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Effectiveness of one-piece implants inserted in cuspid sites

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ABSTRACT

Background: One-piece implants (OPIs) incorporate the trans-mucosal abutment facing the soft tissues as an integral part of the implant. OPIs are usually welded together and loaded immediately. Since no report focuses specifically on OPIs inserted in cuspid sites, a retrospective study is performed.

Materials and Methods: Nineteen patients (10 females and 9 males) with a median age of 62 years (range, 43-80) were admitted at the Dental Clinic, University of Chieti (Italy), for evaluation and implant treatment, by one surgeon between January and December 2010.

Results: In our series, the survival rate (SVR) and success rate (SCR) were 96.8% and 100%, respectively. Statistical analysis demonstrated that no studied variable had an impact on the survival (i.e., lost implants) and clinical success (i.e., crestal bone resorption).

Conclusion: OPIs are reliable devices for oral rehabilitation in the cuspid sites.

Key Words: Immediate loading, one piece-implant, welding

INTRODUCTION

One-piece implants (OPIs) are becoming more and more popular in the last few years. They incorporate the trans-mucosal abutment facing the soft tissues as an integral part of the implant. The interface between the trans-mucosal component and the implant is generally located in the neighborhood of the alveolar bone level. In an OPI, the fixture immediately pierces the soft tissue's barrier (non-submerged fashion) in a one-stage surgery, whereas a two-piece implant system is submerged under the soft tissues for a waiting period in a two-stage surgery.[1]

Thus, with an OPI design, manipulation of the peri-implant soft tissue after initial healing can be avoided. The implant can be provided with a provisional restoration at placement, allowing the mucosal epithelium and connective tissue adhesion to form coronal to the alveolar crest.[2] The preparable abutment portion of the implant makes it possible to create an individualized profile that follows the contour of the gingival margin without violating the soft tissue seal.[1]

The surgical protocol for the placement of this implant includes both flap and flapless procedures.[3] However, avoiding the separation of the periosteum from the underlying tissue may result in a better-maintained blood supply to the marginal bone, thus reducing the likelihood of bone resorption. Therefore, decreased postoperative bleeding, less patient discomfort, shorter surgery time, and reduced healing time are reported advantages for the flapless procedure compared with the flap procedure.[4,5]

We previously reported the effectiveness of the use of a new type of OPI (Diamond, BIOIMPLANT, Milan, Italy) for oral rehabilitation.[6-12] Moreover, we demonstrated that spiral family implants can be used successfully in the low bone.[13]

Since OPIs are becoming more and more popular and no reports specifically focus on the clinical outcome these fixtures inserted in canine sites, a retrospective study is performed.

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MATERIALS AND METHODS

Study design/sample

To address the research purpose, the investigators designed a retrospective cohort study. The study population comprised patients admitted at the Dental Clinic, University of Chieti, Italy for evaluation and implant treatment, by one surgeon as previously reported,[6,7] between January and December 2010, as previously reported.[6-12]

Subjects were screened according to the following inclusion criteria: Controlled oral hygiene and absence of any lesions in the oral cavity. In addition, the patients had to agree to participate in a post-operative check up.

The exclusion criteria were as follows: Bruxists, smoking more than 20 cigarettes/day, consumption of alcohol (more than 2 glasses of wine per day), localized radiation therapy of the oral cavity, antitumor chemotherapy, liver, blood, and kidney diseases, immunosupressed patients, patients taking corticosteroids, pregnant women, patients with inflammatory and autoimmune diseases of the oral cavity.

Variables

Several variables were investigated: Demographic (age and gender), anatomic (tooth site and distance between implants), implant (length and diameter), and prosthetic (welding procedure) variables.

Primary and secondary predictors of the clinical outcome were used. The primary predictor was defined as the presence/absence of the implant at the end of the observation period, i.e., the survival rate (SVR), which is the total number of implants still in place at the end of the follow-up period.

The second predictor of outcome was the peri-implant bone resorption. It is defined as the implant success rate (SCR) and is evaluated according to the absence of persisting peri-implant bone resorption greater than 1.5 mm during the first year of loading and 0.2 mm/year in the following years.[14]

Data collection

Data were collected as reported previously.[6-12]

Surgical protocol

All patients underwent the same surgical protocol.[6-12]

Data analysis

Pearson Chi-square test was used to detect if implant position has an impact both on failures (i.e., lost fixtures) and/or success (i.e., crestal bone resorption more than 1.5 mm around the implants).

RESULTS

Nineteen patients (10 females and 9 males) with a median age of 62 years (range, 43-80) were enrolled. The mean follow up period was 7 months. A total of 176 OPIs (Diamond, BIOIMPLANT, Milan, Italy) were inserted. Among them 32 fixtures were inserted in cuspid sites. Five, 20, and 7 implants had a diameter narrower, equal to, and wider than 4 mm; respectively [Figure 1]. Two, 5, and 25 fixtures were shorter, equal to, and longer than 13 mm, respectively. Seventeen fixtures were placed in the mandible and 15 in the maxilla (15 in females and 17 in males). Twenty-six fixtures were welded. The mean observation period, patients' age, inter-implant distance, and peri-implant bone resorption per implant were 6 ± 5 months (range, 1-24 months), 63 ± 11 years (range, 43-80 years), 4.4 ± 2.2 mm (range, 1.7-9.4 mm), and 0 ± 0.8 mm (range, 1.5-1.8 mm), respectively. Pearson Chi-square test is used to detect if the implant site had an impact both on failures (SVR, i.e., lost fixtures) and/or success (SCR, i.e., crestal bone resorption more than 1.5 mm around the implants).

One implant was lost during the post-operative period (within 3 months) and none had a peri-implant bone resorption greater than 1.5 mm; thus, the SVR and SCR were 96.8% and 100%, respectively. Statistical analysis demonstrated that no studied variable had an impact on the survival (i.e., lost implants) and clinical success (i.e., crestal bone resorption).

Figure 1: One-piece implants (Diamond, BIOIMPLANT, Milan, Italy) inserted in cuspid sites

DISCUSSION

Few articles focus on implants inserted in the canine site, but no article stated the use of OPIs. Some recent papers studied prosthetic restoration. Sailer, *et al.*[15] analyzed if customized zirconium abutments exhibit the same survival rates in the canine and posterior regions as titanium abutments. Twenty-two patients with 40 implants in the posterior region were included and the implant sites were randomly assigned to 20 customized zirconium and 20 customized titanium abutments. All-ceramic (AC) and metal-ceramic (MC) crowns were fabricated. In all, except two, cases the crowns were cemented on the abutments using resin or glass ionomer cements. Two zirconium reconstructions were screw retained. At baseline, 6, and 12 months, the reconstructions were examined for technical and biological problems. Probing pocket depth (PPD), plaque (Pl), and bleeding on probing (BOP) were assessed and compared with the natural teeth (control). The data were analyzed with Student's unpaired *t*-test, analysis of variance (ANOVA), and regression analyses. Twenty patients with 19 zirconium and 12 titanium abutments were examined at a mean follow-up period of 12.6 ± 2.7 months.

The survival rate for reconstructions and abutments was 100%. No technical or biological problems were observed at the test and control sites. Two chippings (16.7%) occurred at crowns supported by titanium abutments. No difference in PPD, Pl, and BOP was observed between the two groups. Thus, the authors concluded that at one year, zirconium abutments exhibited the same survival outcome as titanium abutments.

In the same year Zembic, *et al.*[16] tested whether zirconium abutments exhibit the same survival and technical/biological outcome as titanium abutments. Twenty-two patients receiving 40 single-tooth implants in the canine and posterior regions were included. The implant sites were randomly assigned to 20 zirconium and 20 titanium abutments. AC and MC crowns were fabricated. At baseline, 6, 12, and 36 months, the reconstructions were examined for technical and biological problems. Probing pocket depth (PPD), plaque control record (PCR), and BOP were assessed at abutments (test) and analogous contralateral teeth (control). Standardized radiographs of the implants were made and the bone level (BL) was measured with reference to the implant shoulder on mesial (mBL) and distal sides (dBL). The data were statistically analyzed with Mann–Whitney Rank and Student's unpaired *t*-tests. Eighteen patients with 18 zirconium and 10 titanium abutments were examined at a mean follow-up of 36 months. No abutment fracture or reconstruction loss was observed. Hence, both exhibited 100% survival. Chipping of the veneering ceramic occurred at two MC crowns supported by titanium abutments. No difference was observed in the biological outcome of zirconium and titanium abutments: PPD, PCR, and BOP. Furthermore, the BL was similar at implants supporting zirconium and titanium abutments. Thus, the authors concluded that at 3 years, zirconium and titanium abutments exhibited same survival and technical, biological, and esthetical outcomes.

In 2011, Turkyilmaz and Shapiro[17] reported a clinical case in which a primary maxillary canine with both mobility and root resorption was replaced with an immediately restored dental implant placed into the fresh extraction socket. The implant achieved high primary stability, as determined by resonance frequency analysis, and it was immediately restored with a provisional acrylic resin crown with no centric occlusion. An AC permanent crown replaced the provisonal crown four months after implant surgery. The implant was stable with no periapical radiolucencies, BOP, or pathologic probing depth after 1 year. The peri-implant soft tissue level appeared stable, and the interdental papillae were preserved, contributing to an optimum final esthetic result. This case supports the use of single implants for the replacement of extracted primary teeth, especially in areas where esthetics is of high priority. The immediate provisional crown maintained soft tissue contours and papillary height, thus preventing bone resorption around the dental implant due to peri-implantitis bacteria, which could compromise its stability.[18-20]

Our report is the first study to focus on OPIs. In our series, the SVR and SCR were 96.8% and 100%, respectively. Statistical analyses demonstrated that no studied variable had an impact on survival (i.e., lost implants) and clinical success (i.e., crestal bone resorption).

CONCLUSION

In conclusion, OPIs are reliable devices for oral rehabilitation in the canine sites.

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