

Technical Note Dental Implants

Buccal plate preservation with immediate post-extraction implant placement and provisionalization: Preliminary results of a new technique

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Abstract. Bone resorption and remodelling are inevitable sequelae of dental extraction and begin immediately after the extraction procedure. The buccal plate is especially predisposed to these phenomena, and if affected, may result in an increased risk of facial soft-tissue recession and other adverse clinical effects that may decrease the predictability of implant placement or impair the final aesthetic result. Buccal plate preservation is a new technique aimed at maintaining or improving the appearance of the soft and hard tissues after dental extraction procedures. The aim of this case series is to evaluate the effectiveness of this technique to maintain or improve soft tissue contours in aesthetic areas when used in conjunction with immediate implant placement. Buccal plate preservation as described may help to maintain or improve the appearance and contours of the ridge after tooth extraction, laying the groundwork for optimal functional and aesthetic replacement of the missing tooth with an implant-supported prosthesis.

Key words: buccal plate; implant; resorption.

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Marked alterations in hard and soft tissue contours are expected after tooth extraction, particularly in the anterior maxilla. These may lead to a remodelling of the alveolar socket with profound changes in the buccal-palatal dimension as shown by Schropp et al.¹ and Botticelli et al.² Even when minimal, such resorption usually has significant adverse clinical effects, particularly in the aesthetic zone. Despite

successful osseointegration of a dental implant, an anterior implant restoration may be judged to be a failure if the soft tissue appearance is poor.³ Although it has been postulated that placing an implant into a fresh extraction socket may counteract buccal plate resorption following dental removal,⁴ recent studies in humans and experimental animals have not validated this hypothesis.⁵ Ferrus et al.⁶ concluded

that the thickness of the buccal bony wall, as well as the dimension of the horizontal gap significantly influence the hard tissue alterations following immediate implant placement into fresh extraction sockets. Tomasi et al.⁷ suggested that when immediate implantation is planned, the thickness of the buccal bony walls in the extraction sites and the tri-dimensional positioning of the fixture into the sockets

must be considered, since these factors, besides others such as age, smoking and reason for extraction, can influence the hard tissue changes during healing. Connecting a provisional crown immediately after implant insertion⁸ and grafting of the facial peri-implant marginal defect with bone or bone substitutes⁸ have also been cited as factors influencing the final outcome. In aesthetic areas, any minimal alteration of soft or hard tissue may compromise the final result, thus, preservation of alveolar ridge and soft tissue contours by placement of particulate bone-graft material underneath the soft tissues in a surgically created pouch adjoining the buccal plate has been advocated to prevent recession of the facial wall of the extraction socket without interfering with its natural, self healing process.⁹ This technique, termed buccal plate preservation was originally used when delayed implant placement was planned. It has since also been used effectively in conjunction with immediate implant placement and provisionalisation. The purpose of this article is to report the results of a small case series of patients who underwent buccal plate preservation in conjunction with immediate insertion and provisionalisation of the implant with the aim of maintaining or improving the soft tissue contours and appearance in aesthetic zones areas after tooth extraction.

Materials and methods

10 consecutive patients seeking treatment in two private dental offices participated in this study. Criteria for inclusion included: ASA I physical status; non smokers; one unrestorable, periodontally healthy tooth requiring extraction from the anterior maxilla (first bicuspid to first bicuspid zone); and intact 4-wall extraction socket following extraction. Appropriate informed consent was obtained. The study was considered exempt from institutional review board regulations as per current regulations for research completed solely in a private practice located in Italy.

All patients underwent extraction and buccal plate preservation⁹ (Fig. 1a–c) followed by immediate implant placement and provisionalisation. All teeth were extracted atraumatically with first bicuspid electively sectioned with rotary instrumentation and extracted in two separate pieces. The sockets were thoroughly debrided with hand instruments to remove any residual granulation tissue. A thin periosteal elevator was used to reflect the soft tissue buccal to the bony buccal plate on the facial aspect of the middle of

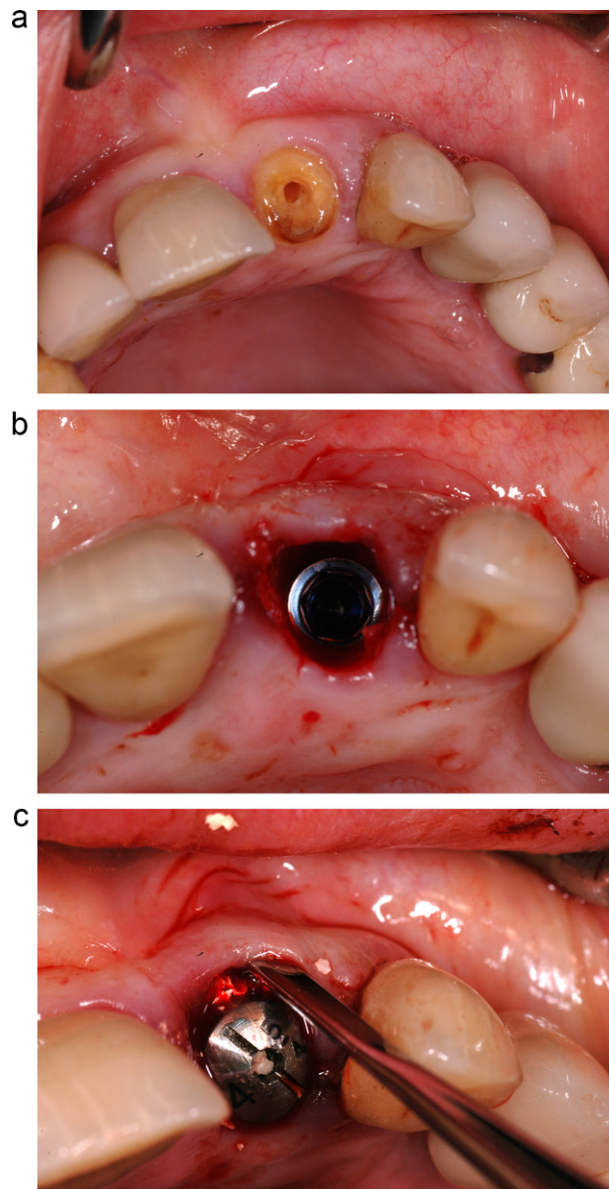


Fig. 1. (a) Non-restorable, endodontically treated tooth number 9. (b) The tooth has been extracted, and an immediate implant placed, engaging the native alveolus and palatal bone. (c) Buccal plate preservation and augmentation is performed as described using xenograft.

the socket in a full-thickness manner, following a corono-apical direction, thereby creating a 'surgical pouch'. Extreme care was paid to avoiding tearing the soft tissue. The dissection was advanced beyond the mucogingival line to approximately two-thirds the depth of the socket, and the pouch was expanded in the mesio-distal direction to stretch the soft tissues away from the underlying bony plate. Granules of bovine xenograft (Endobon[®] Xenograft Granules, BIOMET 3i, Palm Beach Gardens, FL, USA) were hydrated with saline and inserted into the pouch by mean of a small periosteal elevator (Fig. 1c). Additional graft material was

added and compressed until adequate filling of the pouch was achieved without overstretching the soft tissues. Care was taken to avoid the migration of the graft material too far apically, where the mucosa is more flexible and thin, though should this occur, the graft material can be repositioned using manual digital pressure. Since some resorption and exfoliation of the graft is always possible, the authors recommend that the final appearance of the soft tissues should mimic or even slightly exaggerate the appearance of the root eminence of the tooth prior to extraction. A total of eight 4 mm diameter and two 3.25 mm diameter tapered

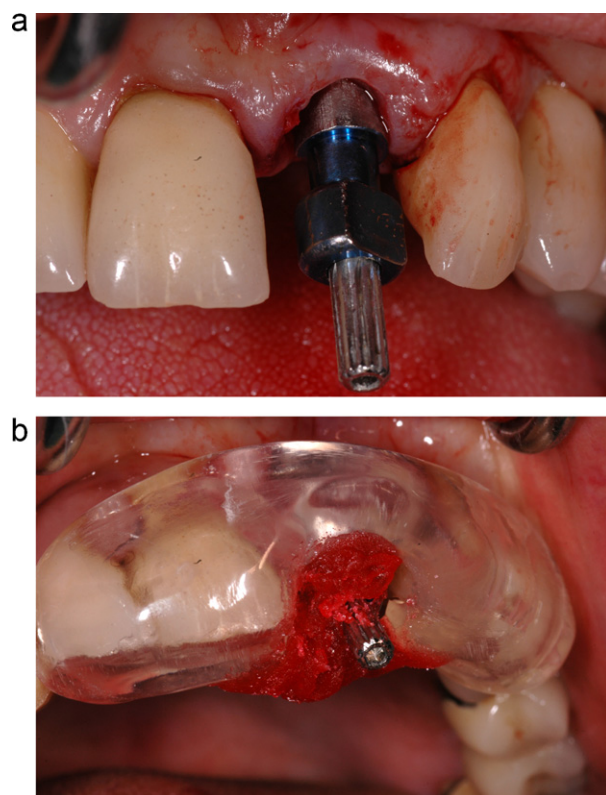


Fig. 2. (a) Transfer coping. (b) A pick-up impression is connected to the surgical stent with self-curing resin to register the position of the implant, which is transferred to a laboratory model.

implants were placed according to the manufacturer's protocol (BIOMET 3i, Palm Beach Gardens, FL, USA), engaging the palatal wall and the native bone above the alveolus (Fig. 1b). The gaps between the buccal bone and the implant surface were filled with the same grafting material (Fig. 1c). At the end of the surgical procedure, a transfer coping was made (Fig. 2a) and a pick-up impression was connected to the surgical stent with self-curing resin to register the position of the implant (Fig. 2b), which was transferred to

a laboratory model. A temporary healing abutment was placed on each implant. Custom abutment and temporary resin crowns were fabricated and delivered to the patients immediately following the surgical procedure (Fig. 3). Suturing was not performed in any patient and no attempts were made to obtain primary closure. The patients were maintained on a liquid diet for 1 week postoperatively followed by a soft diet for 4 weeks. Chlorhexidine gluconate oral rinse was prescribed for 2 weeks to enhance plaque



Fig. 3. Custom abutment and temporary resin crowns are fabricated and delivered to the patients immediately following the surgical procedure.

control. The final restoration was delivered at the 3-month postoperative interval (Fig. 4a and b).

In order to evaluate the efficacy of the buccal plate preservation technique in conjunction with immediate placement and provisionalisation of a dental implants, measurements of the buccal-lingual dimensions of the ridge were taken with callipers prior to placement of the buccal graft (T1) and immediately following graft placement (T2). A final measurement was taken on the day of the final restoration, 3 months from implant placement (T3). Measurements were taken with a custom-made acrylic resin stent fabricated in a dental laboratory, at the mid-point of the extraction socket. A small slot was made on the stent to receive a periodontal probe. Differences in measurements were used to calculate surgical change (T2–T1) and preservation (T3–T2).

Results

The patients were 6 females and 4 males with a mean age of 37.6 years (range 23–64 years). 10 individual extraction sites in the 10 patients were assessed. The difference between the measurement taken at the baseline, after extraction, and at the 3-month follow up ranged between 0.0 and 1.5 mm, with a mean of 0.75 mm (Table 1). None of the patients clinically showed a concavity on the buccal plate. All the placed implants had osseointegrated without complications.

Discussion

Losing a single tooth in the anterior maxilla in an otherwise healthy mouth is an unpleasant experience for most patients. Thus, the need to develop newer methods to substitute the lost teeth immediately has always been in demand. Clinicians have been placing and provisionalising single implants immediately in aesthetic areas

Table 1. The difference between measurements.

Patient	Tooth	Variation baseline – 3-month follow up
	1.1	+1.0
	1.1	+0.5
	2.1	0.0
	1.2	+0.5
	2.2	+0.5
	1.3	+1.0
	1.4	+1.5
	2.4	+1.0
	2.4	+1.5
	2.4	+0.5

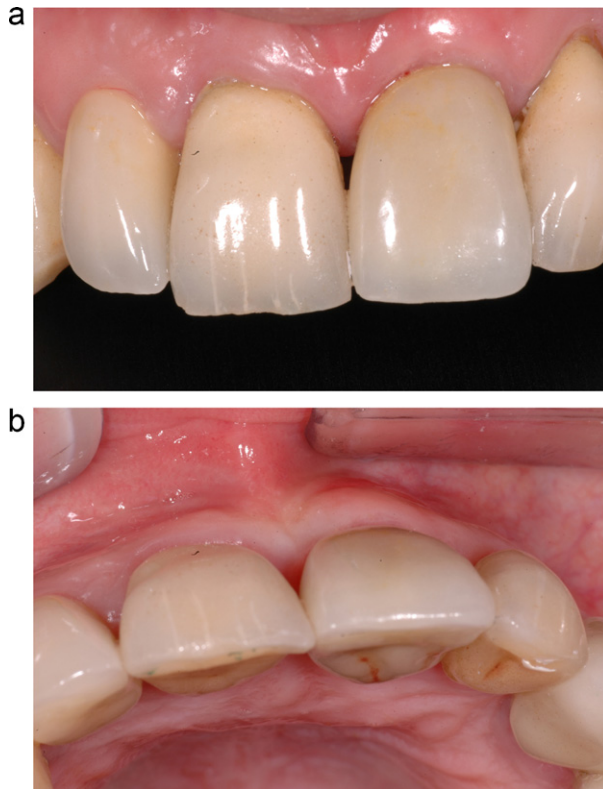


Fig. 4. (a) Final restoration showing excellent aesthetics and preservation of soft tissue structures. (b) Intraoral view of preserved and augmented bucco-lingual width of alveolar ridge.

since 1998, when Wohrle first described 14 consecutive cases.¹⁰ Numerous subsequent studies have demonstrated the viability of such a technique.

Besides patients' demands, another rationale for immediate placement and provisionalisation has been the necessity to maintain the osseous and gingival architecture in an attempt to optimise aesthetic results. A paramount prerequisite for immediate placement and provisionalisation of a single tooth is the presence of ideal hard and soft tissue relationships. Some of the factors influencing outcomes are related mainly to the three-dimensional positioning of the implant while others are related to the clinician's expertise and skills. Hard and soft tissue relationships and gingival biotype are additional factors that complicate the issue. A tendency to recession after dental extraction has been well documented, there is no agreement on 'how and what can counteract such a recession'.^{2,3,5} Placement of an implant into a fresh extraction socket may not prevent buccal plate resorption, as was previously thought. Araújo demonstrated that placing biomaterial in an extraction socket may not accelerate or ameliorate the rate of bone regeneration, but may help modify

remodelling and counteract the marginal ridge contraction that occurs following tooth removal. Histologically, it may mean that the original volume may be preserved, but particles of the graft may still be present in the long-term. This may be regarded as less than ideal in potential implant-placement sites, but according to several authors, once incorporated in bone, the particles may help prevent resorption of the newly regenerated area in the long term.

It has been suggested that in order to maintain good soft and hard tissue relationships in aesthetic areas, a non-resorbable membrane along with bovine xenograft could prevent bone remodelling from taking place. This may be considered a guided bone regeneration procedure and therefore the total healing time would be expanded, thereby delaying re-entry by 4–6 months after the graft. The authors have developed a technique to place the grafting material not inside the socket but externally to the buccal plate in a surgically created pouch.⁹ In a four-wall intact socket, this approach is aimed at optimising the ability of the bone graft to improve regeneration and maintain or improve labial/buccal contours without interfering with the natural healing capability of the

alveolus after extraction. The rationale behind it is that slowly resorbing or non-resorbing particles of bovine xenograft are incorporated in the soft tissues, thereby preventing recession and enhancing the soft tissue appearance of the edentulous ridge. This technique may only be applied when the natural architecture is intact, and the buccal plate is present. This case series has demonstrated that the buccal plate preservation technique can be used successfully when immediate placement and immediate provisionalisation in the aesthetic areas of the anterior maxilla are planned in order to maintain ideal soft and hard tissue relationships.

In conclusion, in four-wall extraction sockets, the buccal plate preservation technique described in this article may help to maintain or improve the appearance and contours of the ridge after tooth extraction, laying the groundwork for optimal functional and aesthetic replacement of the missing tooth with an implant-supported prosthesis. The procedure can also enhance the soft-tissue appearance when implant placement and loading are indicated immediately after tooth extraction. While the preliminary results of using this technique are promising, further investigation is warranted to confirm its efficacy and longevity. There is still a need to understand the biology underlying it, and identify factors that may influence it, such as the thickness of the buccal plate after extraction, the presence of contiguous teeth, the type of bone graft used, use or non-use of a membrane, and positioning of the implant.

Funding

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Competing interests

None.

Ethical approval

Not applicable.

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