Clinical Assessment of Peri-Implant Tissues in Patients with Varying Severity of Chronic Periodontitis

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ABSTRACT

Purpose: This retrospective study assessed the health of peri-implant tissues in patients with varying severity of chronic periodontitis.

Materials and Methods: Sixty-one subjects aged 44 to 70 years (median age 58 years) were recruited. Based on severity of periodontitis, 31 subjects were classified as having severe generalized chronic periodontitis, and the remaining 30 subjects had mild or no periodontitis. Social and medical histories were obtained from each patient. A comprehensive periodontal examination included: plaque index, gingival index, bleeding index, probing depth, clinical attachment level, and radiographic bone loss. Data were analyzed using Fisher's exact and chi-square tests for categorical variables, and *t*-test for continuous variables.

Results: There was a statistically significant greater loss of attachment ($p < .05$) around implants in the group with severe periodontitis compared to the no/mild periodontitis group.

Conclusion: Because of the greater loss of clinical attachment around implants placed in patients with generalized severe chronic periodontitis, close monitoring of these patients is suggested to prevent both development of peri-implantitis and recurrence of periodontal infection.

KEY WORDS: bone loss, clinical attachment loss, dental implants, periodontally compromised patients, periodontitis

An increasing number of partially edentulous periodontally compromised patients are rehabilitated with endosteal implants. It is still unknown, however, if the long-term survival of implants in these patients is similar to that seen in periodontally healthy patients.[1] The type of bacteria in the peri-implant sulcus is influenced by the health of the remaining natural teeth.[2,3] Microbial composition is different between partially and completely edentulous individuals.[2] Peri-implant sulci of partially edentulous individuals harbor more motile rods and spirochetes than those of fully edentulous individuals.[2–5]

Peri-implantitis is a major contributor to late implant failure. Its prevalence is estimated to be between 2 and 10%.[6,7] Peri-implantitis occurs more frequently in patients with poor plaque control.[8] This is a site-specific bacterial infection similar to that associated with periodontitis.[9] Leonhardt and colleagues[10] studied the bacterial colonization of deep pockets after inducing experimental periodontitis/peri-implantitis in a dog model. The authors observed Gram-negative anaerobic bacteria dominating plaque composition at natural teeth and implants. Failing implants were found to harbor more Gram-negative rods and spirochetes than did healthy implants.[9] Becker and colleagues[11] reported moderate levels of *Aggregatibacter actinomycetemcomitans*, *Bacteroides intermedius*, and *Porphyromonas gingivalis* at failing implant sites.

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The ability of peri-implant tissues to resist bacterial infection was suggested to be less than that of periodontal tissues.[12–14] In an animal model, Lindhe and colleagues[12] observed marked differences in the size and location of the inflammatory lesions around implants as compared to natural teeth. Periodontal infection was limited to the connective tissue, whereas in the peri-implant tissue, the inflammation involved both the connective tissue and the alveolar bone.

Few studies have compared the success/survival of implants in periodontally compromised and healthy individuals.[15–18] For example, Hardt and colleagues[15] reported a higher percentage of implants with 2 mm bone loss in patients with periodontitis than in healthy individuals. In another study, lower survival rates and more biological complications were reported in patients with implants replacing teeth lost to chronic periodontitis than in patients without periodontitis.[18] Therefore, the objectives of this study were to assess and compare the condition of the peri-implant tissue in patients with varying severity of periodontitis.

MATERIALS AND METHODS

This study included 61 patients randomly selected from patients treated and rehabilitated with dental implants from 1996 to 2001, and who presented for their maintenance appointments in either the graduate periodontal clinic or the Advanced Education in General Dentistry clinic at Case Western Reserve University. The protocol for the study was approved by the Case Western Reserve University Institutional Review Board.

The participants were divided into two groups based on the severity of periodontitis: subjects with history of generalized severe chronic periodontitis (group A) and those with a history of mild or no chronic periodontitis (group B). Group A included subjects who had ≥6 mm of attachment loss and ≥45% of bone loss at more than 30% of the remaining teeth.

Smoking status and patients' systemic conditions were recorded. The following clinical parameters around the implants and natural teeth were also recorded: plaque index, gingival index, bleeding index, probing depth, and clinical attachment level. In addition, years since placement, length, and width of implants were recorded.

The clinical attachment level for the dental implants was defined as the distance from the implant shoulder to the bottom of the sulcus/pocket around the implant. For the purpose of this analysis, the mid-facial and mid-lingual attachment levels were averaged and treated as one measurement, and the mesio-buccal, disto-buccal, mesio-lingual, and disto-lingual attachment levels were averaged and treated as a single measurement. The bone level around the implant was measured to the nearest millimeter using the University of North Carolina probe from standardized intraoral periapical radiographs (long cone paralleling technique with a focus film distance of 20 to 25 cm). The bone level was measured from the crest of the alveolar bone on the mesial and distal sides of the implant to the fixture/abutment junction. The difference in bone level between radiographs taken at time of implant placement and those taken at the maintenance appointment was calculated. The following statistical tests were employed: the chi-square test and Fisher's exact test for categorical variables, and *t*-test for continuous variables.

RESULTS

There were 61 subjects in this study, 33 women and 28 men. The age of the participants ranged between 44 and 70 years. In these subjects, a total of 153 implants were examined, 76 in the severe periodontitis group (group A) and 77 in the mild/no periodontitis group (group B). There were no statistical differences ($p > .05$) between the two groups in regard to age, gender, smoking, or diabetes (Table 1). The means of age were 57 ± 3.5 and 58 ± 10.6 for groups A and B, respectively. The number of implants with plaque and bleeding upon probing were not statistically different between the two groups (Table 2). The mean of facial/lingual attachment level, and mesial/distal attachment level around implants was significantly ($p < .05$) higher for group A (mean ± SD: 3.7 ± 1.07 vs 2.61 ± 0.58). The mean alveolar bone loss from the time of implant placement to the time of the maintenance appointment (0.76 ± 1.07) was slightly higher in group A than in group B (0.62 ± 0.83), but statistically insignificant ($p > .05$). (Years after implant placement, the width and length of implants were not significantly different between the two groups.)

DISCUSSION

This retrospective study compared the clinical and radiographic conditions of peri-implant tissues in patients with generalized severe chronic periodontitis to those with mild or no history of chronic periodontitis.

TABLE 1 Characteristics of the Study Sample by Periodontitis Status

	Severe Periodontitis *N* = 31	Mild/No Periodontitis *N* = 30
Age (mean ± SD)	57 ± 3.5	58 ± 10.6
Males	16 (52%)	12 (40%)
Diabetics	5 (16%)	4 (13%)
Smokers	6 (19%)	4 (13%)

N represents number of patients.

The results showed significantly greater attachment loss around implants placed in patients with severe periodontitis. The radiographic bone measurement showed a trend of more bone loss around implants in the severe periodontitis group, but not statistically significant from the no/mild periodontitis group. These findings are in line with the findings of a recent systemic review in which the incidence of peri-implantitis and marginal bone loss was higher around implants in patients who lost their teeth because of periodontitis as compared to those lost for other reasons.[1]

In the present study, smoking ($p = .38$), controlled diabetes ($p = .521$), and age ($p = .675$) were not significantly different between the two groups. Plaque index and bleeding index did not show any significant differences between the groups ($p = .133$, $p = .686$). Both groups were kept on maintenance programs in the departments involved in this research.

Rehabilitation of periodontitis patients with dental implants is challenging for several reasons.[19] First, although periodontal therapy may be successful in controlling the periodontal infection, it does not improve the host immune response. Second, periodontal patients usually have bone loss that may affect the choice of the implant diameter and position. Third, translocation of periodontal microflora from the natural teeth to the implant may lead to the development of peri-implant infection. Finally, it is generally accepted that poorly maintained, periodontally compromised patients are at greater risk for failure of periodontal therapy and for recurrence of periodontal disease. Therefore, these patients need to be placed on a strict maintenance program. Furthermore, it may be advisable to have a wider zone of attached gingiva around implants in patients with severe periodontitis.[20,21]

In summary, the results of the present study show a greater loss of implant-supporting structures in patients with severe periodontitis. Although rehabilitation of patients with periodontitis by dental implant is successful, a close monitoring of these patients is required in order to prevent development of peri-implantitis and/or recurrence of periodontal disease.

TABLE 2 Clinical Parameters Measured Around Implants in Patients with Severe and Mild/No Periodontitis Group

	Severe Periodontitis *N* = 76	Mild/No Periodontitis *N* = 77
Plaque present	11 (15%)	19 (25%)
Bleeding on probing	18 (24%)	14 (18%)
Bone loss	0.76 ± 1.07	0.62 ± 0.83
Probing depth	3.33 ± 1.25	3.05 ± 0.70
Attachment level		
Facial/Lingual	3.70 ± 1.07	2.61 ± 0.58*
Mesial/Distal	4.86 ± 1.07	3.80 ± 0.53*

*$p < .01$.
N represents number of implants.

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