

Case Report

The performance of hydroxyapatite-sugar cross linked collagen matrix during immediate single-tooth implant placement in the aesthetic zone

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Abstract: The immediate single-tooth implant placement in the aesthetic zone represents a clinical challenge for preserving the bone contour. Aim of this clinical case was to observe the effect of grafting the buccal bone gap during immediate implant placement. The buccal bone gap was filled with a new hydroxyapatite-sugar cross linked collagen matrix to preserve the mucosal contour. At re-entry surgery, partial preservation of the buccal bone wall was observed after 6 months of healing and stable peri-implant bone was present. Such treatment during immediate single-tooth implant placement in the aesthetic zone may provide buccal contour stability.

Keywords: aesthetics; dental; immediate implant placement; tooth socket



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Introduction

In the era of aesthetics, replacement of the missing tooth with dental implants requires sufficient hard and soft tissue dimensions to protect the natural emergence of the restoration [1]. To reduce the negative outcomes of the tooth loss, different treatment modalities have been proposed so far [2-6]. However, to the date, dimensional preservation of outer bony walls have not been demonstrated yet [7-10]. Considering of these aspects of dimensional changes following tooth loss, flapless immediate implant placement seems to provide some benefits to patient and clinician [11, 12]. For instance, in the presence of buccal bone wall, flapless surgery without sutures brings an advantage of intact vascular supply for buccal bone and reduces the side effects of flap surgery by minimal tissue trauma [13]. Also, with the primary stability of implant, there is a possibility to fabricate an implant-supported provisional restoration [14]. The use of provisional restoration maintains aesthetic appearance of the patient, and may help to guide soft tissue healing following tooth extraction [15-17].

To protect the volume of the immediate implant site, different treatment concepts have been proposed so far. Grafting the gap between implant and buccal bone wall using bone substitute biomaterials has been tested in several clinical studies [18-20]. This approach may help to minimize patient morbidity while preserving soft tissue contours. To date, various biomaterials have been tested in clinical studies, however, none of them demonstrated the use of hydroxyapatite-sugar cross linked collagen matrix to fill the buccal bone gap. More specifically, this matrix is a sponge-

like biomaterial composed of 80% microparticulate hydroxyapatite alloplast graft and 20% sugar cross-linked porcine type 1 collagen, which has already proven to be successful in ridge preservation [21].

The aim of this clinical report was to assess and demonstrate the effect of filling the buccal bone gap using a new hydroxyapatite-sugar cross linked collagen matrix during immediate implant placement. We achieved that after 6-months uneventful healing as there was no penetration of the periodontal probe in the previous buccal bone gap.

Materials and Methods

A 42-year-old female patient referred to the dental practice, requesting the esthetic replacement of upper left central incisor (Fig. 1a). The tooth had suffered from palatal perforation due to several attempt and unsuccessful endodontic treatment. Following the discussion of the treatment plan, the patient decided upon immediate implant placement and provisionalization, then gave her written informed consent. The patient was a light-smoker and systemically healthy. Radiographic examination using cone beam computed tomography revealed a pathology due to palatal perforation and 0.8 mm buccal bone thickness (Fig. 1b).

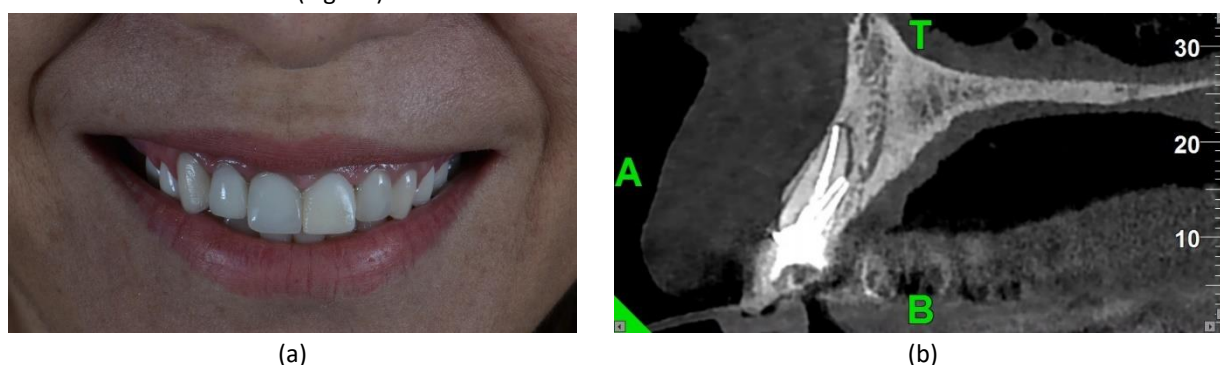


Figure 1. Initial clinical situation: (a) Tooth replacement requirement in the esthetic zone; (b) Palatal perforation and 0.8 mm buccal bone thickness.

The surgical site was disinfected prior to extraction with a 0.12% chlorhexidine digluconate solution. Following the extraction, bone sounding with UNC-15 periodontal probe (Hu-Friedy, Chicago, IL, USA) confirmed the presence of intact thin buccal bone plate (Fig. 2a, 2b). Implant osteotomy was initiated engaging two-thirds of the palatal bone to provide the ideal 3-dimensional position and high primary stability (Fig. 2c).

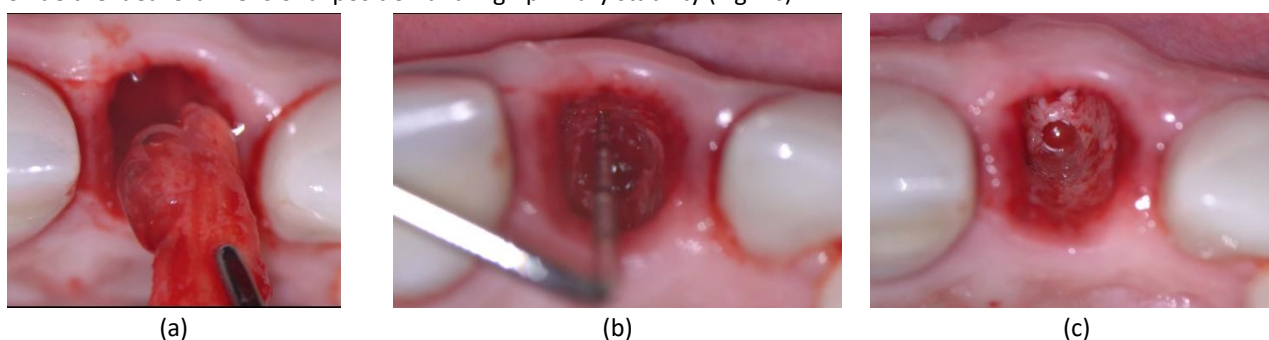


Figure 2. Tooth extraction: (a) Extraction procedure; (b) Intact thin buccal bone; (c) Implant osteotomy.

Then 4.2x13 mm implant (AstraTech EV, Dentsply Sirona, Germany) was inserted and positioned 4 mm apical to the prospective mucosal margin (Fig. 3a, 3b).



Figure 3. Implant placement: (a) Implant insertion; (b) Final implant position.

Consequently, the remaining gap between the buccal bone and the implant was grafted with the hydroxyapatite-sugar cross linked collagen matrix made by GLYMATRIX® core technology (Ossix™ Bone, 5x10x10 mm, Datum Dental Ltd, Israel) [21]. Prior to filling the gap, the matrix was hydrated using the bleeding from the extraction socket followed by size adaptation (Fig. 4a, 4b).

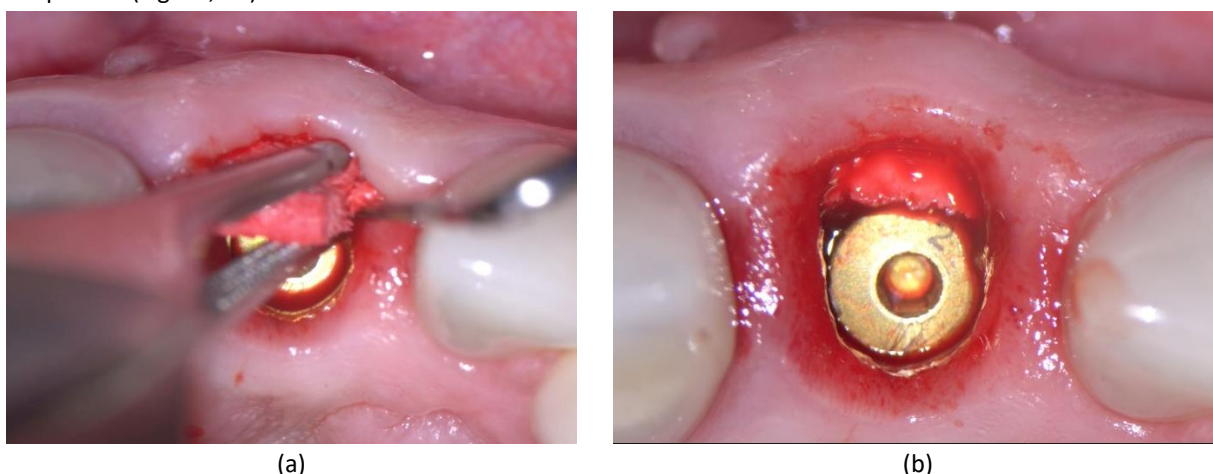


Figure 4. Bone grafting procedure: (a) Matrix insertion; (b) Final matrix position.

Following the digital impression, design and milling, a non-functional CAD-CAM screw-retained provisional was tightened at 15 Ncm of torque onto the implant (Fig. 5a, 5b, 5c).

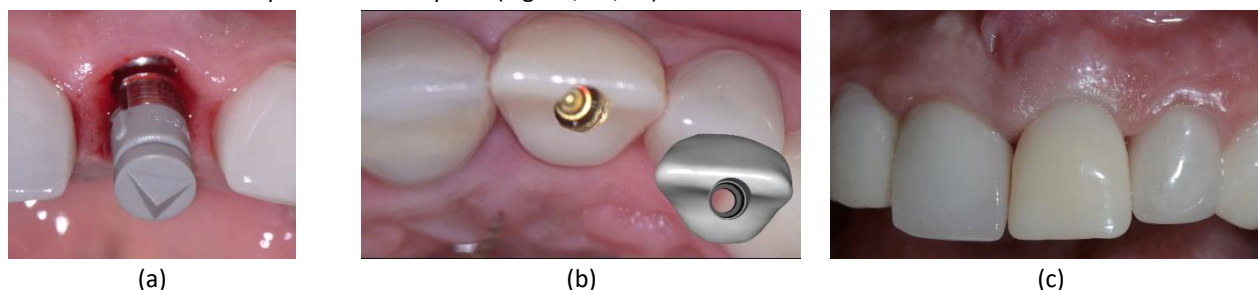


Figure 5. Screw-retained provisional being installed

At the end of the surgery, patient received an analgesic (Brufen 600 mg, Abbott Laboratories, UK) and was instructed to take a subsequent dose 8 hours later. To control bacterial contamination, patient was prescribed systemic antibiotic (Augmentin BID 1000 mg, GlaxoSmithKline, UK) during the first post-operative week. The patient was asked to refrain

from brushing the surgical site for the post-operative 2-week period but to rinse with 0.12% chlorhexidine digluconate for 1 min twice daily. The patient was advised to follow a soft diet and avoid functioning at the implant site.

Results

At 1-week, the surgical site healed without any complications and only a slight oedema was noticed in the buccal aspect. Anyway, after an uneventful healing of 6-months, a crown lengthening surgery was performed to create harmonious gingival margin levels (Fig. 6a). During the surgery, partial preservation of the buccal bone wall was observed and there was no penetration of the periodontal probe in the previous buccal bone gap (Fig. 6b). After 3-months of soft tissue maturation, individually fabricated zirconia abutment luted to the titanium base was tightened at 25 Ncm of torque onto the implant. Afterward, definitive zirconia crown was cemented. Patient was fully satisfied regarding esthetics of the implant restoration and harmonious gingival margins (Fig. 6c).

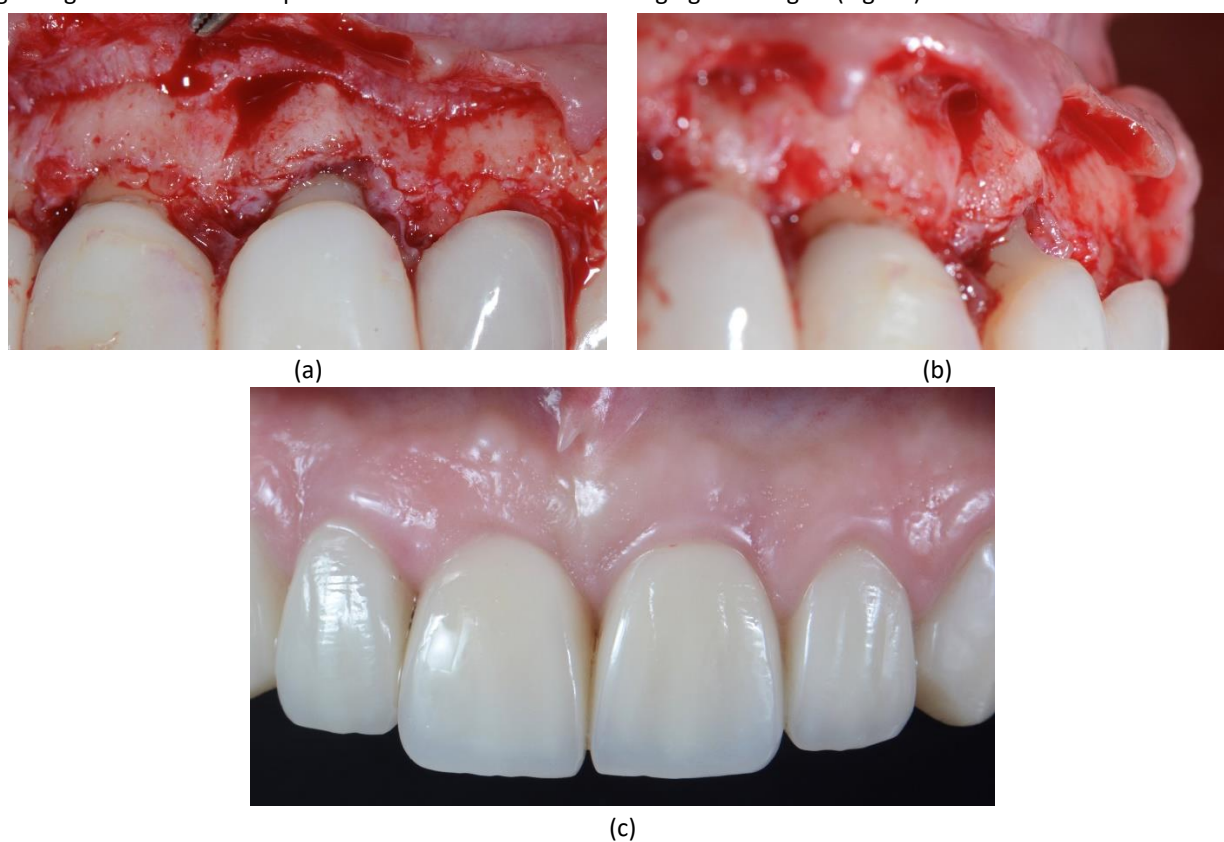


Figure 6. Follow up and satisfactory final outcome: (a) Uneventful healing after 6-months and crown lengthening surgery; (b) Partial preservation of the buccal bone wall; (c) Definitive zirconia crown was cemented after 3 months of soft tissue maturation.

Discussion

This clinical report confirms that filling the buccal bone gap using a hydroxyapatite-sugar cross linked collagen matrix in immediate implant placement and provisionalization is able to maintain the natural appearance of buccal contour without any adverse events. The overall outcome of this case was a success in terms of aesthetics and function.

Implant-supported restoration in the aesthetic zone is a great challenge and affected by several elements such as timing of implant installation, alveolar socket morphology, soft and hard tissue dimensions, clinical skills, implant position and prosthetic design. The aesthetic failures in immediate implantation are questioning the time of placement

[22-23]. Therefore, the concept of early implant placement has been suggested as from the patient's perspective, it requires additional surgical procedures and seems more costly when compared to immediate implant placement [24].

Filling the buccal bone gap with biomaterials in combination with immediate implant placement has the potential to preserve the natural appearance and can be considered minimally invasive as it does not require flap reflection or second-stage surgery, periosteal release, autogenous bone scraping and barrier membrane [25]. However, minimally invasive tooth extraction and implant positioning are technique-sensitive and require surgical expertise to maximize the aesthetic outcome. In this particular case, it is interesting to observe the buccal bone remnants during the second stage surgery. It may be speculated that flapless surgery and gap filling might help to observe this phenomenon.

Recently, Casarez-Quintana and co-workers compared the histological wound healing and ridge dimension changes using 90% bovine-derived xenograft granules in a 10% porcine collagen matrix and sponge-like matrix of 80% microparticulate hydroxyapatite alloplast graft with 20% sugar cross-linked porcine type 1 collagen [21]. The hydroxyapatite-sugar crosslinked collagen matrix yielded statistically significantly more vital bone compared to xenograft matrix due to its synthetic nature, which has much faster biodegradation time. However, ridge dimension changes were similar between two groups and were found adequate for implant placement, which not necessarily guarantees the long-term effect. The benefit of providing more vital bone cannot be justified in short-term studies and requires long-term results and scientific evidence.

It should be highlighted that the buccal bone thickness of the present case was measured 0.8 mm at baseline and was classified as thin bone phenotype. To compensate the missing bone gap, a collagen containing matrix has been used that can be easily adjusted to the defect volume. Here the synthetic hydroxyapatite has the function of maintaining the volume stability while the collagen contributes for faster cells proliferation [25]. A partial preservation of the buccal peri-implant bone was observed after 6 months of healing. The osseointegration process was uneventful and enabled the delivery of zirconia crown installation with custom abutment (Fig 6).

Conclusions

Maintaining the natural appearance and buccal bone continuity is a challenging task with immediate implant placement. Within the limits of this report, buccal contour stability can be obtained by filling the bone gap using a hydroxyapatite-sugar cross linked collagen matrix in immediate implant placement. This technique requires high surgical skills and further clinical studies with long-term results.

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Board review and informed consent statement: The local authorities allow publication of such cases after the patient gives a written informed consent.

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