

The management of recession midfacial to immediately placed implants in the aesthetic zone

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Abstract

Immediate placement and loading protocols are the most technique sensitive and at the highest risk of complication, especially in the aesthetic zone. The peri-implant tissues undergo a resorption pattern that may see exposure of parts supporting the restoration, otherwise intended to be submerged, with extreme aesthetic compromise or even complete failure of treatment. The literature is not definitive in terms of any one treatment modality to recover such a complication. Grafting the exposure by a guided bone regeneration technique and an adjunct soft tissue augmentation could well restore an unaesthetic recession exposure. Recovery of midfacial recession by soft tissue augmentation alone may be successful, as is presented hereafter.

Keywords: Dental implant therapy, recession complication, soft tissue augmentation, aesthetic zone

Introduction

Resorption patterns of the alveolar socket and its associated soft tissue healing differs between tooth sites and presents unique difficulties in managing these following the loss of teeth when proceeding to restore by dental implant therapy. Whilst the management of tooth loss at posterior sites may benefit from a delayed or immediate-delayed approach to first gain soft tissue and closure before implant placement, the aesthetic zone may see collapse of tissues if not supported immediately following tooth removal.¹ An immediate placement protocol, whilst at highest risk of complication, allows for the fixture of a customized abutment or provisional crown which may better support the coronal tissues and limit their collapse. This concept of “dual-zone therapy” underscores the management of these delicate tissues being critical to the maintenance of peri-implant aesthetics.² Hereafter a case of immediate implant placement with customized tissue sculpting abutments that saw radical complication is presented along with its management and 6 year follow up.

Case report

A 35 year old female patient presented in late 2002 for treatment of traumatic fracture involving both maxillary central incisors following a motor vehicle accident (Fig. 1). Both teeth had suffered root fractures without involvement of the alveoli and were deemed at the time as irrational to treat. Both were then removed and two 5.5 x 13 mm tapered internal-hexagon connection implants were placed immediately within the extraction sockets (Frialit 2, Dentsply Friadent).³ According to protocols at the time the implants were placed to “fill the socket” and customized abutments were contoured to provide emergence profiles mimicking the original teeth and fixed to the implants to support the soft tissue in these areas (Figs. 2 – 5).⁴ Prior to the introduction of digital implant stability quotient (ISQ) devices the implants were manually checked at four months of healing for osseointegration, and proving satisfactory were restored with cement-retained crown restorations, early 2003 (Fig. 6).

The immediate postoperative results were very positive – good aesthetics, good soft tissue contours, complete papillae fill, and treatment objectives with positive patient satisfaction were achieved. However, regular follow-up demonstrated at 18 months

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Figure 1: 2002 - Preoperative view of the patient

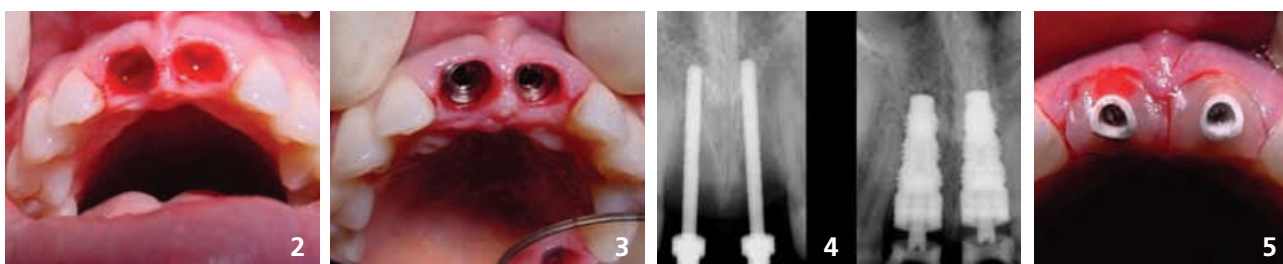


Figure 2: 2002 - The coronal portions of fractured teeth 11, 21 removed and the roots remaining

Figure 3: 2002 - Implants inserted and filling the sockets at 11, 21

Figure 4: 2002 - Periapical views of the implant guide pins, and immediately post-placement

Figure 5: 2002 - Immediately after customizing of the implant abutments



Figure 6: 2003 - The implants restored at 4 months of healing



Figure 7: 2005 - Receded tissues midfacial to both implants clinically exposing the abutment interfaces

postoperative the first signs of complication – minor recession at the midfacial crown margins. The recession continued to progress with slight exposure of the implant surface at the right central incisor, and then later drastic midfacial recession of both implants with exposure of the implant-crown connections (Fig. 7). The exposed implant-abutment interfaces revealed no residual cement material and it was ruled out as the cause. Repair of the case started in 2006, first with a vestibular incision subperiosteal tunnel access (VISTA) technique as later described by Zadeh (Figs. 8 – 10).⁵ The aim was an initial minor augmentation of the soft tissue facial to the implants so as to later comfortably raise an access flap. Following the VISTA technique relief of the prominent labial frenum was done

by laser frenectomy. Once healed, titanium abutments were replaced by zirconium, platform switched, and provisionalized (Fig. 11). A split-thickness papillae-sparing flap with oblique releasing incisions positioned distal to each central incisor was then raised and the soft tissue facial to the implants augmented with a free connective tissue graft with the epithelial border retained (a modification of the Harris technique, not to be confused with a combination onlay-interpositional graft) (Figs. 12, 13).^{6,7} The graft was harvested from the anterior palate and had its connective tissue portion sutured beneath the flap and its epithelial border positioned coronally (Figs. 14, 15). The flap was then repositioned, sutured with 6/0 nylon, and the site left to heal (Fig. 16). Healing was uneventful and the

soft tissue management had successfully treated the recession, 2007 (Figs. 17, 18). Follow up at six years post-repair of the case in 2013 and 2014 demonstrated very positive and stable long term results of the treatment. Clefting at the healed flap margins remains prominent, as well as a border between the flap periphery and the graft epithelial margin. However the soft tissues facial to the implants remain bulked, healthy, and continue to cover fully the previously exposed implants' surfaces (Figs. 19 – 21).

Discussion

The clinician should note that limited literature and/or non-definitive literature is available on the aesthetic outcomes of



Figure 8: 2006 - The vertical incisions to tunnel beneath mucosa
 Figure 9: 2006 - Complete connection between both incisions creating a tunnel, pouch
 Figure 10: 2006 - View of the site closed



Figure 11: 2006 - Titanium abutments removed and replaced by zirconium abutments
 Figure 12: 2006 - Flap design with incisions sparing the papillae
 Figure 13: 2006 - Split thickness papillae sparing flap raised, demonstrating the absence of bone covering the implant necks

guided bone regeneration around implants, on differences in outcomes between implant placement timing protocols, on the treatment of recession complications.⁸⁻¹⁸ This case reports immediate placement and support of the coronal tissues with customized abutments, yet a recent and thorough systematic review by Chen and Buser on the aesthetic outcomes between immediate and early placement protocols in the aesthetic zone could show little to no statistical significance.¹⁹ Though, what the clinician should note is that both protocols will require management of the tissues, and both more than likely a soft tissue augmentation to increase

soft tissue seal around the definitive restoration, to construct an aesthetically satisfactory outcome.

Collapse in the buccopalatal dimension following tooth extraction is well known. The buccofacial plate thicknesses at maxillary anterior teeth are approximately 0.97 ± 0.18 mm (central incisors), 0.78 ± 0.21 mm (lateral incisors), and 0.95 ± 0.35 mm (canines) respectively.²⁰ Viz, the bone buccofacial to teeth being removed in the anterior maxilla is on average less than a millimeter in thickness, and in fact in 25% of sites is absent altogether.²¹ A "thick" buccofacial plate (1 mm or greater) can be expected in only ± 11 % of sites.²²

The bone-PDL-tooth complex responds to occlusal inputs. Bundle bone is only begun to be formed when a tooth comes

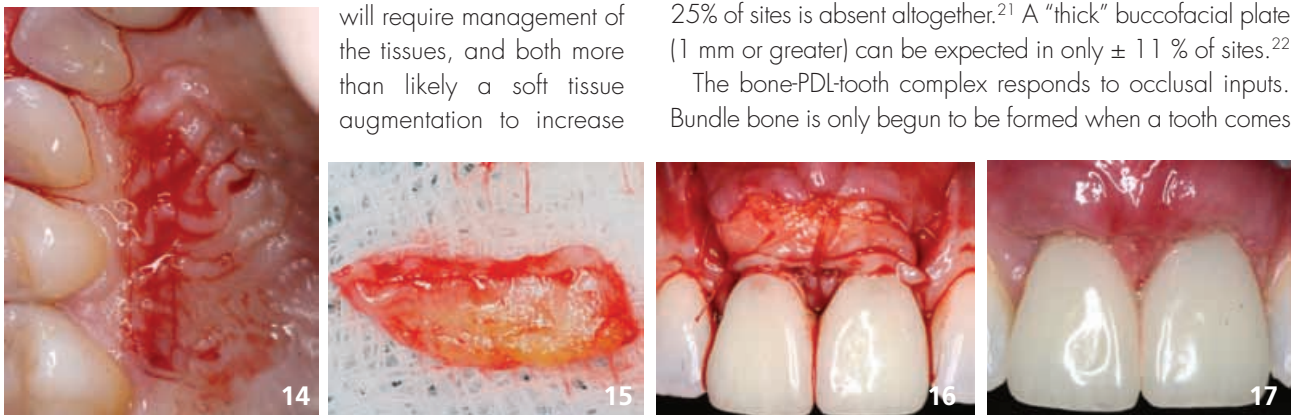


Figure 14: 2006 - Parallel incisions in the anterior palate to harvest the CT graft
 Figure 15: 2006 - The CT graft with a narrow border of epithelium retained at its superior margin
 Figure 16: 2006 - The graft sutured in place prior to final closure of the flap
 Figure 17: 2007 - Suture removal following the final soft tissue graft



Figure 18: 2007 - 2 Months of healing following the final graft. The implants are fully covered



Figure 19: 2013 - 6 Years postop the implants remain fully covered by healthy soft tissue. Note the clefting at the healed incision margins

into function.²³ The periodontal ligament (PDL) vascularizes this bone, and its Sharpey's fibers traverse the bundle bone and insert into lamellar bone of the alveolar socket (Fig. 22). Loss of this fragile tissue can be anticipated as a result of (i) physical trauma during extraction, (ii) loss of vascular supply from the removed tooth root. It can be appreciated that severance of the PDL during extraction results in trauma of this microscopic bony layer. It can also be hypothesized that loss of a functionally loaded PDL negates the need for bundle bone, and this absence of stimulation contributes to its loss. On average this loss of bone following tooth extraction can be demonstrated as a reduction of buccal ridge height of ± 2 mm.²⁴ The clinician is to anticipate this loss and manage the tissues accordingly, to be mindful of the pitfalls leading to recession and complication, to plan the treatment accordingly, as well as being prepared to manage complications should they arise.

Implant system selection: Implant dentistry as a discipline has and continues to rapidly advance. Many techniques

proffered in 2003 are now mostly obsolete. The concept of "filling the socket with the implant" in immediate placement protocols is now well known as a wholly incorrect method of managing post-extraction implant placement.⁴ Placing such large diameter implants in the anterior and aesthetic zone will almost certainly see complication in the form of recession, implant surface exposure, and so forth. The approach for implant selection should rather be as narrow diameter as possible whilst as wide as is necessary.²⁵ Implant manufacturers are nowadays empowering the clinician to select diameters narrower than previously thought possible, due to their augmented strengths from titanium-zirconium alloy.²⁶ Whilst a wide diameter implant displaces the supporting potential of bone and soft tissue, the converse is true when selecting narrow diameter implants that maximize the residual peri-implant tissues, which translates to increased tissue support – both for implant function and for aesthetics. Implant selection is to be extended to also its design, surface, and connection type. Whilst the implants placed in this case in 2002 that saw complication were



Figure 20: 2013 - 6 Years postop, the soft tissue remains bulked facial to the implants



Figure 21: 2014 - Final view of the patient's smile

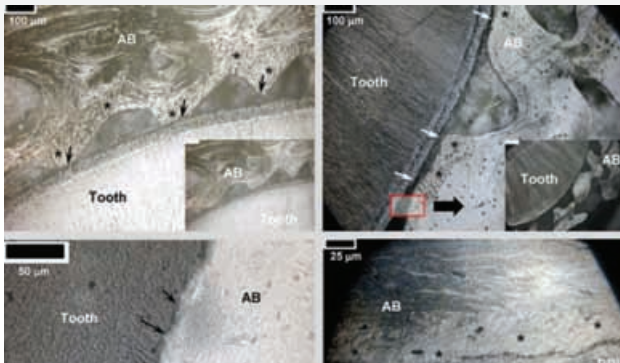


Figure 22: Light micrograph illustrating PDL (arrows) between alveolar bone (AB) and tooth. Bundle bone (asterisks) lines the alveolar bone and is positioned closer to the root cementum, having radial collagen fibers of the PDL inserting into it. From: Hurng et al (2011), Discontinuities in the Human Bone-PDL-Cementum Complex.⁴⁰

exceedingly wide, they were also inferior by their connection mechanism.³ This connection type only benefits from a possible platform switch, and may still elicit an inflammatory response from a micro-mobile implant-abutment interface.²⁷ This interface that is both the cause of inflammatory exudate and a harbor site for infective microbes is most pronounced in external-hexagon connection type implants. Movement at this interface will see an inflammatory reaction with an almost certain loss of coronal bone at the implant collar.²⁸ In the anterior / aesthetic zone this bone is critical to the support of delicate papillae, to gingival margin contours symmetrical to adjacent teeth, as well as the long term longevity and stability of these tissues. Selecting a cold-welding, conical, morse taper connection implant system provides a superior implant-abutment connection seal that limits the possibility of micro-movement at this interface and prevents the colonization of infective microbes in this area.²⁹

Restorative techniques: The concept of immediate loading and provisionalization of single tooth replacements in the aesthetic zone was possibly novel and not widely employed in 2002, but had been reported then for a decade already, and today may be preferential in certain cases for the support and stabilization of tissues immediately following tooth extraction.³⁰ The provisional crown by its narrowed and concave contour emerging from the platform switched and immobile conical connection, will as it traverses the soft tissues allow for bulk of tissue to fill this area.³¹ This emergence profile combined with properly established contacts positively contributes to the sculpting and support of the gingival contours and the papillae fill of interproximal

spaces.³² The bulk of soft tissue can also contribute to circumferential seal around the implant crown that limits the ingress of infective microbia.³³ Selecting an abutment material that is aesthetically pleasing as well as biocompatible, such as zirconium, which has in the literature been demonstrated to allow for hemi-desmosomal attachment, will additionally contribute to this protective seal.³⁴ Critical to recovery of this case were that the bony peaks and papillae interproximal to both implants had remained intact and resilient to the receding tissues. This may likely have been supported by the customized abutments atop the immediately placed implants. Were it not for these the resorption and loss of crestal bone and papillae would have meant greater implant exposure, greater recession, and a possibly disastrous outcome following the loss of both implants.

Augmentation repair techniques: The treatment of recession around teeth by a variety of periodontal plastic surgery techniques has been abundantly reported in the literature for more than 2 decades, and these grafting techniques can be and have been transferred to the management of recession complications following the insertion of dental implants.^{35, 36} Immediate removal may not be the most conservative approach, provided the implants themselves have not failed. A recent systematic review by Levine and coworkers quite thoroughly addressed the focus question: "In adult patients with soft tissue deficiencies around maxillary anterior implants, what is the effect on aesthetic outcomes when a soft tissue procedure is performed?"³⁷ It should be noted however that there is a paucity of research in the literature to definitively conclude on the efficacy of any one treatment modality for recession around dental implants. A review of the aforementioned publication can better acquaint the reader with alternative soft tissue augmentation procedures and their reported outcomes. That said, this case similar to other reports demonstrated the successful recovery of recession facial to two implants in the anterior / aesthetic zone with soft tissue management, specifically free connective tissue grafts, with or without modification of the implant abutment/crown.⁹⁻¹⁴ Subepithelial connective tissue grafts harvested from the anterior palate or maxillary tuberosity area can be transferred to the receded recipient site, augmenting the soft tissue and providing coverage to the implants. This case utilized a modification of the technique by Harris, 1992, and harvested by an envelope access from the anterior palate a connective tissue graft that retained a narrow epithelial border (Fig. 1.5). The donor site

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Direct veneers in anterior smile design

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This clinical case report describes in detail the application of Tetric N-Collection to reconstruct the patient's smile chairside in the least invasive manner.

Direct additive procedures with bonded resin composites are considered the most conservative and least invasive technique¹ to return missing, diseased and unsightly tooth structure to enhanced colour, form and function in the esthetic zone. However, the creation of natural-looking restorations can be quite a challenge for the clinician. For complex anterior composite restorations the clinician must have a comprehensive understanding of the colour, translucency and morphology of natural teeth as well as of the materials science^{2,3} and the restorative techniques involved.^{4,5} Today's nano-hybrid composites provide improved strength, wear resistance, handling properties and surface characteristics.⁶

The question is, however, if their optical properties can ideally mimic natural tooth tissues – a prerequisite for restorations that are invisible to the human eye at a speaking distance.

Case presentation

A 29-year-old male patient presented to the dental practice with the request to have the esthetic appearance of his smile improved. The clinical examination revealed that teeth 13, 12, 11, 21, 22 and 23 were affected by multiple carious lesions, various discoloured composite restorations and slight erosions. In addition, the incisal edges of teeth 12, 11 and 21 were abraded and too short. The tooth proportions were not harmonious: Teeth 11/21 were too wide in relation to 12/22 (Fig. 1). It was the patient's primary goal to get rid of the discoloured restorations, to lengthen the front teeth and to regain a harmonious appearance in terms of shape and colour. In addition, the patient explicitly wished the treatment to be carried out with minimal loss of tooth structure and financial cost.

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Figure 1: Initial situation: Unsatisfactory smile with multiple carious lesions, discoloured composite restorations and abraded areas.