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Diagnosing Solar Retinopathy Using Optical Coherence Tomography (OCT)

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OCT is the most sensitive diagnostic tool for detecting changes due to solar retinopathy.
A 40-year-old African American female presented with a complaint of seeing an irregularly shaped structure when looking at distant surface. Other complaints include photophobia, headaches, and blurry vision at distance and at night. The patient confessed that she had stared at the sun and at red traffic lights on a regular basis for over 1 month thinking that she was getting some vitamins from this activity. Her medical history was unremarkable for any systemic condition.

Clinical findings and OCT interpretation

The patient's best-corrected visual acuity was 20/30 OD and 20/25 OS. The subjective refraction was -1.25-0.50 x 075 OD and-1.25-0.50 x 097 OS. Amsler grid testing revealed metamorphopsia and a central scotoma. The intraocular pressures by NCT were within normal limits. The anterior segment structures and vitreous were normal with slit lamp biomicroscopy. The neuroretinal rims were pink, healthy, flat, and distinct. The central macula contained a yellow spot with surrounding pigmentary changes in both eyes. Dilated retinal exam using binocular indirect ophthalmoscope and 20D lens showed normal peripheral retina. Fundus photography was performed to capture and document the macular lesions to monitor the condition (see fig 1). Spectral domain optical coherence tomography (OCT) was performed bilaterally, and the B scan results are shown in figures 2, 3, and 4.

The scan quality index is 87 in OD and 72 in OS, indicating reliable scans. Looking at the OCT B scans inferior to the fovea, an abnormal focal area of hyporeflectivity can be seen at the level of the RPE with an overlying hyperreflectivity located at the neurosensory retina. This square shaped lesion is clearer when looked at in the gray scale (figures 2 and 3) rather than the color map (fig 4) of the OCT B scans. The outer nuclear layer, the external limiting membrane, the myoid zone, the ellipsoid zone, the outer segment of the photoreceptors, the interdigitation zone and the RPE were all abnormally affected by the lesion. Considering the history of the patient and the presence of a square shaped hyporeflective area (hole) surrounded by a hyperreflective ring, a diagnosis of solar retinopathy was made.

It is important to identify anatomically the right and left eye when looking at the OCT scans. The nerve fiber layer anatomically gets thicker towards the optic nerve. Therefore, the scan in figure 2 is the

right eye because the nerve fiber layer gets thicker towards the right. Also, the scan in figure 3 is the left eye because the nerve fiber layer gets thicker towards the left.

It is also important to bear in mind the differential diagnosis of ophthalmoscopically isolated foveal disorders such as a full-thickness macular hole, an inner lamellar macular hole, a pseudohole associated with epiretinal membrane, focal geographic atrophy, limited choroidal neovascularization, a small focal area of central serous retinopathy, cystoid macular edema with a large central cyst, idiopathic juxtafoveal telangiectasia, a congenital optic pit, whiplash injuries, solitary macular cyst, welder's maculopathy, tamoxifen retinopathy, foveolar vitreomacular traction, a closed macular hole and Stargardt disease.[4] Taking a good patient history, carefully interpreting the OCT images (both the B-scan and en face images (Figures 5,6,7,8)) of the retina and knowing the unique clinical features of the conditions above make the diagnostic decision significantly easier.

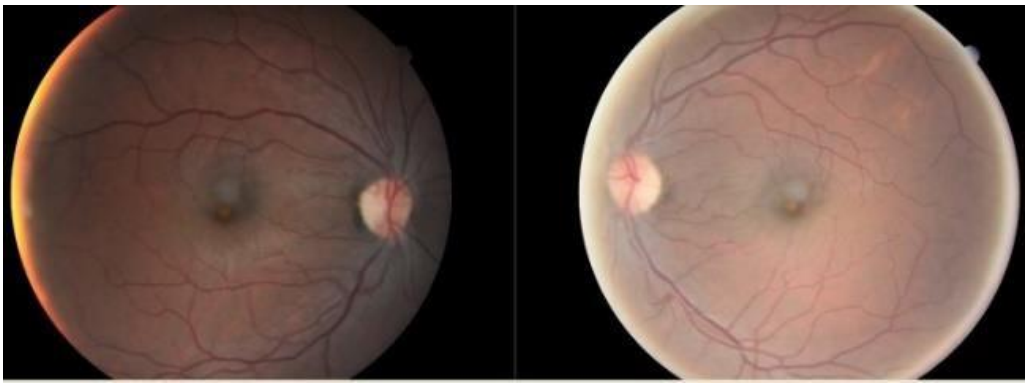

Fig 1: The above fundus photographs show the yellow spots with surrounding pigmentary changes in the macular OU due to solar retinopathy.

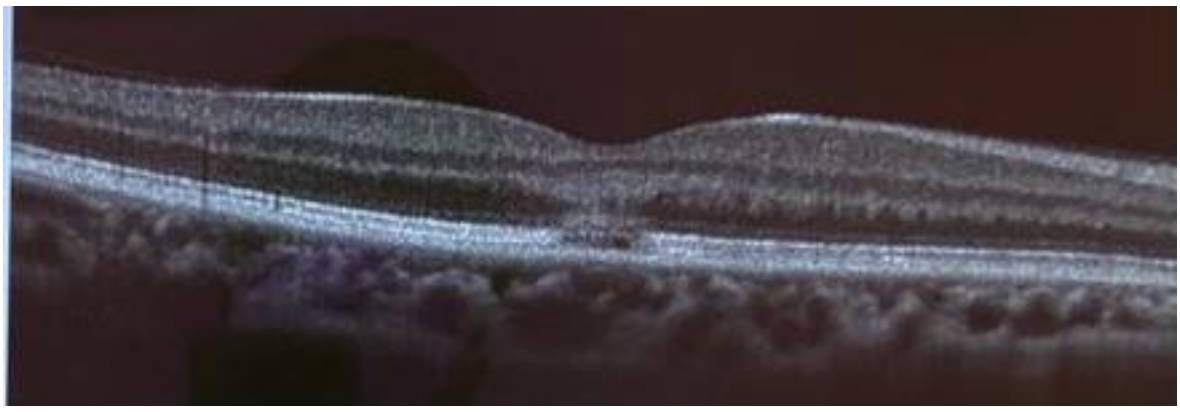

Fig 2: OCT scan showing solar retinopathy. There is focal hyporeflectivity at the level of the RPE and an overlying hyperreflectivity under the macula. This is the scan of the right eye because the nerve fiber layer gets thicker towards the right.

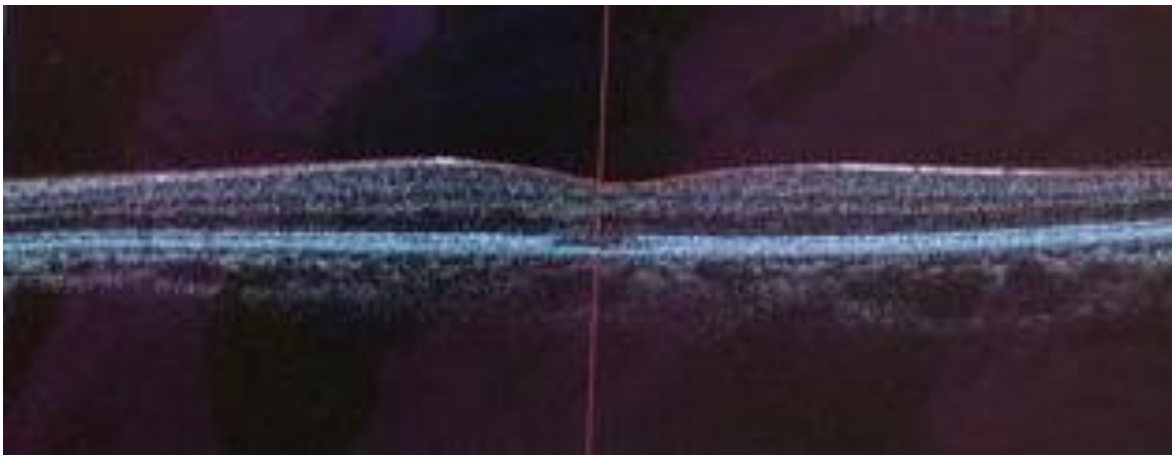

Fig 3: This is the scan of the left eye as the nerve fibers become thicker towards the left. The lesion is not as severe as in the right eye and the visual outcome is better in the left eye than in right eye as shown by the best corrected visual acuities.

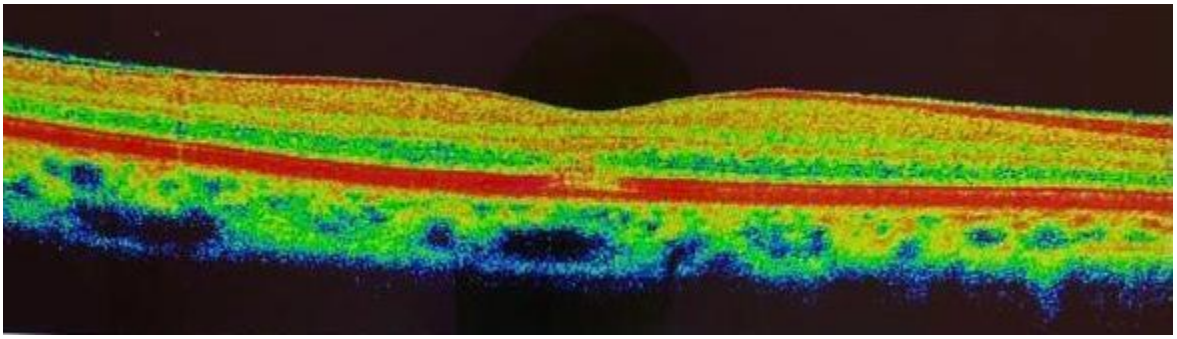

Fig 4: Color scan of OCT showing solar retinopathy.

Fig 5: OCT en face image of the RPE ref OD. The hole appears here in the outer retina. The hole is also irregular in shape.

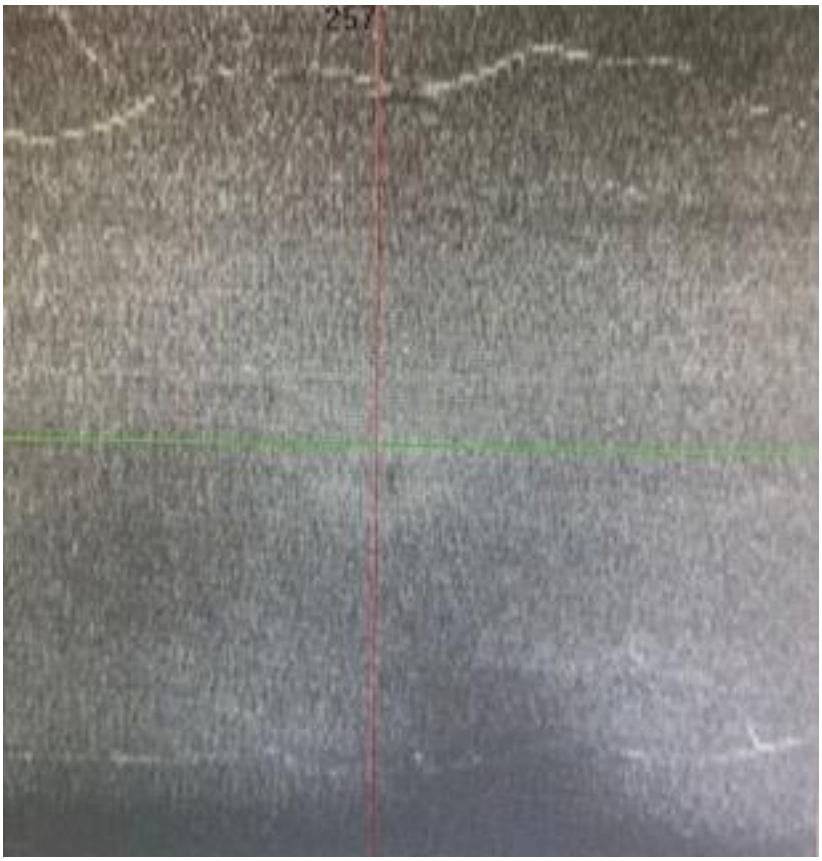

Fig 6: OCT en face image of the inner plexiform layer, OD. The hole does not appear here, showing that it is limited to the outer retina.

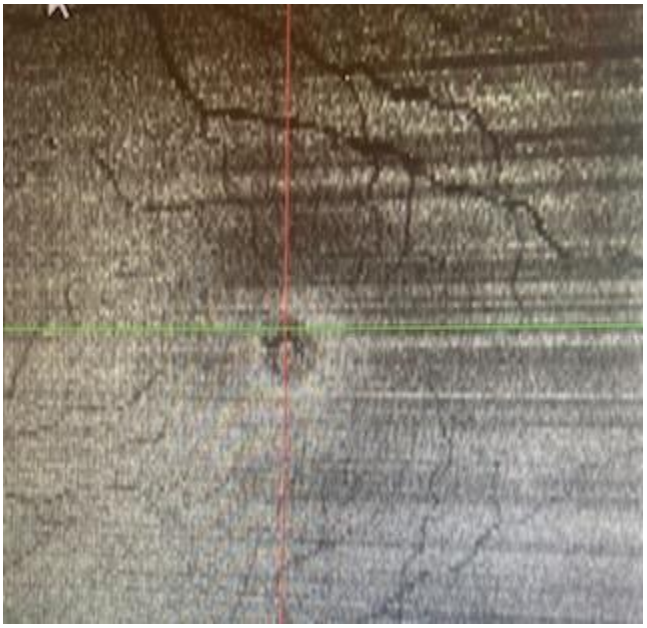

Fig 7: OCT en face image of the RPE ref OS. The hole appears here in the outer retina. The hole is also irregular in shape.

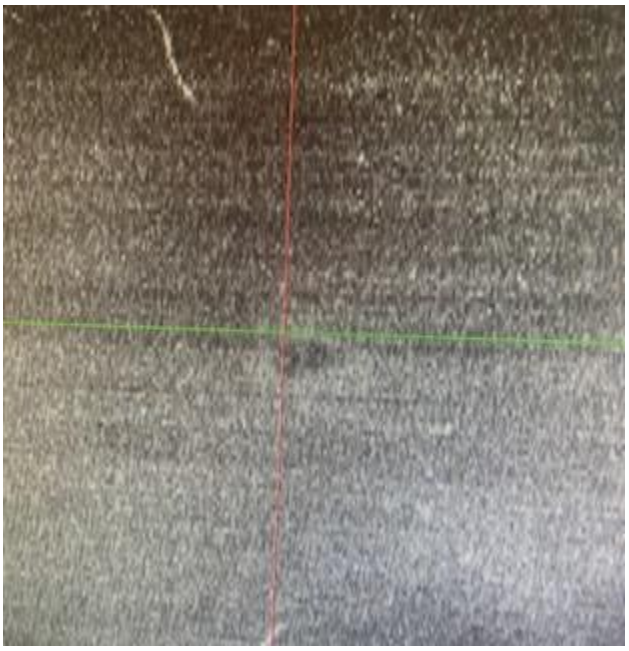

Fig 8: OCT en face image of the inner plexiform layer, OS. The hole does not appear here, showing that it is limited to the outer retina.

Treatment and Plan

There are no effective treatment guidelines for the treatment of solar retinopathy.[6] Some doctors have attempted the use of systemic steroids for the treatment of macular edema, but this treatment puts patients at a risk of developing central serous chorioretinopathy. However, this patient was counselled to refrain from staring at streetlights, sun, or bright lights. Photochromic polycarbonate lenses were prescribed for this patient. The patient was educated on the possibility of the vision improving without treatment. However, she was referred to a retinal specialist for possible treatment.

Discussion

Solar retinopathy, which is also known as photic or eclipse retinopathy, is a retinal injury that results from exposure to solar radiation. Looking directly or indirectly at the sun or engaging in prolonged outdoor activities without protective goggles can lead to solar retinopathy. Studies have shown that prolonged exposure to light from operating microscope during ophthalmic surgery just like arc welding, can result in solar retinopathy.[1] Solar retinopathy occurs via a photo-oxidative pathway rather than by direct thermal injury.[1] From histopathology, both the RPE and the outer segment of the photoreceptors are noted to be the most susceptible to damage. This damage leads to a decrease in the visual acuity**.** OCT is the most sensitive diagnostic tool for detecting changes due to solar retinopathy.[1] It is important for all patients who engage in prolonged outdoor activities have a yearly OCT scan to capture early signs of solar retinopathy. The decreased visual acuity resulting from solar retinopathy in some cases can self-resolve in less than 1 year depending on the degree of the retinopathy and the initial loss of vision. Even with an improvement in visual acuity, residual scotomas and metamorphopsia may persist.

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