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Masking Buccal Plate Remodeling in the Esthetic Zone with Connective Tissue Grafts: Concepts and Techniques with Immediate Implants

Bobby Butler, DDS.
There are different indications for delayed and immediate implant placement, but both approaches are equally successful in terms of implant osseointegration. Immediate implant placement in the esthetic zone is now routine, and cosmetic outcomes are expected for success.1-3 Many factors must be considered with immediate placement, especially with regard to the biology of remodeling the anterior maxillary buccal plate.4 Individual clinical parameters may alter the decision on whether to stage implants with socket grafts, perform immediate placement, or proceed with immediate provisionalization. Even with staging and performing socket grafts, the buccal plate will still resorb to some extent, and the socket graft will only diminish the amount of change.5

Technique decisions must be based on the specific clinical and anatomical findings.6 Immediate implant placement is advocated when possible to preserve osseous and gingival esthetics.2,3 Success with immediate placement is excellent and comparable to staged or delayed placement.3 Questions do arise as to how effectively immediate placement actually preserves the peri-implant gingival and alveolar anatomy. Covani reported a mean of 4-mm facial lingual bone resorption with immediate implants placed in the maxillary anterior area.7 Some cases had significantly more resorption. It is known that an implant placed immediately does not stop or diminish bone remodeling.4,7 Immediate placement/provisionalization is predictable in preserving papillae levels, but it is not as predictable with respect to the facial gingival margin (vertical) level or horizontal crestal bone volume.8

There are many techniques advocated to minimize alveolar and gingival resorption with immediate implant placement. The use of particulate grafts in the facial horizontal defect (gap) and/or the use of connective tissue grafts (SCTGs) that are placed coronal to the crest are technique variations that could affect the amount of buccal plate resorption. This case series discusses technique options for autogenous SCTGs with immediate implant placement.

Abstract: There are many factors to consider concerning immediate implant placement in the esthetic zone, particularly with regard to the biology of remodeling of the anterior maxillary buccal plate. Various techniques have been advocated to minimize alveolar and gingival resorption with immediate implant placement, including the use of particulate grafts in the facial horizontal defect and the use of connective tissue grafts. Full-thickness flaps, split-thickness tunneling, and small subepithelial connective tissue grafts (SCTGs) that are placed coronal to the crest are technique variations that could affect the amount of buccal plate resorption. This case series discusses technique options for autogenous SCTGs with immediate implant placement.
The addition of autogenous connective tissue grafts with immediate implants has been discussed by several authors.\textsuperscript{10-17} Grunder evaluated 24 patients with and without subepithelial connective tissue grafts (SCTGs) in maxillary anterior implant sites. He found that without SCTGs, the mean horizontal facial shrinkage was 1.063 mm. Among the sites evaluated, 33% had 1 mm to 1.5 mm facial resorption and 16.6% had 1.5 mm to 2 mm facial resorption. The group with SCTGs averaged a gain in facial horizontal volume of 0.34 mm. Several of the patients without SCTGs also had unesthetic dark appearances due to thin gingival/osseous volumes.\textsuperscript{15} Kan has published most extensively on this topic. In a recent paper on immediate implants in the esthetic zone, he found that cases without SCTGs had more gingival asymmetry and more recession after implant placement.\textsuperscript{15,17}

One possible downside to the use of autogenous SCTGs concerns whether elevating the periosteum from the thin buccal plate might compromise the blood supply and cause further crestal bone loss. The blood supply to this thin cortical bone comes from the periodontal ligament and the buccal periosteum, which would be severed with the use of an immediate implant and full-thickness flap elevation. Using full-thickness flaps, split-thickness tunneling, and small SCTGs that are placed coronal to the crest are technique variations that could affect the amount of buccal plate resorption. One question that arises is, “Can the use of a connective tissue graft overcompensate esthetically for bone remodeling and blood supply compromise?” The purpose of this case series is to discuss these available techniques for autogenous subepithelial connective tissue grafts with immediate implant placement.

### Immediate Implant Placement without SCTGs

The first two cases are examples of patients in whom SCTGs were not placed. They demonstrate consistent marginal gingival shrinkage seen with immediate placement. The biotype is always a crucial factor, and Kan found more discrepancies with patients who had a thin biotype.\textsuperscript{16,17}

#### Case 1

In the first case (Figure 1 through Figure 4), the biotype was thick and the teeth had a square tooth form (Figure 1). The central incisors were extracted, and the implants were placed into the palatal walls of the alveolus (Figure 2). As with all cases in this series, the 1.5-mm to 2-mm facial horizontal defect gap was grafted with freeze-dried allograft (mineralized). At 2 months, the gingival margin levels were still coronal to the lateral incisors, and the appearance of the buccal aspect was very thick, with minimal change (Figure 3). Figure 4 shows the final restorations after 2 years, and considerable horizontal/vertical changes in the gingival margins are noticeable.

The esthetic results were quite positive, and the gingival and buccal plate remodeling helped obtain a highly optimal outcome. This was expected, and, therefore, this was the rationale for not incorporating an SCTG with implant placement. It is interesting to note that even with a thick biotype, a square tooth form, and the use of a mineralized allograft, a flapless approach, and immediate provisionalization, there was significant facial horizontal and vertical resorption (Figure 4).

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**Fig 1.** Pretreatment photograph showing a square tooth form and thick biotype with the gingival margins of the central incisors more coronal to the lateral incisors. **Fig 2.** Implants placed, incisal view. **Fig 3.** Gingival margin levels shown 2 months after immediate placement and provisionalization. **Fig 4.** Final restorations shown 2 years after completion. (Restorative dentistry performed by Gregory Kinzer, DDS, Seattle, Washington.)
Case 2
Case 2 (Figure 5 through Figure 7) involved a patient whose left central incisor had a normal-to-thick biotype. The implant placement procedure was completed without the use of an SCTG (Figure 5). During the 2 years after immediate placement of the implant, immediate provisional, and final restoration, progressive recession occurred. This is evident in the contrast between the photograph taken 3 months after surgery that showed nearly even central incisor gingival levels (Figure 6) and the photograph taken 2 years after the final restoration (Figure 7), at which point there was a 2-mm discrepancy in gingival levels. The patient became increasingly aware of the slow gradual change and the dark gingival appearance above the left central incisor (Figure 7).

Full-Thickness SCTGs
Case 3
The patient in Case 3 (Figure 8 through Figure 15) exhibited gingival asymmetry of her central incisors and was diagnosed with a vertical root fracture of the left central incisor (Figure 8). The treatment plan called for extraction of the left central incisor and replacement with an immediate implant along with the use of an SCTG. Prior to extraction and osseous recontouring, a full-thickness flap was raised (Figure 9) to enhance access and enable crown lengthening on the right central incisor. The implant site was also grafted with a mineralized allograft. There was 3 mm of gingival asymmetry, and the patient had a thick biotype. After implant placement (Figure 10 and Figure 11), a 1.5-mm thick SCTG was harvested from the palate and placed facially to the implant (Figure 12), which
was provisionalized with a cantilever provisional (Figure 13). The implant and the adjacent central incisor were both restored approximately 12 months after placement (Figure 14 and Figure 15).

The final results showed symmetrical gingival levels (Figure 15). The SCTG preserved the facial vertical and horizontal marginal contours on the implant. The full-thickness flap for the crown lengthening may have contributed to some increase in facial osseous resorption, but the SCTG masked the dimensional loss.

**Tunnel Split-Thickness SCTGs**

*Case 4*

Tunneling and closed flapless immediate placement along with SCTGs have been advocated to decrease alveolar resorption and remodeling. In *Case 4* (Figure 16 through Figure 23), the patient exhibited excessively long clinical crown lengths (13 mm) and there was recession on the adjacent central incisor (Figure 16). The left central incisor was nonrestorable; therefore, the treatment plan included its extraction and replacement with an immediate implant/provisional. The biotype was thin, and SCTGs were planned for both incisors. The goal was to alter and thicken the biotype and also to shorten the clinical crown lengths to improve the esthetic outcome. This would also decrease the extent of the implant shoulder depth and later decrease the interproximal/facial scallop/probing depths (Figure 17). This was followed by try-in of the screw-retained provisional and placement and suturing of the SCTG (Figure 18 through Figure 20).

The use of the SCTG masked the alveolar resorption in this case and also allowed for coronal movement of the marginal gingiva. The root coverage on the right central incisor and the implant remained stable at 2 years (Figure 21 through Figure 23).

**Supracrestal SCTGs**

*Case 5*

This last technique for SCTG placement with immediate implant placement is not discussed much in the literature. This technique, which entails minimal recipient preparation of the site, is flapless and the buccal gingiva is not elevated off the buccal plate or crest. As in the other cases, the implant is placed into the palatal alveolar wall, and a 1.5-mm to 2-mm buccal horizontal defect distance (HDD) is grafted with a mineralized allograft. The implant is placed slightly below the facial osseous crest (0.5 mm to 1 mm). Coronal to this the SCTG is placed, which is approximately 1.5 mm in thickness, 3 mm in height, and 4 mm in width. The graft is usually retained only by the custom impression coping or immediate provisional, although occasionally a horizontal mattress suture is used to retain the graft.

In this case example (Figure 24 through Figure 26), the SCTG was “tucked” into the facial area to prevent apical migration of the gingival margin. This approach may also help diminish the amount of facial horizontal resorption that occurs. The 8-year follow-up photograph (Figure 26) demonstrated the effectiveness of using SCTGs to help maintain the peri-implant cervical gingival esthetics.

**Discussion**

Many protocols are advocated to optimize esthetic outcomes with implants. The use of mineralized allografts/xenografts and/or the use of SCTGs all have been proposed to limit the esthetic implica-
tions of buccal plate resorption. Autogenous SCTGs do improve esthetic outcomes and create a positive change in the gingival biotype.\(^1\)\(^6\) As seen with the cases presented, no one connective tissue graft protocol can be advocated for all immediate implant cases. Understanding the goals, esthetic needs, and the anatomy of the patient are critical.

This article discusses full-thickness flap/flap reflection, partial thickness flaps/tunneling, and supracrestal flapless SCTGs. They all can be beneficial, but the author recommends choosing the technique that can achieve the desired goal with the least amount of trauma. Minimal flap elevation is always optimal in minimizing the amount of buccal plate resorption. It has been shown that a flapless approach can diminish buccal plate resorption with immediate implants.\(^6\) Compromising the buccal plate blood supply should be a consideration, but this should not be a contra-indication for raising a flap if needed. A good example of this was the case needing crown lengthening on the adjacent tooth (Case 3). In this case, using a thicker SCTG helped mask the crestal bone remodeling that occurred. Using an SCTG is even more critical with thin biotypes. While assessing the biotype is usually a subjective evaluation, it should be done routinely. Kan has proposed measuring techniques with calipers or with a periodontal probe.\(^19\)\(^20\)

Placing a mineralized graft material such as anorganic bovine collagen has been shown to be an excellent means of decreasing buccal plate resorption. This technique is quite effective at limiting resorption apically and at the mid implant level. The crest still will remodel and horizontal changes will occur even with the use of bovine mineralized xenografts. Degidi et al found that anorganic bovine collagen was a very effective graft material to improve complete fill of the HDD/osseous gap with immediate implants.\(^9\) They still found the buccal plate to have some resorption; 25.6% vertical resorption and 29.3% horizontal change occurred even with the use of anorganic bovine collagen.\(^9\)

Some have proposed the use of acellular dermal grafts as opposed to autogenous connective tissue grafts. However, the literature is lacking reports on this type of material with immediate implant placement. One paper showed more keratinized gingiva with acellular grafts, but these were in the posterior and done in a free gingival graft manner.\(^21\) The current author has attempted using acellular dermal grafts with immediate non-submerged implants. Several cases had sloughing of the graft material and ultimate resorption of the marginal gingiva. Acellular dermal grafts used in a closed environment can have good results, but not when the dermal tissue is in a partially exposed sulcular immediate implant environment. The use of autogenous subepithelial connective tissue grafts with immediate implants has shown consistent results in multiple studies.\(^10\)\(^15\)\(^17\)

### Conclusion

This case series does support the use of autogenous SCTGs with the most immediate placement implant cases in the esthetic zone. If the buccal plate is extremely thick, ie, greater than 2.5 mm to 3 mm, or if gingival recession is desired to achieve symmetrical gingival levels, grafting may not be necessary. Choosing the least invasive type of autogenous SCTG technique should be consid-

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**ABOUT THE AUTHOR**

Bobby Butler, DDS
Private Practice, Mission Vieja, California

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