counting fingers three meters and 20/60 (Snellen) in the right and left eyes respectively. Clinically, her left eye was normal. Central corneal thickness measurements were 668 µm and 559 µm in the right and left eyes respectively. Confocal microscopy findings in the right eye showed needle-shaped lesions suggestive of scarring in the stroma [Fig. 3B]. Large vesicles were noted in the endothelium. The borders of the endothelial cells appeared indistinct [Fig. 3C]. The left eye showed plenty of hyperreflective dot-like lesions in the endothelium and polymegathism [Fig. 3D]. The endothelial cells could not be counted in the right eye due to indistinct cell margins while the endothelial cell density in the left eye was 1541 ± 45 cells/mm² (normal: 2218 to 4434 cells/mm²).¹

Discussion

In vivo confocal microscopy allows observations of the living human eye at a cellular level. It is based on the principle that the illumination (condenser) and observation (objective) systems are focused on a single point (have common focal points).² This eliminates out of focus information and brings a lateral resolution of 1-2 µm and an axial resolution of 5-10 µm increasing the magnification up to 600 times. Findings such as cracks, vesicles, craters have been described in general in posterior polymorphous dystrophy.³ This case series delineates the morphological features seen on confocal microscopy in each type of posterior polymorphous dystrophy.

In case 1, both eyes showed similar findings on slit-lamp and confocal microscopy examinations. The presence of vesicles and patchy hyperreflective lesions at the level of the Descemet's membrane and around the vesicles corresponded to the gu

Ocular features of hantavirus infection

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Hantavirus infections are an emerging infectious disease that is beginning to be recognized both worldwide and in India as a cause of hemorrhagic fever that may present as a pulmonary syndrome or as a renal syndrome. Reports of ocular involvement are rare and include transient myopia, low intraocular pressure, conjunctival hemorrhages and changes of intraocular dimensions.

Eleven patients (10 males, one female, mean age 37.6 years) were admitted to the intensive care unit for pyrexia of unknown origin or hemorrhagic fever following exposure to flood waters. Five male patients (mean age 31.6 years) were identified as suffering from hantavirus infection. In one patient, dot and blot intraretinal hemorrhages were seen in the macula of one eye and streak hemorrhages of the disc in the other. In the remaining four, no fundus abnormalities were seen. Ophthalmologists should be aware of these features.

Key words: Hantavirus, hemorrhages, hemorrhagic fever, ocular

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Hantavirus infections are increasingly recognized zoonoses. Hantaviruses are members of the virus family, Bunyaviridae and are enveloped, single-stranded RNA viruses. Several species have been identified worldwide including China, the Korean Peninsula, Russia (Hantaan, Puumala and Seoul viruses) and northern and western Europe (Puumala and Dobrava viruses).
The virus is rodent-borne and transmission is via aerosols of excreta, saliva and urine. Following an initial pulmonary infection, there is an initial incubation period of 10 to 14 days following which dissemination occurs that leads to an acute systemic illness characterized by bleeding and shock. The common clinical patterns include hemorrhagic fever with renal syndrome (HFRS) or hantavirus pulmonary syndrome (HPS). Hemorrhagic fever with renal syndrome is marked by sudden and extreme albuminuria, due to renal medullary damage, that may lead to renal impairment and/or failure. Hantavirus pulmonary syndrome is characterized by lung involvement that manifests as an interstitial pulmonary edema. Eventually, the patient experiences hypotension, shock and respiratory distress followed by respiratory failure. In India, hantavirus infection is beginning to be recognized as a cause of pyrexia of unknown origin (PUO) and unexplained renal failure or adult respiratory failure.

Hemorrhagic fever with renal syndrome is characterized by lung involvement that may lead to renal impairment and/or failure. Hantavirus and hantavirus pulmonary syndrome (HPS). Hemorrhagic fever with renal syndrome is marked by sudden and extreme albuminuria, due to renal medullary damage, that may lead to renal impairment and/or failure. Hantavirus pulmonary syndrome is characterized by lung involvement that manifests as an interstitial pulmonary edema. Eventually, the patient experiences hypotension, shock and respiratory distress followed by respiratory failure. In India, hantavirus infection is beginning to be recognized as a cause of pyrexia of unknown origin (PUO) and unexplained renal failure or adult respiratory distress syndrome (ARDS).

Reports of ocular involvement in hantavirus infection are rare and findings from northern European patients have described transient myopia, low intraocular pressure, conjunctival hemorrhages and changes of intraocular dimensions including shallowing of the anterior chamber and narrowing of the anterior chamber angle.

We report the systemic and ocular findings of five patients with hantavirus infection.

Case Report

Following heavy rains on July 26, 2005, several parts of the city experienced flooding forcing residents to wade through ankle-deep or in several cases, waist-deep water. Beginning two weeks later and over the next two to three days, 11 patients were admitted to the intensive care unit for PUO or hemorrhagic fever. There were 10 males and one female patient with ages ranging from 20 to 58 years (mean 37.6 years) and there was a positive history of wading through floodwaters in every case. An initial differential diagnosis of leptospirosis, dengue fever or hantavirus infection was considered and all patients underwent a complete physical, laboratory (hemoglobin estimation, complete blood count, serum bilirubin). There was a marked thrombocytopenia (mean platelet count 28,000/mm³); [normal 150,000-450,000 mm³] and a markedly abnormal coagulation profile with deranged prothrombin and partial thromboplastin times.

At this time all these patients underwent torchlight examination of the anterior segment and an indirect ophthalmoscopy of dilated fundus as part of their workup. In one patient, dot and blot intraretinal hemorrhages were seen in the macula of one eye and streak hemorrhages of the optic disc in the other (Patient 1, Table 1). In the remaining four, no fundus abnormalities were seen.

Following their recovery (five to seven days later) three of these patients (Patients 1, 2, 3) underwent a detailed ocular examination. The visual acuity was 20/20 in all eyes. There were no abnormalities seen on slit-lamp examination, dilated ophthalmoscopy or tonometry. The hemorrhages identified in Patient 1 initially were not detectable at the second examination.

Tests to detect the presence of IgM antibodies, denoting recent infection, to leptospira and dengue were negative in these patients as was a polymerase chain reaction (PCR) for the detection of leptospira from the blood.

Discussion

In this small series, the only positive findings were transient intraretinal hemorrhages, bilaterally in one patient of five (20%). We observed no anterior segment or intraocular pressure abnormalities either initially or on detailed examination. These retinal hemorrhages may be due to the induced

| Age/sex | Fundus (RE) | Fundus (LE) | Hantavirus IgM | Hantavirus IgM (repeat) |
|---------|-------------|-------------|----------------|------------------------|
| 20/M    | Macular dot/blot hemorrhages | Streak hemorrhages (disc) | Negative | 1.33 |
| 40/M    | Normal | Normal | 1.55 | 2.4 |
| 29/M    | Normal | Normal | 1.38 | 3.64 |
| 34/M    | Normal | Normal | Negative | 1.46 |
| 35/M    | Normal | Normal | 1.66 | NA* |

*NA = Not available, (Key to interpretation of IgM values: <0.9 index values are negative; 0.9 to 1.1 index values are equivocal; >1.1 index values are positive), M = Male, RE = Right eye, LE = Left eye
thrombocytopenia whose mechanism remains unclear but hantaviruses have been shown to specifically infect endothelial cells and to interact with platelet B-3 integrins. Alternatively, these hemorrhages may reflect cytopathic effects of the virus.

Several reports and case series from northern Europe describe the ocular findings in patients of hantavirus infection. Ocular lesions are seen in up to 52% of patients with common findings including transient myopia, anterior chamber angle shallowing and hypotony. Other anterior segment findings included lid edema, conjunctival injection and anterior uveitis. Retinal involvement was rare, with hemorrhages and edema being seen in only one of 37 (2.7%) patients in one series.6

The differing patterns of ocular involvement may be due to the fact that European series have described patients with nephropathia epidemica, which is a milder form of hantavirus infection due to the Puumala virus that is spread by Clethrionomys glareolus (red bank vole). This is in contrast to the hantavirus infection from South-East Asia and India which primarily involves infection with Seoul, Hantaan or Thottapalayam virii and possibly different patterns of ocular involvement. A MEDLINE search returned no reports of ocular involvement from Asia or India for us to confirm our hypothesis.

Hantavirus is an emerging infectious disease both worldwide and in India and ophthalmologists should be aware of the ocular features. A larger series will be needed to confirm any possible differences between Asian and European patient groups or to permit use of these findings to differentiate between various hemorrhagic fevers.

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Clinicopathologic correlations in eyes enucleated after uveal melanoma resection with positive surgical margins

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We identified three eyes that had undergone enucleation after transscleral resection of uveal melanoma. Two enucleated eyes with microscopically positive margins of resection exhibited no evidence of residual melanoma and these patients were alive without metastasis with at least four years’ follow-up. One eye with a transected melanoma contained residual melanoma and that patient died with metastatic melanoma to the liver three years after enucleation. There appear to be at least two general types of positive surgical margins of resection of uveal melanoma:

- microscopically positive margins
- macroscopically positive (transected) margins of resection.

**Key words:** Resection, surgical margins, uveal melanoma

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Currently, there is no evidence that indicates the superiority of any single treatment modality with regard to survival of the patient with uveal melanoma.1 Local resection may be appropriate for certain ciliary body melanomas or ciliochoroidal melanomas.2 Local resection of uveal melanoma is a technically demanding procedure with a high incidence of positive or questionable surgical margins of resection.3,4,7 The purpose of this study was to understand the implications of positive surgical margins of resection.

Case Reports

Case 1

A 79-year-old man who had a history of age-related macular degeneration was found on routine ophthalmic examination to have a minimally pigmented tumor in the ciliary body and choroid of his right eye. The patient underwent a lensectomy, cyclectomy and eye wall resection for the tumor. The resected specimen showed a 10 mm diameter X 8 mm thickness minimally pigmented ciliary body/choroidal tumor [Fig. 1].