A 12-Year-Old Male with Visual Blurring and Distortion in Both Eyes

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Introduction:

A 12-year-old male presented to the The Retina Institute complaining of visual blurring and distortion in both eyes following an episode of sun-gazing three days prior. His past medical history was unremarkable and he denies any prior episodes in which he engaged in this behavior.

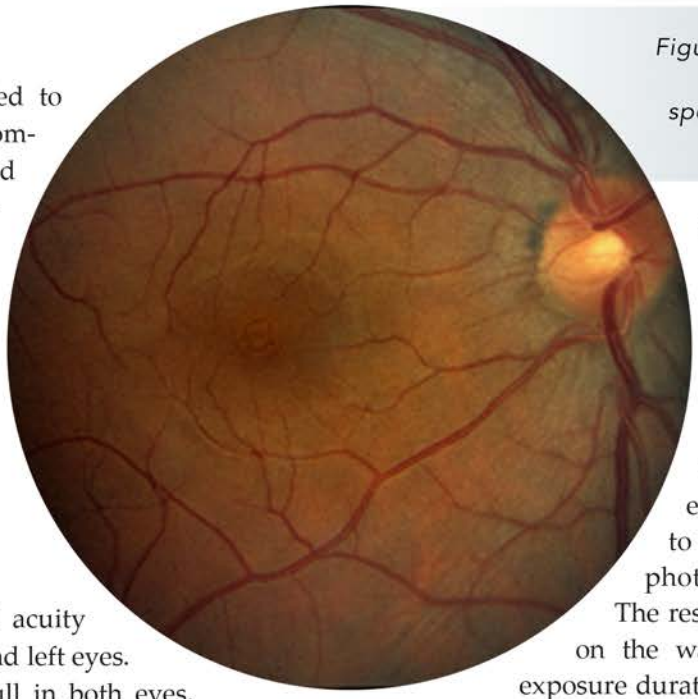
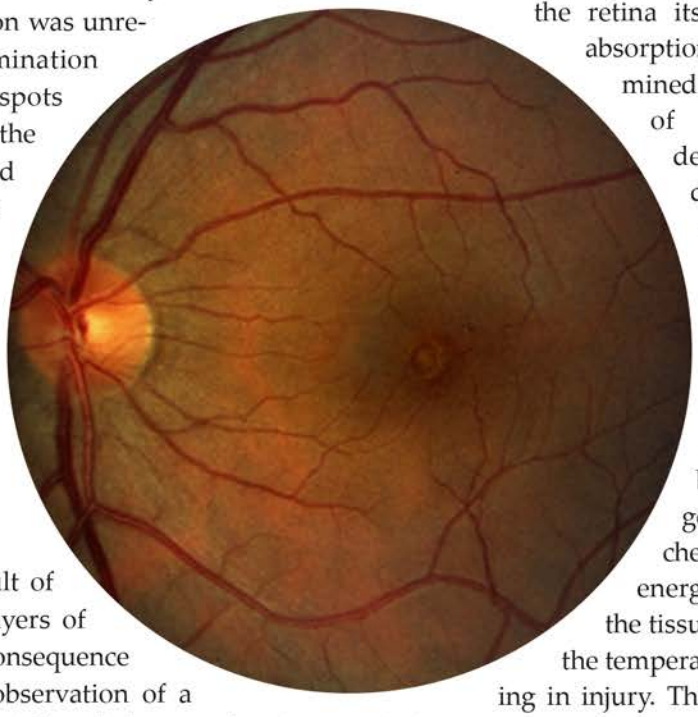


Figure 1: Fundus examination revealed bilateral yellow spots with granular stippling in the fovea.

Exam:

On exam, corrected visual acuity was 20/40 in both the right and left eyes. Confrontation fields were full in both eyes. Anterior chamber examination was unremarkable. Fundus examination revealed bilateral yellow spots with granular stippling in the fovea (Figure 1). OCT revealed outer retinal disruption in the fovea (Figure 2). A presumed diagnosis of solar retinopathy was made and proper sun protection was discussed with the patient and family.



Discussion:

Solar retinopathy is the result of phototoxicity to the outer layers of the retina and occurs as a consequence of sun-gazing or of direct observation of a solar eclipse. Solar ultraviolet light results in photochemical, mechanical, and thermal damage to the macula and specifically to the outer segments of photoreceptors and retinal pigment epithelium[1,2]. It is believed that RPE melanosomes absorb light energy and this in turn leads to secondary damage of the photoreceptor outer segments. The responsible effect is dependent on the wavelength of light and the exposure duration. As light is deposited on the retina its penetration through, and absorption by various tissues is determined by its wavelength. The effect of absorbed light energy depends on the rate of energy deposition which is correlated with exposure duration. If the rate of energy deposition is too low to produce an increase in temperature, than any damage that results is a consequence of oxidative reactions induced by the absorption of energetic photons[2]. This is photochemical damage. If the rate of energy deposition is faster than the tissue can thermally diffuse, then the temperature of the tissue rises resulting in injury. This is thermal damage. If the light energy is deposited faster than mechanical

relaxation can occur, then a thermoelastic pressure wave is induced resulting in mechanical damage.

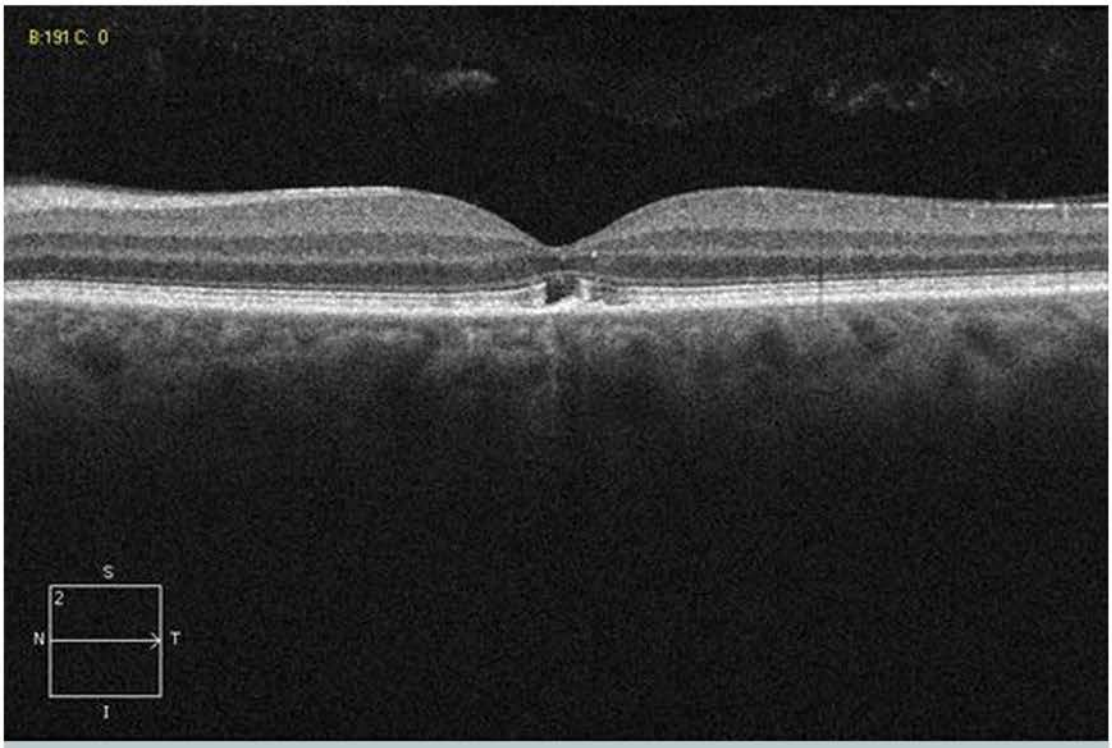


Figure 2: OCT revealed outer retinal disruption in the fovea.

Acute cases of solar retinopathy typically appear as a yellow or reddish, well demarcated, foveal or juxtafoveal 100-200 micron spot with a ring of granular gray pigmentation at the level of the outer retina, approximately two weeks after the inciting event[3]. This lesion will usually become fainter over time. Symptoms are varied depending on the degree of severity and the location of damage but typically include metamorphopsia, photophobia, and chromatopsia. Vision can be mildly reduced or severely affected to the level of finger counting. Solar retinopathy is usually bilateral, although asymmetric manifestations have been described[4]. Although in most cases improvement is spontaneous long standing visual disturbances can persist. Solar retinopathy increases in incidence during episodes of astronomical significance including solar eclipse. It is also seen in some religious practices as well as in psychiatric patients particularly schizophrenics. However, occasionally no direct history of sun-gazing can be recalled in a patient providing a reliable history as was seen in Brue et al. In that situation an emmetropic lightly pigmented younger women was walking on a sunny day at a high elevation and could not recall any sun-gazing[5]. It is possible that her increased body temperature induced a mydriatic effect and the light pigmentation and high altitude led to the classic findings of solar retinopathy.

Defects of the IS/OS junction using optical coherence tomography are classically observed in acute, symptomatic cases. These appear as hypo reflective defects with straight edges extending from the RPE to the external limiting membrane. Other OCT findings have been reported as well including foveal hyper reflectivity and decreased RPE reflectivity[6,7]. As the differential diagnosis for outer retinal defects is broad and can include diseases as diverse as alkyl nitrite abuse and early Stargardt's disease an accurate history is essential to arriving at the correct diagnosis. Imaging of the choroid using SD-OCT has in some cases demonstrated an expansion of choroidal thickness suggesting damage may not be solely limited to outer retinal layers. Fluorescein angiography may show small, punctate hyper fluorescent window defects however this findings is not as common as the outer retinal defects seen on OCT. Fundus autofluorescence is another imaging tool that may demonstrate hypo autofluorescence with a hyper autofluorescent ring corresponding to the defect seen on OCT. Solar radiation interrupts normal outer segment processing leading to the accumulation of outer segments in the outer retina and subretinal space. This material is visible on SD-OCT and is autofluorescent leading to the characteristic FAF findings.

Conclusion:

Our patient was successfully observed and regained 20/20 vision in both eyes. Sun-gazing can result in damage to outer retinal layers that may impair vision temporarily or permanently. Proper sun protection is advised particularly around times of solar eclipse.

References

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