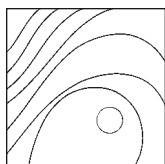


Immediate Palatal Molar Implants: A Simple, Safe, Minimally Invasive Technique



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The purpose of this study was to determine whether a single immediate implant placed into the postextraction palatal socket of a maxillary molar would be as efficacious as a single implant placed centrally in a staged approach. A total of 61 immediate implants were placed in 52 patients and restored after 6 months. Periotest and Osstell were used to determine implant stability, and cone beam computed tomography was used for marginal bone level assessment. During the 2-year follow-up, implant survival was 100%. It was concluded that immediate palatal implants can safely restore extracted molars in the maxilla. Int J Periodontics Restorative Dent 2017;27:e297–e301. doi: 10.11607/prd.3025

Maxillary molars account for 17% to 26% of all missing teeth.^{1,2} Postextraction maxillary first molar sockets left untreated result in vertical reduction of the alveolar crest followed by mesial inclination of the second molar.³ Further crest resorption may reduce the sinus floor by 2 to 5.27 mm in height after multiple extractions.^{4,5} Dental implants used for maxillary molar replacement are subject to significant occlusal forces.^{6,7} Lekholm Class III and IV bone is frequently present in the molar area, making it difficult to achieve high primary stability, and is a risk factor for long-term prognosis.⁸ Implant rehabilitation is frequently performed in stages, with a sinus lift, vertically placed short implants, or both, as the existing paradigm for maxillary molars.^{9,10}

On the other hand, immediate inclined implants are known to succeed in multiple-unit restorations.¹¹ Bridges on four implants (All-on-4) do not show increased bone load and resorption around the inclined implants.¹²

The objective of this study was to investigate whether an immediate single inclined implant with sufficient primary stability would be a safe alternative to a sinus lift or short implants. Therefore, it was decided to study the use of an anchor inclined implant in the palatal socket

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of a maxillary molar immediately after extraction to reduce trauma and treatment time.

Materials and Methods

Characteristics of the Study Group

The study was conducted on 52 patients (26 men, 26 women) from 2011 to 2015. The mean age of the subjects was 50 ± 15 years; 20 subjects (38.46%) smoked 10 or more cigarettes a day, and they received a total of 24 implants (39.34%).

The tooth removal indications were tooth decay, endodontic complications, periodontal disease, root fracture, and resorption. The most common causes of tooth loss were caries (47.5%) and failed endodontic treatment (21.5%).

A total of 61 implants were placed: 3.75 mm diameter in 24.5% of patients and 4.2 mm in 75.5% of cases, and 10 mm length in 36% of patients and 11.5 mm length in 64% of cases.

Of the patients, 43 received only one implant, 6 patients received two implants (one on each side), and 3 patients received two implants next to each other as first and second molars.

The inclusion criteria were as follows: the first, second, or both maxillary molars diagnosed for extraction; generally healthy patient with no chronic disease; lack of focal infection in the oral cavity adjacent to the tooth to be extracted; at least 6 mm of bone height surrounding

the palatal root of the extracted molar measured on cone beam computed tomography (CBCT) scan; typical tooth anatomy; proper oral hygiene and compliance with a hygienist; all other teeth present or restored and in proper occlusion; and no parafunctions.

Surgical Procedures

Diagnostic CBCT (Kodak 3000C 3D, Kodak Dental Systems) images were thoroughly analyzed, oral hygiene treatment was accomplished, and oral Augmentin (0.875 g amoxicillin and 125 mg clavulanic acid, Smith-Kline Beecham Pharmaceuticals) was given every 12 hours starting the day before surgery and continuing for 7 days postoperatively. Infiltration anesthesia was administered using Citocartin 100 (Molteni Dental) containing 40 mg articaine hydrochloride (artycaini chydrochloridum) and 0.01 mg epinephrine tartrate (adrenalin tartras) in 1 mL solution. The crown of the tooth was removed, and all three roots were separated with a cutting drill and removed with luxators and forceps. The alveoli were curetted. No incisions were made. The palatal socket was measured with a surgical depth gauge and implant calipers. All three alveoli were then filled with bovine xenograft material in 0.5- to 1-mm-diameter granules (Alpha-Bio's Natural Bovine Bone Graft, Alpha-Bio). The implant bed was manually prepared with increasing diameter tools to consolidate the filling material and enlarge the

bed without drilling. Implant insertion torque, implant stability quotient (ISQ) (Osstell), and Periotest (Medizintechnik Gulden) values were recorded. The cover screw was then mounted and the control CBCT taken. The wound was protected with surgical cement (Septo-Pack, Septodont) and the cement was changed three times during control visits every 2 days. After the third visit, the wound was allowed to further heal spontaneously by granulation. No temporary prosthesis was constructed.

At 6 months postoperatively, CBCT scans were taken and the implants exposed. Implant stability was measured with Osstell and Periotest. Implants were restored with cemented single crowns.

Patients were under typical hygienic follow-up care. Another CBCT evaluation and implant stability testing with Periotest was carried out at 18 months postreconstruction (24 months postoperative). Marginal bone level measurements were taken at the time of the prosthetic reconstruction and at 18 months after cementation (Kodak Dental Imaging Software version 6.12.32. Kodak Dental Systems). Measurements were made from the implant shoulder level to the nearest bone level indicated on the CBCT scan. Scans were evaluated in two planes: anteroposterior and lateral. Measurements were taken on both sides of the implant. The recorded result was the largest of the four measurements of the distance from the top of the implant to bone level. Figure 1 illustrates a sample case.

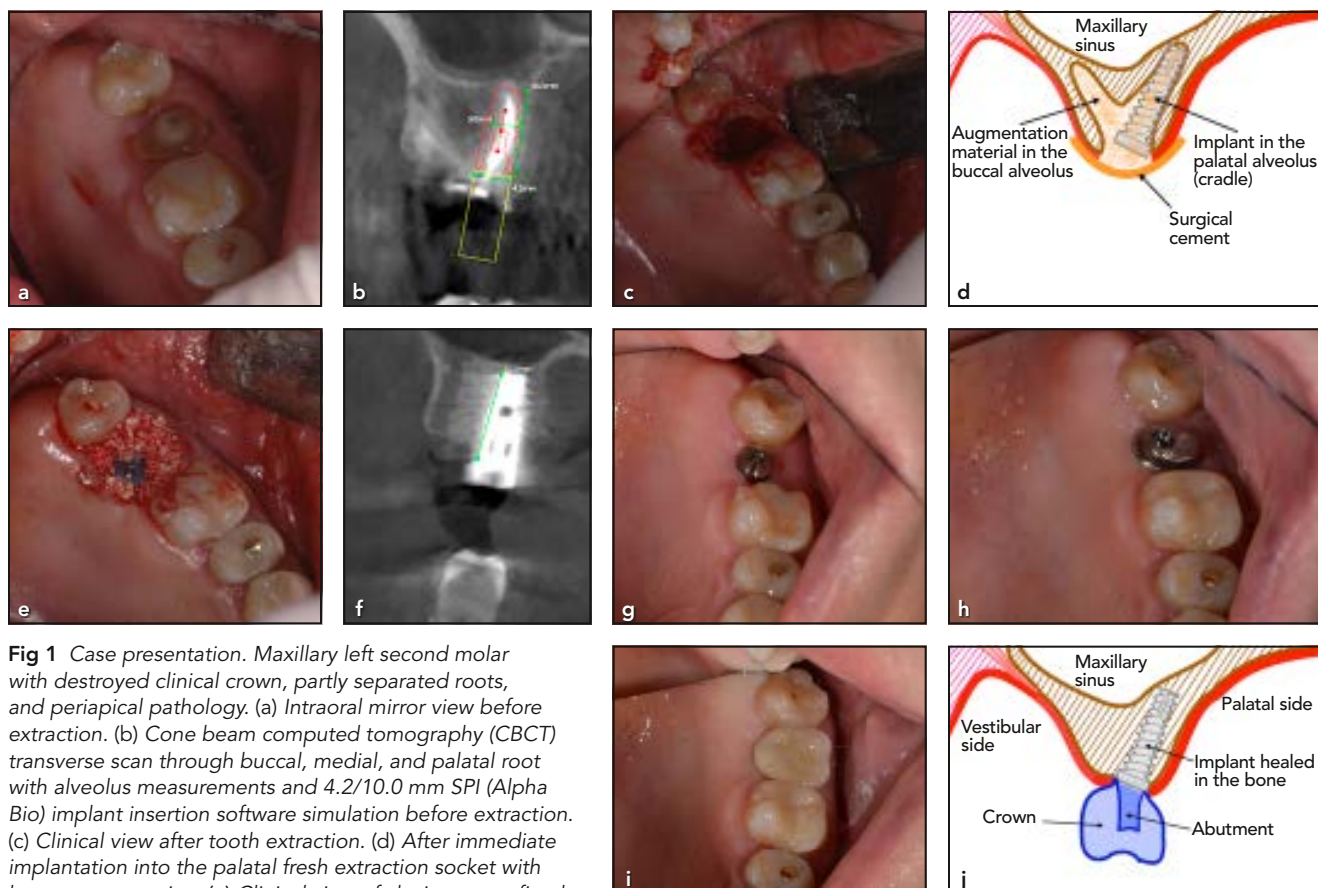


Fig 1 Case presentation. Maxillary left second molar with destroyed clinical crown, partly separated roots, and periapical pathology. (a) Intraoral mirror view before extraction. (b) Cone beam computed tomography (CBCT) transverse scan through buccal, medial, and palatal root with alveolus measurements and 4.2/10.0 mm SPI (Alpha Bio) implant insertion software simulation before extraction. (c) Clinical view after tooth extraction. (d) After immediate implantation into the palatal fresh extraction socket with bone augmentation. (e) Clinical view of closing screw fixed on implant. (f) CBCT transversal scan after healing screw insertion with the bone measurements, 6 months after implantation. (g) Clinical mirror view after healing screw insertion, 6 months after implantation. (h) Clinical mirror view of individual abutment fixed on the implant. (i) Clinical mirror view of full-ceramic crown fixed on the individual abutment. (j) After prosthetic superstructure delivery.

Results

All 61 placed implants healed without complications, were restored with single crowns, and remained in function during the 2 years of follow-up (18 months from loading). No mucogingival pathology was noted in any of the cases. The survival rate was 100%.

Implant stability was measured with Periotest on the day of implan-

tation, and then at 6 and 24 months after surgery, and with Osstell on the day of implantation and 6 months after surgery.

The implant stability measured with Periotest and the ISQ increased significantly.

Bone level was measured at 6 and at 24 months after implant placement (Fig 2). Bone loss measured at the time of implant exposure (6 months postoperative)

ranged from 0.0 to 0.7 mm with an average of 0.11 mm. At 18 months of loading (24 months postoperative), the average bone loss was 0.19 mm.

The positive correlation between the loss of marginal bone and the implant diameter 24 months after implantation was recorded. Data analysis has shown that bone loss increased with a larger diameter of the implant, with 0.046 mm for 3.75-mm implants and an average

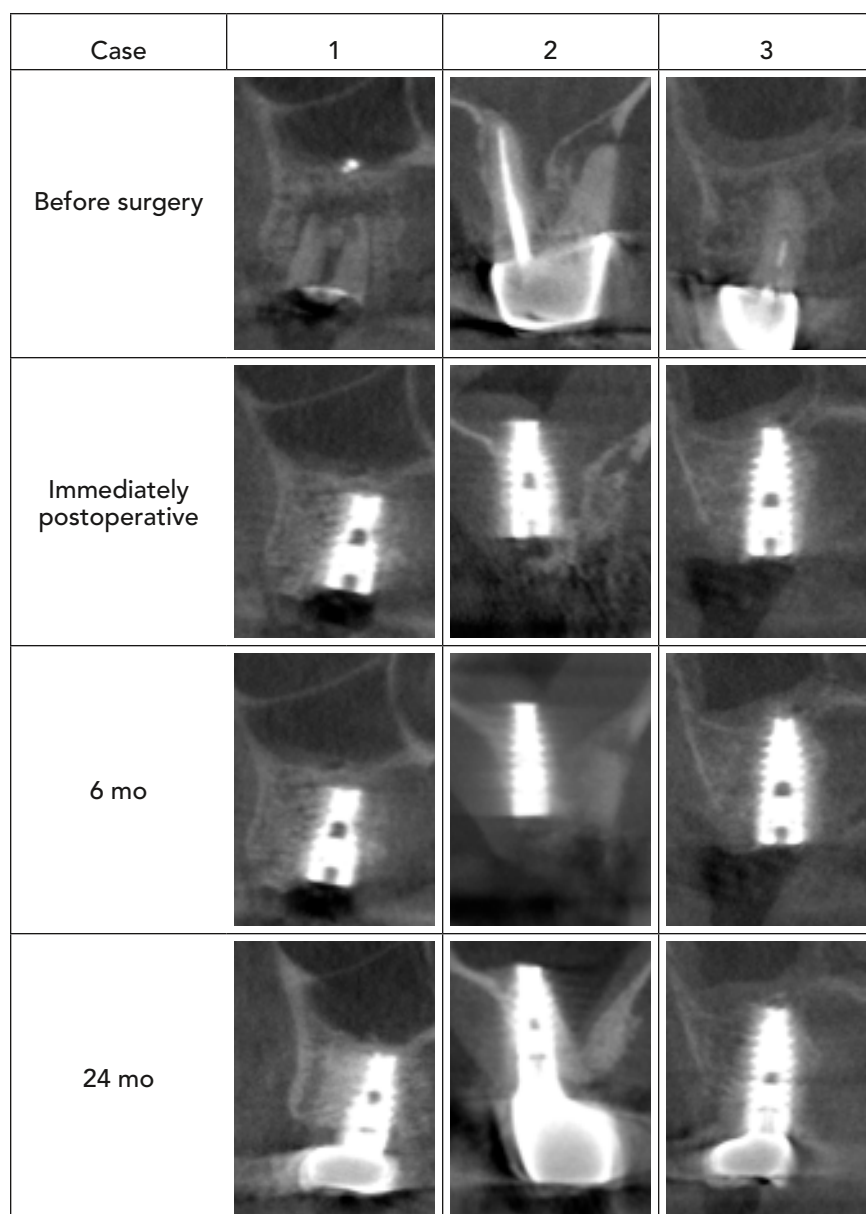


Fig 2 Radiologic cone beam computed tomography follow-up (sample cases).

of 0.078 mm for 4.2-mm implants. No significant influence on bone level was noted related to the age of a patient, the length of an implants, the palatal or distal implant inclination, or the torque and the primary implant stability.

Statistical Analysis

The data are expressed as means \pm SE. One-way analysis of variance, followed by post-hoc Tukey-Kramer or Kruskal-Wallis test, followed by post-hoc Dunn multiple comparison

test or unpaired *t* test were used to determine statistically significant differences between groups (Prism 6 for Mac OS X, version 6.0f, Graph Pad Software). Pearson test was used for correlation analysis. *P* < .05 was considered significant in all statistical analyses.

Discussion

All available publications on maxillary molar implants present implants placed centrally into the interdental septum,^{13–16} which does not provide sufficient anchorage for implants and therefore requires lifting of the maxillary sinus floor.^{16–18}

By placing implants into the palatal sockets, an average primary stability of $> 60 \pm 8$ ISQ was achieved. The ISQ values further increased with time by an average on 4.1 ISQ after 24 months. None of the implants in the study failed to achieve primary stability with < 55 ISQ. Such high primary stability was achieved thanks to thorough analysis of the CBCT scans and socket; proper selection of implant design, length, and diameter (conical SPI, Alpha-Bio); and tightly packed filler material.

Cemented crowns were used for the study as they show greater resistance to high loads.¹⁹

The occlusal load transfer to the bone by inclined implants was studied by Lin et al,²⁰ who did not report any significant differences between implants positioned centrally and implants positioned palatally at an angle of up to 20 degrees to the vertical axis.²⁰ The implants in this study were inclined on average 9.6 ± 0.58

degrees to the vertical axis and never exceeded 20 degrees.

Marginal bone loss is one of the five classical criteria for implant success described by Albrektsson et al.²¹ and Chirom et al.²² To minimize marginal bone loss, flapless procedure was performed. The only increased risk factor allowed was smoking > 10 cigarettes a day, which accounted for 38.46% of patients and 39.34% of the implants in the study.

Marginal bone loss in this study at 6 months was 0.12 ± 0.02 mm on average, and in no case exceeded 0.7 mm. After 18 months, it was 0.19 ± 0.03 mm on average.

Conclusions

Immediate palatal molar implants, where a single implant is placed into the fresh postextraction palatal socket of an extracted maxillary molar, can be a safe alternative to a staged approach. It enables high primary stability and can demonstrate high marginal bone preservation over 2 years. The procedure is simple and minimally invasive. Immediate palatal implants reduces the number of surgeries and overall treatment time and fees. They are not complicated osteogenic procedures.

Acknowledgments

The authors reported no conflicts of interest related to this study.

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