Original Research Article

Rehabilitation with single implants in smokers: a 5-year retrospective study.

Abstract

The individual smoker can present several alterations in the periodontal tissues, such as the reduction of blood flow, the alteration of the inflammatory and immunological responses, the damage in the tissue healing, the modification in the composition of the bacterial plaque, the increase in the depth of the pocket and greater loss of tissue. periodontal attachment. The aim of the present observational cohort study was to assess the peri-implant condition of dental implants in function for 5 years. Methodology: The convenience sample included in the present study consisted of 70 smokers, who had implants placed between 2014 and 2015, and who, after contact attended to undergo clinical periodontal examinations and periapical radiographs. Results: the presence of biofilm was observed in 54.7% of the implants and the mean probing depth was 3.87mm, while in individuals without the presence of plaque it was 3.44mm. For the probing bleeding index, 42 individuals did not experience bleeding and with a mean PS of 3.18mm, the 22 individuals with bleeding on probing had PS of 4.23mm. When considering the location of the implant, 22 were located in the mandible and 42 in the maxilla, with no statistical difference regarding location. Of the individuals evaluated, 27 did not perform annual maintenance in the last 5 years and 37 performed annual maintenance, the observed probing depth averages were 4.89mm and 3.64mm respectively. Conclusion: This study reported that bleeding on probing and lack of annual maintenance can promote an increase in probing depth in implants installed in smokers.

Key words: Smoking; Peri-implantitis; Dental Implants, Single-Tooth; Dental Prosthesis

Introduction

The harmful effect of smoking on the health of the world population has been the subject of numerous investigations and wide dissemination, due to the fact that it increases the risk of oral cancer, injury via the oral mucosa and periodontal disease. The various treatments performed in the oral cavity, both aesthetic and functional, are supported by the periodontium and that, throughout the life of the individual, undergoes physiological changes, such as those resulting from periodontal diseases, often as a consequence of genetic and/or modifying factors acquired [1].

Nicotine is the most important constituent among more than 4000,000 potentially toxic substances in tobacco products. It is the main chemical component responsible for tobacco dependence, appears to mediate the hemodynamic effects of smoking, and has been implicated in the pathogenesis of numerous diseases. Nicotine is a vasoconstrictor that not only reduces blood flow and nutrient delivery to the surgical implant site, but also inhibits the proliferation of fibroblasts, red blood cells, and macrophages. Carbon monoxide decreases the oxygen carrying capacity of red blood cells while hydrogen cyanide leads to hypoxia [2].

The individual smoker can present several alterations in the periodontal tissues, such as the reduction of blood flow, the alteration of the inflammatory and immunological responses, the damage in the tissue healing, the modification in the composition of the bacterial plaque, the increase in the depth of the pocket and greater loss of tissue. periodontal attachment [3,4], which will undoubtedly affect the prognosis or outcome of dental treatments. Rehabilitative treatment with dental implants has become common in the last decade and has grown significantly in recent years. Due to the remarkable success of dental implant therapy, there is a growing interest in identifying the factors associated with implant failure, thus, dental implant loss has been one of the most current topics addressed within implant dentistry [5,6]. Identifying the risk factors that compromise success in rehabilitation is important to know to minimize failure rates [7].

Osseointegration is defined by Branemark as the direct, structural and functional connection between structured, living bone and the surface of an implant subjected to a functional load under optical microscopy. The implant site must have good vascularization. The success of osseointegration has been constantly associated with the quality of bone density that can be impaired, among other causes, by smoking. Several authors have confirmed this deleterious

effect in smoking patients, especially when implants are placed in the maxilla, in relation to light smokers and non-smokers [8-13].

After ten years, smokers with poor oral hygiene had three times more marginal bone loss than non-smoking patients [14]. A systematic reviews noted that there was a significant increase in bone loss around implants in smokers compared to non-smokers, with cigarette smoking being a risk factor for biological complications [15-19].

The current classification of peri-implant disease defines as risk factors for the development of the disease the lack of periodic maintenance and the previous history of periodontal disease [20]. The dental literature has shown that the habit of smoking and the number of cigarettes consumed per day have an impact on the periodontium and on implant failure, which, ultimately, should have repercussions on rehabilitations that are or will be installed in the oral cavity [21]. The number of patients rehabilitated with dental implants grows every year and studies evaluating smokers or patients with systemic impairment are still scarce in the literature. Having knowledge about the current state of implants installed more than five years ago can guide the professional regarding the correct preservation of the implants and verify the tissue conditions of the implants when subjected to exposure to toxic substances from cigarettes.

Methodology

All recruited individuals were offered verbal and written explanations about the objectives, methodology, benefits and possible risks related to participation in the project. Thus, the individuals who agreed to participate in the study signed the Free and Informed Consent Term, previously evaluated and approved by the Research Ethics Committee involving human beings with the number 2,058,961

The convenience sample included in the present study consisted of 70 individuals who sought care and had implants placed at the Dental Clinic of the University Santo Amaro (UNISA), between 2014 and 2015, and who, after contact by phone and/or letter, attended the Dental Clinic from UNISA to carry out the proposed exams. Initially, 136 smoking patients were evaluated and 64 individuals of both genders, between 50 and 70 years of age, with implants placed from 2014 to 2015, were included in the study. With a single implant of the external

hexagon type, installed in the anterior region. Regarding high-intensity (heavy) smoking, current -smokers who smoked ≥10 cigarettes/day [22]. Individuals who required the use or suspension of systemic medication to perform the proposed clinical exams were excluded from the study. All personal information, as well as the medical and dental history, were obtained directly from the medical records or through a questionnaire and recorded in the standard model record of the Discipline of Implantology of the Department of Dentistry.

Each clinical parameter was obtained by a single blinded and previously calibrated examiner. For continuous variables (probing depth) the SEM (standard error of measurement) was used and for categorical variables (modified plaque and gingival indices) the Kappa test was used. Thus, 10 exams were repeated at an interval of 30 days and submitted to analysis. Examiners will be considered calibrated using SEM ≥ 0.8 and K > 0.8 and < 0.95.

To establish the diagnosis and subsequently clinical monitoring, the participants underwent peri-implant examination, with measurements obtained at four points per implant (vestibular; mesial palatine and distal) for probing depth (PD), plaque index (PI), bleeding index on probing (BI), radiographic examinations were performed in all participants in order to verify the level of cortical bone height

Analysis of variance (ANOVA) was used to compare the means of clinical and microbial values obtained. The analyzes and graphs of the present study will be carried out with the help of the statistical program graphPad Prism, version 4.0. The data present in the graphs will be expressed as mean ± SEM (standard error of the mean).

Results

The individuals included in the study had a mean age of 58.25 years, with 35 females and 29 males. All had 1 external hexagon implant installed in the anterior region of the maxilla and mandible. Regarding annual maintenance in the last 5 years, 10 men and 18 women reported performing annual maintenance, while 10 men and 17 women reported not performing annual maintenance (Table 1).

In table 2, we can see the probing depth averages when evaluated with the variables, plaque index, implant location (maxilla or mandible), annual maintenance or not, and probing bleeding rate. When the presence of plaque was evaluated, the average probing depth was

3.87 mm, while for individuals without the presence of plaque it was 3.44 mm. When considering the location of the implant, 22 were located in the mandible and 42 in the maxilla, with no statistical difference regarding location. Of the individuals evaluated, 27 did not perform annual maintenance in the last 5 years and 37 performed annual maintenance, the observed probing depth averages were 4.89mm and 3.64mm respectively. For the probing bleeding index, no bleeding was observed in 42 individuals and with a mean PS of 3.18mm, the 22 individuals with bleeding on probing had PS of 4.23, with a statistical difference (*P*=.05).

Of the sample evaluated, 42.2% did not perform annual maintenance and 57.8% performed it in the last 5 years. When related maintenance appointments with the presence of plaque and bleeding, we can observe that of the individuals with annual maintenance, 59.5% had no plaque adhered to the surface of the implant and 75.6% had no bleeding. conditions when purchased with individuals of the same group (Table 3). When comparing the groups, a statistical difference was observed for the plaque index where the presence is greater in the group without maintenance (*P*=.05).

Discussion

Currently, smoking is commonly accepted as an important modifying risk factor for the development and progression of periodontitis [7,23]. The reasons why smokers are more susceptible to periodontitis and peri-implantitis are complex, but often involve depression of the innate and adaptive immune response, and interference with wound healing [4].

Cigarette smoking is probably the most accepted factor in association with poor dental implant treatment outcomes [3,24]. In smokers, a significant correlation with marginal bone loss around implants has been reported, according to smoking as a risk factor for the development of inflammatory complications is controversial [11], However, most studies report implant failure rates in smokers as being twice as high as in non-smokers. [25] Cigarette smoking has a significant influence on complication rates, causing marginal bone loss after implant placement, increasing peri-implantitis rates, as well as affecting the success of bone grafts [26].

Many studies have found more marginal peri-implant bone loss in smokers than in nonsmokers. [4,12,16,18] Unfortunately, most studies are observational, with many confining factors and which do not allow the confirmation of hypotheses. [17,27,28,29] A recent systematic review with meta-analyses based on implant- and patient-related data showed a significant increase in the RR of implant failure in patients who smoked >20 cigarettes per day compared with non-smokers [21].

Studies that manage to limit confounding factors and that have the same diagnostic and methodology criteria and that allow comparisons are rare. Due to the multifactorial character with influence of microbial, immunological and genetic factors In a retrospective study, the smoking group had a very high bleeding rate, a significant probing depth, intense inflammation of the peri-implant mucosa, and radiographically, visible bone loss mesial and distal to the implant. In the maxilla of smokers these observations were more significant than in the mandible of smokers ($p < 0.01$). These findings confirm that smoking patients rehabilitated with implants are more likely to have peri-implantitis than non-smokers, at least in the maxilla [8]. In the present study, no differences were found regarding the position of the implant.

A limited number of studies available on implants with sand-blasted, large grit, acid-etched and/or acid-etched or anodic-oxidized surfaces did not show significant associations between smoking and implant failure and marginal [15]. All implants evaluated in this study had the same characteristics, all external hexagonal type and without surface treatment.

Regarding the probing depth, a statistical difference was observed for the variables maintenance and bleeding index. No difference was observed regarding the presence of biofilm and a greater probing depth. Patients who underwent annual maintenance in the last 5 years showed less probing depth when compared to those who did not undergo maintenance. The probing depth being greater in smokers seems to be well established in the literature [4-6,16,19], but its relationship with biofilm, bleeding and maintenance variables is not, studies that limit confounding factors are needed to clarify.

Smoking is not an absolute contraindication for implant placement, as the presence of an isolated risk factor is usually insufficient to cause an unfavorable outcome, such as peri-implantitis, which is a multifactorial problem. [19,23]

The regular routine and frequency of maintenance appointments to motivate patients and professionally control the bacterial plaque may prevent the appearance or increase of gingival

inflammation in dental implants with mucosa-supported prosthesis. Individual programs based on clinical evidence for plaque control by the patient are rarely used with patients who have dental implants. They should, however, follow a regime of reduced intervals between appointments, as well as an individual program according to their needs to enforce home plaque control. [30]

When evaluating the performance of maintenance and the presence of biofilm and bleeding, a statistical difference was observed for the greater accumulation of biofilm in patients who did not undergo maintenance annually and the absence of bleeding in patients who underwent annual maintenance. Maintenance of implants is essential for a favorable prognosis.. Because it is a retrospective study, important information about the procedures during the annual appointments, if they were carried out by the same professional, which treatments were performed at each visit, and other information, could not be registered as the patients were not informmed.

The prevention or successful management of peri implant mucositis maintains healthy peri-implant tissues and prevents the conversion of peri implant mucositis to peri-implantitis. Identifying risk indicators for peri-implant diseases would help practitioners to develop prevention and management strategies that detect high risk patients and enhance the likelihood of a predictable result for their dental implants.

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Table 1. Gender, age, number of implants, individuals, implants with or without annual maintenance

Gender	Age	Number of implants	Number of individuals	With anual maintenance	Without anual Maintenance
Male	61,5	29	29	19	10
Female	56,0	35	35	18	17
Total	58,25	64	64	37	27

Variable	N	Average (PD)
Plaque = 0	29	3,44 (0,55) [A]
Plaque = 1	35	3,87 (0,62) [A]
Local = inf	22	3,55 (0,67) [A]

Table 2. Mean and Standard Deviation of Probing Depth

Local = sup	42	3,65 (0,54) [A]
Maintenance = 0	27	4,89 (0,76) [A]
Maintenance = 1	37	3,64 (0,42) [B (p=0,01)]
Bleeding = 0	42	3,18 (0,37) [A]
Bleeding = 1	22	4,23 (0,64) [B (p=0,005)]

Table 3. Correlation betwen plaque and bleeding index with maintenance

	Maintenance = 0	**Maintenance = 1**	**Total**
Plaque index = 0	07 (26%)	22 (59,5%) **	29 (45,3%)
Plaque index = 1	20 (74%) *	15 (40,5%)	35 (54,7%)
Bleeding index = 0	14 (51,8%)	28 (75,6%) **	42 (65,6%)
Bleeding index = 1	13 (48,2%)	09 (24,4%)	22 (34,4%)
Total	**27 (42,2%)**	**37 (57,8%)**	**64 (100%)**