Dentistry 3000

Vol 14, No 1 (2026)
ISSN 2167-8677 (online)
DOI 10.5195/d3000/2026.1103

The Impact of Smoking and Vaping in Teenagers Regarding Periodontal Healing and Surgical Prognosis

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Abstract

Cigarette smoking and vaping use among adolescents are increasing worldwide. Conventional (tobacco cigarette) and e-cigarette (e-cigarette; vaping) smoking is associated with periodontal disease progression and impaired wound healing after oral or periodontal surgery. However, adolescents constitute a vulnerable subgroup due to their developing craniofacial structures, changes in hormonal status, and behavioral practices that may increase the toxicity of nicotine and other toxins. The objective of this work was to provide a summary of evidence related to the influence of adolescent smoking and vaping on periodontal healing and surgical outcomes. The basic biologic processes, clinical implications, and management considerations of this age group, who are managed in the clinical setting with or without periodontal/oral surgery, were addressed. Adolescent smokers/vapers heal less well after surgery. These effects may be minimized by including the assessment of preoperative risk, patient education, and personalized postoperative management in the everyday work of the physician. Cessation programs for adolescents and prevention programs are very important adjuncts to improving oral health.

Open Access

Citation: Shakir SA et al. (2026) The Impact of Smoking and Vaping in Teenagers Regarding Periodontal Healing and Surgical Prognosis. Dentistry 3000. 1:a001 doi:10.5195/d3000.2026.1103
Received: November 15, 2025
Accepted: December 2, 2025
Published: February 9, 2026

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Introduction

There is no doubt that tobacco is one of the most common preventable causes of oral diseases throughout the world. The tendency of teenagers to experiment with smoking and vaping was once thought to apply almost exclusively to adults, but recent surveys are indicating that it may be on the rise. In adolescence, craniofacial development continues, hormone changes occur, and behavior is unique. All of these can affect how prone a person is to periodontal disease and how well surgery works. There are thousands of poisons in cigarette smoke, including the likes of nicotine, carbon monoxide, and reactive oxygen species that can impair immune function, fibroblast activity, and blood flow. E-cigarettes and vaping devices also emit nicotine and other aerosols that can harm the tissues inside the mouth, but they do so in a different way. Although more young people are vaping, the effects on healing from periodontal disease and other surgical outcomes remain poorly understood. It highlights the clinical consequence of treating periodontal and oral surgery in this category of special patients.

Cigarette Smoking During Adolescence: Prevalence and Biologic Effects

Studies of smoking among adolescents worldwide have reported that 10–20% are frequent smokers, but with more in some countries and regions. The pH level of saliva is important regarding oral health, and early onset of smoking increases saliva acidity, which leads to periodontal and dental damage.

- ***Nicotine-generated vasoconstriction:*** reducing the nutritional support to the gingival tissue and hence making less available nutrients and oxygen to healing tissues.

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• ***Fibroblast Hypofunction***: This inhibits wound healing by preventing fibroblasts from dividing, migrating, and building the extracellular matrix.
• ***Inflammatory Mis-regulation:*** This is a modulator of cytokine expression, raising pro-inflammatory mediator production (e.g., IL-1β and TNF-α) to exacerbate the destruction of periodontal tissues.
• ***Oxidative Stress***: Reactive oxygen species generated by smoke cause oxidative injury to periodontal ligament and alveolar bone cells, which reduces the ability of the body to repair.

Impact of Traditional Smoking on Periodontal Regeneration

Adolescents who smoke tobacco exhibit a higher prevalence as well as a greater severity of gingivitis, periodontitis, and alveolar bone loss.
• ***Flap Surgery & GTR:*** Smokers have delayed epithelialization, reduced graft fill, and decreased gain of periodontal attachment.
• ***Periodontal Graft Surgery:*** Rates of graft necrosis and the amount of available keratinized tissue.
• ***Dental Implants:*** Susceptible to peri-implantitis and early implant loss due to the lack of osseointegration.
This is in line with clinical observations that smoking, even episodic use during adolescence, has adverse effects on wounds and underscores the importance of presurgical counselling and cessation interventions.

Vaping/E-Cigarettes: Clinical Effects and Mechanism

Despite marketing claims that vapes are a safe alternative to smoking cigarettes, they are not when you have nicotine, propylene glycol (PG), glycerol, and flavors in contact with oral mucosa.
• ***Nicotine vasoconstriction****:* which affects fibroblasts similarly to how it does in classic cigarettes. Fibroblastic phenotype and function, collagen synthesis, and then ECM synthesis.
• ***Thermal and Chemical Injury:*** Warm aerosol produced by a vape can lead to direct thermal damage to surface epithelium through oxidative injury coproduced with the warm respiratory mucosa.
• ***Immune Modulation:*** changes in the way two types of immune cells—macrophages and neutrophils—perform that can impair the body's ability to ward off infections.
Fresh evidence indicates that vaping can be bad for the entire body, as public health officials have become fixated on dangers to the lungs and on feelings of intense vibrational lung pain often cited by people hospitalized after using either nicotine or cannabis electronic cigarettes. Delayed wound healing and increased postoperative inflammation, as well as impaired connective tissue regeneration, have also been demonstrated.

Smoking vs. Vaping vs. Non-Smokers

Parameter	Non-Smokers	Smokers	Vapers
Gingival Blood Flow	Normal	Reduced	Reduced
Fibroblast Function	Normal	Impaired	Impaired
Inflammatory Response	Normal	Hyperinflammatory	Altered
Healing Time	Standard	Prolonged	Prolonged
Surgical Complications	Low	High	Moderate-High

This comparison forced us to question that all nicotine exposure is unhealthy. The traditional way of smoking is usually much worse, but yes, vaping isn't 100% safe, and it still is scary enough to worry about.

Implications for Periodontal and Oral Surgery

Surgical Prognosis

• *Delayed Healing:* Smoking/vaping delays re-epithelialization, decreases the chances of graft success, and complicates bone formation.
• *Depression of the immune system:* a compromised immune system also increases the chances of postoperative infections.
• *Lower Success Rate*: The success rate of surgeries such as periodontal flap surgery, regenerative therapies, and implants is not satisfactory.

Special Consideration in Adolescents

• *Hormone Influence:* Pubertal hormonal transformation can modify the inflammation, and tissue injury is influenced by nicotine.
• *Patient Compliance/Compliance Patients:* Young children and adolescents may not comply with an oral hygiene/after-surgery routine.
• *Psychological Issues:* The impact of peer pressure, "safe vaping," and propensity to take risks make preoperative counseling more difficult.

Clinical Recommendations

1. Preoperative Counseling: discussion with teens and their parents about the effects of smoking and vaping on results.
2. Interventions: Optional supplementary use of behavioral therapies and nicotine replacement.
3. Improved surgical planning: Do something to manage tissues non-violently and laparoscopically and enhance with regenerative therapies.
4. Post-op Follow-up: Establishing a more comprehensive checkup after surgery will help catch any early signs of infection.
5. Public Health Tools: School-based vaping and smoking prevention interventions will decrease exposure in adolescents with long-term benefits for periodontal health.

Conclusions

Cigarette smoking and vaping in adolescence are strong inhibitors of periodontal healing at the time of surgery. ECs, as well as CS, affect immune response, cellular behavior, and vascularization that are important for tissue regeneration. The hormonal profile, behavior aberrations, and presence of craniofacial growth and developments all make the adolescent patient a special risk type. The prevention, understanding, and individual postoperative aftercare support by dental professionals are crucial for maximizing healing results. A public health agenda to improve oral health outcomes in adolescents must prioritize reductions in adolescent nicotine exposure.

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