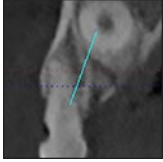




Immediate Loading of Implants Inserted Through Impacted Teeth in the Esthetic Area: A Series of 10 Cases with up to 7 Years of Follow-up



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The purpose of this case series was to evaluate the survival rate and the incidence of complications of implants inserted and immediately loaded in sites where an impacted tooth was present in the anterior maxillary or mandibular arches (incisor to premolar). The implants were immediately inserted, drilling through the impacted teeth. Site preparation started in the crestal bone and continued into the impacted tooth's enamel and dentin. Seven patients were treated and 11 implants were inserted, 3 in the mandibular arch and 8 in the maxillary arch. All implants healed uneventfully without any adverse clinical or radiographic signs or symptoms, resulting in a success rate of 100%. Once loaded, the implants were in function and monitored for 5 to 7 years. Although more studies and a larger sample size are needed to validate this unconventional procedure, it may be considered as a possible clinical option to overcome invasive procedures and surgical complications related to the extraction of impacted teeth. Int J Periodontics Restorative 2019;39:325–332. doi: 10.11607/prd.3978

Replacing a tooth with an implant is a predictable treatment in the presence of adequate bone quantity and quality, with reported success rates up to 99%.^{1–5} In some instances, adult patients need to replace a tooth in an area where one or more impacted teeth are present.

Dental impaction defines a clinical condition in which a tooth does not emerge in the mouth during the primary age of physiologic eruption.⁶ For adolescent or young-adult patients, the treatment of choice usually is orthodontic extrusion, which requires a surgical exposure of the impacted tooth and reposition of the tooth in the dental arch.^{7,8} For adult patients, the result of this clinical treatment is sometimes unpredictable and, in the presence of ankylosed teeth, the orthodontic extrusion is unsuccessful.

An alternative option is to insert the fixture in a site where an impacted tooth is present without removal of the tooth, drilling through the alveolar bone and tooth structure, and inserting the implant in contact with or through the impacted tooth.⁹

The aim of this study is to evaluate the survival rate of implants inserted and immediately loaded in sites where impacted teeth are present as well as the incidence of complications in the medium- to long-term follow-up.

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Fig 1 Case 1. (a) Frontal and (b) right and (c) left lateral views at the end of orthodontic treatment.

Materials and Methods

Adult patients needing tooth replacement with a dental implant in the esthetic area in the presence of one or more impacted teeth were recruited for the study. Inclusion criteria were: full-grown dentition, complete gingival and bone coverage of the impacted tooth, the absence of pathology or symptoms associated with the impacted tooth, and the absence of pathology of the adjacent teeth. All patients received a thorough explanation of the possible alternative treatments, such as orthodontic eruption or surgical extraction of the impacted tooth and reconstruction of the site. Once the unconventional alternative treatment and its related possible

complications were explained, an informed consent form was given to each patient to be signed. No Institutional Review Board was obtained for this study.

Implant Preparation

After completion of orthodontic alignment (if needed) of each patient (Fig 1), cone beam computed tomography (CBCT) was used in combination with a radiographic stent to determine a precise diagnosis of the impacted tooth anatomy and position related to the implant site (Fig 2).

A full-mouth scaling was performed 48 hours before the scheduled surgery. Antibiotic prophylaxis

(1 g of amoxicillin twice a day for 6 days) was started 12 hours before surgery, and patients were instructed to use mouthwash (chlorhexidine 0.20%) three times a day for 2 weeks.

Surgical Protocol

Local anesthesia was induced with articaine 4% with adrenaline 1:100,000 in the vestibular and lingual areas. For all procedures, the extraction of the deciduous tooth was performed using a flapless approach.

Tapered implants were selected (3i 3T and OSSEOTITE, Zimmer Biomet Dental) for insertion in all cases. The osteotomy site preparation was performed using Piezosurgery tips followed by the standard implant drill sequence recommended by the manufacturer.

The reason for the use of Piezosurgery for the initial osteotomy was to avoid excessive chattering of the burs while drilling through the tooth structure, which would create excessive vibration and potential fracture of the impacted tooth, thus jeopardizing precise fitting of implants into the osteotomy. The site preparation started in the crestal bone and continued deeper into the impacted tooth's enamel and dentin.

All implants were inserted using a motor unit, and the final seating was obtained with a calibrated torque hand ratchet (H-TIRW, Zimmer Biomet Dental) in order to evaluate and record the final insertion-torque value.

The buccal gap present between the implant and the buccal ridge was always grafted. The

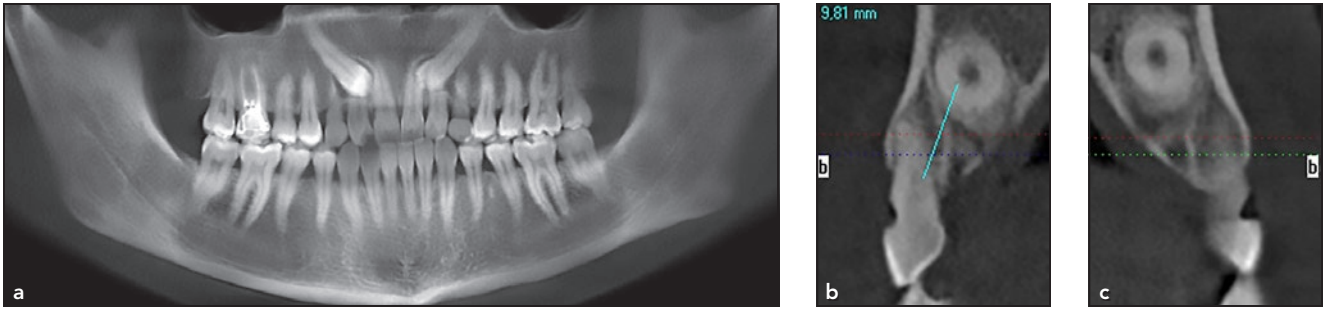


Fig 2 Case 1. (a) Panoramic view and (b) right and (c) left CBCT cross-sections showing the presence of impacted canines in the maxillary implant sites.

graft consisted of a 50:50 mixture of autogenous bone chips collected during the osteotomy creation and anorganic bovine bone granules (Endobon Xenograft Granules, Zimmer Biomet Dental). No sutures were used.

Prosthetic Protocol

In all the cases, a temporary abutment (PreFormance Temporary Cylinder, Zimmer Biomet Dental) was connected to the implant. For all implants, a temporary cylinder that was smaller in diameter was chosen (platform switching). The anatomically designed temporary acrylic-resin shell was luted to the temporary cylinder using low-viscosity composite resin and light-curing. The provisional crown was then removed, refined and polished, and reinserted, and the abutment screw was torqued (20 Ncm) using a calibrated hand torque driver. All provisional crowns were screw retained and left out of occlusion (Fig 3 shows the clinical procedure).

After insertion, a baseline periapical x-ray was taken to monitor peri-implant bone level (Fig 4).

Patients were instructed to consume a liquid diet for the first week after surgery and to refrain from chewing on the implant crown for 8 to 10 weeks. They also were told to use a 20% chlorhexidine rinse three times a day for 2 weeks.

Patients were recalled for a follow-up visit at 1 week and monthly thereafter for the first 6 months. Definitive implant restoration was carried out as follows: A final impression was made 6 months after implant placement using a custom tray, a pick-up coping (IIC41, IIC41, or IMIC30; Zimmer Biomet Dental), and low-viscosity polyether impression material (Impregum Penta, 3M). Gold UCLA definitive abutments (GUCA, IGUCA, or IMUCG; Zimmer Biomet Dental) were connected to all implants. All of the definitive restorations were screw retained, with the abutments torqued (20 Ncm for internal connection implants and 32 Ncm for external connection implants) using a calibrated torque driver as recommended by the manufacturer.

Patients were recalled every 6 months after delivery of the definitive restoration. At each recall appointment, photographs were

taken to document the esthetic appearance (eg, papilla height and presence of any gingival recession). Periapical radiographs were taken to detect any bone loss.

Implants were considered well integrated if no mobility was present and less than 1 mm of bone loss was detected, and they were considered healthy if no signs or symptoms of inflammation were present. Restorations were considered successful if less than 1 mm of recession developed, with no shrinkage of the papillae.

Descriptions of Presented Cases

- Case 1: Single tooth replacement of maxillary deciduous canines (Figs 1 to 5)
- Case 2: Single tooth replacement of maxillary right deciduous canine (Figs 6 to 10)
- Case 3: Mandibular fixed full-arch treatment (Fig 11)
- Case 4: Partially edentulous case; implant inserted in the canine site (Fig 12)

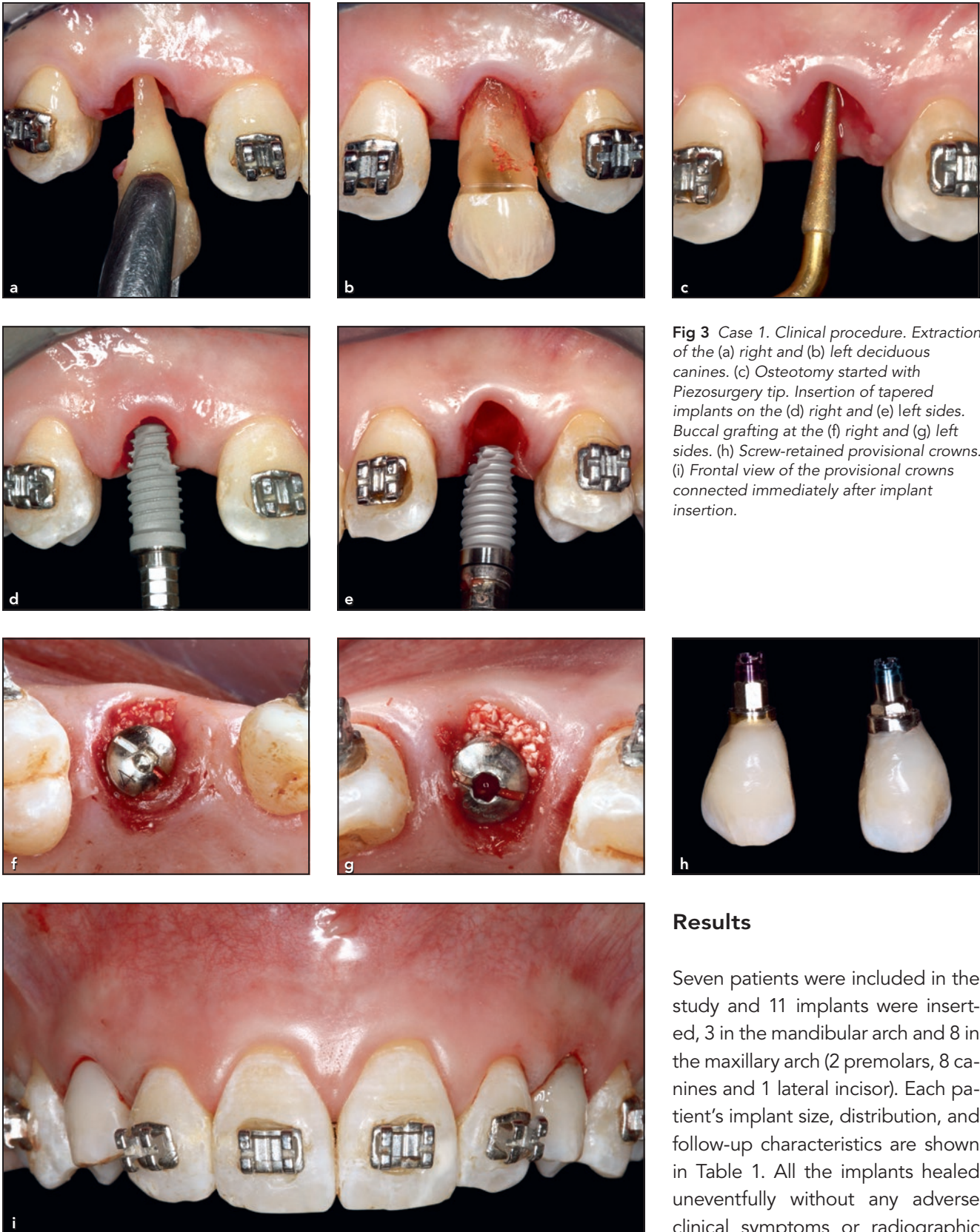


Fig 3 Case 1. Clinical procedure. Extraction of the (a) right and (b) left deciduous canines. (c) Osteotomy started with Piezosurgery tip. Insertion of tapered implants on the (d) right and (e) left sides. Buccal grafting at the (f) right and (g) left sides. (h) Screw-retained provisional crowns. (i) Frontal view of the provisional crowns connected immediately after implant insertion.

Results

Seven patients were included in the study and 11 implants were inserted, 3 in the mandibular arch and 8 in the maxillary arch (2 premolars, 8 canines and 1 lateral incisor). Each patient's implant size, distribution, and follow-up characteristics are shown in Table 1. All the implants healed uneventfully without any adverse clinical symptoms or radiographic

Table 1 Implant Size, Distribution, and Follow-up

Patients	Tooth no. ^a	Implant size	Follow-up
E. F.	6, 11	4 × 10 mm	5 y
D. R.	27, 24, 23	4 × 11.5 mm	6 y
S. G.	6	4 × 10 mm	7 y
L. C.	6	4 × 10 mm	6 y
V. F.	6	5 × 6.5 mm	5 y
P. R.	5, 6	4 × 7 mm, 4 × 10 mm	5 y
R. S.	5	5 × 10 mm	5 y

^aFDI system.

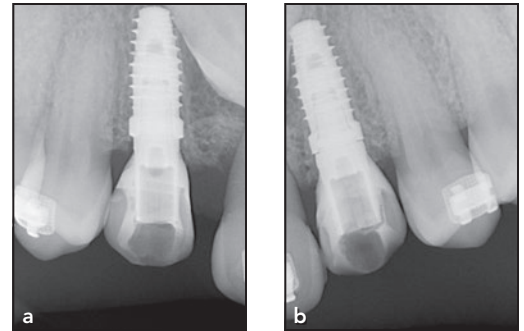


Fig 4 Case 1. Periapical radiographs of the (a) left and (b) right sides taken immediately after implant insertion (baseline).

signs; stable bone level was observed around all implants with no signs of bone resorption, yielding a success rate of 100%. Implants were monitored for a minimum of 5 years up to a maximum of 7 years (Fig 5).

Discussion

Dental impaction is a term that defines a clinical condition where a tooth does not emerge in the mouth during the primary age of physiologic eruption.⁶ Treatment usually requires either the use of orthodontics to extrude the canine into the correct dental arch position or the surgical removal of the impacted tooth.¹⁰

In 2003, Becker and Chaushu¹¹ stated that the success rate of orthodontic treatment of impacted maxillary canines among the adults was 69.5% compared to 100% among the younger controls. The adult patients showed significant increases in the treatment duration and number of visits required for resolving the canine impaction. It was concluded



Fig 5 Case 1 at the 5-year follow-up. (a) Frontal and (b) right and (c) left lateral views of the implant crowns. Radiographs of the (d) right and (e) left sides show stable bone level around the implant neck.

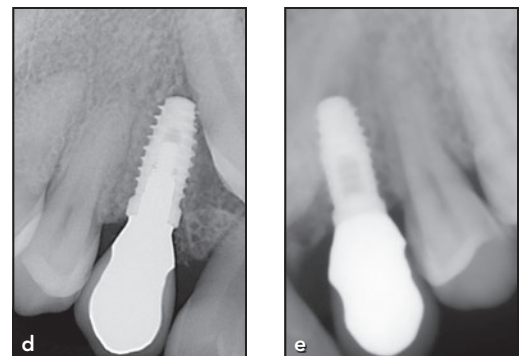




Fig 6 Case 2. Frontal view.

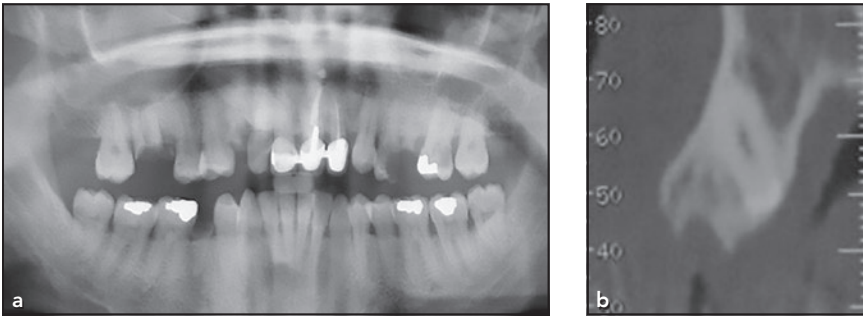


Fig 7 Case 2. (a) Panoramic radiograph and (b) CBCT cross-section showing the presence of a canine in the maxillary implant site.

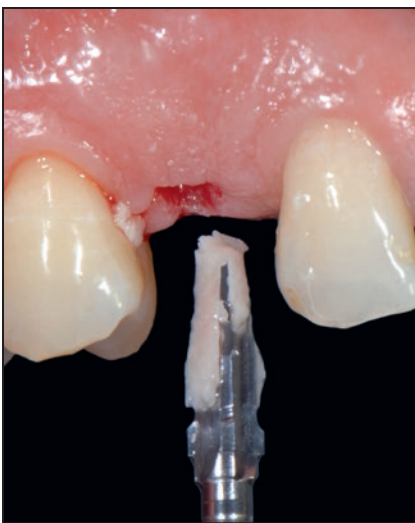


Fig 8 Case 2. Remnants of bone and dentin in the bur flutes.



Fig 9 Case 2. Radiograph taken at baseline.

that the prognosis for successful orthodontic resolution of an impacted canine in an adult is lower than that in a younger patient and that the prognosis worsens with age.¹¹ In 2013, Bazargani et al estimated that duration of treatment is correlated with different factors, such as the zone of canine displacement, distance from the occlusal plane, and inclination of the canine to the midline. Moreover, the treatment for a palatally displaced canine requires a long duration and is sometimes unpredictable.¹²

Davarpanah and Szmukler-Moncler estimated that when surgical removal of the impacted tooth is contemplated, implant placement is performed after completion of bone healing. However, sometimes the removal of the impacted tooth is so invasive that the bony site must be reconstructed prior to implant placement; this is particularly common when the canine is labially impacted.⁹

The same authors in 2015 stated that when extraction of the ectopic tooth is indicated within the frame of an implant-supported rehabilitation, implant placement is postponed until the bone defect is healed. In the best case, when integrity of the buccal or palatal tables is maintained, delivery of the prosthesis is delayed by at least 6 months. However, primary stability is a concern, and achieving it depends greatly upon the position of the ectopic canine within the alveolar ridge.¹³

Ferguson and Pitt stated in 2004 that when impacted teeth are asymptomatic, surgical removal might not be necessary.¹⁴

Fig 10 Case 2 at the 7-year follow-up. (a) Buccal and (b) palatal views of the implant crown. (c) Radiograph shows stable bone level around the implant.

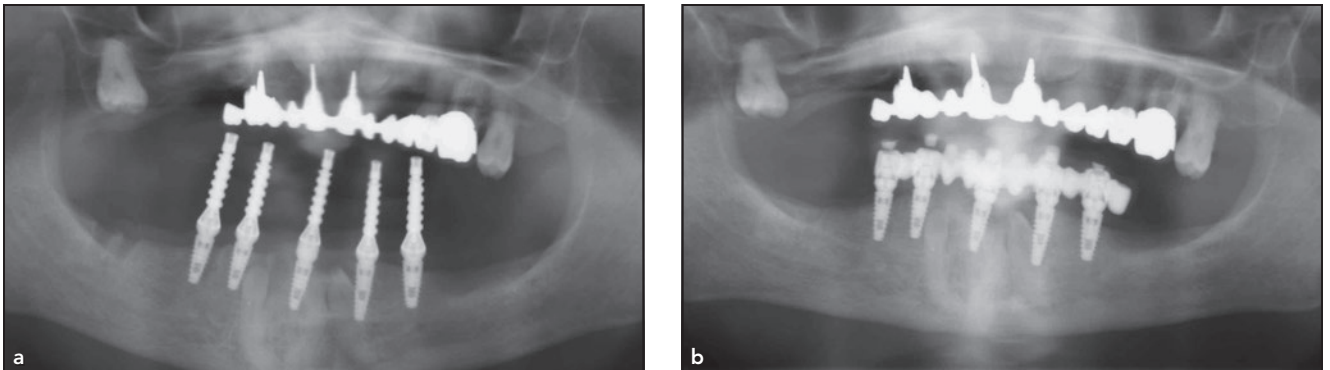


Fig 11 Case 3. Panoramic radiographs taken at (a) baseline and (b) the 6-year follow-up.

An alternative treatment option, such as immediate implant placement through the impacted tooth, could reduce the duration of the treatment and the invasiveness of the procedure.^{9,13} In 2010, a clinical and histologic study by Hürzeler et al showed the success of an implant inserted in contact with a root fragment purposely left after extraction to preserve the buccal bone plate. The histologic specimen showed that the tip of the implant threads integrated in the newly formed cementum, interposed between the dentin and the implant. In some areas, formation of new cementum via cementoblasts and a cementoid occurred directly on and along the implant surface.¹⁵

In 2009, Davarpanah and Szmukler-Moncler⁹ described a technique for inserting an implant through an impacted tooth to avoid invasive surgery, such as surgical removal of the impacted teeth and delayed implant

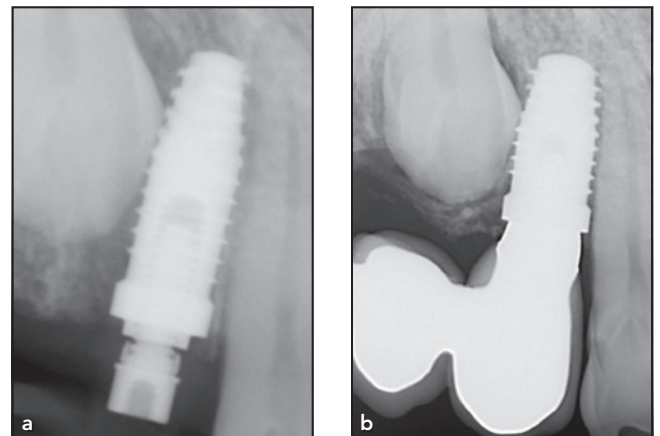


Fig 12 Case 4. Periapical radiographs taken at (a) baseline and (b) the 5-year follow-up.

treatment. Three patients were included in the study and the implants were all submerged. These cases, though limited in number, suggest that implant placement through an impacted tooth might not interfere with implant integration nor harm occlusal function, at least in the short term.⁹

In the present study, the authors wanted to validate the success of this procedure for immediately loaded implants in a larger patient population and for a longer follow-up.

Author Guidelines

Although based on personal empirical experience, some indications and contraindications should be considered to avoid risk of complications.

The impacted tooth should be in healthy condition, and presence of pathology—such as a cyst—should be considered as a contraindication.

The unerupted tooth should be in a fully impacted condition, completely covered by bone and soft tissue and positioned deep; a minimum bone height of 5 mm should be present coronal to the impacted tooth.

Partial coverage of the impacted tooth may lead to bacterial penetration and consequent implant failure. Presence of an adequate amount of bone is necessary to obtain primary stability of the inserted implant. The osteotomy preparation should include the cement and dentine of the impacted tooth, making sure not to extend into the pulp proximity to avoid compromising the vital part of the tooth. The osteotomy should be drilled to full

length and width, as any undersizing may lead to incomplete implant seating or tooth fracture.

Conclusions

Within the limitations of the study, the results show that this unconventional implant placement can be a possible option to avoid invasive surgical procedures and minimize treatment time. In these 7 cases, all 11 implants that were inserted through impacted teeth and immediately loaded integrated successfully and showed no adverse signs or symptoms at follow-up visits. A longer follow-up and larger sample size are needed to further validate this alternative treatment option.

Acknowledgments

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

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