



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2020; 6(3): 318-320
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www.oraljournal.com
Received: 13-05-2020
Accepted: 16-06-2020

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Tobacco and its adverse effects on the oral cavity

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Abstract

The use of tobacco can be taken orally/ through the nose without burning the product and can be smoked. There is a prevalence use of tobacco products in many countries in the world. Young people as well as grown-ups are commonly using tobacco products since it is easy to use without being noticed. Tobacco is proven to contain more than 28 chemical carcinogens. Tobacco is addictive due to the presence of nicotine and when someone starts using, it becomes hard to stop the habit. When taken orally it has adverse effects on the oral cavity like, loss of alveolar bone, oral cancer reduces the periodontal tissue immune defense and increased bacteria strains. Those who take tobacco have deleterious effects associated with periodontal lesions such as a rise in gingival recession as well as attachment loss. Tobacco consumption increases the susceptibility of caries in the teeth because of the high sugar content.

Keywords: Tobacco cessation, oral cancer, periodontal tissue, alveolar bone, bacterial strains

1. Introduction

Tobacco use is established as the main risk for periodontal disease. Research conducted has suggested tobacco users have high chances of problems like teeth coloring and loss of bone as well as giving recession compared to non-tobacco users. Tobacco has the potential to affect the functioning and proliferation of periodontal cells like periodontal membrane cells, gingival fibroblasts and other cells causing into apoptosis of cells. It also weakens the autoimmune defense once it damages and destroys the alveolar bone. Oral cancers are another deadly disease associated with tobacco use. The paper focuses on the adverse effects of tobacco use on the oral cavity.

2. Methods

Web of Science databases, Pub Med, and CNKI was applied as the source of data for the research. The search done included keywords like tobacco, nicotine, oral cancer and periodontal disease. The searches concentrated on studies in English from 1950 to 2020. The search was focused on the articles that addressed the objectives of the review (Spencer & Phillips, 2019) [5]. Articles containing tobacco and nicotine details and included the following key words oral bacteria species, oral cancer, inflammation, alveolar bone, periodontal cells, and periodontal disease were explored. The relevance of the article to the review was assessed through the title and the abstracts. Clinical, immunological and microbiological data concerning tobacco, oral cancer and periodontal disease were collected, studied, analyzed and a conclusion was made.

3. Discussion

3.1 Clinical findings

Periodontal disease is a prevalent inflammatory disease that results in the loss of teeth in adults; it is influenced by the destruction of structures supporting teeth like the gingival, alveolar bone, periodontal ligament and cementum. Tobacco use was highly associated with periodontal disease when the first observation between periodontal tissues and smoking was discovered in the 1950s (Ghate & Pathak, 2017) [1]. The evidence from the articles indicated that the tobacco consumers experience more periodontal disease, tooth loss, pocket formation and gingival recession, unlike the non-tobacco consumers.

3.2 Effects of Tobacco on Periodontal Cells

The periodontal membrane is mostly formed of periodontal ligament cells that characterize proliferation, differentiation and biosynthesis.

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Alveolar bone and various tissues like cementum play a crucial role in maintaining, repairing and regenerating tissues to support teeth. The use of tobacco which contains nicotine as the active ingredient increases gingival collagen degradation in humans (Janz & Day, 2019) [3]. Additionally, tobacco use leads to the direct damage of the cells with the combination of cigarette smoke extract (CSE) increasing the ability of collagen degrading activity of gingival fibroblasts (hGFs).

3.3 Effects of Tobacco on Bacteria

Tobacco consumers have calculus deposited which is stiffer and tightly attached to the teeth. The first step for dental biofilm formation is the attachment of the acquired pellicle to a tooth. Afterward, the bacteria cell attachment follows the acquired pellicle. The tobacco users increase the chances together with the amount of some oral bacterial strains (Ozturk & Mustafa, 2017) [4]. The effects gradually promote pathogens attachment to the teeth as well as the development of the periodontal diseases to the tobacco users.

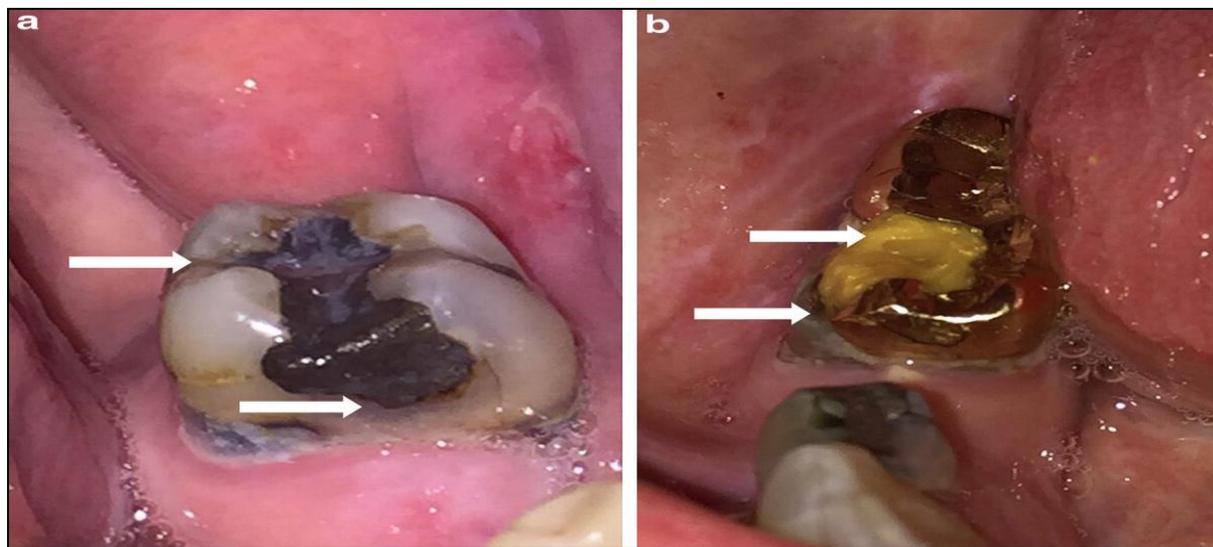


Fig 1: Chewing of tobacco cab associated with harmful bacteria.

3.4 Tobacco Reduces the Periodontal Tissue Immune Defense

The epithelial barrier, saliva, gingival fluid, immune cells, represents the multiple defense barriers of the periodontal tissues. The mechanism is crucial in providing persistence of dental plaque in the gingival furrow together with protecting the periodontal tissue from the invasion of bacteria and destruction. The use of tobacco lowers the immune defense of this mechanism for the periodontal tissue (Hashibe, 2019). Tobacco affects the inflammatory mediators and secretion of cytokines from the immune cells like mononuclear neutrophils cells. However, there is an association of cigarette smoking and delayed would healing in patients, although extensive research is yet to be undertaken. The nicotine in

tobacco reduces nutritional blood flow to the skin, causing tissue ischemia as well as impaired healing of the injured tissue.

3.6 Effects of Tobacco on the Alveolar Bone

The use of tobacco has adverse effects on clinical periodontal variables as well as alveolar bone density and height. This in return acts as a potential risk factor for the loss of the alveolar bone. The findings associated the depletion of the periodontal tissue through the taking of tobacco and unfavorable clinical course of periodontal disease associated with patients who use tobacco (Spencer & Phillips, 2019) [5]. The nicotine present in tobacco has the potential to inhibit osteoblast differentiation.

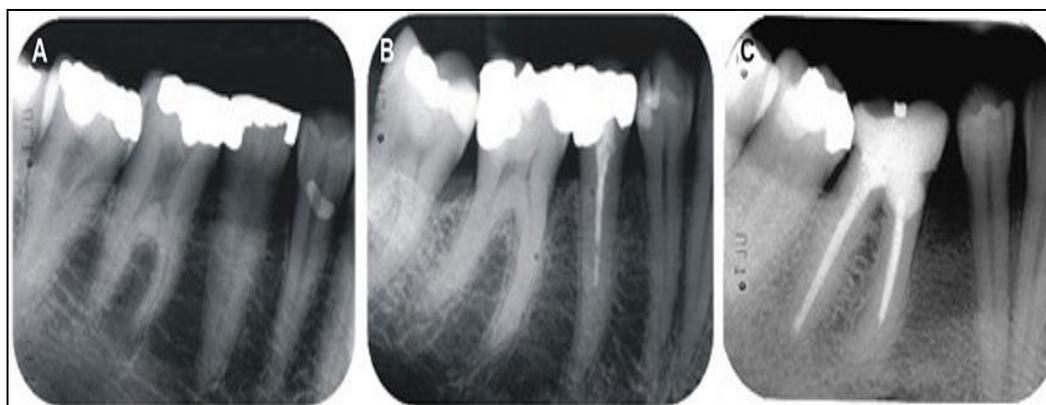


Fig 2: Effects of tobacco on the alveolar bone

The homing and functional ability of the bone marrow is reduced by the use of tobacco which lowers the amount of stem cell circulation. Tobacco users change the metabolism of

the alveolar bone which makes it possible to contribute to the loss of the alveolar bone.

3.7 Tobacco and Oral Cancer

The oral cavity cancer is a traumatizing condition that is closely associated with the consumption of tobacco. Taking tobacco is epidemiologically related to oral cancer and it greatly contributes to its occurrence together with how it develops within the oral cavity of humans. Tobacco users are seven times more likely to develop oral cancer and three times more likely to develop a second type of cancer compared to those who do not use tobacco. The two factors in the tobacco which are connected to the human cancers are carcinogens and nicotine (Hashibe, 2019). From recent studies, there is a relationship between oral cancer and periodontal disease. Some of the studies classified the periodontal disease as an independent factor for oral cancer.



Fig 3: Tobacco causes oral cancer

4. Results

From the studies, the use of tobacco was found to cause direct damage to the periodontal cell despite increasing the collagen-degrading potential with the combination of cigarette smoke extract (CSE). Smoking increases bacterial invasiveness in the oral cavity. Tobacco lowers the immunity of the periodontal tissue (Hashibe, 2019). Additionally, the use of tobacco exacerbates the inflammatory response of the periodontal tissue. Taking tobacco alters the metabolism of the alveolar bone which can synergistically result in alveolar bone loss.

5. Conclusion

Tobacco consumption is a well-established factor for periodontal disease. Those involved in the use of tobacco are at high risk of developing periodontal disease than the people who do not consume tobacco. Tobacco has the potential to damage the periodontal ligament cells, negatively affect the remodeling of alveolar bone during orthodontic treatment and implantation, and increase the rate of losing alveolar bone. The reduction in the concentration of cigarette smoke extract (CSE) encourages biofilm formation of the bacteria causing periodontal disease. From the evidence provided by the articles tobacco substantially increases the development of oral cancer. However, the evidence that oral cancer is associated with periodontal disease is limited to a certain level.

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