

## Evaluation of Clinical Parameters in Implant Maintenance Phase for Prevention of Peri-implantitis

Baburajan Kandasamy<sup>1</sup>, Emmanuel P. Samson<sup>2</sup>, Ashfaq Yaqoob<sup>3</sup>, Pragya Pandey<sup>4</sup>, S. Deenadayalan<sup>1</sup>, Indrani Das<sup>5</sup>

<sup>1</sup>Department of Prosthodontics, CSI College of Dental Sciences and Research, Madurai, Tamil Nadu, <sup>2</sup>Department of Conservative Dentistry and Endodontics, Dr. H. S. R. S. M Dental College and Hospital, Hingoli, Maharashtra, <sup>4</sup>Department of Prosthodontics, College of Dental Sciences and Hospital, Indore, Madhya Pradesh, <sup>5</sup>Department of Prosthodontics, Complete Dental Care, Guwahati, Assam, India, <sup>3</sup>Department of Prosthodontics, College of Dentistry, King Khalid University, Abha, Saudi Arabia

Received : 08-02-18.

Accepted : 28-03-18.

Published : 18-07-18.

### INTRODUCTION

It is been decades that dental implants have been successfully used as a major treatment alternative by the dentists in their clinical practice, due to its evident predictability.<sup>[1]</sup> However, with the increase in its usage, it accompanies some major complications which are faced by the dentist. Peri-implant mucositis and peri-implantitis are one of such common biological complications.

Peri-implant mucositis can be defined as a reversible inflammatory reaction of the mucosa surrounding a

### ABSTRACT

**Aims and Objectives:** Peri-implant mucositis and peri-implantitis are one of the common biological complications affecting implant success. The present study aimed to evaluate various clinical parameters during implant maintenance phase.

**Materials and Methods:** The study included patients undergoing implant maintenance phase for 1-year follow-up. The study consists of a total of forty individuals with age ranging from 35 to 65 years. They were further categorized into two subgroups on the basis of their history, i.e., Group 1: patients with no history of periodontitis before implant placement and Group 2: patients with a history of periodontitis before implant placement. Among the selected patients, a total of 98 implants were studied. All were individually evaluated for clinical parameters such as gingival index, pocket probing depth (PPD), and bleeding on probing (BOP). All the data obtained were tabulated and analyzed using statistical software SPSS version 18.0 for Windows (SPSS Inc., Chicago, USA). Quantitative analysis was done using *t*-test and Mann-Whitney U-test.

**Results:** The mean age of the patients in Group 1 and Group 2 was 58.6 and 62.8 years, respectively, with not much gender difference. The mean plaque index for Group 1 was  $0.17 \pm 0.20$ , while for Group 2, it was  $0.24 \pm 0.14$ . The mean PPD and mean BOP for Group 1 came to be  $2.60 \pm 0.42$  and  $0.42 \pm 0.15$ , respectively, whereas for Group 2, it was  $4.08 \pm 0.30$  and  $0.39 \pm 0.48$ , respectively. Only PPD was found to be statistically significantly different between both the groups. Group 1 showed 2.0% peri-implantitis, whereas Group 2 showed 28% peri-implantitis.

**Conclusion:** Due to increased prevalence of peri-implantitis cases with the increase in usage of implants, it becomes imperative to look up to the etiological factors and contributing factors so that the incidence of these can be minimized.

**KEYWORDS:** Peri-implantitis, periodontitis, plaque index, periodontal probing depth

functional dental implant,<sup>[2]</sup> whereas peri-implantitis around a dental implant is defined as an “infection with suppuration associated with clinically significant progressing marginal bone loss after the adaptive phase, usually restricted to the 1<sup>st</sup> year of function.”

**Address for correspondence:** Dr. Emmanuel P. Samson, Department of Conservative Dentistry and Endodontics, Dr. H. S. R. S. M Dental College and Hospital, Hingoli, Maharashtra, India.  
E-mail: ashishsamson@yahoo.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** reprints@medknow.com

**How to cite this article:** Kandasamy B, Samson EP, Yaqoob A, Pandey P, Deenadayalan S, Das I. Evaluation of clinical parameters in implant maintenance phase for prevention of peri-implantitis. J Int Soc Prevent Communit Dent 2018;8:361-4.

Access this article online	
<b>Quick Response Code:</b> 	<b>Website:</b> www.jispcd.org
	<b>DOI:</b> 10.4103/jispcd.JISPCD_64_18

According to the American Academy of Periodontology, peri-implantitis is “an inflammatory process around an implant that includes both soft-tissue inflammation and loss of supporting bone.”<sup>[3,4]</sup> With an alarming frequency reported to be 1%–47%, peri-implantitis has become a major problem.<sup>[5]</sup> Implant failure can be considered when there is a failure of osseointegration, clinical mobility, bone loss (>1–1.5 mm/year), and peri-implant radiolucency due to infection.<sup>[6]</sup> Several studies have documented similarities in the pathogenesis of both periodontitis and peri-implantitis. However, the etiology behind peri-implantitis seems to be multifactorial.

The present study was done to determine and evaluate various important clinical examination parameters during implant maintenance phase and derive a correlation between them.

## MATERIALS AND METHODS

A total of forty patients undergoing implant maintenance phase for a period of minimum 1 year from the time of placement, i.e., from March 2015 to October 2017, in the age range of 35–65 years, were included in the study. A sample size of forty representatives was calculated in this pilot study at confidence level of 95% and 15.38 confidence interval from 2547 individuals. The momentary rate (mesial and distal) of 1.0 mm/year (or less) bone loss during the 1<sup>st</sup> year criterion was used to assess for implant success.<sup>[6]</sup> Cases of aggressive periodontitis, diabetes, and smoking history were excluded from the study.

A detailed history of each patient was recorded and an informed consent was obtained from all the patients included in the study. The required ethical clearance for the study was taken beforehand from the institutional ethical committee (CSI. Ref No. 0241/15).

The study patients were further categorized into two subgroups on the basis of their history, i.e., Group 1: patients with no history of periodontitis before implant placement and Group 2: patients with a history of periodontitis before implant placement. Among the selected patients, a total of 98 implants were studied with 49 implants in each group to avoid bias.

Chronic periodontitis in patients was diagnosed on the basis of the amount of clinical attachment loss (CAL) for each individual tooth. Complete oral examination was done, and all the details regarding the presence and absence of teeth and number of implants were recorded. All the patients with a previous history of periodontitis were treated in the Department of Periodontology, CSI College of Dental Science and Research, Madurai, Tamil Nadu, India, before placement of dental placement.

To avoid bias in the study, immediate implants were placed in both the groups by the same trained investigator in specified time with the same technique. The evaluation was carried out with clinical and radiographic examination at follow-up visit for 1 year.

Further, for the purpose of evaluation of each implant individual, parameters such as plaque index (PI), pocket probing depth (PPD), and bleeding on probing (BOP) were assessed. Peri-implantitis cases were diagnosed, when the CAL was >3 mm or more, with BOP and evidence of bone resorption seen on radiograph.

All the data obtained were tabulated and analyzed using statistical software SPSS version 18.0 for Windows (SPSS Inc., Chicago, USA). Quantitative analysis was done using *t*-test and Mann–Whitney U-test. Intergroup correlations were done and *P* < 0.05 was considered statistically significant.

## RESULTS

A total of forty patients were enrolled in the study who were subdivided into two groups, with twenty patients in each group. It was observed that the mean age of the patients in the two groups was 58.6 and 62.8 years. No significant difference in gender distribution was observed as the study included 22 males and 18 females [Table 1].

When characteristics such as number of teeth present at the time of start of implant treatment and total number of extracted teeth were compared among the two groups, a statistically significant difference was observed, with Group 2 on the higher side (*P* < 0.05).

For the observed clinical parameters of the population, it was seen that the mean PI for Group 1 was  $0.17 \pm 0.20$ , while for Group 2, it was  $0.24 \pm 0.14$ . Similarly, mean PPD and mean BOP for Group 1 came to be  $2.60 \pm 0.42$  and  $0.42 \pm 0.15$ , respectively, whereas for Group 2, it was  $4.08 \pm 0.30$  and  $0.39 \pm 0.48$ , respectively. It was

**Table 1: Patient characteristics and clinical variables in both the study groups (n=20)**

Patient characteristics/variables	Mean	
	Group 1	Group 2
Mean age	58.6	62.8
Gender (n=40)		
Male (n=21)	11	12
Female (n=18)	10	8
Number of teeth present at the beginning of treatment	26.6	25.8
PI	0.17±0.20	0.24±0.14
PPD	2.60±0.42	4.08±0.30
BOP	0.42±0.15	0.39±0.48

n=Number. PI=Plaque index, PPD=Pocket probing depth, BOP=Bleeding on probing

observed that, though Group 2 showed higher values for all the observed parameters, only PPD came out to be statistically significant.

Further, out of all the patients studied, a total of 98 implants (49 in each group) were evaluated for peri-implantitis. Group 1 showed 1 (2.0%) failure case, whereas Group 2 showed 14 (28%) failures [Table 2].

## DISCUSSION

With the increase in the popularity of implants, the major concern comes into consideration are the common biological complications such as peri-implant mucositis and peri-implantitis. Currently, many studies are being directed, keeping in mind the longevity of various implant-supported rehabilitation therapies. Peri-implant mucositis is the reversible inflammation of the soft tissue surrounding the implant, but peri-implantitis includes both soft-tissue inflammation and loss of supporting bone structure around the functional implant.<sup>[6]</sup>

Previously, many studies have reported varying prevalence rates for peri-implant disease. Ogata *et al.*<sup>[2]</sup> in their study reported the prevalence of peri-implant mucositis and peri-implantitis to be 33.3% and 9.7%, respectively. In another review, Wilson reported the frequency of these perimplant diseases to be 1%–47%.<sup>[5]</sup>

In the present study, a total of 40 patients with 98 implants were evaluated which were further subdivided into two groups based on the history of twenty patients in each group. It was observed that the mean age of the patients in the two groups was 58.6 and 62.8 years, respectively. A previous study on the prevalence of periodontitis revealed that moderate or severe periodontitis was observed in 64% of people over 65 years of age.<sup>[7-9]</sup> Similar findings were observed in our study with an increased prevalence of periodontitis in patients >60 years of age.

No significant difference in gender distribution was observed as the study included 22 males and 18 females. From our results, we can postulate that gender difference does not seem to be a major factor in the development of peri-implantitis.

Importance of the present study is that (i) it assesses the risk of periodontitis in the development of peri-implantitis

and success rate of implant in patients with periodontitis over nonperiodontitis, (ii) there was no gender difference in the success rate of implant, and (iii) there was higher PPD in Group 2 when compared to Group 1.

When we compared patient characteristics such as number of teeth present at the time of start of implant treatment and total number of extracted teeth, between the two groups, a statistically significant difference was observed with Group 2 on the higher side ( $P < 0.05$ ). These results can be justified saying that, as periodontitis is the major causative agent for tooth loss in the elderly, more number of absent teeth can be seen in Group 2.

Further, our results showed that 15.3% (15 out of 98) of the implants in eight patients had peri-implantitis. Although the figures of incidence of peri-implantitis were not much higher in our study population, still it is observed that almost all, i.e., 14.2% of the patients belonged to Group 2 which included patients with a previous history of periodontitis. Only one patient, i.e., 0.01% belonged to Group 1 which included patients without previous history of periodontitis. On comparison between both the groups, the results were found to be highly significant. We have observed from the present study that a previous history of periodontitis can have higher chances of progression into peri-implantitis compared to cases without periodontitis. Our findings are in accordance with the results of Sung *et al.*, de Araújo Nobre and Maló, Monje *et al.*, and Konstantinidis *et al.*, proving a critical role of periodontal disease history in the incidence of peri-implantitis cases.<sup>[10-13]</sup>

We know that poor oral hygiene has been reported to be an important risk indicator for both periodontitis and peri-implant disease.<sup>[2]</sup> Therefore, when the clinical parameters of the population were compared between both the groups, it was observed that the mean PI for Group 1 was  $0.17 \pm 0.20$ , while for Group 2, it was  $0.24 \pm 0.14$ . The difference between both the groups was not statistically significant. Thus, we can infer that plaque control measures were properly followed by both the groups. Similarly, mean PPD and mean BOP for Group 1 came to be  $2.60 \pm 0.42$  and  $0.42 \pm 0.15$ , respectively, whereas for Group 2, it was  $4.08 \pm 0.30$  and  $0.39 \pm 0.48$ , respectively. It was observed that, though Group 2, i.e., patients with a history of periodontitis showed higher values for all the observed parameters, only PPD came out to be statistically significant. For the natural teeth, there is a criterion of critical probing depth (4 mm or more), there are no such reference values for implants as the implant surface differs being threaded or not, also the site and placement depth differ, and the biological width of the implant is also not constant.<sup>[14]</sup>

**Table 2: Comparison of number of cases of peri-implantitis between both the study groups**

	Number of implants studied in each group (n=98)	Number of implants showing peri-implantitis in each group (n=15), n (%)
Group 1	49	1 (2.0)
Group 2	49	14 (28)

n=Number

Salvi and Lang<sup>[15]</sup> stated in their report that there are controversies among researchers in the characterization of peri-implantitis related to PPD. Pocket depth changes can be identified by knowing the initial placement bone level on radiograph and then comparing it to the level after 1 year and then so forth. Gualini *et al.*<sup>[16]</sup> also reported that it is widely stated that probing depth in peri-implantitis diagnosis should be confirmed by radiographic bone loss also.

The primary outcome of the present study is that presence of peri-implantitis secondary to previous periodontitis can hamper the success rate of implant. Even in treated cases with periodontitis, there are higher chances of peri-implantitis compared to nonperiodontal cases. Our study identifies the role of treated periodontitis on the success of dental implant compared to control group with no history of periodontitis or peri-implantitis. In the present study, periodontitis was treated in the department of periodontics before planning for implant placement. Our study shows that periodontal health is important for long-term success of dental implant. The result of our study helps in implementing the data in planning for implant success and assessing its risk factors.

Limitation of our study is smaller sample size in small geographic area. Further, long-term clinical study on larger sample on different geographical area is required.

The maintenance of dental implants should also be given equal importance by the dentist because the peri-implant tissues also behave in the same manner against pathogens, and the health and maintenance for these peri-implant tissues become a deciding factor for longevity of the implant placed. This will ultimately help the clinician in improved success rates and better patient satisfaction.

## CONCLUSION

As peri-implant diseases have increased prevalence in clinical practice, it becomes imperative to look up to the etiological factors and contributing factors so that the incidence of these can be minimized. Thus, from our study, we can state that periodontal supportive therapy is during the maintenance phase after implant placement is equally important and should not be ignored.

## FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

## CONFLICTS OF INTEREST

There are no conflicts of interest.

## REFERENCES

1. Jung RE, Pjetursson BE, Glauser R, Zembic A, Zwahlen M, Lang NP, *et al.* A systematic review of the 5-year survival and complication rates of implant-supported single crowns. *Clin Oral Implants Res* 2008;19:119-30.
2. Ogata Y, Nakayama Y, Tatsumi J, Kubota T, Sato S, Nishida T, *et al.* Prevalence and risk factors for peri-implant diseases in Japanese adult dental patients. *J Oral Sci* 2017;59:1-1.
3. Khammissa RA, Feller L, Meyerov R, Lemmer J. Peri-implant mucositis and peri-implantitis: Clinical and histopathological characteristics and treatment. *SADJ* 2012;67:122, 124-6.
4. The American Academy of Periodontology. Peri-implant mucositis and peri-implantitis: A current understanding of their diagnoses and clinical implications. *J Periodontol* 2013;84:436-43.
5. Wilson V. An insight into peri-implantitis: A systematic literature review. *Prim Dent J* 2013;2:69-73.
6. Geraets W, Zhang L, Liu Y, Wismeijer D. Annual bone loss and success rates of dental implants based on radiographic measurements. *Dentomaxillofac Radiol* 2014;43:20140007.
7. Yu HC, Su NY, Huang JY, Lee SS, Chang YC. Trends in the prevalence of periodontitis in Taiwan from 1997 to 2013: A nationwide population-based retrospective study. *Medicine (Baltimore)* 2017;96:e8585.
8. Nand KY, Oommen AM, Chacko RK, Abraham VJ. Chronic periodontitis among diabetics and nondiabetics aged 35-65 years, in a rural block in Vellore, Tamil Nadu: A cross-sectional study. *J Indian Soc Periodontol* 2017;21:309-14.
9. Eke PI, Wei L, Borgnakke WS, Thornton-Evans G, Zhang X, Lu H, *et al.* Periodontitis prevalence in adults  $\geq 65$  years of age, in the USA. *Periodontol* 2000 2016;72:76-95.
10. Sung CE, Chiang CY, Chiu HC, Shieh YS, Lin FG, Fu E, *et al.* Periodontal status of tooth adjacent to implant with peri-implantitis. *J Dent* 2018;70:104-9.
11. de Araújo Nobre M, Maló P. Prevalence of periodontitis, dental caries, and peri-implant pathology and their relation with systemic status and smoking habits: Results of an open-cohort study with 22009 patients in a private rehabilitation center. *J Dent* 2017;67:36-42.
12. Monje A, Wang HL, Nart J. Association of preventive maintenance therapy compliance and peri-implant diseases: A Cross-sectional study. *J Periodontol* 2017;88:1030-41.
13. Konstantinidis IK, Kotsakis GA, Gerdes S, Walter MH. Cross-sectional study on the prevalence and risk indicators of peri-implant diseases. *Eur J Oral Implantol* 2015;8:75-88.
14. Seki K, Nakabayashi S, Tanabe N, Kamimoto A, Hagiwara Y. Correlations between clinical parameters in implant maintenance patients: Analysis among healthy and history-of-periodontitis groups. *Int J Implant Dent* 2017;3:45.
15. Salvi GE, Lang NP. Diagnostic parameters for monitoring peri-implant conditions. *Int J Oral Maxillofac Implants* 2004;19 Suppl: 116-27.
16. Gualini F, Salina S, Rigotti F, Mazzarini C, Longhin D, Grigoletto M, *et al.* Subcrestal placement of dental implants with an internal conical connection of 0.5 mm versus 1.5 mm: Outcome of a multicentre randomised controlled trial 1 year after loading. *Eur J Oral Implantol* 2017;10:73-82.