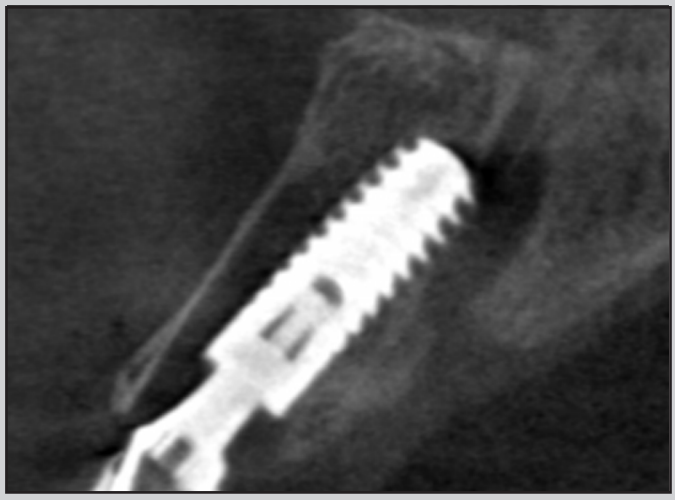
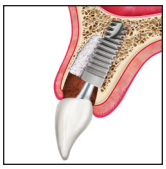


Immediate Provisionalization of Implants Placed in Fresh Extraction Sockets Using a Definitive Abutment: The Chamber Concept



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The purpose of this case series is to present radiographic results of implants immediately placed and restored with a definitive abutment and followed for 18 months. Ten patients who required extraction of the maxillary central or lateral incisor were treated with immediate extraction, implant placement, and provisionalization. Hard tissue measurements were performed using cone beam computed tomography. At follow-up, the mean buccal horizontal gap was –0.21 ± 0.3. The mean vertical gap was 0.15 ± 0.23. The mean distance between bone crest and implant bevel was 1.73 ± 0.17. The favorable results are related to a three-dimensional biologic space created around the abutment called the chamber. (Int J Periodontics Restorative Dent 2013;33:XX–XX. doi: 10.11607/prd.1795).

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The immediate placement of implants after tooth extraction is a common clinical practice with a success rate similar to implants placed in healed sites.[1,2] Nevertheless, the observation of gingival recessions in the buccal aspect of teeth reported by some authors[3,4] raises concern for placing immediate implants in the esthetic zone. Gingival recession is related to the vertical reduction of buccal bone plate and the possibility of preserving this structure seems to be the keystone for a reliable long-term result. In addition, soft tissue thickness can affect gingival recession so thickening the biotype with connective tissue grafting is advisable to reduce this trend and stabilize the esthetic result.[5]

A human histologic study[6] conducted on 48 implants placed immediately after extraction demonstrated bone to implant contact of 65% for maxillary sites and 71% for mandibular sites with no statistically significant difference compared with controls. More recently, Degidi et al[7] reported that Morse cone connection implants immediately placed and restored in combination with a Bio-Oss collagen

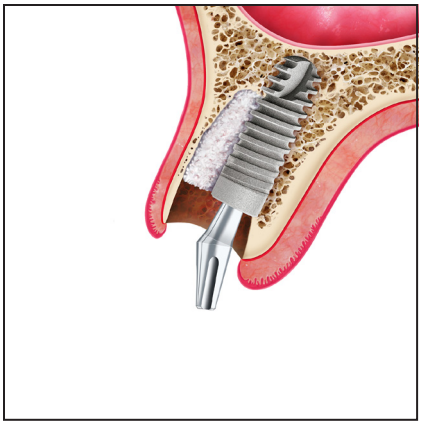

Fig 1 *Positioning of the implant, gap filling, and definitive abutment in place.*

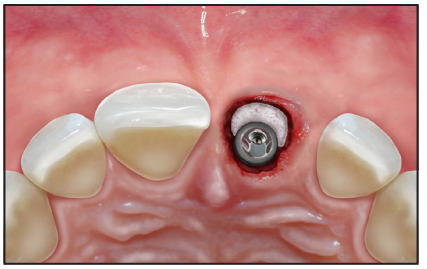

Fig 2 *Positioning of the implant, gap filling, and definitive abutment in place (occlusal view).*

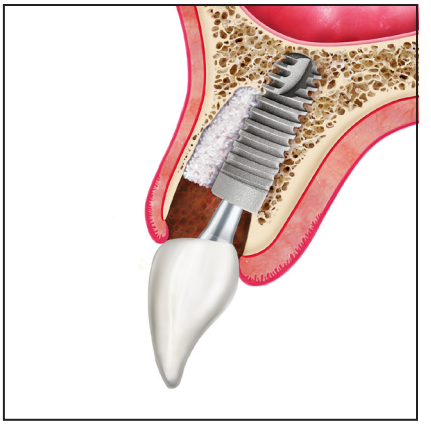

Fig 3 *Provisional crown in place.*

graft can obtain favorable results even in the presence of evident alterations of the buccal bone wall.

A particular concern in the stability of peri-implant health is the repeated dis/reconnections of the abutment during prosthetic phases. The detrimental effect of the abutment dis/reconnection was already demonstrated by Abrahamsson et al[8] with an histologic study on dogs. More recently, a study[9] carried out on 48 implants placed in the posterior mandible concluded that the nonremoval of an abutment placed at the time of surgery results in a significant reduction of the horizontal bone remodeling around the immediately restored implants. The purpose of the present case series is to present radiographic results of dental implants immediately placed and restored with a definitive abutment and followed for 18 months.

Method and materials

From January to December 2010, 10 consecutive patients who required extraction of the maxillary central or lateral incisor for rampant caries, endodontic failure, or root fracture (6 women and 4 men; age ranging from 28 to 64 years) were treated with immediate extraction, implant placement, and provisionalization. All patients gave their informed consent. The study was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2000. Exclusion criteria included active infection in sites intended for implant placement, systemic disease that could compromise osseointegration, treatment with radiation therapy in the craniofacial region within the previous 12 months, heavy smoking (more than 10 cigarettes per day), pregnancy or lactation, bruxism, and insufficient oral hygiene. Prior to implant insertion, each case was accurately evaluated by means of diagnostic casts and periapical and panoramic radiographs.

Surgical protocol

Antimicrobial prophylaxis was obtained with 1 g of amoxicillin twice daily for 5 days starting 1 hour before surgery. Local anesthesia was induced by infiltration with articaine/epinephrine and postsurgical analgesic treatment was performed using 100 mg of nimesulide twice daily for 3 days.

After a flapless extraction of the tooth, the palatal wall of the socket was prepared with a sequence of drills according to the manufacturer instructions in preparation for implant placement and a single implant was inserted so that the implant shoulder was placed slightly palatally and at least 2 mm beneath the bone crest. Implants of 3.5 or 4.5 mm diameter and 14 or 17 mm long were used (Ankylos, Dentsply). Primary stability of the implants was confirmed by resonance frequency analysis (RFA) ≥ 60 ISQ and insertion torque ≥ 25. The gap between the inner surface of the buccal wall and the implant surface was filled with a graft-

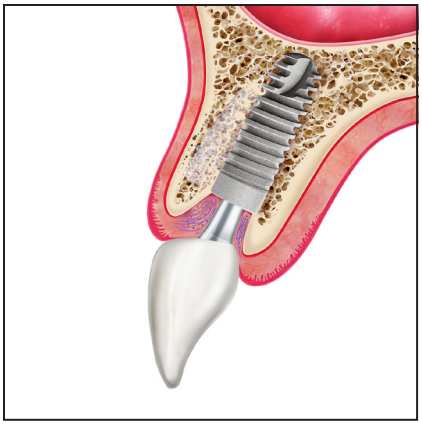

Fig 4 *Implant after healing.*

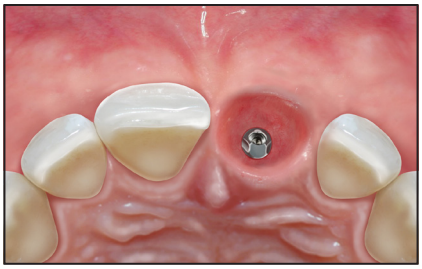

Fig 5 *Occlusal view of implant after healing.*

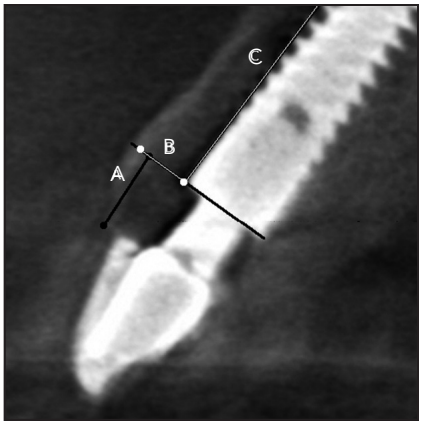

Fig 6 *Radiographic buccal measurements.*

ing material (Bio-Oss Collagen, Geistlich Pharma) up to the implant platform (Figs 1 and 2).

Restorative protocol

After implant insertion, a standard prosthetic abutment (Standard A, Dentsply) was connected to the implant anda premanufactured gold or titanium coping (Dentsply Implants) was then placed on the standard abutment and cut to the proper length according to the dimensions of the provisional crown. The coping was sandblasted and opaqued and the provisional premanufactured crown was relined over the coping with a small quantity of dual cure composite. The crown was then removed from the oral cavity with the embedded coping, further filled with composite, trimmed, polished, and reinserted. Occlusion was checked to avoid centric and lateral excursion contacts. The crown was engaged with the abutment using conic coupling and secured with a lingual screw. Oral hygiene instructions were provided and patients were instructed to have a soft diet for 8 weeks. After 24 weeks, only the provisional crown was removed and the final impression was taken on the abutment using a standard tray and a snap-on abutment copy. The abutment was never removed during the prosthetic procedures. The final restorations were delivered approximately 6 months after implant insertion (Figs 3 to 5).

Radiographic assessments

Dimensional changes of the bone were measured in the postextractive socket at the central buccal and palatal sites. The measuring protocol was already successfully used in a previous publication,[7] nevertheless, the possible presence of radiographic artifacts should be taken into consideration.[10] Three measurements were taken for each site (Fig 6):

- The vertical distance between the perpendicular projection of the peak point on the implant bevel plan and the top of the bone crest (A)
- The horizontal distance between the implant surface and the inner wall of the socket at implant bevel level (B). This measurement had positive or negative values depending on the presence of a gap (positive) or implant platform bone overgrowth (negative)
- The vertical distance between the implant bevel level and the first point of contact of the bone with the implant surface (C). This measurement assumed a zero value when implant platform bone overgrowth was present

All hard tissue measurements were performed using cone beam computed tomography (9000 3D, Kodak) (dimension, 50 × 37 mm; voxel size, 76 × 76 × 76 μm; gray scale, 14 bits; focal spot, 0.5 mm). The measurements were per-

Table 1 Buccal site measurements

	T0	T1
A		
Mean	2.21	1.73
SD	0.12	0.17
B		
Mean	2.02	–0.21
SD	0.30	0.30
C		
Mean	4.07	0.15
SD	0.57	0.23

A = the vertical distance between the perpendicular projection of the peak point on the implant bevel plan and the top of the bone crest; SD = standard deviation; B = the horizontal distance between the implant surface and the inner wall of the socket; C = vertical distance between the implant bevel level and the first point of contact of the bone with the implant surface.

Table 2 Palatal site measurements

	T0	T1
A		
Mean	1.05	0.78
SD	0.14	0.12
B		
Mean	0.51	–0.15
SD	0.27	0.23
C		
Mean	0.59	0.10
SD	0.27	0.18

A = the vertical distance between the perpendicular projection of the peak point on the implant bevel plan and the top of the bone crest; SD = standard deviation; B = the horizontal distance between the implant surface and the inner wall of the socket; C = vertical distance between the implant bevel level and the first point of contact of the bone with the implant surface.

formed on the scans using dedicated manufacturer software (KDIS 6.12.21.0, Kodak). Radiographic measurements were taken immediately after surgery during the fitting of the provisional restoration (T0) and again after 18 months (T1). [Au: Correct?]

Results

After 18 months, all implants were osseointegrated and in function and no major complications occurred in the observation period. The radiographic results are reported in Tables 1 and 2. In particular, the mean buccal horizontal gap was 2.02 ± 0.3 mm at T0 and –0.21 ± 0.3 at T1, demonstrating bone growth over the implant platform. The mean vertical gap was 4.07 ± 0.15 mm at T0 and 0.15 ± 0.23 at T1, with nearly complete gap filling. The mean distance between bone crest and implant bevel was 2.21 ± 0.12 at T0 and 1.73 ± 0.17 at T1.

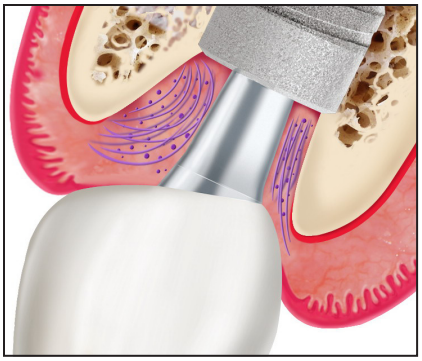

Fig 7 *The chamber.*

Fig 8 *Clinical case: tooth before extraction.*

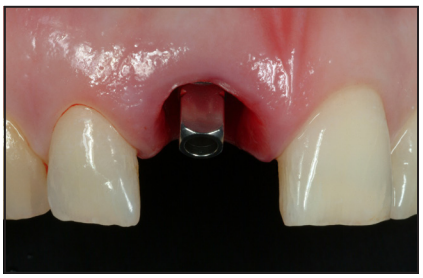

Fig 9 *Clinical case: immediate flapless implantation.*

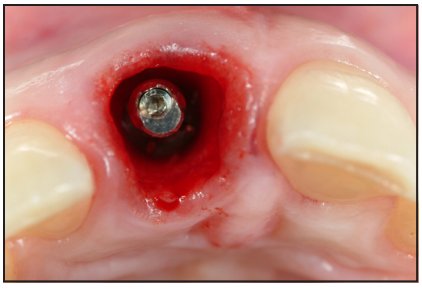

Fig 10 *Clinical case: definitive abutment.*

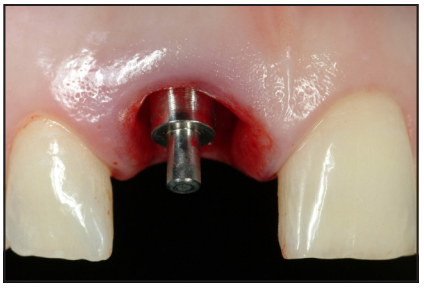

Fig 11 *Clinical case: titanium coping.*

Fig 12 *Clinical case: provisional crown.*

Discussion

Immediate implant placement is a highly predictable procedure; however, there is risk of resorption of the buccal plate. The results of this case series indicate a more limited loss in height of the buccal bone plate, with a mean reduction of 0.48 mm (Figs 8 to 17), even though there was no soft tissue grafting performed for these cases.

From a surgical point of view, the flapless approach is an important feature. Several studies[11,12] support the idea that more bone resorption is associated with flap access compared to flapless techniques. This is most likely associated with the interruption of bone periostal vascularization.[13]

In the present case series, all implants were placed slightly palatally and at least 2.0 mm beneath the bone crest, which may positively impact bone preservation. A recent animal study[14] on the position of implants into fresh extraction sockets demonstrated that the placement of implants along the lingual wall, together with the use of narrow diameter implants in relation to extraction socket width played a key role in reducing the rate of vertical bone resorption at the buccal plate. In addition, recent findings support the use of this particular implant design to maintain bone over the implant shoulder when placed subcrestally.[15,16]

Adequate primary[17] stability is fundamental for immediate provisionalization, as the absence of micromovement is important for developing osseointegration.[18]

Fig 13 *Clinical case: provisional crown in place.*

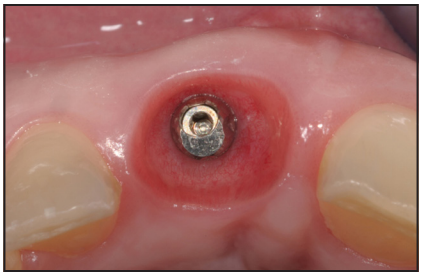

Fig 14 *Clinical case: soft tissue at definitive crown delivery (occlusal view).*

Fig 15 *Clinical case: definitive crown in place.*

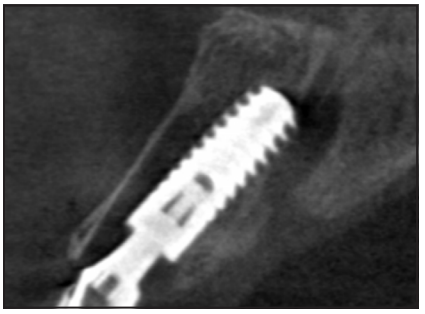

Fig 16 *Cone beam computed tomography immediately after provisionalization.*

Fig17 *Cone beam computed tomography at 18-month follow-up.*

The specific implant design, with a nonself-tapping body and squared threads, generally obtains high insertion torque values because of compression and friction during insertion. The use of a xenograft to fill the implant extraction socket gap reduces dimensional alterations of the postextractive site as described in previous preclinical studies[19,20] and a recent clinical study.[7]

The benefits of a deep platform switching technique intrinsic to this implant system is a notable feature of several studies. The beneficial effect of a smaller abutment on bone resorption increases with the level of the mismatching.[21,22]

The immediate use of a definitive abutment using the one abutment one time concept preserved the initial biologic width that was established during early healing.[7,8] The repeated dis/reconnections of abutments results in a marked increase in bone resorption. The morse-cone connection has a virtual absence of microgap and, therefore, of micromovements allowing bone overgrowth beyond the implant platform.[15,23]

All of the features analyzed, together with the use of a small abutment, create a very particular anatomical condition: the chamber (Fig 7). This three-dimensional biologic space around the abutment is defined by a floor (the implant platform), the four bone lateral walls, and a ceiling, specifically the lower side of the immediate provisional crown. As suggested from previous reports,[24,25] the space described is filled by connective tissue with collagen fibers creating a three-dimensional network around the abutment. The biologic equilibrium obtained in this "chamber," as a consequence of surgical and prosthetic protocols, could be the ultimate reason for the favorable results presented and its maintenance may be of paramount importance for long-term success.

Acknowledgment

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

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