Original Article

Survival and success rate of one-piece implant inserted in molar sites

Francesco Carinci¹

¹Department of Medical-Surgical Sciences of Communication and Behavior, Section of Maxillofacial and Plastic Surgery, University of Ferrara, Ferrara, Italy

ABSTRACT

Background: Recently, the use of one-piece implants (OPI) has become more popular. Since no reports specifically focus on OPIs inserted in molar areas, a retrospective study has been performed.

Materials and Methods: A series of 36 OPIs (Diamond; BIOIMPLANT, Milan, Italy) were inserted into the molar area of patients admitted at the Dental Clinic, University of Chieti, Italy, for oral rehabilitation between January and December 2010.

Results: In our series survival rate (SVR) and success rate (SCR) were 91.7% and 97%, 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).

Conclusion: OPIs are reliable devices for oral rehabilitation in the molar areas.

Key Words: Bone, fixture, immediate loading, implant, one-piece, welding

INTRODUCTION

Two-piece implants inserted into molar areas are predictable tools for oral rehabilitation. In 2008 Fugazzotto¹ reported a series of implants placed at the time of maxillary molar extraction. A total of 391 were reviewed and followed for up to a mean of 40 months. The cumulative survival rate was 99.5%. In a subsequent study, the same author¹ reported the clinical outcome of 341 implants placed into the mandible at the time of molar extraction. Concomitant regenerative therapy was performed around 332 of the placed implants. One implant was mobile 3 weeks post insertion. A second implant was lost after 30 months in function. All other implants were stable at the time of uncover 3-7 months post insertion. A total of 339 implants have been in function for up to 6 years, with a mean time in function of 30 months, yielding a cumulative survival rate of 99.1%.

The ITI Study Group Italia² assessed the clinical and radiographic outcomes of immediate transmucosal implant placement into molar extraction sockets. A 12-month multicenter prospective cohort study was performed. Following molar extraction, implants were immediately placed into the sockets. Molars with evidence of acute peri-apical pathology were excluded. After implant placement and achievement of primary stability, flaps were repositioned and sutured allowing non-submerged, transmucosal healing. Peri-implant marginal defects were treated according to the principles of guided bone regeneration (GBR) by means of de-proteinized bovine bone mineral particles in conjunction with a bio-resorbable collagen membrane. Standardized radiographs were obtained at baseline and 12 months thereafter. Changes in depth and width of the distance from the implant shoulder and from the alveolar crest to the bottom of the defect were assessed. Eighty-two patients were enrolled and followed for 12 months. Extraction sites displayed sufficient residual bone volume to allow primary stability of all implants. Sixty-four percent of the implants were placed in the areas of 36 and 46. GBR was used in conjunction with the placement of all implants. No post-surgical complications were observed. All implants healed uneventfully yielding a survival rate of 100% and healthy soft tissue

Access this article online

Website: www.drj.ir
conditions after 12 months. The authors concluded that immediate transmucosal implant placement represented a predictable treatment option for replacement of mandibular and maxillary molars.

Matarasso, et al.[3] studied the dimensional ridge alterations following immediate implant placement in molar extraction sites. Twelve subjects received 12 immediate transmucosal implants in molar extraction sites. Peri-implant defects were treated according to the principles of GBR by means of a de-proteinized bone substitute and a bio-resorbable collagen membrane. Changes in vertical and horizontal distances of alveolar bony walls to the bottom of the defects and to the implant surfaces were compared between implant placement and surgical re-entry at 6 months. The implant survival rate at 6 months was 100%. Statistically significant differences were observed in the mean changes in vertical distances between baseline and re-entry. At re-entry, all peri-implant marginal defects assessed from the internal socket wall to the implant surface were healed. The authors concluded that the marginal defects around immediate implants placed in molar extraction sites were completely filled after 6 months of healing through de novo bone formation.

Acocella, et al.[4] evaluated the predictability a modified implant insertion at the time of maxillary molar extraction. Sixty-eight patients with a total of 68 teeth scheduled for tooth extraction and immediate implant placement into fresh sockets were included. Implants were positioned just after teeth removal and, in case of necessity, a regenerative therapy was performed at the same time. After a 3-month period of healing, implants were restored with single crown fixed prostheses. All implants restored with single crowns were monitored for 36 months; only three implants failed with a cumulative survival rate of 97.96%. The authors concluded that the combination of a traumatic extraction of maxillary molars, sufficient residual inter-radicular bone, and use of appropriate regenerative material at the time of implant insertion represents a predictable long-term treatment. Lauritano and co-workers [5-7] focused on possible consequences of a peri-implantitis disease caused by bacteria on the stability of the implant. Previously we reported the effectiveness on a new type of one-piece implants (OPI) (Diamond; BIOIMPLANT, Milan, Italy) for oral rehabilitation.[8-14] Moreover, we demonstrated that spiral family implants can be used successfully in low bone.[15]

Since OPIs became more and more popular and no reports specifically focus on their outcome in molar 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, between January and December 2010, as reported previously.[8-14]

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 per 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; immunosuppression; patients on corticosteroids; pregnant women; and inflammatory and autoimmune diseases of the oral cavity.

**Variables**

Several variables are investigated: Demographic (age and gender), anatomic (tooth site, 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 survival rate (i.e., SVR) that 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 implant success rate (SCR) and it 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 per year during the following years.[16]

**Data collection methods**

Data were collected as reported previously.[8-14]

**Surgical protocol**

All patients underwent the same surgical protocol.[8-14]
Data analysis
Pearson $\chi^2$-test was used to detect if implant position has an impact both on failures (i.e., lost fixtures) and/or on success (i.e., crestal bone resorption around implants smaller than 1.5 mm).

RESULTS

Nineteen patients (10 females and 9 males) with a median age of 62 years (min.-max., 43-80 years) were enrolled. The mean follow-up was 7 months. A total of 176 OPIs (Diamond; BIOIMPLANT) were inserted [Figure 1]. Among them 36 fixtures were inserted into the molar area. A total of 1, 6, and 29 implants had a diameter narrower than, equal to, and wider than 4 mm, respectively. A total of 20, 7, and 9 fixtures were shorter than, equal to, and longer than 13 mm, respectively. Twenty implants were placed into the mandible and 16 into the maxilla; 17 in females and 19 in males; and 26 were welded. The mean observation period, patient’s age, inter-implant distance, and peri-implant bone resorption per implant were $8 \pm 6$ months (min.-max., 1-26 months), $65 \pm 11$ years (min.-max., 43-76 years), $3.7 \pm 1.7$ mm (min.-max., 1.1-8.3 mm), and $0.2 \pm 0.7$ (min.-max., $-1.7$-1.8 mm), respectively. Pearson $\chi^2$-test was used to detect if implant site had an impact both on failures (SVR, i.e., lost fixtures) and/or on success (SCR, i.e., crestal bone resorption around implants lower than 1.5 mm).

Three implants were lost in the post-operative period (within 3 months) and one had a peri-implant bone resorption area wider than 1.5 mm; thus SVR and SCR were 91.7% and 97%, respectively. Statistical analysis demonstrated that no studied variable had an impact on survival (i.e., lost implants) as well as on clinical success (i.e., crestal bone resorption).

DISCUSSION

Few articles focus on implants inserted in molar sites\textsuperscript{[17-21]} and none on OPIs. In addition to previously reported articles,\textsuperscript{[17-21]} Annibali, et al.\textsuperscript{[22]} reported a series of patients treated consecutively for first molar replacement according to unconventional (immediate = Group 1, early = Group 2) or conventional (late = Group 3) surgical protocols. Peri-apical radiographs obtained upon delivery of the definitive crown and 1 year later were digitized and assessed to evaluate marginal bone loss (MBL). Clinical photographs were evaluated to determine soft tissue health. Forty-seven patients were treated, with a total of 53 immediate, early, or late single implants. The implant survival rate was 100% for all groups. The success rate was 91.7% for early implants, 95.0% for immediate post-extraction implants, and 100% for implants placed in healed sites. MBL and soft tissue parameters did not differ significantly among the three groups at definitive restoration delivery or 1 year later; a thin gingival biotype, irrespective of treatment timing, was the only covariate that was able to slightly affect the outcome variables. The authors concluded that short-term implant survival and success rates, as well as MBL values for immediate, early, and conventional implants, appear similar for maxillary and mandibular first molar sites.

Freitas-Junior, et al.\textsuperscript{[23]} tested the reliability and failure modes of molar crowns supported by three different implant-supported designs.

There were the following groups: Group 1, one standard-diameter implant (3.75 mm); Group 2, one narrow-diameter implant (3 mm); and Group 3, two narrow-diameter implants (3 mm). Loads were applied as mouth-motion cycles using a step-stress accelerated life-testing method. Abutment screw failure was the chief failure mode. Strength and reliability were significantly higher for Groups 1 and 3 compared with Group 2.

Urban, et al.\textsuperscript{[24]} identified risk factors for early failure of immediately placed implants in molar regions associated with three bone regenerative techniques. Ninety-two patients in need of a single implant crown to replace a molar were included. After placing the implant, patients were randomized to one of three treatment groups for bone reconstruction of remaining peri-implant defects: Autologous bone (AB) chips, ossix membrane (OM), or a combination of AB
chips and OM. The implant was submerged, and after 4 months of healing a re-entry surgery was made to connect a healing abutment. Implants with a dehiscence on ≥2 sites (mesial/distal/oral/buccal), together with ≥50% visible threads, were judged as failures. A series of simple logistic regression analyses was performed to identify risk factors for failure among the following independent variables: Sex, jaw, smoking status, plaque, bleeding on probing, fistula, extraction reason, mean initial peri-implant defect size, treatment group, implant length, buccal bone dehiscence (BBD), soft-tissue dehiscence, and infection. Fifteen implants failed before abutment operation (13 explanations and 2 non-osseo-integrated). Treatment group had no impact on failure. Risk factors for failure were smoking >10 cigarettes per day, BBD, and infection. There was no difference in failure rate between three bone reconstructive techniques.

In our series SVR and SCR were 91.7% and 97%, respectively. Statistical analysis demonstrated that no studied variable had an impact on survival (i.e., lost implants) as well as on clinical success (i.e., crestal bone resorption).

CONCLUSION

OPIs are reliable devices for oral rehabilitation in molar areas.

ACKNOWLEDGMENTS

This work was supported by the University of Ferrara (F.C.), Ferrara, Italy and by PRIN 2008 (20089MANHH_004).

REFERENCES

1. Fugazzotto PA. Implant placement at the time of maxillary molar extraction: Treatment protocols and report of results. J Periodontol 2008;79:216-23.
2. Cafiero C, Annibali S, Gherlone E, Grassi FR, Gualini F, Magliano A, et al. Immediate transmucosal implant placement in molar extraction sites: A 12-month prospective multicenter cohort study. Clin Oral Implants Res 2008;19:476-82.
3. Matarasso S, Salvi GE, Iorio Siciliano V, Cafiero C, Blasi A, Lang NP. Dimensional ridge alterations following immediate implant placement in molar extraction sites: A six-month prospective cohort study with surgical re-entry. Clin Oral Implants Res 2009;20:1092-8.
4. Acocella A, Bertolai R, Sacco R. Modified insertion technique for immediate implant placement into fresh extraction socket in the first maxillary molar sites: A 3-year prospective study. Implant Dent 2010;19:220-8.
5. Brunelli G, Carinci F, Zollino I, Candotto V, Scarano A, Lauritano D. Peri-implantitis: A case report and literature review. Eur J Implant 2012;10:1-6.
6. Brunelli G, Carinci F, Zollino I, Candotto V, Scarano A, Lauritano D. SEM evaluation of 10 infected implants retrieved from man. Eur J Implant 2012;10:7-12.
7. Scarano A, Murmura G, Carinci F, Lauritano D. Immediately loaded small diameter dental implants: Evaluation of retention, stability and comfort for the edentulous patient Eur J Implant 2012;10:19-24.
8. Fanali S, Carinci F, Zollino I, Brugnati C, Lauritano D. One-piece implants installed in restored mandible: A retrospective study. Eur J Implant 2012;10:37-41.
9. Fanali S, Carinci F, Zollino I, Brugnati C, Lauritano D. A retrospective study on 83 one-piece implants installed in resorbed maxilla. Eur J Implant 2012;10:55-8.
10. Fanali S, Carinci F, Zollino I, Brunelli G, Minguzzi R. Effect of distance between one piece implants on crestal bone resorption. Eur J Implant 2011;9:1-6.
11. Fanali S, Carinci F, Zollino I, Brunelli G, Minguzzi R. Effect of one-piece implant diameter on clinical outcome. Eur J Implant 2011;9:7-12.
12. Fanali S, Carinci F, Zollino I, Brunelli G, Minguzzi R. Impact of one-piece implant length on clinical outcome. Eur J Implant 2011;9:13-8.
13. Fanali S, Carinci F, Zollino I, Brunelli G, Minguzzi R. Welding improves the success rate of one-piece implants. Eur J Implant 2011;9:19-24.
14. Fanali S, Carinci F, Zollino I, Brunelli G, Minguzzi R. Bio-grip and machined titanium stimulate dental pulp stem cells towards osteoblast differentiation. Eur J Implant 2011;9:25-30.
15. Danza M, Palmieri A, Farinella F, Brunelli G, Carinci F, Spinelli S. Three dimensional finite element analysis to detect stress distribution in spiral implants and surrounding bone. Dent Res J 2009;6:59-64.
16. Albretkssson T, Zarb GA. Determinants of correct clinical reporting. Int J Prosthodont 1998;11:517-21.
17. Holst S, Hegenbarth EA, Schlegel KA, Holst AI. Restoration of a nonrestorable central incisor using forced orthodontic eruption, immediate implant placement, and an all-ceramic restoration: A clinical report. J Prosth Dent 2007;98:251-5.
18. Chu FC, Deng FL, Siu AS, Chow TW. The use of immediate implant placement for the replacement of a periodontally involved malaligned lateral incisor: A clinical report. J Prosth Dent 2007;98:423-8.
19. Paolantonio M, Pedrazzoli V, di Murro C, di Placido G, Picciani C, Catamo G, et al. Clinical significance of Actinobacillus actinomycescomitans in young individuals during orthodontic treatment. A 3-year longitudinal study. J Clin Periodontol 1997;24:610-7.
20. Penarrocha M, Lamas J, Penarrocha M, Garcia B. Immediate maxillary lateral incisor implants with nonocclusal loading provisional crowns. J Prosthodont 2008;17:55-9.
21. Degidi M, Nardi D, Piattelli A. Immediate rehabilitation of the edentulous mandible with a definitive prosthesis supported by an intraorally welded titanium bar. Int J Oral Maxillofac Implants 2009;24:342-7.
22. Annibali S, Bignozzi I, Iacovazzi L, La Monaca G, Cristalli MP. Immediate, early, and late implant placement in first-molar sites: A retrospective case series. Int J Oral Maxillofac Implants 2011;26:1108-22.

23. Freitas-Junior AC, Bonfante EA, Martins LM, Silva NR, Marotta L, Coelho PG. Effect of implant diameter on reliability and failure modes of molar crowns. Int J Prosthodont 2011;24:557-61.

24. Urban T, Kostopoulos L, Wenzel A. Immediate implant placement in molar regions: Risk factors for early failure. Clin Oral Implants Res 2012;23:220-7.

How to cite this article: Carinci F. Survival and success rate of one-piece implant inserted in molar sites. Dent Res J 2012;9:S155-9.

Source of Support: This work was supported by the University of Ferrara (F.C.), Ferrara, Italy and by PRIN 2008 (20089MANHH_004).

Conflict of Interest: None declared.

Author Help: Reference checking facility

The manuscript system (www.journalonweb.com) allows the authors to check and verify the accuracy and style of references. The tool checks the references with PubMed as per a predefined style. Authors are encouraged to use this facility, before submitting articles to the journal.

- The style as well as bibliographic elements should be 100% accurate, to help get the references verified from the system. Even a single spelling error or addition of issue number/month of publication will lead to an error when verifying the reference.
- Example of a correct style
  Sheahan P, O’leary G, Lee G, Fitzgibbon J. Cystic cervical metastases: Incidence and diagnosis using fine needle aspiration biopsy. Otolaryngol Head Neck Surg 2002;127:294-8.
- Only the references from journals indexed in PubMed will be checked.
- Enter each reference in new line, without a serial number.
- Add up to a maximum of 15 references at a time.
- If the reference is correct for its bibliographic elements and punctuations, it will be shown as CORRECT and a link to the correct article in PubMed will be given.
- If any of the bibliographic elements are missing, incorrect or extra (such as issue number), it will be shown as INCORRECT and link to possible articles in PubMed will be given.