever is endemic in the western region of Saudi Arabia. Most of the cases occur in the summer months of June, July, and August. Fever is the most common feature of the disease followed by generalized muscle aches, headaches, and vomiting. The main neurologic abnormalities are thrombocytopenia and leukopenia.

A new viral hemorrhagic form was described in Saudi Arabia. The flavivirus is referred as “Alkhurma” virus. Infection with Alkhurma virus is characterized by hepatitis with hemorrhagic manifestations and encephalitis. Twenty-five percent of patients infected with Alkhurma virus die. The disease seems to be transmitted from sheep or goats by mosquito bites or direct contact with animals. Dengue fever is caused by the same group of viruses that cause West Nile infection. The typical ocular feature of our two cases with dengue fever chorioretinitis was characterized by foci of multifocal choroiditis with retinal vasculitis involving the small vessels. The clinical findings occurred 1 week after the onset of fever just as the fever was decreasing and the platelet count was increasing. Both patients had a sudden onset of decrease in vision, and the disease was bilateral. The main clinical findings were retinal hemorrhages, sheathing of the veins, cotton-wool spots, and multiple areas of retinochoroiditis with macular edema. Vitreous cells were observed in 1 patient.

In Jeddah, there were severe climate events that led to floods and more stagnated water. Rising temperatures and changing rainfall patterns are expected to have a substantial effect on insect vectors. Aedes aegypti is more active at higher temperatures and thrives in aquatic habitats where they lay their eggs in water-filled and stagnant containers. Epidemics of mosquito-borne infections can also occur during times of drought.

The macular chorioretinitis that occurred in one of our patients led to a marked decrease in vision because of scarring. Spontaneous resolution of the chorioretinitis occurred in both patients. The retinal hemorrhages that were observed may have been due to the dengue virus infection of endothelial cells of retinal blood vessels. In addition, patients may develop plasma leakage and hemorrhages. The FasL/Fas pathway is believed to be involved in dengue virus-induced apoptosis of vascular endothelial cells. This may lead to microvascular occlusions and cotton-wool spots in the inner layers of the retina. The spread of dengue virus in Jeddah was studied by Zaki and associates. They found that 3 of the 4 dengue serotypes (DENV-1, DENV-2,
DENORS-3) were causative agents in Saudi Arabia. More than one dengue virus serotype was detected in each outbreak. In summer of 2004, all three serotypes were isolated, and the DENV-1 serotype was the cause of the outbreak in the summer of 2005 through early 2006. Khan and co-workers documented the occurrence of dengue virus infection in Makkah, Saudi Arabia. In Saudi Arabia, the clinician should consider dengue fever in the differential diagnosis of multifocal chorioretinal lesions and retinal vasculitis.

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