Case Report of Solar Retinopathy Related to Partial Solar Eclipse

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ABSTRACT

In this case report, we reported a patient with solar retinopathy due to direct look to the sun beam without using any protective equipment during a solar eclipse.

The clinical presentation, fundus imaging, perimetry, optical coherence tomography (OCT), fundus autofluorescence (FAF), fundus fluorescence angiography (FFA) findings and follow-up period were evaluated in an 11-years old female patient who had a retinal tissue defect caused by exposure to sunlight with the naked eye. The complications of the disease depend on the duration of exposure to harmful rays and are usually benign.

Keywords: Angiography, Autofluorescence, Optical coherence tomography, Solar eclipse, Solar Retinopathy.

INTRODUCTION

Solar retinopathy is a retinal disorder resulting from direct exposure to harmful sun beam without using protective equipment. Generally, first sign is decreased vision in both eyes. The loss in visual acuity is directly correlated with duration of exposure to harmful beam[1].

It has been proposed that retinal damage due to toxic beam develops through three distinct mechanisms. First is mechanic injury, which is tissue damage occurring as a result of acoustic shock wave due to power of light absorbed together with vapor pressure of gas and water. In the second mechanism, tissue damage develops as a result of protein denaturation due to heat in the tissues (sensory retina and choroid) adjacent to retinal pigment epithelium (RPE). In the third mechanism, it is proposed that the tissue damage results from oxidation of free radicals formed in connective tissue through chemical reactions independent from heat[2].

In the solar retinopathy, yellow-to-white, granular pigmentation are seen at early stage. Again, other findings include photophobia, central scotoma, metamorphopsia, chromatopsia, dyschromatopsia and headache. At late phase, it is characterized by typical hypo-reflective defect in outer retinal layer in OCT[3]. Here, we discussed clinical presentation and follow-up as well as OCT, FAF, FFA and perimetry findings in a patient presented with decreased vision in both eyes during early phase.

CASE

An 11-years old girl presented with decreased vision in both eyes at October 27, 2022 after exposure to sun beam for 10-15 minutes without using protective equipment during solar eclipse at October 25, 2022. In her history, there was no systemic or ocular disease. In ophthalmological examination, visual acuity was found as 7/10 in the right and left eyes with normal color vision; there was no keratometric refractive error. Ocular movements were free in all directions and relative afferent pupillary defect was negative. Intraocular pressure was measured as 13 mmHg in the right eye and 15 mmHg in the left eye. Anterior segment examination was normal. In dilated fundus examination, bilateral foveal reflection was decreased and there was tiny juxtafoveal lesions. On spectral-domain optical coherence tomography (SD-OCT), foveal margins

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were spared and there was a rod-like hyper-reflectivity extending to inner retinal layer from outer segments of RPE with two-sided interruption of IS/OS junction. There was bilateral hyper-autofluorescence in fovea on FAF while there was no abnormal finding on FFA (Figures 1-2). The patient was scheduled for control visit one month later and no treatment was given. In the control visit, visual acuity was 10/10 in both eyes. Anterior segment and dilated fundus examination was normal. It was seen that OCT and perimetry findings returned normal (Figures 3-4).

DISCUSSION

Solar retinopathy is a maculopathy where a retinal defect developed due to photochemical and thermal mechanisms related to direct exposure to sun beam[4]. The severity of tissue injury depends on duration of exposure, intensity of light, media opacity, environmental factors and body temperature. In general, it is bilateral but it may also be asymmetrical[5]. Women are more vulnerable to solar retinopathy when compared to men[6]. Young adults are affected more commonly. This is due to transfer of high-energy ultraviolet B (UV-B) beam to retina by crystallized lens[7].

In this case report, the younger, female patient had potential higher risk in agreement with literature. Given that the differences in education level, seasonal variations and sun beam angle across regions in Turkey, it is thought that solar retinopathy incidence may vary across regions. In Turkey, there is no study on solar retinopathy frequency in geographic regions. In the literature, there is also limited number of studies about genetic predisposition to solar retinopathy.

In a study by Atmaca et al., it was reported that clinical recovery was rapid in the patients with visual acuity ≥2/10 at early stage. Authors reported that recovery was rapid between weeks 2 and 4 after exposure[8]. Decreased visual acuity may persist at long-term due to retinal degeneration and atrophy[5]. In our case, visual acuity was 10/10 in both eyes on week 4. In addition, it should be emphasized that OCT findings were also recovered rapidly.

In conclusion, prevention is the major issue in the solar

Figure 1: *Findings at presentation. Right eye a1; right eye fundus image, b1; right eye OCT, c1; right eye FAF, d1; right eye FFA*

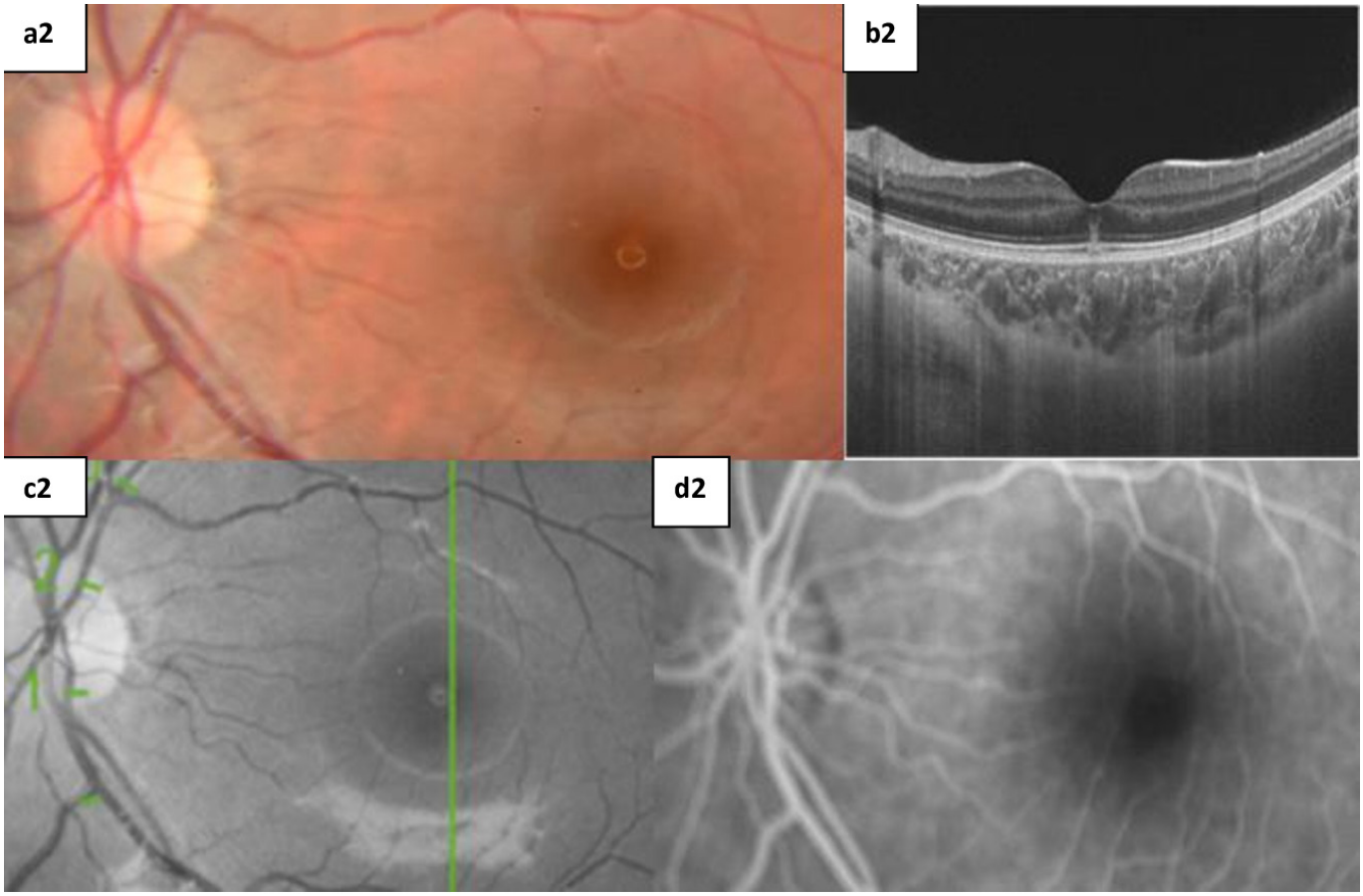

Figure 2: *Findings at presentation. Left eye ; a2; left eye fundus image, b2; left eye OCT, c2; left eye FAF, d2; left eye FFA*

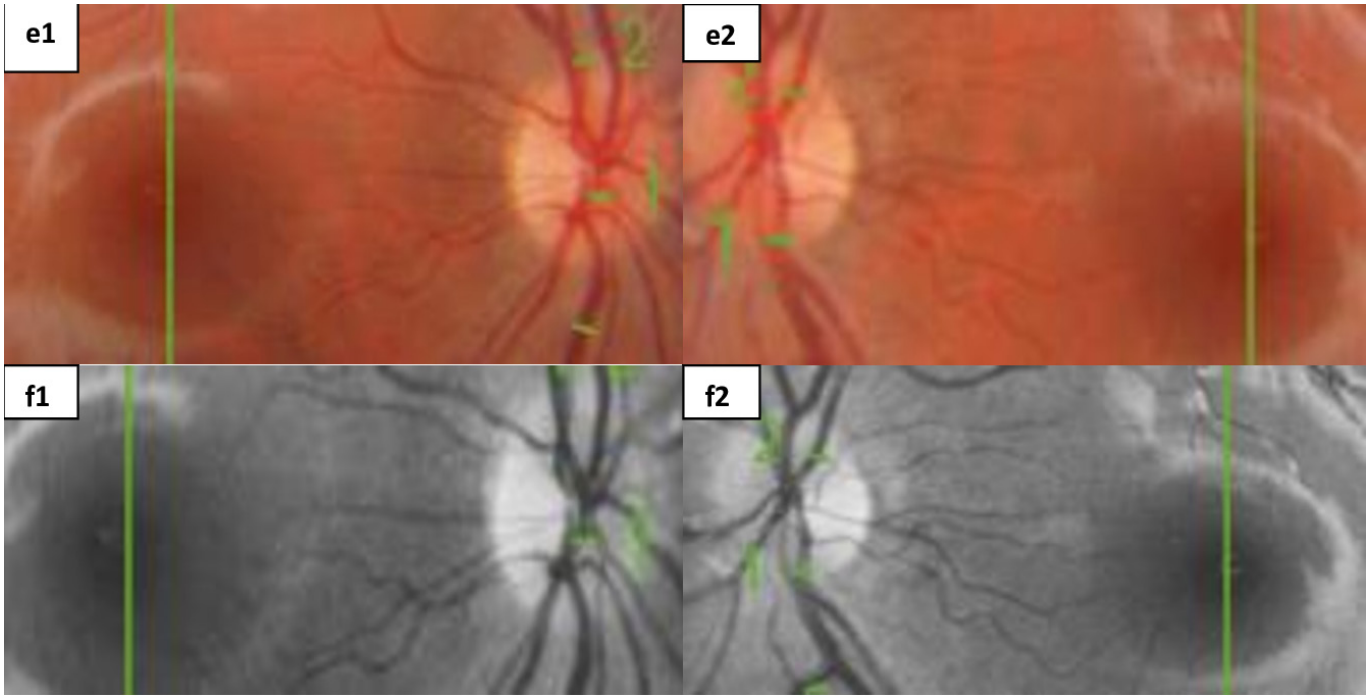

Figure 3: *Findings on month 1: e1; right eye fundus image, e2; left eye fundus image, f1; right eye FAF, f2; left eye FAF*

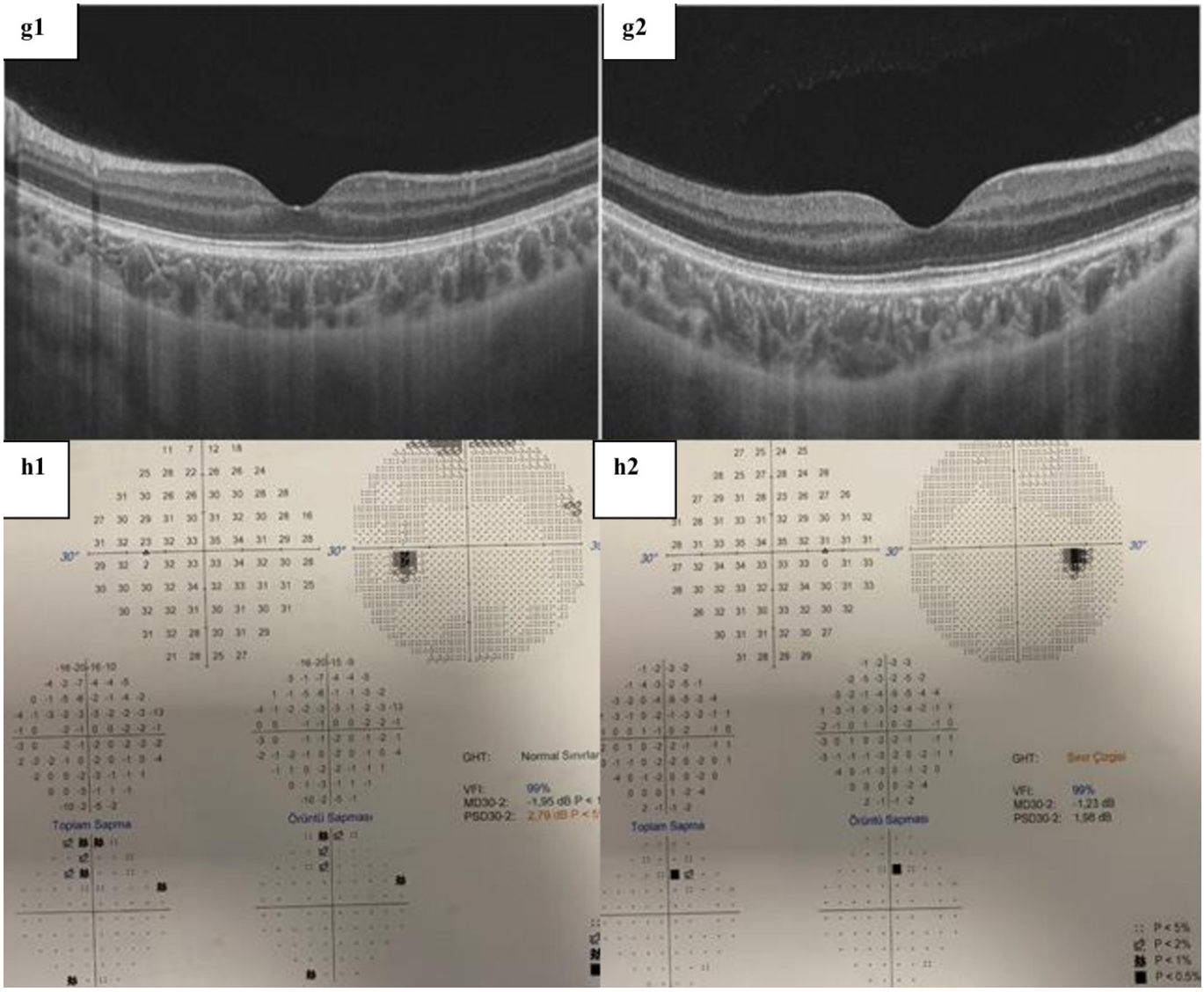

Figure 4: *Findings on month 1: g1; right eye OCT, g2; left eye OCT, h1; right eye perimetry, h2; left eye perimetry*

retinopathy. It is needed to avoid direct exposure to sun beam, use of protective equipment and provide educations in schools. In addition to clinical findings, OCT, perimetry and FAF are important to determine localization and extent of lesion and monitor photoreceptor injury and chronic sequels.

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