Possible Effects Vaping Nicotine has on Laryngeal and Vocal Health

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Abstract

The act of smoking electronic cigarettes, known as “vaping”, has increased in popularity in recent years. According to the FDA, 1 in 10, more than 2.5 million, U.S high school and middle school students have reported using e-cigarettes in 2022. In 2018, an estimated 8.1 million U.S adults reported using e-cigarettes (Villarroel et al, CDC). Vaping is defined as “inhaling a smoke-free aerosol through a mouthpiece, which is produced through the heating of a liquid such as glycol or glycerin in an electronic device” (Lyzwinski et al., 2022). Vaping was originally marketed as a safer alternative to traditional smoking; however, research proving potential benefits is lacking (Laucks & Salzman, 2020). In recent years, more research is available discussing the negative effects vaping has on the respiratory system, oral health, and mental health. This presentation will discuss research showing the effects vaping nicotine has on laryngeal, respiratory, and oral health in adolescents and adults who vape nicotine. This presentation will also discuss implications vaping nicotine may have on vocal quality. Because research in this topic is limited, this presentation aims to educate participants on what information is available, as well as why more research should be conducted.

By participating in this presentation:

- Participants will be able to list 3 possible effects vaping nicotine has on laryngeal health.
- Participants will be able to summarize the incidence among the different populations who vape nicotine.
- Participants will be able to explain why more research on this topic needs to be conducted in this field.

Electronic Cigarettes and its Population

- Electronic cigarettes, commonly known as vapes or e-cigarettes, were introduced by a Chinese inventor in 2003 and spread to Europe and North America in 2006 (Becker & Rice, 2022).
- Chemical composition of nicotine vapes: carbonyl compounds, aldehydes, volatile organic compounds, and tobacco-specific nitrosamines. Vegetable glycerin and propylene glycol are used as carrier liquids (Gayle, 2019).
- When first released, e-cigarettes were marketed as a cessation aid for adults who smoke cigarettes (Becker, 2022).
- In 2018, 3.2% of U.S adults were current e-cigarette users. The most prevalent population of adults who vape nicotine are white men aged 18-24 (Villarroel et al, CDC).
- As of 2022, 2.5 million U.S middle and high school students are using e-cigarettes (FDA, 2022)
- Prevalence of vaping: USA (19%), Canada (20%) Western/Eastern European countries (24.4%), Japan (3.5%), Korea (10.1%), China (1.2%) (Lynzwinski et al., 2022).
- The rise of popularity in adolescents and young adults can be attributed to:
  - Positive social media marketing (Becker & Rice, 2022)
  - Taste and entertainment (Becker & Rice, 2022)
  - Better first-time experience than cigarettes (Laucks & Salzman, 2020)
  - More publicly accepted than cigarettes (Laucks & Salzman, 2022).
- In 2020, e-cigarette sales declined due to the COVID-19 pandemic and lock down (Besaratinia, 2021).

Vaping Nicotine and its Effects on the Vocal Folds

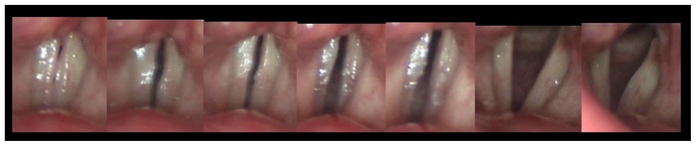
Gayle’s (2019) case study compared the vocal folds of 7 e-cigarette users, 4 cigarette smokers, and 6 non-smokers. The participant’s vocal quality and vocal fold health were examined via acoustic analysis, videostroboscopy, and a questionnaire.

Acoustic Results:

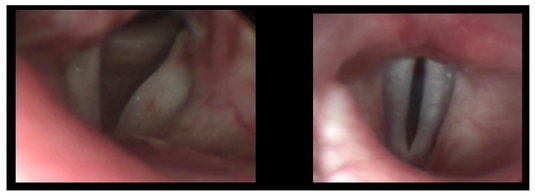
- Fundamental frequency and jitter percent values were within normal limits
- Nicotine vape users had an increased shimmer percent
  - Irritation and epithelial changes resulting from exposure to irritants and cytotoxic compounds may be responsible.

Videostroboscopy Results:

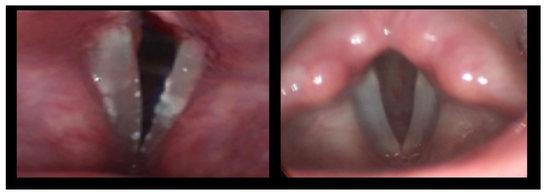
- Significant relationships identified between nicotine vape users and abnormal mucosal wave, free edge, phase closure, vocal fold varices, vocal fold edema, and abnormal phase symmetry.



- Abnormal phase symmetry found in nicotine vape user



- Unilateral edema of Reinke’s space in nicotine vape user (LEFT) and no abnormal edema in nonsmoker (RIGHT)



- Thick, white mucus in nicotine vape user (LEFT) and thin, clear mucus of nonsmoker (RIGHT)

Questionnaire Results:

- Participants had been vaping nicotine for average of 3.64 years
- 5 out of 7 participants vaped nicotine because they believed it to be “safer than traditional cigarettes”
- 5 out of 7 nicotine vape users reported using their device more than 20 times throughout the day.

The results of another study showed that exposure of cells to nicotine vapor extract can induce cellular damage in vocal fold apical epithelial cells, which disrupted VF mucosal homeostasis and innate barrier function and triggered epithelial remodeling during VF epithelial recovery (Lungova, Wendt, Thibeault, 2022).

Other Areas Affected by E-Cigarettes

Oral Health

- The long-term impact vaping e-cigarettes has on oral health is “relatively unknown” (Yang, Sandeep, Rodrigues, 2020).
- A wide range of oral health issues may be *associated* with nicotine vape use (Yang, Sandeep, Rodrigues, 2020).
- Daily e-cig usage was associated with significantly increased odds of permanent loss of any tooth and may be a risk factor for periodontal disease and tooth loss (Andrikopoulas, 2019)
- A study showed an association between e-cigarette use and pain in the tongue and/or inside-cheek in adolescents (Andrikopoulas, 2019)

Respiratory Health

- Vaporized propylene glycol causes significant respiratory irritation and increases the incidence of asthma (Laucks & Salzman, 2020).
- E-cigarettes are associated with eosinophilic pneumonia, epiglottitis, bronchitis, and acute respiratory distress (Lyzwinski et al., 2022)
- Vaping has been the confirmed cause of tachycardia, shortness of breath, and coughing in teenagers who vape nicotine products (Lyzwinski et al., 2022)
- Secondhand nicotine vape exposure was associated with increased risk of bronchitis and shortness of breath among young adults (Islam et al., 2022).

A Need for More Research

- There are limited numbers of studies on the long-term health effects of nicotine vape products (Gayle, 2019).
  - Most likely due to recent availability on the global market as well as lack of regulations and standards
- Only **one** human study on the effect e-cigarettes have on the larynx has been published (Gayle, 2019).
- The larynx is one of the affected locations by traditional smoking, so it is necessary to evaluate if vapes have any effect on the larynx (Gayle. 2019).
- In recent years, the number of vaping associated acute lung injuries have continued to rise (Becker & Rice, 2022).

Studies show that vaping nicotine has similar effects on oral health, respiratory health, and now laryngeal health, compared to traditional cigarettes. As individual’s continue to vape nicotine, long term effects may continue to increase. More studies must be completed in order to understand the effects vaping nicotine has on the vocal folds. Once there is a better understanding of the effects vaping nicotine has on the vocal folds and larynx, studies can be conducted to determine the best form of treatment.

References

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