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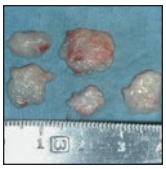
Enhancing Root Eminence and Papilla Contour Using Single, Contoured, Subepithelial Connective Tissue Autografts for Recession Coverage



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Current techniques using autogenous soft tissue in periodontal plastic surgery have limitations in the number of teeth that can be treated and may result in suboptimal esthetic results. The innovative use of single, contoured grafts reported in this article overcomes the drawbacks associated with these techniques by more efficient use of available donor tissue. Autogenous tissue is used to graft each individual tooth, leaving the interdental areas uncovered. Multiple teeth—in some cases an entire arch—can be treated in one session, providing consistent and predictable reestablishment of the normal scalloped gingival architecture and convex root eminence. Int J Periodontics Restorative Dent 2017;37:751–757. doi: 10.11607/prd.2793

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Since the improvisation of Edel in 1974 that led to the use of autogenous subepithelial connective tissue grafts (SCTG) in periodontal plastic surgery procedures, a plenitude of techniques for their use in recession coverage have been published.[1] The vast majority of contemporary root coverage techniques are based on modifications of the classic Langer and Langer technique.[2] In this technique, a SCTG is harvested, most commonly from the palate, and placed under a flap that allows blood supply from both the recipient bed and the overlying flap. The major attribute that has made the SCTG the gold standard for root coverage is its esthetic outcome.[3] In contrast to a free gingival graft, use of a SCTG gives the treated site an esthetic appearance that closely resembles adjacent untreated sites.[4]

The size of the SCTG is determined based on the span of the recipient site. Thus, there is an inherent limit to the number of sites that can be grafted simultaneously. To surmount this obstacle, acellular dermal matrix allografts were introduced for use in the treatment of mucogingival defects.[5] The rationale behind the use of allograft tissue is that its supply can be replenished without the need for additional donor sites.[5] This unlimited source of tissue allows for the simultaneous treatment of numerous sites in the

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Fig 1 *Maxillary dentition with Miller Class I and II recession defects ranging from 1 to 7 mm in depth and significant noncarious cervical lesions on the right premolars and canine and the left lateral incisor through first premolar. The lesions were previously restored with composite restorative material.*

same patient. Initial results from the use of this biomaterial were promising, yielding comparable recession coverage to that of SCTGs.[6–8]

Based on short-term observations, several authors sensed that the time was ripe to establish acellular dermal allografts as an indispensable addition to the periodontist's arsenal.[5]

The first study to report longitudinal data on the use of soft tissue allografts proved to be a harbinger of bad news for advocates of their use in root coverage procedures.[9] Harris reported that even though short-term results from the use of acellular dermal matrix and SCTG were directly comparable, long-term follow-up revealed a significant relapse in recession coverage with the allograft tissue in the mandible.[9] Approximately 4 years postsurgery, recession coverage in the allograft group ebbed to 65.8%, from an initial mean coverage ratio of 93.4%.[9] Since then, significant attention was drawn again to the use of SCTG as the more adequate treatment option for management of mucogingival defects.[10]

Advancements in soft tissue surgery with SCTG aim to improve esthetic outcomes and reduce patient morbidity associated with harvesting donor tissue for coverage of large defect areas.[11,12] The ultimate goal of each recession coverage technique is to restore the natural gingival architecture. The physiologic gingival apparatus is characterized by a complex three-dimensional structure defined by the underlying support provided by the anatomy of teeth and bone. In a patient with a healthy periodontium, the gingiva at the midfacial aspect of the tooth is more convex, consistent with the eminence of the root. Subsequently, the soft tissue dips in the interdental area as it follows the bone contour and rises again when it meets the next root eminence. Inevitably, when a SCTG is laid over several denuded root surfaces as well as the interdental areas between the roots, the bulk of the graft tents the overlying flap and often results in a bulbous appearance of the healed site obscuring the natural convexity of the root eminences. In addition, clinicians squander donor tissue volume in interdental spaces that do not need to be grafted to achieve recession coverage, limiting the number of teeth that can potentially be treated with the available donor tissue.

The aim of this paper is to report an innovative technique that has been specifically developed to overcome drawbacks associated with the currently employed SCTG techniques.

Materials and Methods

Surgical Technique

A clinical case with 3-year follow-up will be presented to illustrate the surgical steps used in this technique. A healthy 41-year-old man was referred for management of significant gingival recession and tooth hypersensitivity. Intraoral evaluation revealed generalized Miller Class I and II recession defects throughout the maxillary dentition that ranged from 1 to 7 mm in depth.[13] Additional findings included significant noncarious cervical lesions on the

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Fig 2 *Prior to flap reflection, the apical extents of the cervical restorations were adjusted by positioning the restorative material at the desired level of the CEJ. Root surface preparation was done to achieve a smooth, even transition from the exposed root surface to the previously unexposed healthy root apical to the gingival attachment prior to and following flap reflection.*

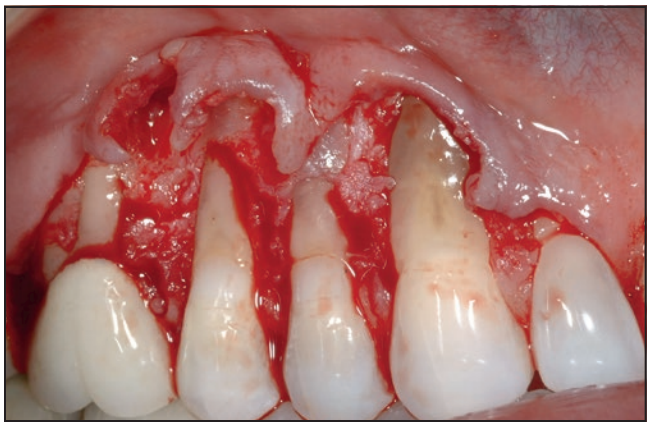

Fig 3 *Full-thickness flap reflection extended to the mucogingival junction with split-thickness dissection apically to mobilize the flap to allow coronal repositioning to the desired level. Leaving periosteal tissue of sufficient thickness apically is important to secure stabilizing sutures.*

maxillary right premolars and canine and the left lateral incisor through the first molar. The lesions previously had been restored with composite restorative material (Fig 1). The patient was scheduled to undergo a surgical session for recession coverage using single, contoured, subepithelial connective tissue (CT) autografts with a coronally repositioned flap.

Surgical Site Preparation

Prior to surgical treatment, scaling and root planing therapy was performed and new cervical composite restorations were placed on the maxillary right premolars and canine and the left lateral incisor through the first molar due to the patient's complaint of posttreatment root hypersensitivity. At the time of surgery, these restorations were adjusted to position the apical extent of the restorative material at the desired level of the cementoenamel junction (CEJ). This was accomplished with the use of Gracey curettes and/or 12-bladed finishing burs. The cervical restorations and the underlying root surfaces were then smoothed to eliminate irregularities. The restorative material is typically removed prior to flap reflection, and the root surface is prepared both prior to and following flap reflection to achieve a smooth, even transition from the healthy root surface apical to the gingival attachment onto the previously exposed surface (Fig 2). Intrasulcular incisions were traced bilaterally from the distobuccal extent of the tuberosity and involved the sulci of all included teeth. The labial third of each interdental papilla was included in the flap design according to the principles of the curtain technique to minimize adverse loss of papillary height.[14,15] The flap was designed as a combined full- and partial-thickness flap. Initial reflection of the flap from the marginal gingiva apically to the mucogingival junction was performed in full thickness to retain maximum thickness of the flap for ease of handling and nourishment of the underlying CT graft during the incipient stages of healing. Flap reflection initially extended to the mucogingival junction to create sufficient separation between the flap and alveolar bone. A split-thickness dissection was then made using a Bard Parker 15 blade and Lagrange scissors, being careful to leave sufficient thickness to the flap and an adequate thickness of periosteal tissue to secure sutures to stabilize the grafted tissue. This dissection was extended to create sufficient mobility to coronally position the flap to the desired level (Fig 3). Since the length of the flap allowed for ease of access to place and secure the grafts, no vertical incisions were necessary in this case. Typically,

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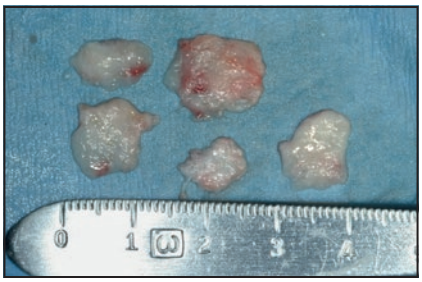

Fig 4 *Epithelial remnants were removed from the dense CT, which was then dissected to approximately 1 to 1.5 mm in thickness and contoured to fit individual teeth, precisely covering each root from slightly lingual to the mesial and distal line angles and coronoapically between the CEJ and the osseous crest.*

vertical incisions are avoided whenever possible in the esthetic zone. In addition, when the maxillary incisors are treated, the papilla interproximal to the central incisors is most often left intact.

Following visual inspection of the defects, any epithelial remnants on the interdental papillae were removed with a sharp Gracey curette and/or Lagrange scissors. On the flap margins where the gingival thickness was sufficient, the sulcular epithelium was also removed using Lagrange scissors. The smear layer was removed from the dentin with 24% ethylenediaminetetraacetic acid (EDTA) applied on the exposed root surfaces for 2 minutes. EDTA is a water-soluble root conditioner with neutral pH that is readily removed from the surgical area with sterile saline irrigation.[16]

Donor Site Selection

In this case CT was harvested from the right and left maxillary tuberosity areas using the technique recommended by Hirsch et al.[17,18] The tuberosity harvest technique included a linear incision extending from the distal crevicular area of the most posterior maxillary tooth to the mucogingival junction at the terminal end of the maxillary tuberosity. Following flap reflection, the dense connective tissue that made up the tuberosity protuberance was dissected from the flap with a fresh 15c blade and Kirkland knife and removed with tissue pliers. When there is sufficient donor tissue in the tuberosity, this tissue provides dense CT that can be readily dissected to create donor pieces approximately 1 to 1.5 mm thick for use on individual teeth. This tissue can be left thicker to fill or augment deep, noncarious cervical lesions. Following removal of the epithelial remnants, the pieces were cut to fit precisely and cover each root from slightly lingual to the mesial and distal line angles and coronoapically between the CEJ (or desired level of the CEJ, when restorations are present) and the osseous crest. Apical extension beyond the level of the osseous crest is unnecessary and can complicate precise flap closure and result in gingiva that appears bulky when healed. Additionally, overextension of the CT graft into the interproximal areas and apically increases the amount of donor tissue required and can compromise the esthetic result by reducing the prominence of the simulated root eminence without significantly contributing to esthetics (Fig 4).

SCTG Adaptation and Flap Management

For this patient, each tooth was treated individually as is usually done when using the presented technique. The configured donor tissue was placed on the root surface and secured with an intrasulcular, circumferential sling locking suture (5-0 chromic gut suture with a P3 needle; a FS2 needle is recommended for molar teeth) originating from the palate.

The needle was initially guided to enter the palatal tissue approximately 5 mm apical to the gingival margin and exited into the palatal gingival sulcus. It was then carried through the interdental embrasure to the facial side and penetrated the edge of the CT graft approximately 1 mm from the graft margin. Subsequently, the needle was carried back through the interdental embrasure to the lingual side and passed around the lingual aspect of the tooth and then through the opposite gingival embrasure to the facial to secure the contralateral edge of the CT graft approximately 1 mm from the graft margin. Last, the needle was carried back through the interdental embrasure to the lingual and penetrated into the lingual sulcus to exit the palatal gingiva adjacent to the tag end of the suture, where it was tied off with successive alternating overhand knots. This suturing approach allowed the graft to be secured and tightly approximated to the facial root surface. Following secure adaptation of the coronal portion of the CT graft to the tooth, several strapping sutures

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Fig 5 *Immobilized CT grafts. Grafted tissue was securely adapted to the tooth using intrasulcular, circumferential sling locking sutures originating from the palate with several vertical tensioning sutures between the CT graft and facial periosteum.*

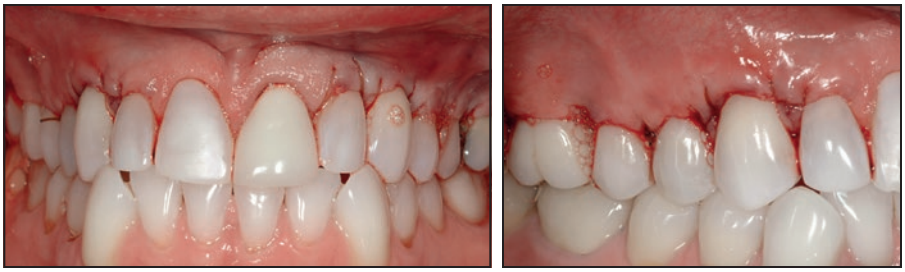

Fig 6 *Coronal positioning of the mobilized flap covering grafted tissue. Due to variations in the amount of recession at each site, the flap margins typically required contouring to fit precisely one site at a time, beginning with the mesial portion of the flap prior to securing with single interrupted and/or circumferential sutures.*

Fig 7 *Posttreatment reestablishment of the normal scalloped gingival architecture bilaterally on teeth with Miller Class I and II recession defects treated in one session with individual SCTG on each tooth.*

were placed between the CT graft and the facial periosteum to secure the graft apically and tied off with a surgeon's knot (Fig 5). The SCTG should be uniformly adapted and well secured against the root surface. Following verification of graft stability, the flap was coronally positioned to the desired level on the teeth. Due to the variations in the amount of recession at each site, it was expected that the papilla would not line up with the corresponding interdental areas and/or would not adapt neatly to the interproximal areas. The flap margins typically require contouring to fit precisely, and this adjustment should best be done one site at a time, beginning with the mesial portion of the flap. The flap was then secured with single interrupted and/or circumferential sutures. In this case, a 4-0 or 5-0 chromic gut suturing material can be used (Fig 6). A nonresorbable (6-0) nylon suture, which allows for precise and secure closure is often used.

Postoperative Care and Long-Term Follow-Up

The patient was premedicated with an antibiotic for 1 week beginning the day of surgery, a tapering dose of dexamethasone for 5 days to minimize swelling and discomfort, and appropriate analgesics. Postsurgical home care instructions included application of ice for the first 2 days, gentle application of chlorhexidine with a soft surgical brush, and avoiding flossing and eating in the surgical area. Postoperative evaluations were performed at 2 and 4 weeks. Occasionally, ecchymosis is seen as a consequence of the split-thickness dissection, even though it was not encountered in the presented case. The patient was asked to resume routine oral hygiene practices at 3 to 4 weeks following surgery. With this routine, most patients have a relatively uneventful postoperative experience (Fig 7). The patient entered a maintenance schedule with

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Fig 8 *Clinical image obtained at 3 years follow-up showing stability of the outcome with coronal migration of the gingival margins.*

Fig 9 (a, b) *Maxillary dentition with Miller Class I and II recession defects ranging from 1 to 6 mm in depth and significant noncarious cervical lesions on the right and left lateral incisors, canines, and first premolars.* (c, d) *Full-thickness flap reflection extended to the mucogingival junction with split-thickness dissection apically to mobilize the flap, leaving periosteal tissue of sufficient thickness apically for securing stabilizing sutures.* (e) *Dense connective tissue from a unilateral superficial harvest of palatal tissue was prepared by removing the superficial oral epithelium and the deep adipose tissue to create a 1- to 1.5-mm thickness. This tissue was then contoured to fit individual teeth, precisely covering each root.* (f) *Immobilized CT grafts securely adapted to the tooth using intrasulcular, circumferential sling locking sutures originating from the palate with several vertical tensioning sutures between the CT graft and facial periosteum followed by* (g) *coronal flap advancement.*

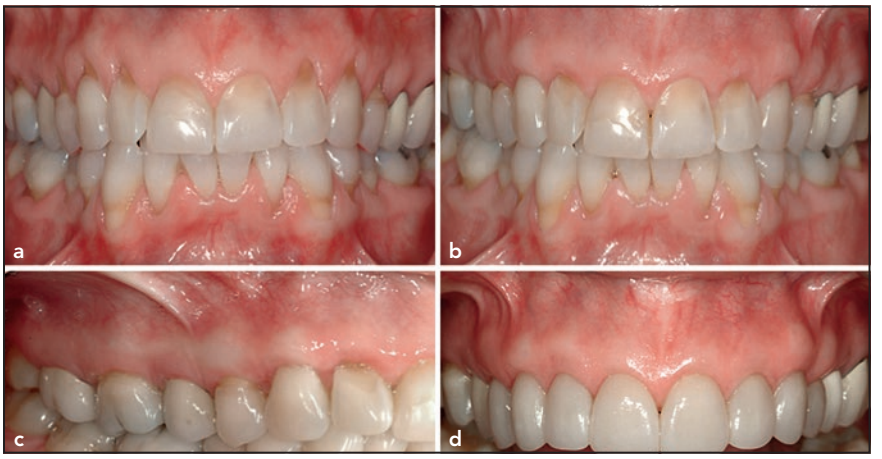

Fig 10 *Baseline* (a) *and 3 months posttreatment* (b) *facial view. Note the reestablishment of the normal scalloped gingival architecture bilaterally on teeth with Miller Class I and II recession defects treated in one session with individual SCTG on each tooth. A documented clinical attachment gain of 2 to 5 mm was achieved.* (c, d) *Clinical view at 7 years posttreatment including porcelain veneers demonstrating stable maintenance of the esthetically pleasing scalloped gingival architecture and root coverage on teeth with Miller Class I and II recession defects. Note the significant gain in soft tissue thickness in the grafted sites closely replicating the root eminence of each tooth.*

his general dentist and was recalled after 3 years to evaluate the long-term stability of the augmented tissue. Figure 8 demonstrates the very good stability of the sites with actual noticeable coronal creeping of the marginal gingiva and favorable tissue contours replicating the root eminence on the majority of the treated sites. An additional case with long-term follow-up is presented in Figs 9 and 10.

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Conclusions

The use of autogenous SCTGs in periodontal plastic surgery procedures is a mainstay in the treatment of recession defects and in augmentation of tissue deficiencies at implant and pontic sites. For recession coverage, currently reported techniques using available autogenous tissue have limitations in the number of teeth that can be treated with a given amount of donor tissue. Treating more teeth can give an esthetic result that is less than optimal. When acellular dermal allografts are used for recession coverage, significant relapse has been reported. The technique reported in this paper overcomes the drawbacks that are associated with these currently employed SCTG techniques. With this technique, available donor connective tissue is more efficiently used by limiting application of the CT to each individual tooth with recession, leaving the interdental areas uncovered. Multiple teeth, in some cases an entire arch, can be treated in one session, providing consistent and predictable reestablishment of the normal scalloped gingival architecture of convex root eminences and a phenotype indiscernible to that of normal, healthy gingiva with proven long-term stability.

Acknowledgments

The authors reported no conflicts of interest related to this study.

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