IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 7 Ver. III (July. 2016), PP 48-51
www.iosrjournals.org

Photic Retinopathy –Role of Optical Coherence Tomography (OCT).

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Abstract
Objective: *To evaluated the role of OCT in the definitive diagnosis of photic retinopathy.*
Materials and methods: *41 eyes of 27 patients evaluated at Aravind Eye hospital, Pondicherry the with a diagnosis of solar retinopathy between 2007 and 2010 were included. A detailed history regarding watching solar eclipse, welding work and sungazing was noted. Examination of all the patients was carried out which included recording of duration of exposure, protective device used, if any, subjective symptoms, visual acuity (Snellens chart), fundus examination, refraction and OCT. OCT findings were analysed by two senior retina consultants.*
Results: *Of 27 patients, 63% (17) were male, 37%(10) were female , age group ranged from 14 year to 63 years. 81% patients' fundus showed red dot like lesion. Patients with larger outer retinal defect diameter showed a poorer visual acuity.*
Conclusion: *In pantients presenting with the history of watching solar eclipse OCT helps to diagnose , document and prognosis, in patient without the history of watching solar retinopathy OCT helps to diagnose the solar retinopathy by its peculiar appearance.*
Keywords: *Solar retinopathy , OCT, Photic retinopathy.*

I. Introduction

Photic retinopathy is a manifestation of a solar eclipse, sunbathing and welding work. Visual deterioration caused by watching a solar eclipse has been recognised since the time of Plato.[1] Photic retinopathy results from toxic free radical production that overcome the normal defence mechanism.[2] Common visual symptoms include decreased visual acuity, central scotomas, metamorphopsia, micropsia, and dyschromatopsia.[3] Visual acuity may range from normal to 20/100.[2] A central yellow spot or red foveal lesion may be evident in the first few days after injury. Several weeks later, this yellow lesion fades, and a sharply defined foveal defect with irregular borders may be visible. Traditionally, diagnosis has depended on history and funduscopic appearance. Although diagnosis may be straightforward in patients who describe acute loss of vision following prolonged sun exposure, patients who present months to years later may present more of a diagnostic challenge. Fluorescein angiography typically appears normal, but a small retinal pigment epithelial (retinal pigment epithelium) defect is occasionally present. We evaluated the role of OCT in the definitive diagnosis of photic retinopathy.

II. Materials and Methods

Institutional review board approval for the study was obtained. 41 eyes of 27 patients evaluated at Aravind Eye hospital, Pondicherry the with a diagnosis of solar retinopathy between 2007 and 2010. A detailed history regarding watching solar eclipse, welding work and sunbathing was noted. Examination of all the patients was carried out which included recording of duration of exposure, protective device used, if any, subjective symptoms, visual acuity, fundus examination, refraction and OCT(strautus). OCT findings were analysed by two senior retina consultants. The diameter of the outer retinal defect noted at the photoreceptor layer was measured by callipers in the retinal thickness analysis protocol of the Stratus OCT. The scan with the maximum diameter was noted. This was done by a senior retina consultant. Spearman's rank correlation is used to find the association between vision and size of the defect present at junction of inner and outer 3 segment of photoreceptors

III. Results

Of 27 patients ,63(17)% were male,37(10)%were female , age group ranged from 14 year to 63year.81% patients fundus showed red dot like lesion . Among 27 patients, 37% (10)had history of watching solar eclipse, 14.8% (4) gave history of welding work, 44.4%(12) didn't give any significant history contributing above mentioned fundus

findings. Of 41 eyes, 70% (29) eyes had vision ≤6/9, 30% had 6/6 vision. We have evaluated the correlation between vision and size of the defect present at junction of inner and outer 3 segment of photoreceptors. . Spearman's rank correlation is used to find the association between vision and size of the defect present at junction of inner and outer 3 segment of photoreceptors. A negative correlation was observed between vision and OCT defect. The decrease in vision and increase in defect in OCT can be explained 28% of times (r= -0.280).

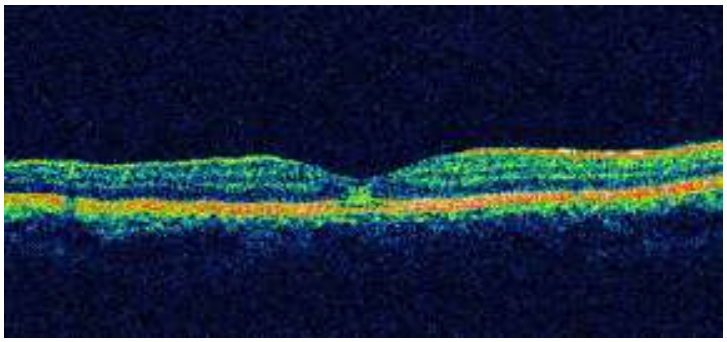

Fig 1 shows break in inner and outer segment of photoreceptor, with disruption of surrounding retinal tissue.

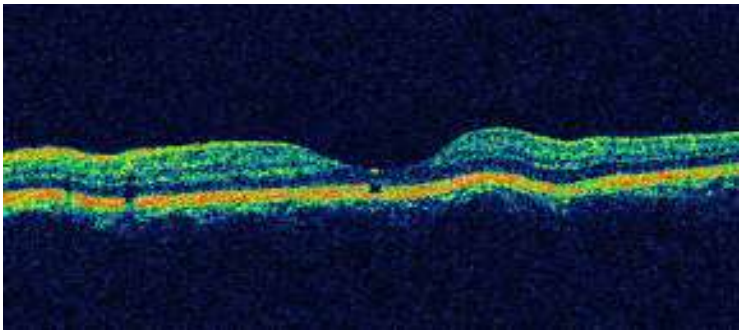

Fig 2 shows well defined area of break at the junction of inner and outer segment of photoreceptor without disruption of surrounding retinal tissue

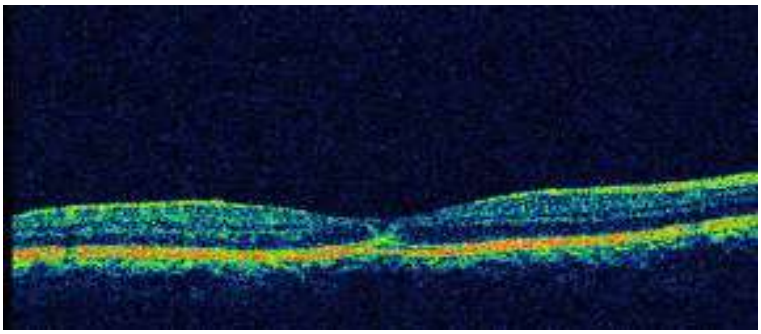

Fig 3a shows irregular border at the junction of inner and outer segment of photoreceptor

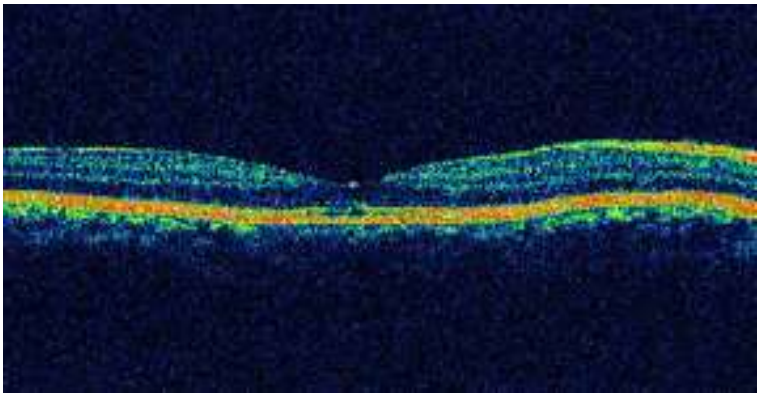

Fig 3b shows regular border at the junction of inner and outer segment of photoreceptor

IV. Discussion

Photic retinopathy generally occurs in patients who have viewed an eclipse, have gazed directly at the sun, or have been subjected to a form of accidental or experimental intense light.[4] Light causes damage to retina by following mechanisms: photochemical, photomechanical, and photothermal.[5] Examination of the macula in an acute phase of more severe cases of solar retinopathy, the so-called eclipse burn reveals a solitary or less commonly, multiple yellowish-grey spots at or near the foveola .These lesions may be enveloped completely or incompletely by a faint grey annulus. By approximately 2 weeks after sungazing, the initial moderate to severe lesion is replaced by a 25 to 75 ,u-sized, oval-shaped, reddish, sharply but irregular demarcated outer lamellar defect in the foveola, or more commonly in the juxtrafoveolar area. The excavated appearance, presumably from outer retinal shrinkage, can be seen clinically with the slit-lamp biomicroscope. It may be surrounded partially and irregularly by some greyish mottling to the pigment epithelium. The crust or apparent macular hole becomes clinically more evident as the acute manifestations resolve.[6] More the duration of visualisation, more the damage.[7] Shorter duration of visualisation mostly results in macular edema. But duration more than 2 minutes resulted in macular burn. If the duration of observation appears to be the main risk factor in terms of severity, it should emphasize the concept of individual susceptibility, which will depend on many parameters such as age, the transparency of the media, aphakia, emmetropia or low hyperopia, the pupil diameter, elevation of body temperature and skin pigmentation.[8,9]

Rodrigo Jorge described three patterns of Optical coherence tomography abnormalities in 4 patients 1) optically clear spaces within the entire photoreceptor reflective band 2) optically clear spaces at the level of the reflective band corresponding to photoreceptor outer segments with maintenance of reflective signal from photoreceptor inner segments and 3) fragmentation of the photoreceptor reflective layer with loss of the double high-reflective-layer pattern.[10] Sunir J. Garg demonstrated a well-demarcated hyporeflective space involving the outer retina and RPE with overlying central neurosensory retinal thinning in 8 patients of chronic solar retinopathy.[11] Alexandros N. Stangos evaluated the role of OCT in 4 patients and showed an outer retina hyporeflective space limited to the fovea.[12]

We have included both acute (1 month duration) (10 cases) and chronic(17 cases) cases of photic retinopathy. We found that OCT in acute cases showed break in inner and outer segment of photoreceptor, with disruption of surrounding retinal tissue(fig1). In chronic cases OCT well defined area of break at the junction of inner and outer segment of photoreceptor without disruption of surrounding retinal tissue (fig2). Acute cases (4 cases) which were followed also showed conversion from irregular border to well defined border at the junction of inner and outer segment of photoreceptor(fig 3a, b). The relation between visual acuity and size of break was evaluated, we found that greater the defect more the visual loss. There was no correlation between duration of symptom and visual acuity. In patients with visual acuity 6/6 the average defect at inner and outer segment junction was 125µ (range 38-399 µ) and in patients with visual acuity ≤ 6/9 average defect is 265µ(range 64-498 µ).

Table 1

Slno	Age	Gender	Laterality	Duration	Protection	Visualacuity	Fundoscopy	OCT
1.	53	M	RE	6months	Welding Yes	6/12	Yellow spot	311
2.	34	M	BE	1 wk	Welding work	BE-6/9	Red dot	336 237
3.	17	F	BE	1 wk	Solar eclipse	BE-6/12	Red spot	237 174
4.	25	M	BE	1 yr	Welding	BE-6/9	Red dot	112 124
5.	41	M	BE	3months	----------	BE-6/6	Red dot	50 135
6.	29	M	LE	2 days	----------	BE-6/6	Red dot	52
7.	54	M	RE	3months	----------	BE-6/6	Red dot	125
8.	26	F	RE	2 days	----------	BE-6/6	Red dot	38
9.	30	M	BE	6months	Welding	BE-6/12	Red dot	101 104
10.	29	F	BE	10days	Solar eclipse	BE-6/12	Red dot	374 386
11.	20	M	RE		---------	BE-6/6	Red dot	112
12.	63	F	LE	6months	----------	BE-6/9	Red dot	187
13.	15	F	BE	1year	---------	RE-6/18 LE-6/6	Red dot	124

14.	31	F	BE	1week	---------	RE-6/6 LE-6/9	Red dot	38 64
15.	14	F	RE	10days	Solar eclipse	RE-6/12 LE-6/6	Red dot	610 274
16.	25	F	BE	5year	Sun gazing	BE-6/9	Red dot	88 139
17.	45	F	RE	2year	---------	RE-6/12 LE-6/6	Red dot	100
18.	34	M	RE	2year	------	BE-6/9	RPE changes	374
19.	20	M	RE	2months	Lightenin	RE-6/9 LE-6/6	Yellow spot	224
20.	56	M	LE	5year	--------	RE-6/6 LE-6/18	RPE changes	250
21.	15	M	BE	1week	Solar eclipse	BE-6/9	Red dot	498 389
22.	25	M	BE	15days	Solar eclipse	BE-6/9	Red dot	474 449
23.	16	M	BE	1month	Solar eclipse	BE-6/12	Red dot, yellow surr.	261 187
24.	14	M	BE	4days	Solar eclipse	BE-6/6	Red dot	399 199
25.	45	F	LE	6months	Sun gazing	RE-6/9 LE-6/18	Reddot, RPEchanges	100
26.	51	M	LE	2yrs	----------	RE-6/6 LE-6/12	Red dot	137
27.	25	M	BE	6months	Solar eclipse	BE-6/6	Red dot	102 162

(r= -0.280)

V. Conclusion

In patients presenting with the history of watching solar eclipse OCT helps to diagnose, document and prognosis and in patient without the history of watching solar retinopathy OCT helps to diagnose the solar retinopathy by its peculiar appearance.

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