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Footnotes and Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this article.

Waxing and waning poppers maculopathy

Poppers are volatile aromatic liquids typically available in vials. They make a popping sound upon opening. Poppers are a member of the alkyl nitrites, chemicals with nitric oxide donor characteristics. Poppers have been a popular recreational drug for years owing to their transient euphoric, myorelaxant, and aphrodisiac effects presenting just seconds after inhalation.[1,2] Although they are illegal to sell as such, they are easily obtainable, and are often sold as air fresheners online or in nightclubs.[2] In recent years, the use of poppers has been associated with maculopathy that might cause fluctuating vision, scotoma, photophobia, metamorphopsia, and phosphenes.[2,3] The symptoms are usually bilateral and reflect morphologic changes in the macula. A yellow foveal spot can be seen on fundus examination, which corresponds to a subtle disruption of the foveal ellipsoid zone on spectral-domain optical coherence tomography (SD-OCT) images.[2–4] Visual improvement and resolution of the morphologic changes were described in some cases after cessation of popper use. We are reporting a case of a reversible popper maculopathy with a 2.5-year follow-up.

Case Report

In March 2018, a 50-year-old man presented with a 6-month history of central, glaring, slowly enlarging bilateral scotoma, which appeared 3 months after starting to use poppers regularly several times per week. His medical history included arterial hypertension, asthma, thalassemia, and narcolepsy; past ocular history was negative. At presentation, Snellen best-corrected visual acuity was 20/20 both eyes, on fundoscopy bilateral pale yellowish dots were seen in the fovea, the rest of the eye examination showed no abnormalities. The microperimetry (MP1, Nidek Technologies, Padua, Italy), colour vision, and fluorescein angiography were unremarkable. Infrared reflectance imaging showed dark foveal spots in both eyes (Fig. 1). Fundus autofluorescence imaging revealed very subtle foveal changes in both eyes (Fig. 1). SD-OCT (HRA + OCT Spectralis, Heidelberg Engineering, Heidelberg, Germany) demonstrated bilateral focal hyperreflectivity and disruption of the foveal ellipsoid zone (Fig. 1). Multifocal electroretinogram (ERG) performed with RETIscan system (Roland Consult, Brandenburg an der Havel, Germany) showed a reduced central retinal function (Fig. 2). Scotopic and photopic ERG showed a bilateral prolonged photopic response, alongside with reduced amplitudes in the left eye. At that time, we suggested abstinence of popper use and the use of lutein supplements.

In November 2018, after 8 months without using poppers, the patient reported resolution of the symptoms. The eye examination and SD-OCT showed no abnormalities (Fig. 1).

In May 2019, the patient reported recurrence of glowing central bilateral scotoma after resuming popper usage several times per week. The SD-OCT demonstrated foveal changes similar to when the patient was first examined (Fig. 1). Furthermore, the ERG showed a reduced central retinal function, similar to the first presentation. In September 2019, the patient reported complete resolution of the symptoms again. Barely noticeable foveal changes were observed on SD-OCT. From December 2019 to August 2020, the patient had a fluctuating intensity of visual disturbances and similarly fluctuating SD-OCT changes.

In August 2020, the patient reported complete resolution of all symptoms. Eye examination and SD-OCT showed no abnormalities (Fig. 1). Multifocal ERG in the right eye was normal and borderline normal in the left eye (Fig. 2). The patient revealed that he continued to use poppers several times per week but was careful to use only those that did not induce visual symptoms. He had noticed visual impairment after using butyl nitrite, isobutyl nitrite, and isopropyl nitrite. The use of amyl nitrite or pentyl nitrite caused no symptoms.

Discussion

In recent years, poppers maculopathy has become increasingly recognized as a complication of poppers abuse.[3] The pathogenesis remains unclear; however, it is believed to be the result of the toxic effects of nitric oxide.[2,4,5] Our patient developed symptoms soon after using poppers for the first time. Diagnostics showed typical changes that entirely resolved after abstinence and reoccurred after using certain types of poppers. This is comparable to some other case reports.[4,5] To the best of our knowledge, we are the first to report a case where, surprisingly, the symptoms and function improved entirely after switching from butyl nitrite, isobutyl nitrite, or isopropyl nitrite to amyl nitrite or pentyl nitrite-based poppers, although the patient continued to use them several times per week. This is supported by a case series of Rewbury et al. where symptoms were linked to certain popper brands, and it was suggested that chemically different poppers differ in their toxic effect.[5] We speculate that the

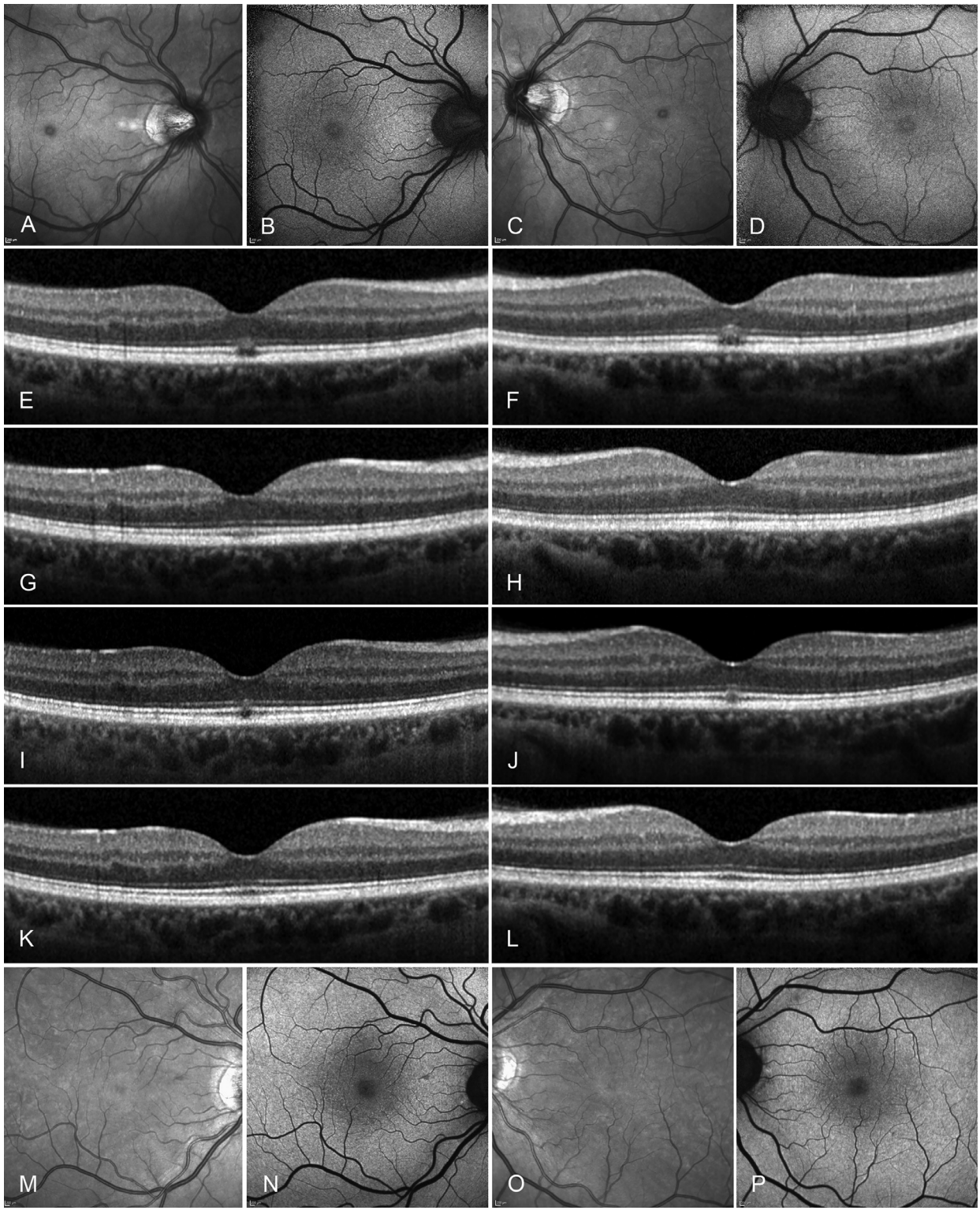

Fig. 1—The first presentation in March 2018: Infrared reflectance images demonstrate a small dark spot in the fovea of (A) right eye and (C) left eye, fundus autofluorescence images reveal a barely visible brighter dot in the center of the fovea of (B) right eye and (D) left eye, and optical coherence tomography (OCT) images demonstrate focal hyperreflectivity and disruption of the foveal ellipsoid zone in (E) right eye and (F) left eye. November 2018: OCT images show resolution of foveal changes in (G) right eye, (H) left eye. May 2019: OCT reveals recurrence of subfoveal changes in (I) right eye and (J) left eye. The last follow-up visit in August 2020: infrared reflectance, fundus autofluorescence, and optical tomography images demonstrate complete resolution of foveal changes in (K, M, N) right eye and (L, O, P) left eye.

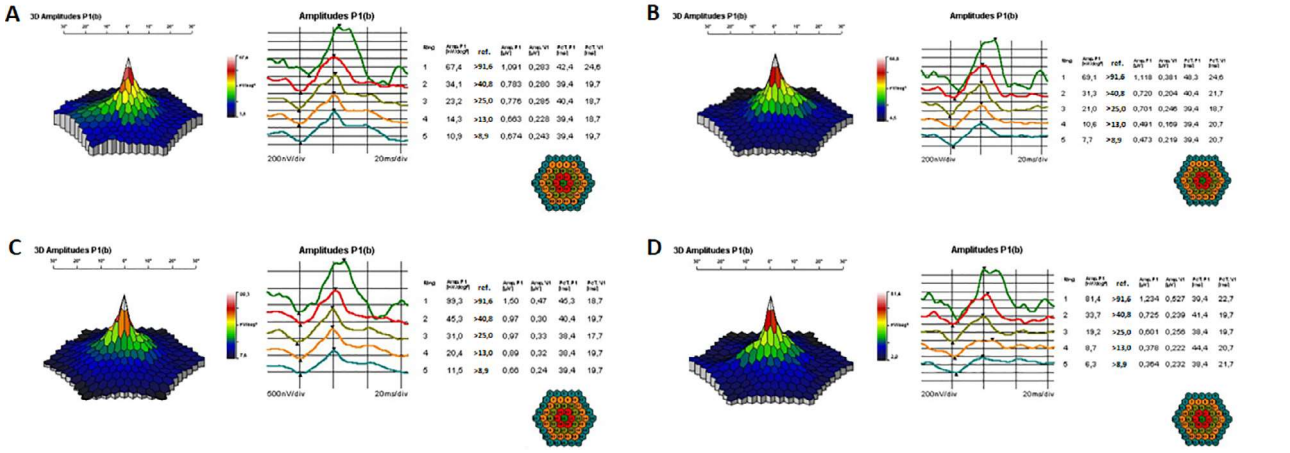

Fig. 2—Multifocal electroretinogram: a reduced central retinal function at the first presentation (March 2018) in (A) right eye and (B) left eye; normal multifocal electroretinogram at the last follow-up visit (August 2020) in the right eye (C) and borderline multifocal electroretinogram in the left eye (D).

steric properties of the alkyl group might influence the binding affinity of poppers to a currently unknown binding site within a cone photoreceptor, resulting in differing toxicity of various alkyl nitrites.

Rok Sega,
Mojca Urbancic
Eye Hospital, University Medical Centre Ljubljana, Ljubljana, Slovenia.

Correspondence to:
Mojca Urbancic, MD, PhD; mojca.urbancic@kclj.si.

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Footnotes and Disclosure

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Central retinal artery occlusion associated with Sweet syndrome

A 64-year-old Caucasian man presented with a 1-day history of acute painless vision loss in the right eye. On examination, his visual acuity was hand motions OD and 20/30 OS. His intraocular pressures were normal OU and he had a 3+ relative afferent pupillary defect OD. The anterior segment examination was unremarkable OU. Fundoscopic examination of the right eye revealed a cherry red spot (Fig. 1A). No vitreous cell, vasculitis, or chorioretinitis was noted OU. A fluorescein angiogram of the right eye showed an arterial filing line (Fig. 1B) with no leakage or staining in later frames. Optical coherence tomography of the right eye showed inner layer hyper-reflectivity indicative of acute ischemia (Fig. 1C). A bilateral carotid doppler ultrasound and computed tomography angiography of the head and neck was negative for stenotic disease. Given the patient's age and elevated inflammatory markers, a temporal artery biopsy was done, which did not show evidence of giant cell arteritis.

Before presentation, the patient returned to Canada from a 1-month trip to Mexico where he developed upper respiratory tract symptoms. Following self-isolation for 14 days as a result of coronavirus disease (COVID-19) precautions, his symptoms resolved. Three weeks later, the patient developed a progressive, painful, diffuse, nodular rash to all 4 extremities (Fig. 1D), polyarthritis, fever, and difficulty ambulating. He was admitted to the general internal medicine ward where initial testing revealed neutrophilia, an elevated C-reactive protein, and strongly positive anti-cyclic citrullinated peptide titers (>500 U/mL). The patient underwent a skin punch biopsy of the right arm, which showed a dense neutrophilic infiltrate and confirmed a diagnosis of acute febrile neutrophilic dermatosis, also known as Sweet syndrome. A full body positron emission tomography