

When considering implants, patients should be informed that the lifetime burden of maintenance associated with implantation may make adhesive bridges a more attractive option. Survival rates of implant-retained crowns are high, but the biological and technical complications over the course of an implant's life must also be considered.

## DISCUSSION

General dentists who are called upon to assess a patient for possible hypodontia should be vigilant about the patient's eruption patterns, refer the patient for early treatment, and reinforce the importance of maintaining excellent oral hygiene. Patients and

clinicians can benefit from the use of diagnostic wax-ups to depict possible outcomes. In addition, when a patient is undergoing a space opening procedure, it's important to review the patient's response before debonding and adapt the treatment program if needed.

Westgate E, Waring D, Malik O, et al: Management of missing maxillary lateral incisors in general practice: Space opening versus space closure. *Br Dent J* 226:400-406, 2019

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# VAPING

## Dangers of e-cigarettes

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### BACKGROUND

Vaping, or using e-cigarettes, has been marketed as a way for smokers to quit smoking. This marketing leads one to believe that e-cigarettes are less harmful than cigarettes and allow the user to enjoy a nicotine fix without the adverse health effects of smoke. In reality, e-cigarettes pose a serious risk to oral as well as overall health. A look at the prevalence of e-cigarettes and the dangers they present was offered.

### PREVALENCE

Marketing efforts have made e-cigarettes appeal to a segment of the young population that has no history of tobacco usage and never intended to smoke. Middle and high school students have had declining smoking use since 2014, but since e-cigarettes were introduced, an estimated 20% of high school students may be using tobacco products.

### DANGERS

#### Chemical Exposure

One danger of e-cigarettes is related to propylene glycol (PG), which is primarily used in producing polymers and in food processing. It can also be used as a carrier for inhalant pharmaceutical products, which includes nicotine. PG is a major ingredient of the e-liquid used in e-cigarettes. The breakdown products related to its oral use include acetic acid, lactic acid, and propionaldehyde, all of which have toxic effects on enamel and soft tissue. The hygroscopic qualities of PG produce tissue desiccation, resulting in xerostomia, which is related to an increase in caries, gum disease, and other oral health problems.

Vegetable glycerin (VG) and flavorings combine to produce a 4-fold increase in microbial adhesion to enamel and a 2-fold



**Figure 2.** Effects of e-cigarette usage. (Courtesy of Froum S, Neymark A: Vaping and oral health: It's worse than you think. *Dent Econ* 109:78-80, 2019.)

increase in biofilm formation. Enamel hardness is diminished by 27% when flavorings are added to e-liquid compared to unflavored e-liquid. In addition, e-liquid viscosity allows *Streptococcus mutans* to adhere to pits and fissures. The overall effect is for more cavity-causing bacteria to adhere to softer teeth and lead to rampant decay.

Although the percentage of nicotine is considerably lower than in traditional tobacco products, a single electronic cartridge, which delivers 200 to 400 puffs, can equal smoking 2 to 3 packs of regular cigarettes. Nicotine not only has adverse effects on oral gingival tissues but also affects gingival blood flow, cytokine production, neutrophil function, and the function of other immune cells. Connective tissue turnover is diminished. The ultimate result is a higher risk for developing disease of the gums and loss of teeth.

## Lithium Batteries

The lithium batteries in the vape pen have been known to overheat and explode. Usually these explosions are attributed to improper charging of the device or lack of internal safety in a device called a mechanical mod. It's believed that the occurrence of explosions is likely underestimated at 195 between 2009 and 2016. Another report suggests 2035 e-cigarette explosions and burn injuries occurred between 2015 and 2017 in the United States. The injuries are serious and often lead to disfigurement of the oral soft tissues.

## DISCUSSION

E-cigarettes are marketed as a safe alternative to smoking, but vaping is actually associated with dangers as serious as those associated with smoking cigarettes. These products are often flavored so that they appeal to members of the younger generation who have never taken up smoking. Even when e-cigarettes are used to help smoking cessation efforts, their effects can have an adverse impact on oral structures. One patient who had been caries free for 35 years decided to vape rather than smoke. Within 1 year, cervical enamel demineralization and

interproximal lesions developed on the mandibular anterior sextant, which is consistent with the primary point of contact with the e-liquid aerosol (Figure 2).

### Clinical Significance

Although advocates of vaping cite e-cigarette use claim it has value in helping people quit smoking cigarettes and is a healthier option, this claim overlooks the effects on nonsmokers who start vaping because it seems innocuous and tastes good. For both populations, oral health is at risk because of the chemicals used in vaping and the risk of unforeseeable lithium battery explosions.

Froum S, Neymark A: Vaping and oral health: It's worse than you think. *Dent Econ* 109:78-80, 2019

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