

The effect of electronic cigarette and tobacco smoke exposure on vocal fold mucosa remodeling and inflammation

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Introduction

Electronic cigarettes (e-cigarettes) are nicotine delivery systems that generate an inhalable aerosol containing nicotine, flavors, propylene glycol, and vegetable glycerin. They appeal to current and former smokers to help smoking cessation, and young people who never smoked. Emerging evidence suggests that there is a long-term risk associated with the use of e-cigarettes. At the moment it is difficult to quantify this risk due to the lack of studies, especially in relation to tobacco smoking. The main aim of this study was to investigate the effect of e-cigarettes on the inflammatory response and remodeling of human vocal fold (VF) mucosa.

Methods

Engineered human VF mucosae composed of human induced pluripotent stem cell derived VF epithelial cells and primary VF fibroblasts were exposed to 5% e-cigarette vapor extract (ECVE) for 1 week to mimic chronic e-cigarette vapor exposure. The effect of ECVE on the VF mucosa remodeling was examined by looking at the distribution and expression levels of structural and functional genes in VF epithelial cells and VF fibroblasts.

We also measured the levels of pro-inflammatory genes in these cell populations. Parallel experiments using 5% cigarette smoke extract were performed as controls.

Results

Human VF mucosa undergoes remodeling in response to 5% CSE and ECVE. As previously suggested, CSE causes excessive accumulation of cytokeratins in the epithelial luminal compartment, so called hyperkeratosis, in an attempt to protect epithelial cell layers from breakdown. On contrary, ECVE does not seem to induce keratotic changes in VF epithelial cells and reduces the cell adhesion, which may affect the compactness of the epithelial barrier. As a result, the epithelial cell layers may be more susceptible to damage. Moreover, oil droplets accumulate in the luminal cell layer, which likely induces inflammatory response in VF epithelial cells and fibroblasts.

Conclusion

ECVE compromises the compactness of the VF epithelial protective barrier. This raises concerns over the safety of e-cigarette use.