

## Effect of Smoking in Peri-Implant Diseases: Literature Review

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### Abstract

Periimplantitis is an infectious bacterial disease that affects soft and hard tissues around the implant, promoting the loss of osseointegration. Among the risk factors, smoking and periodontal disease can be considered, since when present, they can exacerbate bone loss, make it difficult to heal after mucogingival surgery, and cause implant failure. The objective of this study is to do a review of the literature on the relationship between smoking and peri-implant diseases, the research was conducted in the pubmed database. The main finding was that smoking is considered a risk factor for failure of dental implants and for the development of peri-implant. In the comparison of smokers with nonsmokers, failure in the treatment of the implant is higher in smokers, as well as in the presence of peri-implant diseases. The failure rates of implants placed in grafted maxillary sinuses are observed twice as much in smokers as in nonsmokers, in addition to the greater of marginal bone loss.

**Keywords:** Smoking; Tobacco; Dental Implant; Periodontitis; Contraindications

### Introduction

Periodontal disease is an inflammation caused by the presence of a dental biofilm that acts through direct mechanisms, both in the gingiva and in the tissues of dental support, which can cause the destruction of both. Subgingival periodontal disease (periodontitis) occurs through the presence of supragingival disease, gingivitis, in susceptible patients, and may compromise the functionality and stability of teeth [1].

The loss of this support can be explained by the release of bacterial plaque toxins, which stimulate an inflammatory response, with the formation of an infectious periodontal pocket. As the disease progresses, the pouch becomes deeper and the bone and tissues are destroyed, and there may be tooth mobility or loss of teeth [1,2].

A rehabilitating alternative for the replacement of teeth lost by periodontitis is the possibility of placing dental implants, which are usually titanium structures, positioned surgically below the gingiva, allowing integration to the bone and allowing the dental surgeon to mount a replacement crown on it [3,4]. The success of osseointegrated implants depends on maintaining the health of the surrounding tissues. Thus, patients with a prior history of periodontal disease may predispose a greater risk of loss [4,5].

Periodontally compromised patients have a reduced rate of osseointegration, since periodontitis can modify bone volume and quality, preventing this process from occurring. Therefore, the presence of sufficient nutrients in the surrounding bone is essential. These nutrients are transported through the alveolar bone in the blood supply, if this supply is reduced, the osseointegration is compromised [5,6].

Associated with this, the health status and habits of the patient are also considered. Oral hygiene is indispensable for the treatment of periodontitis since the disease must be stabilized before the dental implant placement is initiated and the patient must be motivated to maintain a good oral hygiene after implant implantation.

Smokers also contribute to the failure of osseointegration when they present a prior history of periodontitis, since smoking is a risk factor for periodontal disease. Tobacco consumption plays an important role in the pathogenesis of inflammatory disease, not only in the higher prevalence, but also in severity [5,8].

The formation of the biofilm on the implant induces an inflammatory response in the host, initially located in the soft tissues adjacent to the implant, called Mucositis, being reversible with plaque control. The progression of Mucositis may lead to Periimplantitis, an inflammatory process that affects the tissues around the already osseointegrated implant, resulting in the loss of supporting tissues [7]. The implant surface may influence the buildup of plaque, implant abutments with rough surfaces tend to accumulate more plaque than smooth surface implants. In this context, different implant surfaces may influence the microflora of the peri-implant and, possibly, the inflammatory process around them [6].

There is no doubt about the negative effects of smoking on the human body. The oral cavity is also adversely affected by cigarette smoke, which can cause an increase in bacterial plaque accumulation, a higher incidence of gingivitis, a risk factor for periodontitis, increased alveolar ridge resorption, and also tooth loss [9]. Smoking reduces the vascularization of the alveolar bone, interfering in the concentration of essential nutrients for the success of osseointegration of the implant [5]. Tobacco has many toxic substances, such as nicotine, carbon monoxide, and hydrogen cyanide, which compromise bone healing after implant insertion [10].

Based on the foregoing, the objective of the present study was to review the literature on the relation between smoking and peri-implant diseases.

### Literature Review

Initially, a search was performed on the Pubmed database, which was limited between 2005 and 2015. The following descriptors were used: (peri-implantitis OR peri-implantitis OR peri implantitis) AND (smoker OR smokers).

It can be observed that most of these articles were published between the years of 2008 and 2015, and the authors in the literature point to smoking as an important risk factor that can affect the success rate of dental implants [11,13-15,17,20,21].

In a study on the effects of smoking, the authors had a failure rate/treatment failure with implants of 5.92%. When divided in smokers and nonsmokers, the rate of failure in smokers was 11.28%, and in nonsmokers of 4.76%, this difference being statistically significant ( $p < 0.001$ ) [11]. The failure rates of implants placed on maxillary sinuses grafted in smokers were observed twice as much as in nonsmokers [11,19]. For Stoker, *et al.* (2012), in a study with 94 patients, comparing, in the long term, three different types of mandible implant treatments, with emphasis on smokers, indicate that smokers with peri-implant disease present marginal bone loss almost two than nonsmokers, regardless of the treatment strategy chosen [13].

Wahlström, *et al.* (2010), in their study, in a sample of 46 rehabilitated patients with 116 implants, divided into three groups according to the height of the marginal bone. Five patients reported being smokers and 26 ex-smokers. Ex-smokers had significantly fewer teeth, more periodontal pockets, and a greater tendency ( $p = 0.06$ ) for marginal bone loss, compared to nonsmokers, with 5 of the 26 patients presenting Mucositis and 1 Periimplantitis. On the other hand, smokers had significantly ( $p < 0.01$ ) more teeth with periodontal pockets  $> 6$  mm compared to nonsmokers and ex-smokers, and 3 patients out of 5 had Mucositis and 1 Peri-implant [12]. Serino and Ström C (2009) reported that smoking is considered a risk factor for implant treatment and has been associated with peri-implantitis. Of the 23 patients involved in this study, 6 were smokers, and in comparison, with non-smokers, the mean number of affected implants was higher in the smokers group [14].

Similarly, Heitz-Mayfiel and Guy Huynh-Ba (2009), when comparing the history of periodontitis and smoking as risk factors for implant treatment, concluded that there is an increased risk of peri-implantitis in smokers compared to nonsmokers. And the combination of periodontal disease and smoking, increases the risk of implant failure and bone loss in Peri-implant [15].

In the systematic review and meta-analysis of Momen., *et al.* (2013), subgroup analysis was performed to provide an estimate of peri-implantitis based on the presence of risk factors: smoking, diabetes and periodontal disease. The authors affirmed that the frequency of the implanto-bearing participants who presented peri-implant disease was significantly higher among the smokers (36.3%) [16]. In the analysis by Sgolastra., *et al.* (2015), who attempted to evaluate the scientific evidence as to whether smoking could be considered a risk factor for peri-implantitis, they stated that, on implants, there is a more significant risk of peri-implantitis in smokers when compared to nonsmokers ( $p = 0.001$ ) [17].

In 2015, Pozzi., *et al.* carried out a prospective clinical study over a period of 3 years, including 54 partially edentulous patients, with 3 smokers (5.6%), where each patient received a single prosthesis. The only complication observed (1.9%) was the presence of peri-implantitis, consisting of a loss of marginal bone (PI 3,2 mm), with bleeding probing in a smoking patient [18]. Similarly, Degidi., *et al.* (2015) analyzed 114 patients for a total of 284 implants, observed over 10 years. The authors stated that smoking significantly influences the long-term survival prospects of the implant ( $p = 0.01$ ), with an increase in bone mass loss and higher marginal probing values of 2.8mm in smokers, compared to 2, 4 mm in non-smokers, but a lower incidence of bleeding at 15.2% in smokers and 18.9% in non-smokers.

In an article published in 2012 by Kasat and Ladda [20] on the relationship between smoking and dental implants, the authors stated that the rate of implant failures is higher in smokers compared to nonsmokers, being directly proportional to smoking and that smoking is a risk factor for implant failure, but it is not a contraindication for such a procedure.

The combination of poor oral hygiene and smoking is sufficient to compromise the results of an implant rehabilitation [14-16,19,20]. For Serino and Ström (2009) [14], a high proportion of implants diagnosed with peri-implantitis was associated with no accessibility or poor accessibility to oral hygiene.

Baig and Rajan (2007) identified smoking as a risk factor for implant failure, as well as for the development of peri-implant diseases [11]. In addition, smokers have a higher risk of marginal bone loss [15,21], in another study, LJA Heitz-Mayfield and Guy Huynh-B [15] have shown that many aspects of the immune and inflammatory system affect smoking, impairing healing of wounds, reduction of the peripheral circulation and compromise of the biological processes that involve the osseointegration and maintenance of the implant. Smoking may also affect bone remodeling and microvascularisation of soft tissues [19].

Ex-smokers seem to have a reduction in the adverse effects of tobacco consumption on implant survival [11]. Smoking cessation may reduce risks for such patients [11,20]; however, if the patient is unable to quit smoking, the decision to proceed with implant treatment should be made by the dentist, depending on the number of patients smoked cigarettes and the risk of failure [11].

Baig and Rajan (2007) added that cessation of smoking, associated with smoking history for long years, decreases the likelihood that bone quality will improve significantly in a short period of time [11].

Considering that more than two million oral implants are placed annually, peri-implant disease can affect more than half a million implants per year. Therefore, clinicians and patients should be prepared for such a situation, that is, having the control routine in order to identify early signs of the disease. Regular follow-up care may allow early intervention to interrupt the progression of mucositis into peri-implantitis [16].

According to Baig and Rajan (2007), the following recommendations should be suggested:

- The history of smoking: this should include the duration of smoking, the intensity (past and present) and the present status. It is especially important to identify former heavy smokers who have recently stopped;
- Appropriate oral hygiene instructions should be given and the deleterious effects of smoking on oral hygiene should be highlighted, with particular reference to the effect of smoking as a risk factor for periodontal disease. The patient's periodontal condition is also a valuable prognostic indicator;
- The patient should then be informed about the prognosis of implants in smokers, especially in the maxillary region. Increasing the predictability of dental implant success. Patients should be advised to stop smoking for good.

### Conclusion

It is agreed by the authors in the literature that smoking is considered a risk factor for periodontal disease, as well as for the development of peri-implant and therefore may affect the success rate in dental implant treatment. The combination of periodontally compromised and smoker patients may reduce osseointegration of the implant.

There is no doubt that smoking is harmful to health in general. It can be said, then, that the negative effects of tobacco and its toxic substances on the oral cavity, before and after insertion of the implant, favor the idea that the professional should detach them to the patient and report on the possibility of poor prognosis, as well as make a control and maintenance evaluation, to diagnose signs of disease or to prevent its progression.

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