Review

Dental implant treatment in patients with periodontitis. A Review of literature.

Shrestha R[1], Shrestha B[2], Ou G[3]

[1]Postgraduate student, State Key Laboratory of Oral Disease, Dental Implant Center, [2]MDS, Department of Orthodontics, Stomatology center, Wuhan Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China. [3]Associate Professor, State Key Laboratory of Oral Disease, Dental Implant Center, [1,3]West China Hospital of Stomatology, Sichuan University, Chengdu, China

Abstract

Periodontitis is one of the main reasons for edentulism. The issue of successful placement of dental implant in patients with a history of periodontitis is an important treatment planning consideration. This article broadly reviews the success and survival rates of implant therapy in patients with history of periodontitis as well as the role of implant design/ implant surface and smoking including the role of supportive periodontal therapy/ infection control program for those patients.

Introduction

Periodontitis is a multifactorial disease[1] with micro-organisms being the main etiologic agent. However, genetic factors may explain as much as 50% of the disease[2]. The main reason for tooth loss is periodontal diseases[3-7]. It is the principal reason for edentulism in individuals vulnerable to periodontal diseases[7-9]. In both fully[10,11] and partially[12,13] edentulous patients dental implant is an effective and predictable treatment modality for replacing missing teeth and has become one of the first choices of treatment for those patients. Because more teeth are lost due to periodontal disease than any other oral infection, the issue as to the success of placing dental implants in patients with a history of periodontitis is an important treatment planning consideration.

Several systemic reviews have studied implant therapy in patients treated with periodontitis[3,14-19].

1. According to Ong et al.[3] there is some evidence that patients treated for periodontitis may experience more implant loss and implant complications than non-periodontits patients.
2. According to Klokkevold and Han[14] a history of treated periodontitis does not seem to adversely affect implant survival, but that these patients may experience more complications and a lower success rate, particularly over longer periods.
3. Karoussis et al.[15] found that there were no statistically significant differences in either short-term or long-term implant survival between patients with a history of treated periodontitis and non-periodontitis patients. When evaluating success criteria, patients with a history of treated chronic periodontitis exhibited significantly greater long-term probing pocket depth and marginal bone loss compared with periodontally healthy subjects.
4. Quirynen et al.[16] found in patients with a history of treated periodontitis who had implants with minimally/moderately rough surfaces and received supportive periodontal therapy, the implant failure rates and marginal bone loss remained low.
5. According to Schou et al.[17] there was also significantly more marginal bone loss observed in patients with periodontitis-

Correspondence: Dr. Rachana Shrestha, State Key Laboratory of Oral Disease, Dental Implant Center, West China Hospital of Stomatology, Sichuan University, Chengdu, China. Email: esnehas@live.com

associated tooth loss after 5 years.

6. Schou[18] concluded that while implant survival is high in individuals with periodontitis-associated tooth loss, the high incidence of periimplantitis might jeopardize the long-term outcome of implant treatment in periodontitis-susceptible patients.
7. Van der Weijden et al.[19] found implant survival and success might be different in patients with and without a history of treated periodontitis.

Patients with history of Aggressive Periodontitis

Aggressive forms of periodontitis are characterized by rapid attachment loss and alveolar bone destruction in systemically healthy individuals. Besides, familial aggregation is often at play[20]. This form of periodontits was previously known as juvenile and rapidly progressive periodontits[20]. Periodontal therapy may control periodontal infection and improve tooth survival. However, such action is not expected to resolve impairment of host defense. Furthermore, susceptible individuals need meticulous, lifelong home and professional care to ward off recurrence. Because periodontal treatment is not likely to improve an immune response, it is reasonable to expect lower survival rates in these patients.

According to a systemic review by Al-Zahrani[21], there was good short-term survival of implants placed in patients treated for aggressive periodontitis that subsequently were periodontally maintained. The data indicated, however, that bone loss occurred around implants in patients with a history of aggressive periodontitis more often than around implants in patients with history of chronic periodontitis or periodontally healthy individuals. In addition, the author made several comments that should be underscored to interpret these findings:

i. Before placement of implants periodontal and dental diseases should be controlled
ii. Individuals with aggressive periodontitis may be susceptible to additional periods of disease progression. At present, however, no recommendations can be made to define a time period that should elapse before initiating implant therapy.
iii. There are a limited number of studies addressing the survival rate in patients with aggressive periodontitis.
iv. It is unknown what effect retention of questionable teeth in these patients will have on the success rate of implants in individuals who had aggressive periodontitis.

Prognostication Of Periodontally Compromised Teeth

The concept of early extraction of periodontally involved teeth and their replacement with dental implants is based on a perceived advantage of implants over teeth in terms of [22]: unpredictability of tooth survival following treatment of periodontal disease, better long-term prognosis of implant-supported restorations in comparison to teeth or tooth-supported restorations, lack of complications in comparison with teeth, better function than teeth, better long-term cost–benefit, better esthetics, and better patient satisfaction

In this era of greater dental implant use, there is a tendency to misjudge the long-term prognosis of a tooth with a compromised periodontium (treated or untreated) [23-25]. Thus, the practitioner may remove a tooth prematurely, reasoning that its retention can damage a potential implant site, or its inclusion in prosthesis is too risky. Most studies, however, indicate that periodontally treated but questionable teeth have a better long-term retention rate (5 to 40 years) than expected[23].

Several recent review papers have noted that there is no single clinical parameter (eg, probing depth, bone loss, clinical attachment loss, mobility, or furcation invasion) that can reliably predict periodontal disease activity, tooth loss, or conversely, long-term tooth preservation[23,25]. Therefore, combinations of parameters need to be evaluated in agreement with clinical judgment to plan treatment and to predict therapeutic outcomes. Furthermore, there is no accurate way to denote a threshold for tooth removal based on periodontal status that is correct in every circumstance. Accordingly, the judgment to remove a tooth will vary depending on its clinical

status, and this endeavor should be supported by the best available literature, clinical experience, and the patient's declared goals[23].

Usually, the decision to extract a tooth is based on multiple patient and site risk factors, determined according to periodontal, endodontic and restorative criteria, which are also associated with the strategic role of the tooth in the dentition. The choice of treatment may not be influenced solely by the scientific evidence on the efficacy of these two treatment principles (i.e. to maintain and treat the tooth or to extract the tooth and replace it with an implant). The dentist s personal clinical experience, access to technology and postgraduate education, as well as patient preferences and economic parameters, will also affect the decision-making process[26-28].

It is also important to emphasize that the extraction of periodontitis-affected teeth does not resolve or eliminate the underlying h ost response-related problems that may have contributed to the development of periodontal disease and which may be predisposing factors for the development of peri-implantitis. Therefore, it could be argued that periodontally compromised teeth should be treated for as long as possible, being extracted and replaced by some means only when successful periodontal treatment is no longer possible[22]. Admittedly, the good or poor prognosis of periodontally involved teeth is not always easy to predict.

Implant Design /Implant Surface

Albrektsson & Wennerberg[29] identified three distinctive different types of surface roughness (Sa) among the available oral implants:

i. Minimally rough (Sa=0.5 μm, which is the majority of previously marketed implants, also called the machined implants, smooth, turned),
ii. Moderately rough (Sa between 1.0 and 2.0 μm, presently most marketed implants such as Osseotite [3i Implant Innovations], TiUnite [Nobel Biocare, CA, USA] and SLA [Straumann company, MA USA]) and
iii. Rough (Sa>2.0 μm, like some plasma-sprayed or HA-coated implants).

Within the oral cavity, surface roughness has a dominant impact on the biofilm formation[30,31]. All intra-oral hard surfaces (teeth, dentures, restorative materials and implant surfaces) attract more bacteria (supra- as well as subgingivally) when increasing their surface roughness[31]. As such, it might be reasonable to consider the implant surface roughness as a co-factor in the analysis of their longevity. Becker et al.[32] compared minimally rough implants placed in one and two stages with plasma-sprayed implants, over a period up to 3 years, and observed significantly more marginal around the latter. Ostrand et al.[33] illustrated in an randomized-controlled trial with a split-mouth design that an implant with a rough surface developed significantly more peri-implantitis than minimally rough implants. The latter was confirmed via a systematic review[34,35]. Besides the surface, the macro-design of the implant might also play a significant role. As such, several large variations have been reported within implant systems, depending on the implant design[36,37] .

Rosenberg et al.[38] reported that the exclusion of hydroxyapatite-coated implants from the overall number of implants evaluated in their study increased the implant survival rates, both for periodontally compromised patients (from 81% to 90.6%) and for periodontally healthy subjects (from 92.6%to 93.7%). Wennström et al.[39] found no statistically significant differences in peri-implant bone loss between machined and rough surface designs.

Junker et al.[40] in a system review of the experimental surface alterations revealed that thin calcium phosphate (CaP) coating technology can solve the problems associated with thick CaP coatings, while they still improve implant bone integration compared with non-coated titanium implants. Nevertheless, there is a lack of human studies in which the success rate of thin CaP-coated oral implants is compared with just roughened oral implants

Smoking As Risk For Implant Therapy In Periodontitis Patient

Heitz-Mayfield and Hunh-Ba[41] in their review evaluated the history of treated periodontitis and smoking as risk factors for adverse dental outcomes, concluded that the combination of treated periodontitis and smoking increases the risk of implant failure and periimplant bone loss.

Kokkevold et al.[42], in their systemic review found statistically significant difference in implant survival and success rates for smokers (better for nonsmokers). They concluded that, the effect of smoking on implant survival appears to be more pronounced in areas of loose trabecular bone.

Supportive Periodontal Therapy

Supportive periodontal therapy (SPT) is identified as regular visits to the therapist for periodontal control and maintenance in a well-organized scheme, the number of appointments per year following a pre-designed subject-tooth/implant-site risk assessment method[43]. SPT forms the basis of long-term success after periodontal surgery[44]. Overall, SPT seems to be effective in preventing recurrence of periodontitis.

A large number of long-term clinical trials have been performed assessing the treatment of periodontitis. These studies have clearly demonstrated that supportive periodontal treatment is essential in preventing disease recurrence and tooth loss[44-49]. The importance of periodontal supportive therapy for the long-term survival of implants placed in treated peri- odontitis patients is also well documented[50]. The procedures to be followed at regular intervals are similar to the usual periodontal supportive-therapy procedures for prevention of periodontitis and should include peri-implant probing pocket depth, peri-implant bleeding on probing and radiographic assessment of marginal bone loss[51,52].

A systemic approach for the prevention and treatment of peri-implant diseases has been recommended in the Cumulative Interceptive Supportive Therapy (CIST) protocol[53,54]. The CIST protocol has been shown to be effective in improvement of clinical and microbiological parameters in prospective cohort studies[55--57]. As biological complications around dental implants share several etiological factors with the development of periodontal disease, it is reasonable to assume that long-term success of dental implants can be achieved in patients with a history of periodontitis, using the same principles as those used for maintenance of teeth in periodontitis-susceptible individuals.

In general, procedures for maintenance of patients with implants are similar to those for patients with natural teeth[58-61] with the following three differences:

1. Special instrumentation that will not scratch the implants is used for calculus removal on the implants.
2. Acidic fluoride prophylactic agents are avoided.
3. Nonabrasive prophylactic pastes are used.

Considering the number of publications on implant dentistry procedures, it is interesting to note that a recent systematic review, which assessed whether long-term supportive-treatment procedure prevented the development of peri-implant disease and implant loss, revealed that there is no evidence available to suggest the frequency of recall intervals or to propose specific hygiene regimes[62]. However, to make effective supportive care possible, it is a prerequisite that the design of the implant-supported fixed partial denture is such that it permits access for plaque control performed by the patient and by the dentist and □ or dental hygienist[63].

Suggestion for a supportive periodontal therapy/infection control program for patients restored with implant-supported reconstructions[22].

1. After implant placement, at the delivery of the prosthetic construction and at the 1-year follow up, immediate radiographic documentation to achieve baseline data for future follow up and to allow determination of the time of occurrence of any potential peri-implant bone loss.

2. Post-treatment patient instruction for self-performed plaque control, focusing on interdental cleaning with interproximal brushes. The patient should also be enrolled in an individually designed professional supportive-care program according to their specific risk-assessment profile.
3. Patient follow-up on every 3, 6 or 12 months. Clinical examinations should be performed depending on the severity of the case and the presence of risk factors for disease development progression. The examination should include evaluations of bleeding on probing, probing depths and presence of plaque including evaluating of the function of the prosthesis.
4. Professional plaque-control measures should be performed, as indicated, using ultrasonic and hand instruments specially modified for titanium surfaces every 3-6 months.
5. The presence of high bleeding on probing scores and probing pocket depth more than or equal to 5 mm are indications for further radiographic examination to evaluate alveolar bone margin and determine treatment according to CIST protocol, as needed.

Summary

Replacement of missing teeth with dental implants in patients with periodontitis has favorable survival and success rates. Implant success and survival rates are higher provided with the use of rough surface implants and use of calcium phosphate coated implant surface. Smoking and diabetes mellitus have been shown to increase implant failure rate. Supportive periodontal therapy need to be provided for patients with history of periodontitis as in the case of treatment of periodontal disease. Aggressive forms of periodontitis patients need special concern for implant treatment but the implant survival and success can greatly enhance provided supportive periodontal therapy followed by meticulous periodontal health.

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