

RECREATING BALANCE, HARMONY, AND SYMMETRY IN THE GINGIVAL COMPLEX IN CONJUNCTION WITH IMMEDIATE IMPLANT PLACEMENT AND RESTORATION



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ABSTRACT

Adequate zones of attached, keratinized tissue are important for the periodontal health of the natural tooth system and surrounding bone. This principle becomes more significant in periodontal/prosthetic and cosmetic dental procedures. Additionally, in tooth replacement procedures, adequate zones of attached, keratinized tissue can lead to a healthy implant/gingival complex. This article discusses acellular dermal tissue grafting in conjunction with dental implant placement prior to the finalization of prosthetic procedures.

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INTRODUCTION

The esthetic enhancement of the natural dentition is a significant component of the contemporary dental practice. Proper zones of attached/keratinized tissue can lead to a balanced, harmonious gingival complex that can complement the ceramic alteration of the natural tooth, or tooth replacement with dental implants. In areas where there is a lack of attached keratinized tissue, in addition to root surface exposure, consideration must be given to correcting the deficient tissue contours prior to any tooth alteration and/or implant placement procedures. Various procedures to correct deficient gingival contours have been well documented in the dental literature.



Figure 1: Pretreatment view, left central incisor.

LITERATURE REVIEW

Increasing zones of attached gingiva using palatal donor tissue and the free gingiva grafting procedure was introduced by Bjorn almost a half century ago.¹ Using palatal donor tissue in the form of a free soft tissue autograft for root-coverage procedures was reported by Miller.² Additional procedures were reported utilizing lateral³ or coronal⁴⁻⁶ repositioning of the adjacent attached gingivae via a pedicle flap, or the coronal repositioning of previous grafted tissue.^{7,8} Miller also reported gingival grafts placed over root surfaces to correct areas of deep-wide gingival recession.⁹ Further surgical advancements led to utilizing subepithelial connective tissue from the palate to obtain root coverage.^{10,11}

One of the impediments to patients accepting soft tissue procedures to correct gingival loss is the trauma from harvesting palatal donor tissue. Depending upon the volume of tissue required to correct the recession present, multiple harvesting procedures may be required. Also, an inadequate amount of connective tissue may be present, and the patient's medical status may play a role in whether he or she is a good

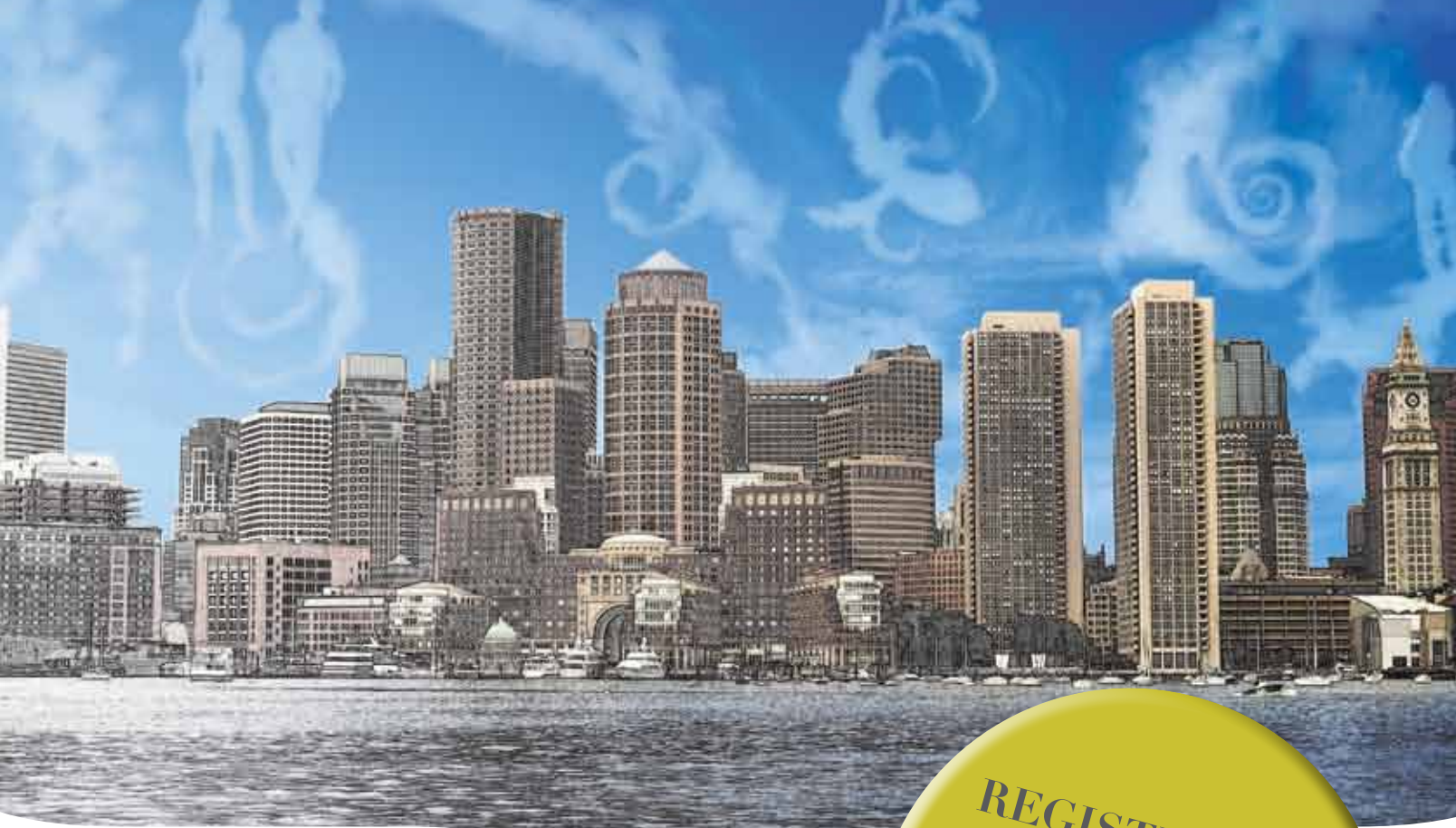
candidate for the palatal donor site surgery. As a result of some of these concerns, corrective gingival surgery expanded to the use of acellular dermal matrix (ACDM) grafts as a substitute for palatal connective tissue grafts.¹² Harris reported a comparative study of root coverage obtained with an ACDM versus a connective tissue graft.¹³ He observed no clinical or statistical difference between the two materials. Henderson and colleagues reported on predictable multiple-site root coverage using an ACDM autograft,¹⁴ with additional clinical documentation of dermal matrix grafts and their successful use in root-coverage procedures.¹⁵⁻¹⁹ Allen described a tunneling technique whereby a surgical pouch is created, the ACDM is placed into the pouch, and the pouch is then coronally repositioned to cover the graft completely.²⁰

When required, pre-prosthetic gingival surgery can enhance the final result in reconstructive and cosmetic dentistry.

Obvious advantages exist in utilizing ACDM grafts. The avoidance of harvesting the palatal tissues is a

major benefit to patients undergoing this type of treatment. For the surgeon, to have unlimited amounts of tissue available, and to be able to treat multiple teeth sites at one visit, makes the surgical procedure more efficient and less traumatic. Additionally, a high quality of the donor tissue, in addition to its natural esthetic appearance, and patients' improved acceptance of therapy, makes this tissue an ideal replacement procedure for palatal soft tissue grafting.

As dentistry continues to expand into the esthetic realm, whether by enhancement of the natural tooth, or replacement of the tooth system with dental implants, the soft tissue contours established and maintained play a major role in the success of the reconstruction and/or cosmetic procedure. When required, pre-prosthetic gingival surgery can enhance the final result in reconstructive and cosmetic dentistry. As the popularity of dental implants as a tooth replacement option continues, especially in the esthetic zone, the necessity of a thick biotype of soft tissue,²¹ in addition to attached keratinized gingivae,²² is important to increase the predictability of the



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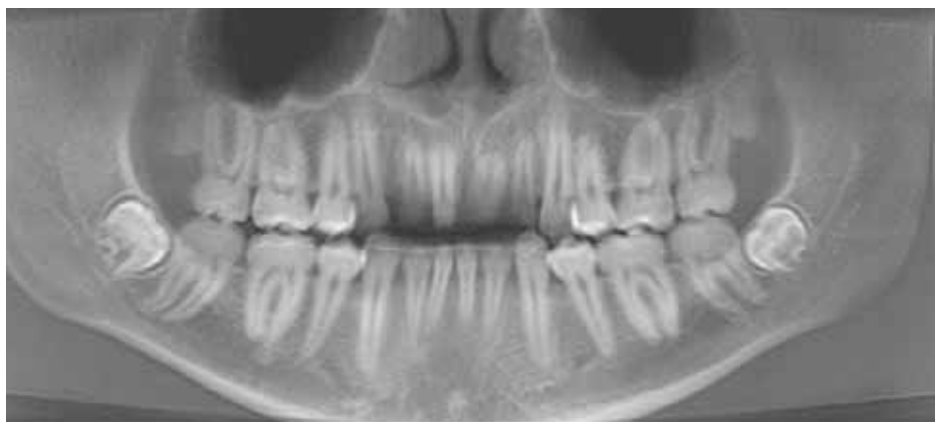


Figure 2: Pretreatment panoramic radiograph.

procedure. Additionally, incorporating prosthetic principles at the time of surgery can enhance the esthetic aspect of the procedure by utilizing those principles to sculpt and guide tissue contours.²³⁻²⁷

The following clinical case discusses the use of ACDM grafts around natural teeth, and dental implants, to augment insufficient gingival contours.

CASE REPORT

A 24-year-old, non-smoking male presented for treatment of a horizontally fractured left central incisor (Figs 1 & 2). The patient had requested an implant to replace the left central incisor so as not to incur any damage to the adjacent dentition.

Complicating the treatment site was the apically positioned facial height of contour at the left central incisor and adjacent left lateral incisor (Fig 1). Additional sites of recession were present throughout the oral cavity; these would be addressed by the tunnel grafting procedure previously outlined.

TREATMENT OPTIONS

Treatment options for this case were as follows:

- Tooth removal, ridge preservation, healing phase, implant placement, healing phase, abutment connection (removable partial denture at provisional).
- Tooth removal, implant placement, bone grafting (non-immediate provisional technique) utilizing a removable partial denture as provisional, healing phase, then Stage II.
- Tooth removal, implant placement, bone grafting, abutment connection and immediate provisional restoration, with simultaneous soft tissue augmentation with dermal matrix tissue and the tunnel graft procedure, all by minimally invasive means.

After review, the patient selected the third option.

TREATMENT

After administration of an appropriate local anesthetic, a frenectomy was performed utilizing an Nd:Yag

laser (Fig 3). This would allow for the loosening of the facial tissues and the coronal repositioning of the pouch at the termination of the procedure. Following the frenectomy the left central incisor was removed by an atraumatic technique, preserving the soft tissue emergence profile (Fig 4). Debridement of the extraction socket preceded atraumatic site preparation techniques. A 3.5-mm diameter by 13-mm tapered implant (Prima Connect, Keystone Dental; Burlington, MA) was placed to the appropriate depth measurements planned.^{26,27}

Following the frenectomy the left central incisor was removed by an atraumatic technique, preserving the soft tissue emergence profile.

Once the implant was seated, the cover screw was placed, and the facial defect present at the buccal aspect of the implant was corrected utilizing mineralized, large particle cancellous chips (Lifenet; Virginia Beach, VA) and a solution of plate-



Figure 3: Laser frenectomy, left lateral view.



Figure 4: Atraumatic extraction, left central incisor.



Figure 5: Minimally invasive bone grafting, after implant placement.



Figure 6: Titanium abutment seated.



Figure 7: Retrofitted natural tooth shell.



Figure 8: Immediate provisional restoration.



Figure 9: ACDM placed into "pouch."



Figure 10: Pouch coronally advanced over dermal matrix graft.



Figure 11: One-week postoperative clinical view.

let rich plasma (PRP), forming a graft/prp gel complex. The graft complex was heavily condensed into the void present, to the level of the facial aspect of the polished collar on the implant (Fig 5).

Following placement of the graft complex, a titanium abutment with a 1-mm collar (Quick abutment, Keystone Dental) was seated and hand-tightened (Fig 6). Retrofitting of the natural tooth shell preserving the pre-existing contact point relationships and line angle positioning was accomplished from a pretreatment incisal edge registration. The retrofitted natural tooth shell is shown in Figure 7, and the immediate post-surgical clinical view prior to soft tissue enhancement can be seen in Figure 8.

Creation of the facial pouch was accomplished by surgical techniques reviewed earlier. Intra-sulcular incisions were made from the distal line angle of the right central incision to the distal line angle of the left canine, with care given to not totally incise the papillae at the interproximal aspect. Using muco-periosteal elevators and blunt dissection, the pouch was extended apically beyond the muco-gingival junction, and laterally to the facial aspect of the tunneled papillae. The pouch was then deepened and mobilized by sharp supra-periosteal dissection. The pre-trimmed dermis (AlloDerm, Biohorizons, Inc.; Birmingham, AL), rehydrated with non-activated PRP, was placed into the pouch, superior to the allogenic bone graft placed to correct the facial defect at the implant site, from the mesial of the right central to the mesial of the left canine (Fig 9). The dermal matrix was secured with a 6.0 polypropylene suture, and the pouch coronally advanced to cover the dermal matrix graft completely, using a 5.0 Monocryl (Ethicon; Somerville, NJ) suture with an interrupted sling-suturing technique (Fig 10).

The provisional restoration was an immediate non-functional restoration, and was free of contact in centric occlusion,



Figure 12: Pretreatment view, left canine and lateral incisor.



Figure 13: ACDM placed into "pouch" around natural teeth.



Figure 14: "Pouch" coronally repositioned over dermal matrix graft.



Figure 15: Three months post-treatment, right lateral view.

protrusive, and right and left lateral excursive movements.

POSTOPERATIVE

A one-week postoperative view can be seen in Figure 11. Please note the free gingival margin at the mid-facial point of the left central incisor, and compare that to the pretreatment level seen in Figure 1.

At this time, the correction of the gingival deficiencies at the maxillary right canine and lateral incisor was accomplished. The pretreatment clinical view can be seen in Figure 12. Following the surgical procedure to create the "pouch" earlier de-

scribed, the dermal matrix graft was inserted sub-epithelially into the pouch, and secured with a 6.0 polypropylene suture (Fig 13). This was followed by coronally repositioning the "pouch" over the dermal matrix graft previously inserted, with 6.0 polypropylene sutures using an interrupted "mattressing" technique (Fig 14).

The three-month postoperative view of the maxillary right canine and lateral incisor is shown in Figure 15. Please note the root coverage obtained, along with the zone of keratinized tissue present.

At this time, the restorative procedures were initiated at the left central incisor implant site (Fig 16). After removal of the retrofitted natural tooth crown (Fig 17), the stock titanium abutment can be seen within the soft tissue emergence profile obtained by the immediate restoration procedure performed (Figs 17 & 18). After insertion of an appropriate transfer coping assembly, registration of the fixture level and tissue emergence profile present were obtained by routine impression methods, along with appropriate bite registrations.

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Figure 16: Three months post-treatment, maxillary left central incisor.



Figure 17: Three-month post-treatment soft tissue emergence profile, provisional abutment seated.



Figure 18: Three-month post-treatment soft tissue emergence profile.



Figure 19: Custom-milled Lava abutment and all-ceramic final restoration.



Figure 20: Custom-milled Lava abutment seated clinically.



Figure 21: Final provisional restoration seated four months post-surgically.



Figure 22: Case-complete cone beam image, serial view.



Figure 23: Case-complete periapical radiograph, left central incisor.

The custom-milled Lava (3M; St. Paul, MN) abutment and all-ceramic restoration are shown in Figure 19, with the custom-milled Lava abutment seated intraorally in Figure 20. Please note the contoured abutment, and how it sits spatially within the sculpted soft tissue emergence profiles obtained. The final provisional is seen in Figure 21, seated with provisional cement, four months after implant placement. Minor shading issues, along with line angle and cervical contours, will need to be corrected, but please observe the excellent soft tissue interproximal contours maintained, and the repositioning of the facial gingival tissues in the coronal aspect when compared to that shown in Figure 1. The case-complete cone beam image, serial view, is shown in Figure 22; the case-complete digital periapical radiograph is shown in Figure 23.

CONCLUSION

Adequate zones of keratinized, attached tissue are important for long-term periodontal health and maintenance. Restorative and/or cosmetic dental procedures benefit from having this type of periodontal environment. Soft tissue grafting and augmentation procedures have been developed and perfected over the last 30 years, and incorporation of ACDM grafts have simplified the procedure and made it more patient-friendly, allowing patients who have avoided the palatal donor harvesting procedure to have the procedure accomplished by using a safe and effective biomaterial.

Acellular dermal matrix tissue has proven up to the task for palatal connective tissue for root-coverage procedures in randomized, controlled clinical studies.^{12,16-19} Tal and colleagues reported that the use of AlloDerm, under a coro-

nally advanced flap, produces an esthetic outcome superior to that achieved with a palatal connective tissue graft.¹⁸

Dermal matrix grafting possesses distinct advantages over palatal connective tissue because:

- the palatal donor surgical site can be avoided
- multiple teeth can be treated at one visit
- unlimited amounts of donor tissue are available
- the donor tissue is of high quality
- there is the ability to match, or be superior to, the results observed with autogenous palatal tissue grafts.

Reestablishing the proper soft tissue quality prior to restorative intervention contributes to more predictable outcomes for tooth enhancement and replacement proce-

dures. Incorporating multiple procedures, although technique-sensitive, can decrease surgical trauma, allow for less soft tissue shrinkage and recession, and can simplify the entire tooth replacement procedure, while allowing for the regenerated bone and soft tissue to heal and mature over the same time frame. This, in turn, can enhance the tooth replacement procedure.

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