Solar Maculopathy- An OCT Study

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Solar maculopathy is a rare form of photic retinopathy and is caused by sun-gazing without protection. Retinal damage is believed to be an effect of the photochemical changes that occur at the time of sun observation and in most cases appears to be reversible. The advent of newer diagnostic tools like the optical coherence tomography has enabled us to study such macular pathologies in detail.

We report a case of bilateral solar maculopathy. A 15 yr old female student presented 24 hrs after direct sun gazing with symptoms of blurred vision and central scotoma. The act was done as part of a religious ritual as advised by her friends. Total direct viewing time was approximately 20 min. On presentation, her visual acuity was 6/18 both eyes. Anterior segment examination was within normal limits. The intraocular pressures were normal in both eyes. Ophthalmoscopic examination revealed a bilateral yellowish-white spot in the center of the foveal region (Fig 1a,b). Rest of the fundus was normal on examination.

Optical coherence tomography (OCT) examination revealed bilateral full thickness increased reflectivity in the foveal region associated with normal central foveal thickness (Fig 2a,b). These findings were suggestive of a full thickness burn of the foveal region with photoreceptor damage. In view of the severity of the burn and poor vision in both eyes, she was treated with IV Dexamethasone 8 mg BD for 3 days.

The visual acuity improved to 6/9 in the right eye and 6/6 in the left eye by 10 days and fundus examination revealed RPE mottling in the fovea and OCT revealed almost normal foveal appearance with subtle hyporeflectivity in the involved part of the macula (Fig 3a,b).

By 1 month, the visual acuity was 6/6 in both eyes with normal OCT findings. At 12 months follow up the patient complained of persistent mild distortion of vision. The visual acuity remained 6/6 in both eyes and high definition 3D OCT examination revealed the presence of a focal defect in the IS/OS junction above...
the intact RPE suggestive of a microhole in both eyes (Fig. 4 a,b). The patient was reassured and advised periodic follow up.

**Discussion**

Solar maculopathies are rare retinal problems and are seen following direct or indirect sun gazing. Common visual complaints after an acute injury include blurred vision, central scotoma, afterimage and erythropsia. Fundus examination usually reveals a typical small yellow white foveolar lesion which may fade off after a period of 1 to 2 weeks and may be replaced by a normal looking fovea or lamellar hole. Fluorescein angiographic evaluation is usually normal but minor RPE window defects may be seen. Visual acuity is usually diminished in the range of 6/12 to 6/60 but may also be normal. Visual acuity usually recovers to 6/6 to 6/9 range over a period of 6 months.

Variability in the appearance and severity of solar maculopathy is due to the differences in exposure parameters and patients. Lengthy exposure with good fixation usually produce the most severe damage. Although solar retinopathy was initially believed to be due to retinal photoagulation, photochemical damage appears to be the predominant mechanism. Retinal temperature rise from solar observation are usually too low for thermal damage to occur. Brief solar observation during a solar eclipse is potentially dangerous due to pupillary dilatation. However even with a constricted pupil sustained solar observation for more than 90 seconds (eg; in a religious ritual or under the effect of psychotropic drugs) will exceed the threshold for photochemical retinal damage and may cause photocoagulation. These severe foveal burns may cause more visual deficit and have a poor outcome and hence conservatively managing these situations may not be prudent. Intravenous steroids are used to treat inadvertent foveal burns during retinal photoagulation. This was the rationale for steroid trial in this case where there was a alleged history of 20 minute direct exposure (possibly photocoagulating exposure). Moreover eyes with increased pigmentation are likely to have more damage due to the more light absorption at the pigmented RPE which is an additional risk in Indian eyes.

Moreover as also in this case, clear crystalline lens in young people allow a lot of scattered light in the UV-B spectrum to reach the retina and accentuate the direct damage. This indirect damage may be the cause of solar maculopathy in young people who may deny direct sun exposure. Other patient characteristics that may increase the risk of solar retinopathy include aphakia, psuedophakia with poor UV protective IOLs, larger light adapted pupil, increased body temperature from exercise, infection, fever etc. Environmental conditions like highly reflective surroundings, reduced ozone etc may predispone to the development of solar retinopathy.

One series revealed that only 47 % of patients with visual complaints after solar eclipse viewing had a discernable fundus lesion while the rest had normal fundus. OCT may therefore be a better tool to study these pathologies and explain the visual deficit. Various OCT findings have been reported depending on the intensity and frequency of sun exposure in eyes with acute solar maculopathy. The reported OCT alterations include; a reduction in the intensity of reflectiveness of the retinal pigment epithelium, intraretinal nonreflective spaces between the inner retinal layers, increased reflectiveness of the inner retinal layers and a round hyperreflective formation in the vitreous just in front of the fovea. In our case, OCT showed a full thickness increased reflectivity including the RPE confirming a severe burn. Our observation also demonstrates that OCT appears to be potentially useful in the follow-up of these conditions and may correlate to the visual outcome better than clinical examination. Though lamellar holes have been reported following solar maculopathy, the occurrence of microholes have not been reported. Microholes are focal defects in the IS/OS junction which is better defined on high definition 3D OCT. Though this patient had 6/6 vision the presence of microhole could account for the persistent visual distortion that the patient complained. Thus OCT is an invaluable tool in the follow up of these pathologies.
Though solar maculopathy is a self resolving pathology, we preferred to use steroids in view of the prolonged exposure (possibly photocoagulating exposure) and severe burn as demonstrated by a full thickness burn on OCT. It is however debatable whether steroids had any independent effect or it just hastened the natural resolution of the condition.

References