

Original Article

Restoration of incisor area using one-piece implants: Evaluation of crestal bone resorption

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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. Since OPIs become more and more popular and no report specifically focuses on OPIs inserted in incisors' area, a retrospective study is performed.

Materials and Methods: Fifty-five OPIs were inserted in incisors' area in a series of patients admitted at the Dental Clinic, University of Chieti (Italy), for evaluation and implant treatment between January and December 2010.

Results: In our study, the survival rate and success rate were 96.2% and 96.1%, 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).

Conclusions: OPIs are reliable devices for oral rehabilitation in the incisors' area.

Key Words: Fixture, immediate loading, one-piece, welding

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INTRODUCTION

Only few specific reports focus on incisors rehabilitation, but none of them involve the use of OPIs.

In 2007, some case reports were published on two-stage implants. Holst, *et al.*^[1] described a case of restoration of a nonrestorable central incisor using forced orthodontic eruption, immediate implant placement, and an all-ceramic restoration. Chu, *et al.*^[2] reported the use of immediate implant placement for replacing a periodontally involved misaligned lateral incisor. Paolantoni, *et al.*^[3] described a case of rehabilitation of a central incisor.

In 2008, Peñarrocha, *et al.*^[4] described a series of 10 implants placed in lateral incisor sites, all of

which were subjected to immediate rehabilitation with provisional acrylic resin crowns in nonocclusal loading. One implant failed 3 weeks after placement because of acute local trauma. The other nine remained functional within the mouth, with normal clinical and radiological characteristics after a minimum follow-up period of 12 months. Thus, the authors concluded that immediate placement of the implant fixed provisional restorations retained by friction in maxillary lateral incisors offers an esthetic solution, eliminates the need for a removable provisional restoration, and avoids implant failures associated with excess cement or screw loosening. Moreover, in case of extractions, immediate placement and provisionalization of implants in maxillary lateral incisors can effectively optimize the peri-implant esthetic results by maintaining the existing hard and soft tissue architecture of the replaced tooth, thereby reducing the possibility of bone resorption caused by bacteria.^[5-7]

In 2009, Degidi, *et al.*^[8] compared the bone loss pattern and soft tissue healing of immediate versus one-stage loaded 3.0-mm diameter implants in cases involving a single missing lateral maxillary incisor. Sixty patients with a missing lateral incisor in the maxilla

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were randomized to one of the treatments: 30 patients in the immediate-restoration group and 30 in the one-stage group. All implants were placed in healed sites and had to be inserted with a torque >25 Ncm. The implants in the immediate-restoration group were fitted with a non-occluding temporary crown on the day of surgery. Both groups received a full occluding final crown 6 months after surgery. Mean marginal bone loss, probing depth, and bleeding on probing were assessed at follow-up periods of 6, 12, 24, and 36 months by a masked examiner. Sixty 3.0-mm diameter implants were placed. All implants osseointegrated and were clinically stable at the 6-month follow-up. No statistically significant differences were observed for bleeding or plaque index. No implant fractures occurred. At the 36-month follow-up, no statistically significant difference were detected for the tested outcome measures between the two procedures. Thus, the authors concluded that in the rehabilitation of a single missing lateral maxillary incisor, no statistically significant difference was assessed between immediate and one-stage restored small-diameter implants with regard to implant survival mean marginal bone loss and probing depth. Three-millimeter diameter implants proved to be a predictable treatment option in our test and control groups if a strict clinical protocol was followed.

Thus OPI seems to be the best solution for incisor rehabilitation. Previously, we reported the effectiveness on a new type of OPIs (Diamond, BIOIMPLANT, Milan, Italy) in oral rehabilitation.^[9-15] Moreover, we demonstrated that spiral family implants can be used successfully in the low bone.^[16] Since no report specifically focus on clinical outcome of OPIs inserted in incisor areas, a retrospective study is performed.

MATERIALS AND METHODS

Study design/sample

To address the research purpose, the investigators designed a retrospective cohort study. The study population was composed of patients admitted at the Dental Clinic, University of Chieti (Italy), for evaluation and implant treatment, by one surgeon as previously reported,^[9,10] between January and December 2010, as reported previously.^[9-15]

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 program.

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

The second predictor of outcome is 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/years during the following years.^[17]

Data collection methods

Data were collected as reported previously.^[9-15]

Surgical protocol

All patients underwent the same surgical protocol.^[9-15]

Data analysis

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

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 55 fixtures were inserted in the incisors area [Figure 1]. Four, 41, and 10 implants had a diameter narrower, equal to, and wider than 4 mm, respectively. Five, 12, and 38 fixtures were shorter, equal to, and longer than 13 mm, respectively. Twenty-nine fixtures are placed



Figure 1: Wide diameter one-piece implant

in the mandible and 26 in the maxilla; 30 fixtures in females and 25 in males. Forty-three fixtures are welded. The mean observation period, patient age, inter-implant distance, and peri-implant bone resorption per implant was 7 ± 6 months (range, 1-24 months), 62 ± 11 years (range, 43-80 years), 3.8 ± 1.8 mm (range, 1.3-10.3 mm), and 0 ± 0.8 (range, 1.8-2.1 mm), respectively. Pearson Chi-Square test was used to detect if the implant site has an impact both on failures (SVR, i.e., lost fixtures) and/or success (SCR, i.e., crestal bone resorption around implants less than 1.5 mm).

Two implants were lost in the post-operative period (within 3 months) and two had a peri implant bone resorption greater than 1.5 mm; thus, the SVR and SCR were 96.2% and 96.1%, respectively. Statistical analysis demonstrated that no studied variable has an impact on survival (i.e., lost implants) as well as on clinical success (i.e., crestal bone resorption).

DISCUSSION

Only few specific reports focus on incisors rehabilitation, but none of them involve the use of OPIs.^[1,2,4,8,18] In addition to those previously reported, Turkyilmaz, *et al.*^[19] described the replacement of a maxillary peg-shaped lateral incisor with the placement of an immediate implant and a provisional restoration following a minimally invasive extraction to preserve anterior esthetics. Extraction sites in the anterior maxilla can present restorative challenges with regard to esthetics. Resistance to wearing a temporary removable partial denture during healing makes immediate implant therapy an appealing

alternative to patients. Implant placement into fresh extraction sockets using no flap elevation has become more popular recently because of advantages such as less bleeding, less swelling, and the preservation of existing soft tissue contours. A 20-year-old woman with a peg-shaped maxillary left lateral incisor was treated using an implant placed into the fresh extraction socket using a flapless approach and immediate provisional crown fabrication. Flapless implant placement helps to preserve site morphology by protecting and supporting existing hard and soft tissues while minimizing surgical trauma to the adjacent tissues.

Using a previously fabricated acrylic index, a provisional acrylic crown was fabricated on the adjusted temporary abutment and delivered to the patient on the same day during the extraction visit. Thus, the authors concluded that flapless implant insertion into fresh extraction sockets and placement of immediate provisional crowns in cases involving the maxillary anterior region represent a viable treatment option in appropriate clinical situations where esthetics is of high priority. The strategy preserves optimum gingival contours, and papillary height may be a viable option compared with fixed partial dentures. In 2012, Sekine, *et al.*^[20] reported a 67-year-old female with root fracture of the maxillary central incisor, which underwent implant placement immediately after extraction, with the goal of shortening the treatment period. The superstructure was placed on the implant after a 4-month healing period. A review performed 5 years after the implant loading revealed no clinical problems. Thus, they concluded that the treatment time was shortened effectively by the flapless immediate post-extraction placement procedure. Immediate post-extraction implant placement based on proper examination and diagnosis would reduce patient burden.

Previously, we investigated the reliability of OPIs in various clinical situations.^[9-15] OPIs became 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 a OPI, the implant 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.^[9-15]

In the present report, the SVR and SCR were 91.7% and 97%, respectively. Statistical analysis demonstrated that no studied variable has an impact on the 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 incisors.

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