The treatment aim of vertical periodontal defects is the regeneration of a true functional attachment. By definition, periodontal regeneration involves the reconstruction of three different tissue types: cementum, periodontal ligament and bone. The use of Straumann® Emdogain™ offers an easy-to-apply treatment option with capabilities to regenerate periodontal tissue as shown in several pre-clinical and human histological case reports2-5 and randomly controlled clinical trials.1

Toward successful treatment of vertical defects with Straumann Emdogain

Decisions regarding which regenerative material or technique to use for a particular patient normally focus on the size and shape of the defect. A clinical decision tree for the treatment of periodontal intraosseous defects has been published by Froum et al. The clinical decision tree (Fig. 1) recommends that Emdogain should be used in periodontal osseous defects to promote the regeneration of the tissues in the periodontium. The addition of other materials is based on defect dimensions and the need to have additional support during the healing period.6

Application of clinical concepts

<table>
<thead>
<tr>
<th>Deep, well-contained defect</th>
<th>EMD alone</th>
<th>Coronal flap (if necessary)</th>
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<tbody>
<tr>
<td>Moderate to deep, noncontained intraosseous defect</td>
<td>EMD + graft</td>
<td>Coronal flap (if necessary)</td>
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Fig. 1 Clinical decision tree for treatment of periodontal defects with Emdogain

In practical application, as general rule in our practice, we primarily use Straumann Emdogain for treatment of intrabony defects. Depending on the size and morphology of the defect, we will then add a bone graft material, such as demineralized freeze-dried bone allograft (DFDBA), as needed.

For example, it is very important to select defects that lend themselves to flap support, when Straumann Emdogain is employed as a monotherapy. We also exclusively use Straumann Emdogain in more moderate defects. This is because bone grafts are not as necessary in this type of application and have been a valuable alternative to resective therapy. More extensive, complex defects frequently require the addition of a bone graft material for flap support.

A comparison of two clinical case reports

Initial situation

Two patients were referred to our practice by their general dentists, both due to demonstrated clinical evidence of attachment loss with increased probing depth. We believe it is important that restorative dentists and periodontists work together in a team approach for optimal patient outcomes. Vertical lesions have a much higher risk of continued attachment loss and regenerative interventions should be considered early in their diagnosis. The periapical radiographs presented two different situations. Patient #1, a 46-year-old female, presented with what appeared to be a deep, well-contained defect on the distal aspect of the left mandibular first molar, probing at 10+ mm (Figs. 2a and 2b). The radiographs of patient #2, a 51-year-old female, confirmed the presence of a deep vertical defect on the distal aspect of the right mandibular first molar...
The lesion showed an 8 mm defect along the distal aspect of the first molar extending past the distal-facial line angle. As we will not know until we enter the sites what materials might be necessary, patients are often presented with the possibility of the various materials that might be needed in order to ensure the success of treatment.

The goal of both treatments was not only to decrease the clinical probing depth, but to also gain clinical attachment and realize a gain in bone. Ultimately we wanted to minimize the vertical component of the defect as much as possible. In addition, regenerative therapy has the unique advantage of preserving crestal bone height and soft tissue contours for improved esthetics over resective approaches.

In consideration of our goal of periodontal regeneration for this lesion, there are only a limited number of materials and techniques known to result in human histological evidence of regeneration.2-4 This means that evidence of new cementum, new alveolar bone and new periodontal ligament must be demonstrated. Basically, in our practice we choose between bone graft substitutes, Straumann® Emdogain™ or a combination of these materials.

Surgical Approach

From the standpoint of technique, we prefer sulcular incisions to allow for conservation of as much tissue as possible. Following reflection of full-thickness facial and lingual flaps, extensive root preparation is done. While ultrasonics and hand instruments are used, their effectiveness and ease of access to the lesion are limited and can become compromised when dealing with deep lesions like this. Because of this, we often employ the use of high speed finishing burs and diamonds to facilitate easier and more complete root preparation. The use of a 24% EDTA solution (Straumann® PrefGel®) to the prepared root surface for two minutes completes this process. After thorough rinsing of the site with sterile saline, we pack the defect with saline-soaked gauze to control bleeding.

At this point in the procedure, we make a final decision on which material or combination of materials or techniques will be employed. Because our primary goal is periodontal regeneration with predictable results, Straumann® Emdogain is our treatment of choice and was utilized in both cases. For Patient #1, we decided to use Emdogain as a monotherapy due to the depth and morphology of the defect. We were able to get excellent flap support with the existing bony walls and therefore, did not need any additional materials (Fig. 2c). However, in the case of Patient #2, as the lesion wrapped around the facial (Fig. 3b), a bone graft substitute (DFDBA from LifeNet Health®; now available directly from Straumann) was also packed in the site following the application of Straumann Emdogain for flap support prior to flap closure. Our first application is with Emdogain to saturate the root surface to initiate the regenerative process. Evidence suggests that enamel matrix proteins, a constituent of Emdogain, function not only to stimulate cell proliferation, but also function as signalling proteins in selecting for cells to differentiate into cementoblasts.7 This is an essential step in periodontal regeneration. Following this initial application, we then pack DFDBA that has been hydrated with sterile saline directly into the defect. Combination therapy using Emdogain with bone grafts has been shown to be osteopromotive.8 Closure was completed with a non-braided, non-absorbable continuous suture.

For all regenerative cases, the sutures are left in place for two weeks to maximize wound stabilization, as seen in Fig. 3c. During that time there is no periodontal dressing used. The patient is instructed in the use of a chlorhexidine swab twice daily. We also place these patients on an antibiotic (usually doxycycline) for the first ten-day post-operative period. Thereafter, the patient is seen at two-week intervals over the next 8 weeks for plaque control and post-operative follow up.

We gently probe the site at a final post-operative visit at eight weeks and then place the patient on periodontal maintenance every three months. We generally do not take a radiograph of the site until six to nine months post regenerative treatment. With regard to regeneration, one of the issues that we talk to patients and general dentists about is that many times these lesions continue to improve radiographically over time, provided that the patient is on a strict three-month maintenance schedule. While we generally alternate maintenance visits with our referring dentists for patients that are comparatively low risk, regenerative patients are seen in our office exclusively for the first six months after surgery. This is because the regenerative site(s) is managed with a strict treatment and monitoring protocol in our office using modified ultrasonics, focused plaque control instructions and, in more severe cases, long-term anti-inflammatory medications. We believe that it is important that the periodontist direct the post-operative management for this critical six-month period. Following this first six-month period the patient is usually returned to an alternating schedule with the general dentist.
Clinical results

Patient #1
The clinical results demonstrate a 7 mm gain in clinical attachment with minimal probing depth (Fig. 2d). The radiograph demonstrates favorable bone response with increased fill and density, which is an indicator of an excellent regenerative response (Fig. 2e). This region is now amenable to long-term maintenance care.

Patient #2
Similarly, the clinical results demonstrate a 5 mm gain in clinical attachment with minimal probing depth (Fig. 3d). The radiograph demonstrates favorable bone response with increased fill and density which is an indicator of an excellent regenerative response (Fig. 3e). This region is now amenable to long-term maintenance care.
Conclusion

Periodontal regeneration in the treatment of periodontal diseases is preferable to both patients and clinicians, because we have the opportunity to restore lost hard and soft tissues as well as decrease probing depths. With these goals in mind, we have found Straumann® Emdogain™ either alone or in combination with a bone grafting material can provide safe, effective, and predictable results in our practice. Clearly, the decreased probing depths will allow for easier and more effective maintenance care while preserving function and esthetics. In most cases, we prefer to avoid pre-surgical root planing when considering periodontal regenerative options, and move directly into the reconstructive phase following a plaque control program with the patient. It is important that periodontists and referring dentists establish protocols for identifying these patients at high risk who may benefit from advanced regenerative therapies early in their diagnosis. Restorative care will be more predictable, easier maintained and the patient will have been reconstructed with a new attachment apparatus which replicates the form and function of their original anatomic structures. That is what the team approach is all about—optimal clinical outcomes in the patient’s best interest. We are fortunate to work with a wonderful team of referring dentists and hygienists in this regard and would encourage our periodontal colleagues to actively engage their dental community to function as their resource in achieving these outcomes for the patients we serve.

References