Oral hygiene instruction program for implant patients Evaluation of clinical utility based on plaque control records and changes in prevalence of deep pocket probing depths and bleeding on probing

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Successful dental implant treatment requires thorough oral self care by the patient, and depends, to a large extent, on improving the patient’s understanding and behavior with regard to self care. We developed a personalized oral hygiene instruction program and attempted to demonstrate its clinical utility based on changes in the intraoral environment with the aim of establishing a more effective oral instruction hygiene program than those conventionally offered. Patients were given a CD-ROM containing photos of their mouth and dental casts as well as instructions on how to perform self care, and were instructed to view them on their own personal computers. Changes in their plaque control record (PCR), in the prevalence of sites with pocket probing depths (PPD) of 4 mm or greater, and in bleeding on probing (BOP) were monitored. The results were examined in a retrospective cohort study. We found that patients who participated in the new instruction program exhibited a significant decline in all three outcome measures upon subsequent examination. The findings suggest that our instruction program made it easy for patients to understand their oral condition, and to learn and repeat appropriate self care practices. (J Osaka Dent Univ 2012; 46: 245–249)

Key words: Oral hygiene instruction program; Implant treatment

INTRODUCTION

It is well known that oral self care is crucial to the success of dental implant therapy. Conventional oral hygiene instruction programs (herein collectively referred to as the ‘conventional instruction method’ (CIM)) have relied on prepared diagrams and dental casts that patients use to check their own teeth and gingiva with a mirror.¹⁻³ However, the recent increase in implant treatment and the diversity of implant superstructures has added to the complexity of the oral environment, with many patients failing to properly understand their own oral condition.⁴

Thorough self care is indispensable in maintaining oral hygiene and the question of how to improve patient understanding and behavior with regard to self care is a crucial one.⁵ Moreover, personal computing and information technology (IT) have become integral parts of daily life in Japan, and there is a high rate of personal computer (PC) ownership.⁶ With this in mind, we attempted to create a PC-based oral hygiene instruction program with efficacy superior to that of the CIM by developing a personalized oral hygiene instruction program, the ‘new instruction method’ (NIM) and testing its clinical utility in a retrospective cohort study.

MATERIALS AND METHOD

Subjects

This study targeted implant patients treated between November 1986 and March 2012 who had adhered to the CIM since commencing their treatment, and were subsequently divided into the CIM group or the NIM group at 3 or more years after placement of the implant superstructure. Neither group demonstrated superiority in any of the three outcome measures,
namely: 1) plaque control record (PCR), 2) probing depth (PD), and 3) bleeding on probing (BOP) (Table 1).

The study population consisted of 53 patients, of whom 25 (3 men and 22 women aged 24–67 years with an average age of 51 ± 13 years) were assigned to the CIM group, and 28 (3 men and 25 women aged 21–69 years with an average age of 54 ± 11 years) were assigned to the NIM group.

**Instruction methods**

**CIM group**

Patients were instructed on how to use a toothbrush (GUM[1]; Sunstar, Tokyo, Japan), an interproximal brush (Lumident[2]; Heraeus Kulzer Japan, Tokyo, Japan) and an end-tufted brush (Plaut[3]; Oral Care, Tokyo, Japan) while checking their teeth and gums with a mirror and referring to a prepared diagram and dental casts.

**NIM group**

Plaster casts of a patient’s maxilla and mandible were made and marked with a pen to show the positions of missing teeth and implants as well as the size of the toothbrush, interproximal brush and end-tufted brush to be used when cleaning. A chart containing this information was also prepared (Fig. 1). Photos of the patient’s mouth and cleaning results were taken during the initial consultation, placement of the implant,

![Fig. 1 Dental casts and charting provided to the patient. Correct usage is described on the dental cast and chart.](image-url)
and fitting of the superstructure, and a diagram of the inserted implants was prepared. Photos of the patient’s mouth, taken while providing instructions on how to use the toothbrush, interproximal brush and end-tufted brush, were marked with lines indicating the correct orientation (Figs. 2 and 3). These materials were then loaded onto a CD-ROM and given to the patient.

Timing of evaluation
The outcome measures were evaluated at 3 years after placement of the superstructure (baseline) and again at 3 months after distribution of the CD-ROM to the NIM group or at 3 months after commencing instruction in the CIM group (post-instruction). The following outcome measures were evaluated at baseline and post-instruction.

Fig. 2 Instructions for interproximal brush use provided to the patient. Insert the interproximal brush at the position indicated by the green line. Start with a large-sized brush before trying smaller brushes. Be aware of orientation of the tooth and implant when brushing. When attempting to clean hard-to-reach areas, use an angled interproximal brush starting at the base of the gums and work your way up. Clean each area five times.

Fig. 3 Instructions for end-tufted brush use. Insert the brush so that the bristles reach the gumline adjacent to the tooth or implant.

Outcome measures

**Oral hygiene index (OHI)**
The OHI was determined using O’Leary’s plaque control record (PCR).

**Probing pocket depth (PPD)**
All teeth were probed using a periodontal probe (PCP 11 Color-Coded Probe®; Hu-Friedy Japan, Tokyo, Japan) and the percentage of total tooth surfaces with a PPD of 4 mm or greater was calculated to obtain the prevalence of PPD (PD).

**Bleeding on probing (BOP)**
All teeth were probed using a periodontal probe (PCP 11 Color-Coded Probe®; Hu-Friedy Japan, Tokyo, Japan), and the presence of bleeding gums was evaluated within 15 min of PPD. The percentage of to-
Arterial tooth surfaces with bleeding sites was then calculated to obtain the BOP.\textsuperscript{5} PPD and BOP were measured in four locations on each tooth (mesial, distal, buccal, and lingual). As these outcomes were only measured for teeth and not at implant sites, edentulous regions are not reflected in the results.

**Statistical analyses**

Baseline outcome measures in the CIM and NIM groups were compared using an unpaired t-test, and changes in the data of both groups and at both evaluation time points were analyzed using two-way repeated measure analysis of variance (ANOVA). Analyses were performed using Excel Statistics 2008 (SSRI, Tokyo, Japan).

This study was undertaken in accordance with the ethical principles of the Edinburgh revision of the Helsinki Declaration (October 2000). The study plan was designed in consideration of the rights and interests of the subjects, and was conducted with the approval of the Ethical Review Board of Osaka Dental University (approval no. 110506).

**RESULTS**

PCR declined from 25\% at baseline to 23\% post-instruction in the CIM group, and from 21\% at baseline to 14\% post-instruction in the NIM group, with a significant difference at 1\% observed between the two groups (Table 3). PD decreased from 15.3\% at baseline to 14.6\% post-instruction in the CIM group, and from 10\% at baseline to 7\% post-instruction in the NIM group, with a significant difference at 5\% observed between the two groups (Table 4). There were no significant intergroup differences in BOP at either evaluation time point. No interaction was seen between the instruction groups and BOP (Table 5).

**DISCUSSION**

In the present study, we attempted to create an effective oral hygiene instruction program for implant therapy patients by devising and implementing a personalized PC-based NIM and evaluating its clinical utility based on the outcome measures of PCR, PD, and BOP. Previous studies have described a periodontal maintenance care interval of 2 weeks,\textsuperscript{10} 2 to 3 months,\textsuperscript{11} and 3 to 4 months.\textsuperscript{12} Based on these references, we set the interval between baseline and post-instruction measurements at 3 months after distribution of the instruction materials.

**PCR**

A significant intergroup difference in PCR at 1\% was observed. There was no interaction between the groups and PCR, and this was attributed to an improvement in self-care awareness and behavior as a result of the NIM. A study by Ohmori \textit{et al.}\textsuperscript{8} found that ongoing maintenance care led to a decrease in PCR over time, a result that the authors ascribed to improved self-care awareness and effort among both health care providers and patients.

**PD**

A significant intergroup difference in PD at 5\% was observed, and there was no interaction between the groups and PD. Ohmori \textit{et al.}\textsuperscript{8} reported that even when several deep PPD sites were present during the
maintenance care period, they did not tend to worsen. The decline in the NIM group from 12% at baseline to 4% post-instruction suggests that the NIM played a part in improving PD.

BOP
There was no significant intergroup difference in BOP at either of the evaluation time points. Moreover, there was no significant intragroup difference between BOP at baseline and post-instruction. Although BOP is generally regarded as a highly specific test, a single examination is not a certain predictive indicator of disease progression. The likelihood of further attachment loss in individual teeth is reportedly low when BOP is 20% or less. In the present study, BOP was low throughout the entire duration of the study at 4% to 7%, which is likely why there were no significant differences between the groups and between evaluation time points.

The significant decline in the NIM group’s PCR and PD values seen at the post-instruction examination could indeed mean that providing patients with a CD-ROM containing photos of their own mouth and dental casts along with cleaning instructions facilitates an awareness and concrete understanding of their oral condition via the use of their own PC, and enables them to apply the self-care procedures. The feasibility of an oral hygiene instruction program hinges upon improving patients’ understanding and maintaining their motivation by explaining the course of treatment using photographs and other personalized instructional materials from their own mouth. It is these attributes that enabled the patients who underwent the NIM program to perform thorough oral self care.

CONCLUSION
The findings of this study suggest that the NIM has greater clinical utility in implant therapy than the CIM.

REFERENCES