CASE REPORT

Guided Tissue Regeneration to Treat Mucogingival Defects Using a Collagen Sponge as a Space-Filler Material for Cell Proliferation: Clinical Case Reports With Long-Term Follow-Up

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Introduction: Guided tissue regeneration (GTR) protocols for root coverage have proposed space-filler artifacts to create an area between the membrane and the root surface to provide adequate space for cell migration. Extensive instrumentation of the root to obtain a concave shape, suturing of the membrane to keep it convex, or the use of titanium-reinforced membranes are some of the most common techniques for creating the space needed for regeneration. The primary objective of these case reports is to show the clinical application of collagen sponge as a space-filler material in cases in which GTR procedures were used to treat marginal tissue recession.

Case Presentation: These case reports describe the results obtained with root-coverage procedures of a Miller Class I defect on the buccal surface of tooth #11 in two patients. Bioabsorbable polyglactin 910 and non-absorbable expanded polytetrafluoroethylene barrier membranes were used along with a collagen sponge interposed on the root surface. It should be emphasized that the use of the collagen sponge was to create a biologic space and thereby induce cellular proliferation at the site of the recession. Three years after surgery, the treated areas showed complete root coverage with an increase of keratinized and attached gingiva with appropriate contour and thickness.

Conclusion: These results demonstrate the possibility of using a collagen sponge as a space-filler material in cases in which the principles of GTR are used in the successful treatment of root recession. Clin Adv Periodontics 2016;6:9-16.

Key Words: Collagen; gingival recession; guided tissue regeneration.

Background

Obtaining root coverage for esthetic and functional purposes has become an important part of periodontal therapy. The

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advantages resulting from the treatment of areas with marginal tissue recession (MTR) include increasing the width and thickness of the gingiva, reduction of root hypersensitivity, prevention of root caries, and alteration of the topography of the cervical marginal tissue to facilitate the control of bacterial plaque.¹

MTR is a clinical entity found commonly in everyday periodontal practice. A study in the United States² showed that 23.8 million people had recession, and, of these, 58% had an average of 3 mm at one or more locations. A positive correlation was observed with age and an increased prevalence, extent, and severity of gingival recession. Most of these defects are located on the buccal surfaces, occurring more frequently in males than females.
Currently, root coverage procedures involving a subepithelial connective tissue (CT) graft are considered to be the gold standard, providing long-term stable and predictable outcomes. However, because of the lack of evidence, it is still unclear whether this procedure can result in the regeneration of the periodontal structures.

The concept of guided tissue regeneration (GTR) was introduced in the literature in 1982. Initially, this technique was used to treat intrabony and furcation defects. Subsequently, it was introduced for root coverage with clinical results comparable with traditional procedures in terms of clinical attachment gain. The new CT attachment was histologically documented in humans on previously exposed root surfaces.

The primary objective of these case reports is to describe the usefulness of a collagen sponge (CS) used as a space-filler material when treating Miller Class I recessions following GTR guidelines. The clinical parameters of interest are probing depth (PD), MTR, keratinized tissue (KT), and attached gingiva (AG).

Clinical Presentation

Two patients, a 45-year-old female (patient 1) and a 28-year-old male (patient 2), both self-reported non-smokers in good general health and with no contraindications for periodontal surgery, were referred in 2000 for treatment of mucogingival deformities to a private practice (JC) in Londrina, Paraná, Brazil. The patients reported esthetic concerns and exaggerated sensitivity associated with tooth #11.

Both cases presented with an MTR of 3 mm on the buccal surface, PD of 1 mm, and KT of 3 mm (Figs. 1 and 2). The areas were diagnosed as gingival recession, which was likely caused by excessive pressure during toothbrushing. After discussion of treatment options, both patients signed an informed consent for GTR treatment.

Initial photographs were taken and documented before any periodontal therapy. Using a periodontal probe, initial PDs, MTR, and the amount of KT and AG were recorded. Before the surgical procedures, instructions for oral hygiene and modification of traumatic brushing were given. Intraoral mouthwash with 0.12% chlorhexidine for 2 minutes followed by extraoral face cleaning containing 2% chlorhexidine was used for antisepsis.

Case Management

After local anesthetic infiltration with 2% lidocaine with epinephrine concentration of 1:100,000, a trapezoidal flap with a large base was made on the buccal surface of tooth #11 using a horizontal incision, followed by two divergent vertical incisions extended through the mucosa (Figs. 3a and 4a). A full-thickness flap was displaced 4 mm apical to the crestal bone, and then a partial dissection was created to a point at which the flap was free of tension and could be positioned passively over the defect. Subsequently, the interproximal papillae were de-epithelized, the root was debrided, and an odontoplasty was performed using burs and curets to reduce the edges and obtain a more concave profile (Fig. 3b). No root modification agents were used. A CS hydrated previously in saline solution was adapted to the exposed roots (Figs. 3c and 4a).

In patient 1, a bioabsorbable polylactic acid membrane was trimmed to cover the exposed root and 3 mm surrounding the adjacent bone. The membrane was then secured at the level of the cemento-enamel junction (CEJ) with a suture using an absorbable polyglactin 910 suture (Fig. 3d). The flap was positioned coronally 1 mm above the CEJ covering the entire membrane and sutured with 4-0 silk material. The vertical incisions were sutured with absorbable polyglactin 910 suture (Fig. 3e).

In patient 2, a non-absorbable expanded polytetrafluoroethylene membrane was trimmed to cover the exposed root and 3 mm surrounding the adjacent bone. The membrane was secured at the level of the CEJ with a suture using a nylon 6-0 suture. Then, it was flipped coronally, and the CS was...
FIGURE 3 Patient 1. 3a A trapezoidal flap was made. The incision and flap reflection were completed to allow for tension-free primary closure. 3b Root preparation with curets and diamond burs to create a concave root profile to provide a more favorable surface topography. 3c A CS was placed on the prepared root surface. 3d The bioabsorbable membrane was applied over the CS. 3e The flap was coronally positioned and sutured 1 mm coronal to the CEJ.
placed along the root surface (Fig. 4a). The membrane was re-
placed in its original position, and the flap was advanced co-
ronally 1 mm above the CEJ and sutured with 4-0 silk material
(Figs. 4b through 4d). No periodontal dressing was used.

The patients were instructed regarding postoperative care, which included a restriction on brushing the surgical site for 4 weeks and to avoid any compression of the area. The 0.12% chlorhexidine was used locally twice a day for 2 minutes during the first 2 weeks, and mouthwash was restricted to avoid any flap tension. Ibuprofen (600 mg every 6 hours for 3 days) for pain and amoxicillin (500 mg every 8 hours for 7 days) for infection were prescribed.

Patient 1 returned weekly for prophylaxis during the first month. Afterward, the patient returned every 6 months for an additional 3 years for prophylaxis.

Clinical Outcomes

The preoperative and postoperative results in relation to PD, MTR, KT, and AG are summarized in Table 1.

For both patients, the clinical measurements 3 years after the initial surgical technique resulted in the same outcomes: 1) complete root coverage; 2) 3 mm of AG; 3) an increase of 1 mm in KT; and 4) an increase of 3 mm in clinical attachment gain. The final esthetic results were acceptable in terms of both color match and tissue contour, and the patients no longer complained of hypersensitivity (Figs. 8 and 9). Additionally, no gingivoplasty was needed to improve the esthetic appearance.

Discussion

The treatment of MTR through the techniques of periodontal plastic surgery has proven to be efficient and predictable. However, controversies exist regarding the type of attachment formed over the root. With the introduction of GTR techniques, predictable results were achieved for restoration of supporting tissues that were lost as a consequence of inflammatory periodontal disease. By excluding the epithelial and gingival cells with a membrane, the site could be repopulated with cells capable of regenerating lost tissues.

An important fact to remember is that recession is associated with loss of attachment and bone, and the GTR principles were adapted to root-coverage procedures to restore the periodontium structures.

Both non-absorbable and bioresorbable membranes are used with this purpose. The main advantages of bioresorbable membranes include elimination of a surgical reentry procedure to remove the material, providing a less expensive and less time-consuming treatment.

The non-absorbable membrane has an advantage of enabling an additional coronally repositioned flap to the level of the CEJ at the time of membrane removal in cases of premature membrane exposure that would lead to recession. The original tech-
Some artifacts have been created, and some materials have been used together to permit adequate space. Hand instrumentation of the root surface to obtain a concave shape, suturing the membranes to keep it convex,10 the use of a titanium-reinforced membrane,11 and bone-filler materials12 are the most common methods to create the space desired.

However, to the best of the authors’ knowledge, no reports exist in the literature on the use of the CS as space-filler material for the treatment of these defects. This material is compatible with the surrounding tissue and is physiologically metabolized, and its hemostatic properties facilitate wound maturation and stability by enhancing initial clot adaptation and fibrin linkage formation.13 Also, it is easy to handle, inexpensive, and readily available.

The GTR protocol was used in these cases with both bio-absorbable and non-absorbable membranes along with the CS. The purpose of the CS was to maintain the space between the membrane and the root, creating a scaffold for cell proliferation.

The reason to select the GTR principle instead of CT graft or coronally positioned flap14 was based on the morphology of the root wear. Both cases presented with advanced root concavities that produced adequate contour and space for cell proliferation, which facilitated the use of the membranes.

It is interesting to note that, for patient 2, in which the reopening procedure was necessary for membrane removal, the newly formed tissue was positioned at the level of the CEJ and had normal appearance compared with traditional GTR reentry procedures.

The outcome of complete root coverage and a gain in KT with minimal PD, as demonstrated in these case reports, is in agreement with previous studies using GTR in which different materials were used to treat the recession.15 Additionally, the healing process was uneventful, with the patients experiencing little to no discomfort. The color of

**TABLE 1 Preoperative and Postoperative Results for Tooth #11 at Baseline and 3 Years**

<table>
<thead>
<tr>
<th>Clinical Parameters (mm)</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Year 3</td>
</tr>
<tr>
<td>PD</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MTR</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>KT</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>AG</td>
<td>2</td>
<td>3</td>
</tr>
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tissues and the gingival contour had a normal appearance and were stable during the 3-year observation period, during which no changes in the gingival margin were detected.

The results of these long-term clinical case reports suggest that either a bioabsorbable or non-absorbable membrane used together with a CS to provide an adequate scaffold for cell migration can be an effective and predictable procedure to treat MTR by GTR principles. However, this finding should be further tested in a study with a larger sample size.
Summary

<table>
<thead>
<tr>
<th>Why are these cases new information?</th>
<th>These cases suggest that a CS could be used as a scaffold for cell migration when used in conjunction with the principles of GTR to treat defects associated with MTR.</th>
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<tbody>
<tr>
<td>What are the keys to successful management of these cases?</td>
<td>For regeneration to occur, adequate space for cell proliferation between the membrane and the root surface must be created and maintained.</td>
</tr>
<tr>
<td>What are the primary limitations to success in these cases?</td>
<td>Limitations include lack of regular maintenance care and membrane exposure during the early healing phase.</td>
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Acknowledgment

The authors report no conflicts of interest related to this case report.

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References


○ indicates key references.