Original Article

Periodontal parameters around implants and natural teeth

Anjani Kumar Pathak, Kopal Goel[1], Vijay Shakya[2], Arunesh Kumar Tiwari[3]

Departments of Periodontology, [1]Prosthodontics Including Crown and Bridge, [2]Conservative Dentistry and Endodontics and [3]Oral and Maxillofacial Surgery, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India

Address for correspondence:
Dr. Anjani Kumar Pathak, C-50, Butler Palace Colony, Jopling Road, Lucknow, Uttar Pradesh, India.
E-mail: dr.anjanipathak@gmail.com

ABSTRACT

Introduction: Nowadays, dental implants permit consideration of as one of the most reliable therapeutic modalities during the establishment of any prosthetic treatment plan. In numerous clinical situations, implants can clearly contribute to a notable simplification of therapy, frequently enabling removable prostheses to be avoided, keeping it less invasive with respect to remaining tooth structure. The aim of the present study was to clinically assess the peri-implant and periodontal conditions after the placement of crowns in partially edentulous patients. **Materials and Methods:** Twenty-five participants with 28 implant supported crowns were recruited in the study. After the insertion of suprastructure, meticulous scaling and root planing were performed on adjacent teeth which served as control. The clinical examination was carried out by a single examiner after placement of crowns at an interval of 1, 3, 6, 9, and 12 months and included the assessment of modified plaque index (mPII), bleeding score, calculus score, probing pocket depth (PPD), and recession on the four aspects of each implant and adjacent teeth. **Results:** The mPII, modified bleeding index (mBII), calculus score, PPD, and recession decreased from 1 month to 12 months in both implants and in control teeth. The mean mPII, mBII, and calculus score were comparatively high in control teeth than implants. PPD was found to be more on implants than in control teeth. Recession was slightly higher in control teeth than implants throughout the study period, but it was not statistically significant. **Conclusion:** An implant patient must always be enrolled in a supportive therapy program that involves recall visits at regular intervals.

Key words: Dental implants, peri-implant tissues, periodontal parameters, single crowns

Introduction

The clinical replacement of lost natural teeth by osseointegrated implants has represented one of the most significant advances in restorative dentistry. Since their introduction in the 1970s, endosseous oral implants have become an integral part of reconstructive dentistry. Initially, implant therapy was predominantly intended for the fully edentulous patient. In recent years, however, the partially dentate patient has also become a candidate for implant placement. In such patient, dental implants are used to reconstruct the compromised dentition. This blend of teeth and implants is, in particular, critical in the periodontally susceptible patient in whom the submarginal biofilms may harbor putative periodontal pathogens which may also be involved in the processes associated with the resorption of the bony support for the implant.

One of the key factors for the long-term success of oral implants is the maintenance of healthy tissues

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around them. A cause–effect relationship between bacterial plaque accumulation and the development of inflammatory changes in the soft tissues surrounding oral implants has been developed. If this condition is left untreated, it may lead to the progressive destruction of the tissues supporting an implant (peri-implantitis), which may compromise its future and ultimately lead to its failure.[1] An implant patient must always be enrolled in a supportive therapy program that involves recall visits at regular intervals.

The aim of the present 1-year study was to assess and compare the peri-implant status after the placement of prosthesis in partially edentulous subjects to the periodontal status of adjacent teeth which served as control teeth.

Materials and Methods

A total of 25 participants with 28 implant supported crowns (median age 30 years), irrespective of sex, were recruited from a list of consecutive implant patients treated at a postgraduate section of the Department of Periodontics, Faculty of Dental Sciences, King George's Medical University, Lucknow. The inclusion criteria were systemically healthy patients with good oral hygiene, implant supported single crown, restorative suprastructures provided satisfactory fit, and adjacent control teeth periodontally healthy. Exclusion criteria were patients with deleterious habits such as smoking, chewing tobacco, patients with parafunctional habits such as bruxism, clenching, and grinding subjects with overhang crown margins on implants carious exposed control teeth.

The suprastructures consisted of 28 single cemented crowns that were seated postsurgically. For all patients, a uniform prosthetic procedure was performed by one experienced prosthodontist. After the insertion of suprastructure, full mouth oral prophylaxis was performed and meticulous scaling and root planing were performed on adjacent teeth which served as control. Preventive measures such as high level of plaque control with the help of toothbrush using BASS technique supplemented by long-term application of antiseptic mouthwash (0.2% chlorhexidine) was advised to the patients. The patients were asked to report after 1, 3, 6, 9, and 12 months for clinical evaluation. The baseline parameters were recorded 1 month after suprastructure placement.

The clinical examination was carried out by a single examiner after the placement of crowns at an interval of 1, 3, 6, 9, and 12 months and included the assessment of the following parameters at four aspects of each implant and adjacent teeth. The patients were motivated to maintain good oral hygiene as a part of supportive periodontal therapy. The modified plaque index (mPlI) according to Mombelli *et al*. 1987,[2] the bleeding score according to the Muhlemann index (0–3) modified by Mombelli *et al*.,[2] calculus score, and probing pocket depth (PPD).

Statistical analysis

For each period, the implants and control teeth were compared by analysis of variance followed by Dunnett's test. A two-tailed (α =2), probability (P) value <0.05 was considered to be statistically significant, $P < 0.01$ highly significant and $P > 0.05$ not significant. MS Excel (MS Office 97–2003) and GraphPad Prism (version 5, GraphPad Software, Inc., 7825 Fay Avenue, Suite 230, La Jolla, CA 92037 USA) were used for the analysis.

Results

Table 1 lists the overall means of the clinical parameters assessed at four aspects around each implant and control teeth and shown graphically by line diagrams in Figure 1.

During the study period, the mPlI, modified bleeding index (mBlI), calculus score, PPD, and recession

Table 1: Comparison of periodontal parameters between implants and natural teeth

Indices	Groups	Periods				
		1	3	6	9	12
Modified plaque	Mesial	4.61 ± 0.42*	4.00 ± 0.41	2.93 ± 0.30	2.86 ± 0.39	1.68 ± 0.27
	Distal	3.61 ± 0.36	3.25 ± 0.31	2.57 ± 0.32	2.50 ± 0.31	1.32 ± 0.25
	Implant	3.21 ± 0.40	2.96 ± 0.35	2.21 ± 0.24	1.96 ± 0.30	0.93 ± 0.19
Modified bleeding	Mesial	4.29 ± 0.22	3.43 ± 0.28	2.79 ± 0.24	2.29 ± 0.20	1.43 ± 0.15
	Distal	4.96 ± 0.36	3.79 ± 0.29	3.07 ± 0.23	2.46 ± 0.23*	1.57 ± 0.22
	Implant	5.07 ± 0.21	3.11 ± 0.24	2.25 ± 0.23	1.54 ± 0.18	0.96 ± 0.17
Pocket probing depth	Mesial	2.55 ± 0.07*	2.40 ± 0.05*	2.28 ± 0.06	2.27 ± 0.06	2.12 ± 0.05
	Distal	2.32 ± 0.09**	2.20 ± 0.07**	2.07 ± 0.08**	2.07 ± 0.08**	2.01 ± 0.09**
	Implant	2.90 ± 0.10	2.65 ± 0.09	2.54 ± 0.10	2.46 ± 0.11	2.37 ± 0.11
Recession	Mesial	0.68 ± 0.27	0.68 ± 0.25	0.61 ± 0.21	0.46 ± 0.17	0.46 ± 0.17
	Distal	0.61 ± 0.19	0.61 ± 0.19	0.50 ± 0.15	0.64 ± 0.20	0.50 ± 0.14
	Implant	0.36 ± 0.18	0.29 ± 0.11	0.25 ± 0.10	0.21 ± 0.08	0.18 ± 0.07
Calculus	Mesial	1.71 ± 0.25	1.25 ± 0.24	0.64 ± 0.18	0.46 ± 0.13	0.50 ± 0.13
	Distal	1.75 ± 0.25	1.11 ± 0.19	0.75 ± 0.18	0.68 ± 0.15	0.61 ± 0.16
	Implant	1.32 ± 0.21	0.79 ± 0.16	0.39 ± 0.16	0.25 ± 0.08	0.36 ± 0.11

*- $P<0.05$; **- $P<0.01$

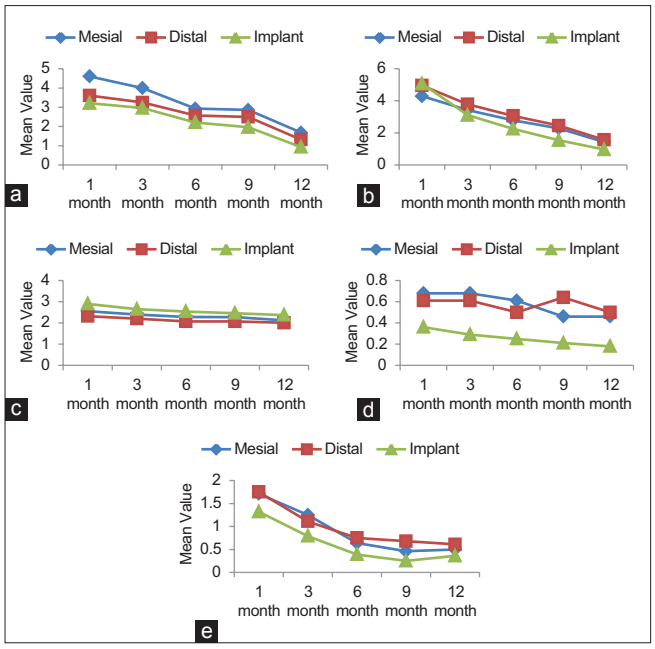

Figure 1: (a) Modified plaque index. (b) Modified bleeding index. (c) Probing pocket depth. (d) Calculus score. (e) Gingival recession

decreased from 1 month to 12 months in both implants and in control teeth. The mean mPlI, mBlI, and calculus score were comparatively high in control teeth than implants in all assessed periods [Table 1]. The mean mPlI in implant was 3.21 ± 0.40 in the 1st month which reduced to 0.93 ± 0.19 in the 12th month [Figure 1a].

The mean mBlI was comparatively high in control teeth than implants in all assessed periods. The mean mBlI in implant was found to be 5.07 ± 0.21 in the 1st month which reduced to 0.96 ± 0.17 in the 12th month. In mesial teeth, it was found to be 4.29 ± 0.22 in the 1st month which reduced to 1.43 ± 0.15 in the 12th month. In distal teeth, the mean was found to be 4.96 ± 0.36 in the 1st month which reduced to 1.57 ± 0.22 in the 12th month [Figure 1b].

In the present study, the mean (± standard error [SE]) PPD in implants was 2.90 ± 0.10 in the 1st month which reduced to 2.37 ± 0.11 in the 12th month. The mean (±SE) PPD in mesial teeth was found to be 2.55 ± 0.07 in the 1st month which reduced to 2.12 ± 0.05 in the 12th month. In distal teeth, the mean PPD was 2.32 ± 0.09 in the 1st month which reduced to 2.01 ± 0.09 in the 12th month [Figure 1c].

The mean level of calculus score was comparatively high in control teeth than implants in all assessed periods [Figure 1d].

Recession was slightly higher in control teeth than implants throughout the study period, but it was not statistically significant ($P > 0.05$) [Figure 1e].

Discussion

During the course of the study, the mPlI decreased from 1 month to 12 months in both implants and in control teeth. The mean mPlI was comparatively high in control teeth than implants in all assessed periods. On comparing, the mean mPlI of implants and control teeth in all assessed periods did not differ significantly ($P > 0.05$) except mesial teeth at 1 month, which is significantly ($P < 0.05$) high in mesial teeth (4.61) than implant (3.21) [Table 1 and Figure 1a].

Our results are seen in accordance with the studies of Machtei *et al*. 2006[3] in which he found that PI was significantly higher in teeth than implants (1.2 vs. 0.8).

The amount of plaque accumulation and the signs of inflammations were even lower around the implants compared to control teeth. This may reflect a greater attention to the implant sites during home care procedures or a different association of implants to plaque accumulation. The tight recall schedule and high motivation among the patients had a substantial influence on plaque control.

Like mPlI, mBlI also decreased from the start of the study to the end of the study in both implants and control teeth. The mean mBlI was comparatively high in control teeth than implants during the study period. On comparing, the mean mBlI of implants and control teeth in all assessed periods did not differ significantly ($P > 0.05$) except distal teeth at the 9th month. In this period, the mean levels of control teeth were significantly high ($P < 0.05$ or $P < 0.01$) than implants [Table 1 and Figure 1b]. Our results are seen in accordance with the studies of Brägger *et al*. 1997[4] in which he found that the mean mBlI was 0.35 in implants and 0.44 in control teeth. However, Juodzbalys and Wang *et al*. 2007[5] reported that mBlI remained unchanged at 1-year follow-up. Weber *et al*. 2000[6] observed no significant difference in mBlI during the evaluation periods.

The rather low values of mBlI around implants appear to confirm that patients investing in implant therapy and suprastructures in general were cooperative and performed good oral hygiene. However, a slight increase in mBlI was noticed in distal, which could be due to less attention toward control teeth compared to implants.

A significant difference was observed between implants and control teeth with respect to mean PPD. PPD decreased in both implants and control teeth throughout the study period. According to the study of Adell *et al*. 1981[7] and Buser *et al*. 1990,[8] peri-implant probing depth up to 3 mm around implants was considered "healthy." In our study, PPD in implants was found to be 2.90 in

the 1st month which reduced to 2.37 in the 12th month. Less than 3 mm of probing indicated that there was no progressive peri-implant connective tissue destruction around implants. Increased PPD was reported to be an important indicator, suggesting a high risk of infection developing in the implant mucosa. An increase in PPD was not observed with time in the present study, indicating that the implant mucosa was kept in a healthy condition from the beginning of the study. The PPD in control teeth in all the assessed periods was significantly ($P < 0.05$ or $P < 0.01$) low as compared to respective implant except mesial teeth at the 9th month and 12th month [Table 1 and Figure 1c]. The results were seen in accordance with the study of Nishimura *et al*. 1997[9] in which PPD was found to be around 2.0 mm. Brägger *et al*. 1997[4] also found deeper probing depth around implants than teeth (2.55 mm at implants/2.02 at teeth). In contrast, increased PPD was observed to be associated with a high risk of inflammation.[6,10]

Because of patients' good oral hygiene maintenance as indicated by the decreased mPlI, the calculus score also decreased during the course of the study except at the 12th month in implants where calculus score was slightly increased from 0.25 to 0.36. The mean level of calculus score was comparatively high in control teeth than implants in all assessed periods [Table 1 and Figure 1d].

The present study therefore emphasizes that an implant patient must always be enrolled in a supportive therapy program that involves recall visits at regular intervals.

Long-term studies can be done for bacterial monitoring around different dental implant system, and various immunological parameters of teeth and different dental implant platforms should also be investigated.

Conclusion

The detained results suggested that the tight recall schedule and high motivation among the patients had a substantial influence on plaque control; therefore, the present study emphasizes that an implant patient must always be enrolled in a supportive therapy program that involves recall visits at regular intervals.

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Conflicts of interest
There are no conflicts of interest.

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