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From Our Office to Yours....

Soft tissue grafting procedures to treat gingival recession and altered tissue morphology have greatly advanced over the years. Early attempts to transplant gingival soft tissue from one site to another have led to more sophisticated techniques. These new methods may include envelope pouch, tunnel or pinhole approaches.

Furthermore, today's soft tissue grafting procedures may include the use of biologic mediators and biomaterials to enhance the healing process and improve the periodontal phenotype.

While all soft tissue grafting techniques may provide reduction in gingival recession, some are more effective than others depending on the individual clinical situation.

This current issue of ***The PerioDontaLetter*** *reviews the soft tissue grafting procedures and materials currently being used, when to use them, and why.*

As always, we welcome your questions and comments.

Soft Tissue Grafting Procedures and Materials: When to Use Them and Why

The aim of soft tissue grafting is to augment the zone of keratinized tissue, increase tissue thickness, and when possible, achieve root coverage.

Root coverage procedures must not only cover exposed roots with tissues that are stable, healthy and esthetic, optimally they can result in tissue coverage that is well-adapted and adherent to the previously exposed root surface.

The ideal outcome of soft tissue grafting would be true regeneration of the periodontal attachment with new cementum, periodontal ligament, inserting connective tissue fibers, and new bone.

Identifying and selecting the appropriate cases for root coverage, and determining the predictability of success for a given case depends on a number of factors, including the etiology of recession, severity of tissue destruction and the clinician's ability to control contributing factors.

Grafting Procedures

Four basic surgical procedures are used in the treatment of recession defects.

Figures 1 and 2. Gingival recession, abfraction and tooth erosion caused significant damage and cosmetic concerns. The anterior segment was treated with Alloderm grafting resulting in complete root coverage and subsequent tooth protection.

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Autogenous Free Soft-Tissue Grafting

Autogenous free soft tissue grafting is indicated for sites where recession makes it difficult for the patient to clean, and where the tissue is chronically inflamed, progressively receding, esthetically unacceptable to the patient, and/or the roots are sensitive to a variety of stimuli, A zone of keratinized tissue is ideal around the margins of any restoration.

The **Free Gingival Graft (FGG)** is harvested from the surface of a keratinized area, usually from the palate, and placed on a de-epithelialized connective tissue recipient bed at the defect site.

Advantages of this technique are that it can be applied to both single and multiple recession defects, and it has the potential to increase the width of keratinized tissue, deepen the vestibular depth and modify the periodontal biotype.

Disadvantages are that palatal donor sites may be limited in the amount of tissue that can be harvested, heal more slowly and are more susceptible to bleeding and discomfort, and the color match of the graft at the recipient site may be less favorable than other types of gingival grafting. However, the success rate of enhancing the width of the gingival tissues is very high.

The **Sub-Epithelial Connective Tissue Graft (SECTG)** site is prepared similarly to the traditional FGG, but varies at the donor site where subepithelial connective tissue is harvested from beneath a keratinized zone of epithelium (usually from the palate) rather than from the surface epithelium.

The subepithelial connective tissue graft with flap coverage is a highly successful technique and considered the gold standard for root coverage in terms of predictability, percentage of coverage and long-term stability. Mean root-coverage outcomes of 91.1 percent and 95.8 percent for molar and non-molar sites, respectively, have been reported.

The AAP regeneration workshop found connective tissue graft-based procedures have shown the best outcomes for root coverage and increased keratinized tissue width, especially when treating Miller Class I and II gingival recession defects.

Various flap techniques have been developed to cover SECTGs for better circulation and graft survival. The dual blood supply of the flap and the recipient connective tissue site contribute to high predictability, great esthetics, and the donor site produces less postoperative discomfort when compared to free soft tissue grafts.

In addition to autogenous soft tissue grafting, free soft tissue grafting may also be performed using **Acellular Dermal Matrix Allograft (ADM)** and other **Xenograft** materials. Grafting with ADMs and xenografts are safe, viable options for patients who may not have enough native tissue to harvest.

These grafting techniques are short procedures which offer the potential to enhance soft tissue root coverage and increase the gingival thickness without a palatal harvest or the need for a second surgical site.

Pedicle Soft-Tissue Autografting

The **Coronally Advanced Flap (CAF)** can be used for single or multiple recession sites with adequate keratinized tissue apical to the root exposure. A flap is created including the papilla and gingival margin, and the entire complex is advanced coronally to cover the recession. Because the flap is similar in color, texture and thickness to that originally present at the recession defect, it

Figures 3 and 4. Recession is beginning in the presence of a very thin gingival biotype. Following the placement of a gingival graft, not only was the exposed cementum recovered, but a broad zone of keratinized gingiva was established.

Figures 5 and 6. The exposed root surfaces and cosmetic concerns were totally resolved with a sub epithelial connective tissue graft.

often has the potential to provide an excellent result.

Rotational flap procedures, such as the **Laterally Sliding Flap**, utilize a full or partial thickness flap design to move the tissue laterally to cover an adjacent recipient site. This allows adequate keratinized tissue from an adjacent location to be repositioned over an exposed root surface while remaining attached at the base.

The advantages of this technique are its inherent attached blood supply, relative ease, avoidance of the need for a second surgical site and predictable esthetic results.

In patients with high cosmetic expectations, coronally advanced flaps or laterally positioned flaps are excellent therapeutic options, assuming there is available adequate keratinized tissue.

These grafting procedures maintain the patient's own blood supply and minimize postoperative discomfort and potential complications because there is no need for a secondary site from which to harvest tissue.

The Tunnel Technique

The unique characteristic of root coverage tunneling procedures, also known as the Supraperiosteal Envelope Technique, is that a tunnel is created keeping the interdental papillae adjacent to the recession defect intact.

A horizontal tunnel is created starting with an apical approach through a pinhole, or more coronally through the sulcus. A connective tissue graft, acellular dermal matrix graft, or a collagen membrane is then placed in the tunnel, and the tissue is sutured coronally covering the exposed cementum. The absence of vertical incisions and inclusion of the existing blood supply is more likely to produce better esthetics with less discomfort.

The Pinhole Technique

The pinhole technique moves the patient's existing gingiva coronally to cover the exposed root surface similar to the tunnel technique.

A sterile needle is used to penetrate the alveolar mucosa apical to the recessed areas. This creates a pinhole through which specific instruments can be inserted to elevate a full-thickness flap without severing the interproximal papillae.

Like the tunnel technique, the pinhole technique eliminates the need for a donor site, keeps the papillae intact, and offers a bilaminar blood supply, increasing the chance for revascularization of the graft and more predictable root coverage.

Grafting Materials

The **Autogenous Soft Tissue Graft** is considered the gold standard in grafting materials as it includes the patient's own vital cells, such as keratinocytes and fibroblasts.

True periodontal regeneration is the goal. But there is limited human histologic evidence that true periodontal regeneration has actually been achieved with an autogenous tissue graft.

Acellular Dermal Matrix (ADM) Allografts — sterilized and medically-processed soft tissue usually obtained from human tissue banks — provide a scaffold on which patients can use their own cells to incorporate new blood vessels and grow new soft tissue cells in the graft.

Numerous research studies have shown this technique to be safe and effective in treating dental soft tissue conditions. Various ADM grafting materials are available, including AlloDerm Regenerative Tissue Matrix, Puros Dermis Allograft Tissue Matrix, PerioDerm Acellular Dermis, Oracle, and SureDerm.

Xenografts — sterizilized and processed animal tissue (generally derived from a cow or pig) — provide an unlimited supply of tissue readily available to treat more areas of recession at one time. These graft

materials are primarily used to augment tissue thickness instead of increasing the width of keratinized tissue.

Collagen Membranes have shown promising results in guided tissue regeneration. Several properties make them attractive candidates for use as barriers. These include the inhibition of epithelial migration and promotion of new connective tissue attachment; the ability to aggregate platelets, thereby facilitating wound stabilization and maturation; the promotion of cellular migration and wound closure; the elimination of the need for reentry surgery; and the ability to augment tissue thickness.

Xenogenous collagen membranes in particular are biocompatible with the human body. Their characteristics lead to better wound healing by promoting primary wound coverage, angiogenesis, space creation and maintenance, and clot stability, making these membranes a reliable alternative for use in root coverage procedures.

Studies of **Porcine Enamel Matrix Derivative (EMD), Recombinant Human platelet-derived growth factors (rhPDGF) and platelet concentrate** suggest that EMD, rhPDGF and platelet concentrate may enhance healing in grafting. A histologically more appealing type of graft attachment has been demonstrated with the use of EMD or rhPDGF. Studies have shown sites treated with EMD and rhPDGF exhibited signs of new cementum, periodontal ligament fiber and islands of bone after six months of healing.

Xenogeneic Bioabsorbable Collagen Matrix (XBCM) — a bovine- or porcine-derived biologic plastic which does not contain vital cells — is designed primarily for augmenting gingival thickness.

While short-term studies show these alternatives may be effective in augmenting keratinized tissue, further studies are needed to support stable long-term clinical outcomes.

The two commercially available XBCM products are Mucograft and DynaMatrix.

Tissue Engineering: The Future of Grafting

Tissue engineering — the application of biotechnologies to facilitate tissue regeneration — shows great promise in improving the future of soft tissue grafting.

The application of biologic signaling molecules (e.g., growth/differentiation factors and plasma preparations), cells (stem cells) and/or scaffolding matrices may promote regeneration of new tissue characteristically and functionally indistinguishable from the original tissue.

In addition to the various biologic agents currently available, new agents and cell-based therapies are under investigation. These include using platelet rich fibrin (PRF) membrane for root coverage on the labial surfaces of the mandibular anterior teeth for wound healing and soft-tissue reconstruction. Adding stem cells to soft tissue grafts may enhance the soft tissue quality.

Tissue engineering has the potential to alter gingival phenotype. It can change a thin phenotype into a thick phenotype, increase the bone volume of the mucogingival complex, and increase the gingival resistance to inflammatory or restorative trauma.

These new and exciting clinical applications may be applied in areas with a compromised periodontal phenotype where no treatment would have been considered in the recent past.

Conclusion

When selecting soft tissue grafting materials and procedures, it is most important to consider the source of blood supply for the grafts and whether the grafts contain vital cells. Based on these two major biologic features, clinicians can select the most optimal material to achieve the root coverage goal.

Figures 7 and 8. Significant gingival recession and cementum erosion was totally repaired with root shaping, cervical composite and pinhole type surgery.

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