



Case report

## Drone retinopathy

Victoria Rohring<sup>a,b</sup>, Ahmad Rehmani<sup>a,b,\*</sup>, Emily Smith<sup>c</sup>, Edward Smith<sup>b</sup>, Peter Berg<sup>b</sup>

<sup>a</sup> St. John's Episcopal Hospital, New York, NY, USA

<sup>b</sup> Kingsbrook Jewish Hospital, New York, NY, USA

<sup>c</sup> Downstate Medical Center, New York, NY, USA

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### Abstract

**Purpose:** To report a case of solar retinopathy due to inadvertent exposure to the sun while piloting a drone without protective eyewear.

**Methods:** A 29-year-old male underwent a complete eye exam including optical coherence tomography (OCT) of the macula.

**Results:** Bilateral juxtafoveal outer retinal microcystic cavities present on OCT consistent with solar retinopathy.

**Conclusion:** With the increasing popularity of unmanned aircrafts, eye protection awareness during drone use is essential.

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**Keywords:** Drone; Solar retinopathy

### Introduction

Solar retinopathy refers to retinal injury induced by direct or indirect solar viewing. Ocular damage from solar viewing has been recognized for centuries. Galileo, the father of astronomy, tragically injured his eyes by solar observation through the telescope.<sup>1</sup> It has also been associated with religious sun gazing, psychiatric disorders, sunbathing, solar eclipse viewing, and the use of photosensitizing drugs which may predispose to photochemical damage of the retina.<sup>1,2</sup>

With the recent popularity of drones, there are more individuals looking to the skies as they fly their aircraft. Thus, we expect the incidence of drone retinopathy to increase. To our knowledge, this is the first report of solar retinopathy secondary to flying a drone from a comprehensive reference to PubMed database.

### Case report

A 29-year-old male presented to Kingsbrook Jewish Medical Center complaining of one month of blurred vision in both eyes (OU). Symptoms began shortly after looking towards the sun while flying a drone. He was not wearing sunglasses or a hat, and denied the use of systemic or topical medications or any previous medical history. On examination, best corrected visual acuity was 20/20 in the right eye and 20/25 (with + 2) in the left eye. The anterior segment was within normal limits. Intraocular pressure (IOP) measured 10 mmHg OU. Ishihara color testing was intact OU. Fundus examination showed an irregular foveal light reflex OU. Optical coherence tomography (OCT) of the macula one month after exposure showed a disruption of the ellipsoid zone with maintenance of the foveal contour (Fig. 1). Juxtafoveal microcystic cavities at the level of the outer retina and retinal pigment epithelium (RPE) were present consistent with outer retinal holes OU.

### Discussion

Solar radiation damages the retina through photochemical effects. The extent of photochemical damage is multifactorial

Conflict of interest: None.

\* Corresponding author. 333 Schermerhorn Street, Apt 34P, Brooklyn, NY 11217, USA.

E-mail address: [ahmadsrehmani@gmail.com](mailto:ahmadsrehmani@gmail.com) (A. Rehmani).

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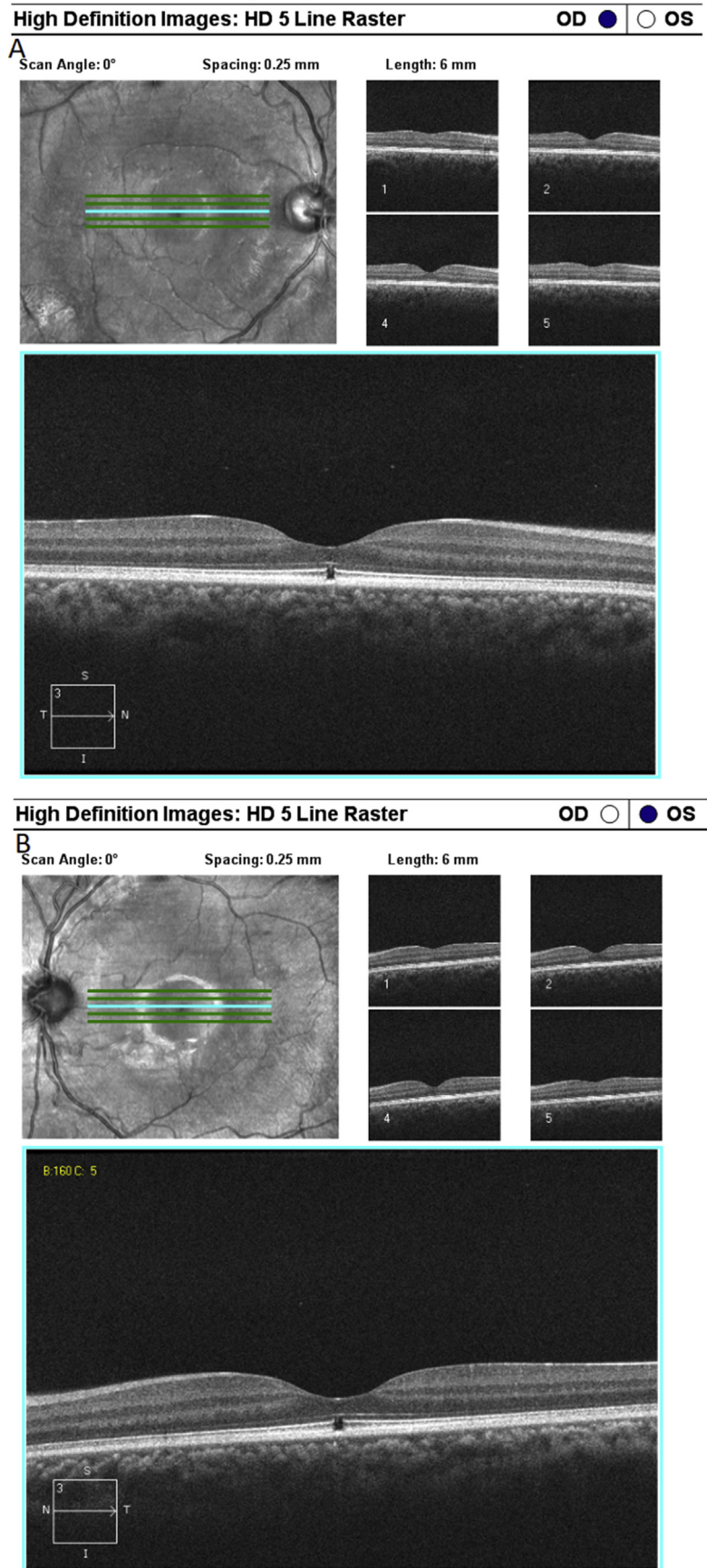


Fig. 1. Spectrum domain optical coherence tomography (SD-OCT) images: SD-OCT images taken 1 month after solar exposure, showing a maintained foveal contour with juxtafoveal microcystic cavities at the level of the outer retina and retinal pigment epithelium (RPE), (a) right eye and (b) left eye, respectively.

and strongly dependent on the wavelength of light, intensity, duration of exposure, and individual susceptibility.<sup>1</sup> Symptoms usually develop 1–4 hours after solar exposure. Visual acuity ranges from 20/40–20/200.<sup>2</sup> Patients may also report metamorphopsia, central or paracentral scotomas, chromatopsia, afterimage and periorbital ache. Yellow-grey spots at or near the fovea may be noted; however, mild cases of photochemical damage may not be symptomatic or visible on fundus examination.<sup>2–4</sup> The degree of photoreceptor involvement and foveal thickness has been correlated with poorer visual acuity and chronicity of disease.<sup>5,6</sup> As the vision recovers, usually weeks after exposure, the yellow lesion is replaced with focal depression with RPE mottling or a lamellar hole signifying outer retinal damage.<sup>7</sup>

No specific therapy exists for solar retinopathy. The vision in most patients returns to the level of 20/20–20/30 within 3–9 months.<sup>2</sup> A small central scotoma or metamorphopsia may persist. The use oral steroids for acute episodes has been reported in literature but is controversial as visual acuity often improves spontaneously.<sup>2,8</sup>

An important way of protecting the eye from solar radiation is through the use of appropriate solar filters and a brimmed hat as recommended by the American Academy of Ophthalmology (AAO).<sup>2,9</sup> Ordinary sunglasses or homemade filters are not safe for looking at the sun and may be even more harmful than no sunglasses at all.<sup>10</sup> Dark lenses cause mydriasis and, as a result, allow more radiation to enter the eye. Commercially available, high quality lenses which filter out wavelengths most hazardous to the eye, particularly those below 450 nm, should instead be used.<sup>1,11,12</sup> However, protective eyewear may interfere with proper viewing of the aircraft and/or controller. Thus, the risks of piloting with or without solar filters should be considered by the pilot on a case-to-case basis. Most importantly, abstaining from prolonged sun viewing while operating the drone along with awareness and public health education may reduce visual morbidity.

Unmanned aircrafts, more commonly known as drones, have gained recent popularity, and sales have markedly increased in recent years. In 2016, the Federal Aviation Administration (FAA) reported the commercial and consumer drone fleet to be numbered at 42,000 and 1.1 million, respectively. By 2021, the agency estimates the numbers will near 442,000 and 3.55 million, respectively.<sup>13,14</sup> Drone sales from 2017 more than doubled from 2016. The large increase in

unmanned aircraft has led to government regulations requiring all drones to be registered by the FAA.<sup>14</sup> Thus, we expect the incidence of drone usage-related solar retinopathy in unprotected eyes to increase in the coming years.

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