The Tear Function in Electronic Cigarette Smokers

By: Md Isa, NA (Md Isa, Nur Amalina)[1]; Koh, PY (Koh, Poh Yi)[1]; Doraj, P (Doraj, Pavithra)[1]

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Abstract

PURPOSE Little is known about the effect of e-cigarettes on the eyes except for reported eye irritation among individuals who were exposed to e-cigarette vapors and e-liquids. This study aims to investigate the effect of vaping on ocular surface health of long-term vapers. METHODS Twenty-one vapers and 21 healthy nonsmokers who are all male underwent measurements of the Ocular Surface Disease Index, noninvasive tear breakup time, fluorescein breakup time, ocular surface staining, tear meniscus height, and the Schirmer test. The effect of voltage used during vaping was also evaluated against the measurements. RESULTS Vapers experienced moderate-to-severe eye dryness (25.0 [interquartile range, 14.6 to 43.7]) as indicated by the Ocular Surface Disease Index. Significant reductions of noninvasive tear breakup time (3.13 +/- 0.97 vs. 6.57 +/- 2.31 seconds; P < .0001), fluorescein breakup time (2.68 [interquartile range, 2.33 to 3.18] vs. 4.12 [3.56 to 5.07] seconds; P < .0001), and tear meniscus height (203.0 [193.0 to 225.5] vs. 235.0 [210.0 to 253.50] mu m; P = .002) were noted in vapers, but the Schirmer test showed higher results (14.5 [12.0 to 17.0] vs. 8.0 [7.0 to 11.0] mm; P = .001) compared with nonsmokers. Increase in vaping voltage aggravated the dry eye symptoms and tear instability (P < .05). Higher Schirmer test result was also noted as voltage increases. CONCLUSIONS Vapers showed moderate-to-severe symptomatic dry eye and poorer tear film quality compared with nonsmokers. High vaping voltage may have aggravated the dry eye syndrome because of hazardous by-products from pyrolysis of the e-liquid constituents. Investigation of the ocular surface health at cellular and molecular levels is warranted to gain a deeper understanding on the effect of e-cigarette to the eyes.

Keywords

KeyWords Plus: FREE-RADICAL FORMATION; OCULAR SURFACE; FILM; FLUORESCEIN; SMOKING; AEROSOL; VAPORS; EYE; TEMPERATURE; EVAPORATION

Author Information

Reprint Address:
Natl Inst Ophthalm Sci, Lorong Utara B, Petaling Jaya, Malaysia.
Corresponding Address: Md Isa, NA (corresponding author)

Natl Inst Ophthalm Sci, Lorong Utara B, Petaling Jaya, Malaysia.

Addresses:

[1] Natl Inst Ophthalm Sci, Lorong Utara B, Petaling Jaya, Malaysia

E-mail Addresses: amalina@thoneh.com

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