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# Photic Retinopathy



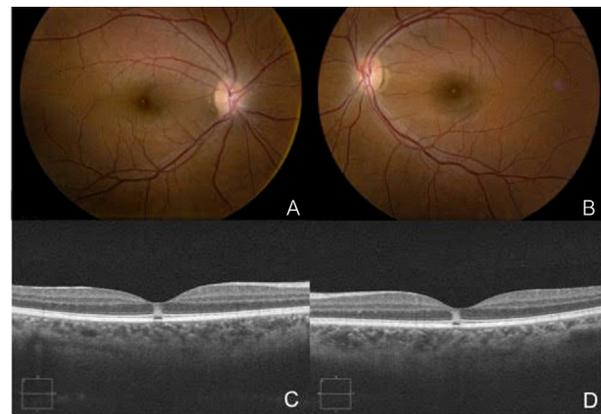
Photic retinopathy is a visual disturbance sustained due to prolonged or high intensity exposure of the foveal tissue to light energy.<sup>1</sup> It is characterized by damage to the outer segments of the photoreceptors and retinal pigment epithelium with resultant foveal atrophy. The mechanism of injury is a photochemical injury in which biochemical reactions cause tissue destruction without elevation of temperature, likely due to free radical formation.<sup>2</sup> Photochemical injuries occur at much lower retinal temperatures than those that can cause photothermal damage. The most well-known form of photic retinopathy is solar retinopathy, which is commonly associated with sun gazing and eclipse viewing.<sup>3</sup>

Patients with solar retinopathy commonly present with decreased visual acuity, central scotoma and metamorphopsia. History taking is very important in cases of suspected solar retinopathy. Important factors in history taking include asking about solar eclipse viewing without precautions, rituals involving sun exposure, a diagnosis of schizophrenia or use of psychoactive substances. Risk factors for solar retinopathy include young age, a clear phakic lens and photosensitizing drugs such as tetracycline or psoralens. Protective measures include cataracts or darkly pigmented fundi.

Fundus examination can initially reveal a yellow-white spot in the fovea.<sup>4</sup> Optical coherence tomography (OCT) may show a hyperreflective area involving all foveal layers, and/or defects in the outer photoreceptor layer and retinal pigment epithelium.<sup>3</sup> Over weeks, the hyperreflective lesions can fade and can leave foveolar distortion or pigment changes. OCT imaging in chronic solar retinopathy has been shown to demonstrate a well-demarcated hypo-reflective space involving the outer retina and RPE. Fundus autofluorescence may show a hypoautofluorescent fovea with a faint irregular ring of hyperautofluorescence.<sup>5</sup> Fluorescein angiography can occasionally show central window defects in the macula correlating to damage to the outer retina and retinal pigment epithelium. Fluorescein angiography, however, is a poor tool to aid in diagnosis

Differential diagnosis for yellow foveal spot includes vitreomacular traction syndrome, lamellar hole, poppers retinopathy, juxtafoveal telangiectasia, tamoxifen retinopathy and adult onset foveomacular vitelliform dystrophy.

No guidelines exist for the treatment of solar retinopathy. Steroids have been used to treat solar retinopathy in the past but have not been shown to be particularly effective.<sup>6</sup> Prognosis is oftentimes good with recovery occurring within the first six months with significant visual acuity improvement. However, scotomas may continue to persist. Better visual acuity on presentation correlates to better final visual acuity.

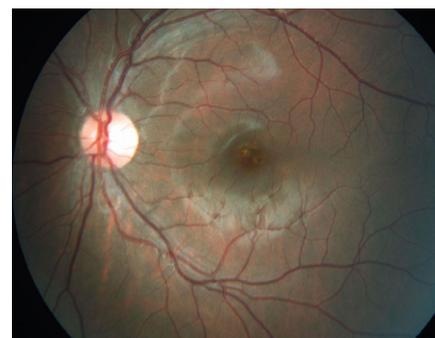


**Figure 1:** Color fundus photographs of the right (A) and left (B) eyes show round, yellow foveal lesions. Optical coherence tomography images show full thickness foveal hyper-reflectivity with focal disruption of the ellipsoid zone in the right (C) and left (D) eyes.

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Image 1 is from a 31 one year old female with no past medical or past ocular history who presented with a 3-day history of blurry vision and a central scotoma in both eyes after staring at an eclipse. She reported staring at the eclipse for one full minute while wearing sunglasses and several seconds without sunglasses. Her best corrected visual acuity was 20/30-2 in the right eye and 20/50+2 in the left eye with normal intraocular pressures and no pupillary examination. Anterior segment examination was normal but posterior segment examination revealed small, round, well-demarcated foveal lesions in both eyes. Spectral domain OCT (SD-OCT) which was obtained 3 days after the eclipse showed full thickness foveolar hyperreflectivity with focal disruption of the ellipsoid zone in both eyes. This patient was subsequently lost to follow up so long-term data is not available.

Other forms of photic retinopathy include laser pointer induced injury, arc welding and iatrogenic exposure to microscope lights or endoilluminators.<sup>7</sup> Laser pointer injuries can often be seen in children. Patients with laser pointer injuries can present with significantly decreased vision which can be permanent if the fovea is involved. There has been increased availability of high-powered lasers to the general public. Laser pointer injury occurs through both photochemical and photothermal injury.<sup>8</sup> Funduscopic examination can reveal yellow streak-like lesions and retinal pigment epithelium mottling. Laser pointer injuries can also cause retinal hemorrhages.<sup>9</sup> Optical coherence tomography can show ellipsoid zone disruption and retinal pigment epithelium loss. Images 2-5 show fundus photos and OCTs from a patient with laser retinopathy.

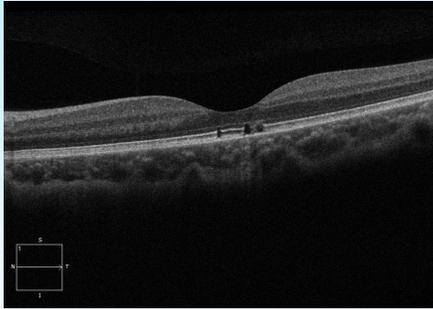


Left Eye Laser Retinopathy Color



Right Eye Laser Retinopathy Color

**Figures 2-5:** Fundus photos and optical coherence tomography images show laser pointer induced injury



Left Eye Mac Cube



Right Eye Mac Cube

Arc welding injuries are best diagnosed based on history, and the findings are very similar to solar retinopathy. Arc welding injuries can also cause a photokeratitis. Iatrogenic microscope light induced injury can be related to cataract surgery or less commonly related to vitrectomy. Of note, most iatrogenic microscope light induced injury is inferior on the retina and does not involve the fovea. These patients may thus complain of paracentral scotomas.

It is very important to stress education about eclipse safety and the dangers of sun-gazing as well as avoiding prolonged surgical times to avoid microscope light-based injury. Other mechanisms for safety to avoid photic retinopathy include keeping laser pointers out of reach of children and also making sure there is appropriate protection for arc welders. With education, many forms of photic retinopathy can be avoided.

**Figures 2-5:** Fundus photos and optical coherence tomography images show laser pointer induced injury

#### References:

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NJRetina continuously conducts clinical trials at key locations. Our clinical research coordinators will be happy to discuss the inclusion/exclusion criteria or any other aspect of these studies with you or your patients. If you have any questions, please feel free to contact:

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## Enrolling Studies:

### Dry AMD

#### Teaneck and Toms River

Gallego: A Phase II, Multicenter, Randomized, Single-masked, Sham-controlled Study to Assess Safety, Tolerability, and Efficacy of Intravitreal Injections of FHTR2163 in Patients with Geographic Atrophy Secondary to Age-related Macular Degeneration (Gallego)

### Diabetic Retinopathy

#### Teaneck

Altitude: A Phase 2, Randomized, Dose-escalation, Observation-controlled Study to Evaluate the Efficacy, Safety, and Tolerability of RGX-314 Gene Therapy Delivered Via One or Two Suprachoroidal Space (SCS) Injections in Participants with Diabetic Retinopathy (DR) without Center Involved-diabetic Macular Edema (CI-DME) (ALTITUDE)

### Wet AMD

#### Edison

Opthea Coast: A Phase 3, Multicenter, Double-masked, Randomized Study to Evaluate the Efficacy and Safety of Intravitreal OPT-302 in Combination with Aflibercept, Compared with Aflibercept Alone, in Participants with Neovascular Age-related Macular Degeneration (nAMD)

#### Toms River

Opthea Shore: A Phase 3, Multicenter, Double-masked, Randomized Study to Evaluate the Efficacy and Safety of Intravitreal OPT-302 in Combination with Ranibizumab, Compared with Ranibizumab Alone, in Participants with Neovascular Age-related Macular Degeneration (nAMD)

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