ABSTRACT

Case report: Ocular examinations and optical coherence tomography (OCT) were performed in three patients with retinal phototoxicity lesions. Fluorescein angiography depicted a window defect. OCT exhibited hyporeflectivity at the outer foveal retina and fragmentation of the inner reflective layers, corresponding to the junction between the inner and outer photoreceptor segments.

Discussion: Retinal damage after light exposure has a rapid onset and shows different patterns in OCT examination. OCT findings suggest that decreased visual acuity may be associated with full-thickness photoreceptors and retinal pigment epithelium (RPE) involvement. OCT is a useful tool for objective assessment of retinal pathology in phototoxicity cases where fundus changes may be minimal or absent (Arch Soc Esp Oftalmol 2008; 83: 267-272).

Key words: Phototoxicity, solar retinopathy, solar eclipse, foveomacular retinitis, Optical coherence tomography, microscope light.

RESUMEN

Caso clínico: Se realiza una exploración ocular y tomografía de coherencia óptica (OCT) en tres pacientes con lesiones fototóxicas retinianas. Las angiografías fluoresceínicas muestran un defecto ventana. La OCT muestra hiporreflectividad en la porción externa de la fóvea y fragmentación de las capas más internas entre la porción interna de los fotorreceptores y los segmentos externos.

Discusión: Las lesiones retinianas tras exposición a la luz aparecen precozmente mostrando diferentes patrones en la OCT. La OCT sugiere que la disminución de visión asocia una lesión de fotorreceptores y epitelio pigmentario retiniano (EPR). La OCT es útil para objetivar la retinopatía fototóxica donde los cambios oftalmoscópicos pueden estar ausentes o ser mínimos.

Palabras clave: Fototoxicidad, retinopatía solar, eclipse solar, retinitis foveomacular, tomografía de coherencia óptica, luz del microscopio.
INTRODUCTION

Phototoxic maculopathy (PM) is a retinal alteration which appears in patients whose fovea has been exposed for a long time to an intense light source. It generally affects patients after watching a solar eclipse without protection. Many exhibit psychological problems, consume drugs (LSD) or are involved in mystic practices. In addition, similar injuries have been described after watching welding arcs without a protection mask, laser pointers or even after ocular surgery due to a photochemical reaction in light receptors. These patients may notice a pericentral scotoma, metamorphopsia or slight/moderate vision loss between 1 and 4 hours after exposure. The ophthalmoscopy shows a small yellow foveal lesion in the form of an exudate or edema, followed about two weeks later by foveal reflex loss, formation of pigment accumulation and thinning of the fovea. The scotoma may diminish after a few months and the patient usually recovers part of the lost eyesight (1,2). At present, with Optical Coherence Tomography (OCT) we are able to describe the damages at the intra-retinal level because, in a high number of cases, the retinal lesions cannot be observed ophthalmoscopically.

CASE REPORT

Case 1

A 60 year-old woman who visited the service due to blurred vision and feeling a central spot in both eyes. She referred having observed a sun eclipse two months earlier. Upon exploration, her visual acuity (VA) was of 0.5 in both eyes, with the intraocular pressure and anterior segment normal. Both maculas showed rounded hypo- and hyper-pigmented lesions (fig. 1 A and B). OCT exhibited a loss in the retinal pigmentary epithelium layer (RPE). The rest of retinal layers did not exhibit alterations (fig. 1 C and D). Fluorescein angiography (FA) showed early hyper-fluorescent areas in the ring (fig. 1 E).

Case 2

Male, 39 years intervened for pterygium in the right eye (RE) on two occasions in the past 6 months, with an approximate duration of 1.5 hours for each surgery. Prior to the intervention, the patient’s VA was of 1 in both eyes and the anterior and posterior segment were normal. In the latest checkup, the patient complained of VA reduction in RE which made it difficult to read plus metamorphopsia. VA was of 0.4 in RE and 1 in LE. The eye fundus exhibited a hypo-pigmented rounded lesion in the macular area (fig. 2 A). FA showed a hyper-fluorescent area of early appearance (fig. 2 B). The OCT revealed a detachment of the RPE (fig. 2 C).

Case 3

Male, 55 years of age, diagnosed with nuclear cataracts in both eyes and intervened in RE for phacoemulsification plus intraocular lens two months earlier. After sunbathing (he admitted falling asleep for one hour) he noticed a reduction of VA in the RE. The macula showed a yellowish lesion (fig. 2 D). The OCT revealed a thickening of the retinal layers, RPE rupture and slight serous retina detachment, with a hyper-reflective signal at the macular level (fig. 2 E). No retinal damages appeared in the LE.

DISCUSSION

PM is the result of a photochemical and thermal lesion of the retina due to ultraviolet radiation, either from sunlight or a microscope, characterized by affecting the outermost retinal layers. It is related to the intensity, exposure time and wavelength of the light source, with blue and UV light (wavelength below 300-350 nm) being the most damaging for the eye (3-5). At the clinical level, it is characterized by a yellowish lesion at the foveal level, a window defect in FA and a central or para-central scotoma which diminishes with time. The initial yellowish lesions are subsequently replaced by a dotting of the RPE or even a lamellar hole. Histologically, the acute phase of the lesion shows damages in the RPE with detachment, necrosis, irregular pigmentation and changes in light receptors (1,2). Patients with transparent, aphakic, emmetrope and low hypermetrope eyes seem to be at greater risk of developing PM due to an increased capacity to concentrate light on the retina and macula.

It is important to emphasize that in 50% of cases the foveal lesion cannot be identified at the opht-
halmoscopic level even though clinical signs are expressed. In these cases, OCT is of great help for revealing subtle changes where conventional techniques such as ophthalmoscopy and FA do no assist in defining in vivo damages. OCT shows a hyper-reflective area which generally affects all the foveal layers without appreciating underlying edema and with the macula maintaining a normal contour. The size and location of the lesion revealed by OCT can be related to funduscopic vision. On other occasions, the innermost layers are whole and it is possible to see RPE disruption under the fovea, suggestive of a lamellar hole (1,2). However, the structural alterations detected by OCT in the macula are not the same in all eyes or in all the papers found in literature (1,2,4). Therefore, there must be external factors such as the intensity and duration of exposure and individual factors to account for the lesions. Perhaps the only constant finding described in the literature is the focal loss of RPE and hypo-reflectiveness of the internal retina layers.

Bechmann et al (2) pointed out that the hyper-reflective retinal alterations appear early after exposure to sunlight and disappear during the first month with the exception of the RPE. In our two solar maculopathy cases, this defect endured up to one year later and, in the case of the RPE detachment of patient #2, it remained unchanged. In all, VA remained the same since the first visit. Other pathologies such as chorioretinopathy could yield similar images in eye fundus exploration, but in

Fig. 1: A and B: RE and LE retinography showing a scarred solar retinopathy characterized by hyper-pigmented areas surrounded by a hypo-pigmented halo. C and D: RE and LE OCT showing local cell loss in the RPE layer. E: LE FA showing a window defect at the foveal level, with the same findings in the RE.
these cases they would not match the classical chimney smoke images or inkspots revealed by fluorescein angiography. In addition, there are no signs of sub-retinal neovascularization or RPE rupture, where we would see two clearly differentiated areas with a well-defined line corresponding to the edge of the retracted RPE. We also excluded infections due to the absence of vitritis, retinitis or choroiditis and because the lesion remained stable through time. In the second case a differential diagnostic was established with adult vitelliform foveomacular dystrophy, but in our patient the presentation was not bilateral and the OCT did not show deposits of material between the RPE and Bruch’s membrane in the form of a hyper-reflective strip.

The visual prognosis for solar retinopathy is generally positive, with spontaneous VA improvement. Accordingly, the use of corticoids has been questioned, although education of the general public, prevention and prophylaxis in surgical acts such as using the lowest possible light intensity, placing opaque elements in the pupillar area, indirect oblique lighting or use of filters in anterior segment interventions are crucial for preventing said damages.

By way of conclusion, OCT can be a useful tool for verifying, characterizing and following up retinal damages as described above, where sometimes the eye fundus changes may be absent or negligible. OCT findings suggest that vision reduction is associated to the damages in photoreceptors and the RPE.

Fig. 2: A: Rounded and under-pigmented lesion in the macular area. B: Hyper-fluorescent areas of early appearance. C: RPE detachment sustained through time. D: Rounded and under-pigmented lesion in the macular area. E: RPE rupture and hypo-reflectiveness of external layers representing a slight serous retina detachment.
REFERENCES