



Minimally Invasive Soft Tissue Grafting

An advanced surgical technique with predictable root coverage

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Soft tissue grafting has received a great deal of attention in recent years, as surgical techniques have become less invasive, outcomes more esthetic, and root coverage more predictable. Contemporary surgical procedures virtually eliminate surface incisions as tunnel techniques have largely replaced traditional flap procedures. Use of allograft tissue rather than palatal donor tissue further reduces morbidity and allows treatment of multiple teeth in one visit without concern for the amount of palatal tissue available or the complications associated with palatal harvesting. Increased predictability of root coverage and greater patient comfort parallel these advances.¹⁻⁴

Soft Tissue Grafting Indications

Soft tissue grafting is indicated for treating teeth with gingival recession and for increasing the width and thickness of attached gingiva around teeth and implants. Gingival recession causes several problems for patients, including negatively affecting esthetics and causing root sensitivity.

Complete root coverage can be achieved in sites where there is no loss of interdental bone height.⁵ In sites where there is a loss of interdental tissues, the root can be partially covered while the gingiva can be thickened to resist progression of recession.



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Surgical Techniques

Free gingival grafts (FGG), introduced in the 1960s, were the first effective technique for increasing the gingiva around teeth. However, this technique requires harvesting tissue from the surface of the palate and is not generally successful for covering roots. Subepithelial connective tissue grafts (CTG) were introduced in the 1980s and use an internal palatal harvest technique that is far more comfortable for the patient and results in predictable root coverage.

The recipient site preparation method for an FGG requires exposing a vascular bed by raising and excising a tissue flap over the area to be grafted, while a CTG retains the tissue flap to partially cover the graft. Tunnel procedures for coverage of CTGs have been described more recently.⁶⁻⁸ The tunnel technique does not require surface incisions and is equally successful with allografts as with palatal tissue, thus providing a more comfortable postoperative course for the patient.^{9,10}

The Tunnel Technique

Recipient Site Preparation

As with most root coverage procedures, the roots are planed to remove any surface irregularities and clean and freshen the surface prior to grafting. The recipient site for the tunnel technique is prepared without the use of surface incisions. The soft tissue⁴ attachment to the cervical area of the tooth is detached by an incision with an Allen Intrasulcular Knife (Hu-Friedy, www.hu-friedy.com) within the sulcus that extends approximately 2 mm from the base of the sulcus to the alveolar crest. This intrasulcular incision provides access for apical blunt dissection of a pouch facial to each tooth with recession using an Allen Microsurgical Elevator (Hu-Friedy). The dissection continues laterally under the papillae adjacent to

each tooth to connect the individual pouches and create a tunnel. The recipient site is then extended apically and laterally with an Allen Modified Orban Knife (Hu-Friedy) to mobilize the pouch sufficiently to cover the graft and allow passive coronal advancement to the cemento-enamel junction (CEJ).

This type of site preparation works best in the maxillary arch where the anatomic environment presents few limitations and the quality of the marginal tissue is good. In the

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mandibular arch, one must exercise caution when dissecting near the mental foramen located apical to the second premolar. In addition, a shallow vestibule, aberrant frenal attachments, thin tissue, and prominent roots present challenges during the site preparation process with this technique.

The advantages of eliminating vertical incisions include better root coverage, improved postoperative course, and enhanced esthetics.^{11,12} The disadvantage of the tunnel technique is the greater technical difficulty of site preparation. It has traditionally been considered a somewhat time-consuming and technique-sensitive approach. Surgical experience

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and occasional use of papillary access incisions simplify the site preparation process.

Allograft Donor Tissue

The tunnel recipient site is suitable for either a palatal CTG or an allograft. Postoperative morbidity, possible side effects, and inconvenience for the patient associated with palatal

donor harvesting are reduced when using an allograft.^{13,14} In spite of the improved palatal harvesting with the CTG technique compared to the FGG procedure, many patients are reluctant to have soft tissue grafting because of fear of potential postoperative sequelae. Explaining that palatal surgery will not be necessary allays the patient's apprehension.

Allograft donor tissue offers unlimited tissue for the treatment of multiple teeth and sites in a single appointment. It also eliminates surgical time spent harvesting the



(1.THROUGH 3.) A 65-year-old patient presented with generalized severe recession and root surface abrasions in the maxillary arch. **(4.)** Example of acellular dermal matrix graft (AlloDerm) trimmed and placed on the surface before insertion into the tunnel preparation facial to the first molar through the central incisor (different patient).



palate. Conversely, the palate provides a limited amount of donor tissue of varying quality and limits the amount of soft tissue grafting that one can accomplish. A case example of a 65-year-old patient with generalized severe recession and root surface abrasions in the maxillary arch is presented in Figure 1 through Figure 10.

An acellular dermal matrix (ADM) is the most common allograft on the market today. Of all the ADM options currently available, the author prefers AlloDerm® (LifeCell, www.lifecell.com). AlloDerm was originally introduced in 1994 to treat burn patients, but it is now used for many surgical applications. Since 1994, numerous studies of AlloDerm use have been published in the medical and the dental literature, including randomized controlled trials, systematic reviews, and meta-analyses.^{2-4,15-19} No other allograft has such a vast amount of scientific studies and long-term history of safety and positive outcomes. When compared to CTG, AlloDerm has been shown to result in equivalent root

coverage, an increase in tissue thickness, and a gain in keratinized tissue.^{2-4,15,18}

Graft Insertion

The graft is inserted into the tunnel preparation and aligned facial to the teeth level with the gingival margin. Both the graft and overlying tissue are advanced simultaneously and secured at the level of the CEJ with a single continuous sling suture using 6-0 polypropylene with a C-17 needle (Hu-Friedy).²⁰

Post-Surgical Care

Patients generally have an uneventful postoperative period following grafting with the tunnel technique and require only one to two doses of pain medication. It is important to avoid trauma to the surgical site from mastication and oral hygiene procedures for the first 2 weeks. Post-surgical hygiene is commonly managed with antimicrobial rinses until gentle brushing can be resumed. An antioxidant gel, AO ProVantage Gel (PerioSciences, Inc., www.periosciences.com), recently became available. It provides both antimicrobial and anti-inflammatory activity without tooth staining. The topically active antioxidants also stimulate wound healing by promoting fibroblast migration.²¹

Final Considerations

Soft tissue grafting techniques evolved from effective yet invasive methods that required vertical releasing incisions and palatal donor tissue to minimally invasive tunnel recipient site preparation and use of allografts rather than palatal donor tissue. Recipient site preparation is accessed through the sulcus, which requires no surface incisions. Refining this technique using microsurgical instruments and non-irritating 6-0 monofilament sutures results in a more comfortable and less intimidating procedure and post-surgical period for the patient. It also enhances the esthetics of the outcome and allows the treatment of multiple teeth in a single surgical appointment.

Disclosure

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(5. THROUGH 7.) After insertion of the AlloDerm graft facial to the right first molar through the left second premolar, a continuous sling suture coronally advances and secures both the AlloDerm graft and the overlying tissue, completely covering the roots. **(8. THROUGH 10.)** Close to 100% root coverage seen at 8 months after grafting. The lone exception is the right first molar, an extruded tooth where complete root coverage is not possible.

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