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Electronic cigarette (vaping) induced panuveitis: A case report and literature review

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Abstract

Tobacco cigarette contents are associated with inflammatory conditions. To our knowledge, this is the first case reporting of electronic cigarette-induced panuveitis.

A 41-year-old gentleman with no known comorbid presented with a two-day history of sudden blurring of vision in the left eye, associated with mild photophobia. He was well, with no similar episodes prior. Lifestyle inquiry revealed history of vaping daily for the past two years. Although vision was 6/9 in both eyes, left eye exhibited anterior chamber inflammation cells 2+, with spillover to anterior vitreous and macula oedema. Right eye examination was unremarkable.

Diagnosed as a case of left eye panuveitis, he was treated with topical steroids. As advised, he stopped vaping. One week later, the cells resolved, and the subretinal fluid reduced. In the following six months, he abstained from vaping and had no recurrent episodes. The dangers of electronic cigarettes to ocular health should be communicated clearly.

Keywords: Electronic cigarette; Vaping; Panuveitis; Ocular inflammation.

Abbreviations: SD-OCT: Spectral Domain Optical Coherence Tomography; VDRL: Venereal Disease Research Laboratory test; NIKBUT: Non-Invasive Keratograph Break Up Time; CIN: Conjunctival Intraepithelial Neoplasia.

Introduction

Tobacco cigarettes and their contents are associated with inflammatory conditions, including uveitis [1,2]. The rise of electronic cigarette smoking over the past decade has led to the discovery of many adverse effects on ocular health [3]. These include disruption in tear film, choroidal blood flow and ocular saccadic rhythms.

There is no known report on uveal inflammation due to vaping so far. Only two reports [4,5] have been published on ocular effects in vaping persons from Malaysia, even though few other papers are available on the electronic cigarette smoking effects on the eye in the literature [6-10]. Therefore, we report the first case of panuveitis induced by electronic cigarette smoking that we encountered with good outcomes following treatment.

Case presentation

A 41-year-old gentleman with no known comorbid ocular or systemic conditions presented with a two-day history of sudden blurring of vision in the left eye. This was associated with mild eye discomfort and photophobia. He was otherwise well, with no trauma or prodromal illness before this. He denied previous similar episodes of blurring of vision or eye redness and pain. Upon further questioning, there was a history of vaping electronic cigarettes daily for the past two years with flavoured additives. The frequency of vaping had increased significantly recently as he had lost his job. He had not smoked tobacco cigarettes before.

Initial examination vision was 6/9 in both eyes. A slit lamp examination of the left eye showed anterior chamber inflammation of cells 2+ with spillover to the anterior vitreous. Dilated fundus examination with a +90D lens showed the presence of central macular oedema with no changes of retinitis or vasculitis in the left eye (Figure 1). The right eye did not show any signs of inflammation in the anterior or posterior segment.

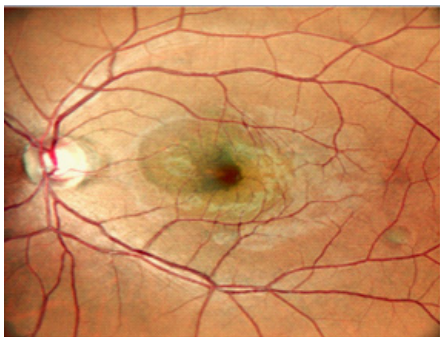

Figure 1: Left eye macula oedema involving the fovea.

He was diagnosed with a case of panuveitis in the left eye and was treated with topical steroids (Guttate Prednisolone Forte 2 hourly for the first week) whilst awaiting investigation results. He was advised to stop vaping, which the patient complied as confirmed by his wife.

Spectral Domain Optical Coherence Tomography (SD-OCT) was performed, and the left eye exhibited central subretinal fluid (Figure 2a). Although there was no presence of inflammation in the fellow right eye, the SD-OCT detected scattered small-sized serous Pigment Epithelial Detachments (PED).

His blood pressure and fasting blood glucose were normal. Other investigations were negative, such as white cell count, Venereal Disease Research Laboratory Test (VDRL) and Mantoux test. Chest x-ray was not suggestive of any ongoing infection or tuberculosis.

On his 1-week follow-up appointment, the cells had resolved in the anterior chamber, and subretinal fluid was reduced in the macula (Figure 2b).The topical steroid drops were reduced to 4 hourly drops with subsequent slow taper for the next six weeks.

In the subsequent visit after six weeks of treatment, the OCT revealed complete absorption of the subretinal fluid (Figure 2c). Vision in both eyes remains good at 6/6. To date, six months after the initial presentation, the left eye remained free of inflammation with no recurrence of subretinal fluid.

Figure 2: a) OCT macula on presentation detected central subretinal fluid in the left eye. b) OCT macula after one week showed reduced central subretinal fluid in the left eye. c) OCT macula after six weeks showing complete absorption of subretinal fluid in the left eye.

Discussion

The effects of electronic cigarette smoking on ocular health reported in different countries are summarised in Table 1. In a study of 21 vapers and 21 healthy nonsmoker males, Md Isa et al. reported that electronic cigarette smokers have significantly reduced tear meniscus heights and breakup times [4]. Formaldehyde, acrolein, acetaldehyde and free radicals were released in greater amounts at higher voltages and temperatures of the e-cigarette hand-held device, corresponding with the severity of dry eyes [4]. Flavoured additives may catalyse damage in the lipid layer of the tear film [4].

However, Munusamy et al., in their study of 64 patients, did not elicit any significant changes in corneal epithelial thickness nor Non-Invasive Keratograph Break-Up Time (NIKBUT) [6]. Misuse of electronic cigarette liquid [7,8] and ocular injury from a vaping-related explosion [5,9] have been reported earlier. Shields et al. published a case of Conjunctival Intraepithelial Neoplasia (CIN) in an electronic cigarette smoker [10].

Tobacco cigarette components are pro-inflammatory. The electronic cigarette contains similar ingredients, albeit at lesser concentrations. Besides nicotine, e-cigarette vapour contains flavouring such as diacetyl, volatile organic compounds, carcinogens, ultrafine particles and heavy metals (Table 2) [11].

The odds of ocular inflammation rise 2.2-fold in tobacco cigarette smokers compared to nonsmokers [2]. The risk of cystoid macula oedema increases by 4% for each cigarette smoked per day in patients with intermediate uveitis [12,13]. Active smoking also increases the dose and length of steroid eyedrops used in treating uveitis [13,14]. Macula oedema was also reported to be less responsive to treatment than nonsmokers [13,14].

Postulated pathogenic mechanisms for this include endothelial dysfunction resulting in retinal blood vessel leakage and blood-retinal barrier damage. Furthermore, the absorption of reactive oxygen species and nicotine present in cigarette smoke promotes the activity of macrophages against the uvea [1,14]. Polycyclic aromatic hydrocarbons stimulate leukocytic extravasation [1,14].

Table 1: Effects of electronic cigarette smoking on ocular health.

Author	Study	Country	Results
Md Isa et al., 2019 [4]	Cohort	Malaysia	Vapers had reductions in tear breakup time and tear meniscus height compared to nonsmokers.
Khairudin et al, 2016 [5]	Case Report	Malaysia	Eyelid and conjunctival laceration, Berlin oedema, commotio retinae and cataract from a vaping-related explosion
Munusamy et al, 2019 [6]	Single group pretest post-test design	South Africa	No significant change in corneal epithelial thickness ortear breakup times post-vaping.
Jamison et al, 2016 [7]	Case Report	United Kingdom	Mild chemical injury secondary to misuse of vape liquid
McCague et al, 2018 [8]	Case Report	Ireland	Chemical injury secondary to misuse of vape liquid
Paley et al., 2016 [9]	Case Series	USA	Corneoscleral laceration and thermal injuries from electronic cigarette explosion
Shields et al., 2020 [10]	Case Report	USA	High-grade Conjunctival Intraepithelial Neoplasia (CIN) in a young patient with chronic vape exposure

Table 2: Chemicals present in cigarette smoke [11].

Immunomodulatory toxins	Addictive toxins	Carcinogenic toxins
Nicotine	Nicotine	Polycyclic aromatic hydrocarbons
Carbon monoxide	Acetaldehyde	N-Nitrosamines
Acrolein	Ammonia	Cadmium
Reactive Oxidative Species (ROS)	Others	Nickel
Others		Chromium
		Arsenic
		Miscellaneous organic compounds

Conclusion

E-cigarette vapour contains toxins that can augment ocular inflammation. Ophthalmology service providers should proactively educate patients about the dangers of smoking electronic cigarettes, particularly to ocular health and vision.

Declarations

Patient declaration of consent statement: The patient has consented to the use of case details obtained from medical records, including all audio-visual recordings, for the purpose of publication.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

Declaration of prior publishing and presentation: This case report was presented as an e-poster at the 11th Conjoint Ophthalmology Scientific Conference (COSC)- Asia Pacific Ophthalmology Trauma Society (APOTS) Ophthalmic Trauma Meeting 2022 on 17-18th September 2022 in Kuala Lumpur. The abstract was published in the Abstract Compilation in Malaysian Journal of Ophthalmology Volume 4, Issue 3, 2022.

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