

## CASE STUDY

# The treatment of multiple gingival recession defects with connective tissue grafting and enamel matrix derivative in a private practice setting: Two case reports

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**Abstract**

**Background:** Dentofacial esthetics has become a mainstay treatment in periodontics. For a periodontal private practice to succeed in a referral-based environment, predictability and stability in treatment results are crucial. The scientific literature provides a guide to successfully treating multiple recession defects with non-carious cervical lesions and lingual recession. These case reports show how the use of biologic mediators, proper case selection, and proper surgical technique may provide a better treatment outcome for our patients.

**Methods:** Two patients with multiple gingival recession defects were treated with autogenous tissue grafting in conjunction with the application of enamel matrix derivative (EMD) to attempt root coverage. Based on the Cairo classification, the recession defects were classified as type I in the maxillary buccal and lingual recession in the mandibular anterior. There were areas of no attached gingiva, loss of enamel, and the presence of non-carious cervical lesions.

**Results:** At 3-month post-treatment in case #1 and 6-month post-treatment in case #2, satisfactory esthetic results for the patients and clinician were achieved. These short-term follow-ups were favorable for root coverage and soft tissue healing, especially at the 1-week visit. There was noticeably less edema and erythema. Additionally, dental hypersensitivity was no longer reported for both patients.

**Conclusion:** By using biologic mediators, such as an EMD combined with connective tissue grafting, both multiple recession defects with non-carious cervical lesions, and lingual recession cases, can be treated successfully in a private practice setting. Using an EMD provides no additional risks to patients, may result in faster healing, and would afford stability of long-term success by influencing true periodontal regeneration.

**KEYWORDS**

autogenous connective tissue grafts, biologic mediators, EMD, mucogingival surgery, root coverage

**INTRODUCTION**

Root coverage of recession defects has been studied abundantly and is considered a predictable treatment in many cases. In a Cochrane systematic review, it was noted that the use of a subepithelial connective tissue grafting (CTG), often in conjunction with biomaterial, remains the gold standard in obtaining root coverage.<sup>1</sup> This is further supported by the recent best evidence consensus on biologics used for root coverage. This new systematic review will

show that root coverage is an extremely predictable procedure to offer our patients. Expert opinion confirms that use of biologics can provide us many benefits for our patients healing processes, especially if the main goal is true periodontal regeneration.<sup>2</sup> Ideal coverage of recession defects should include the restoration of the protective functional morphology of the mucogingival complex, recreation of the esthetic balance between marginal tissues and the adjacent tooth root and crown, and the regeneration of the lost attachment apparatus, including the formation

of new cementum with inserting connective tissue fibers and supporting alveolar bone.<sup>3</sup> Unpredictability in root coverage procedures will often occur in recession defects due to underlying conditions, such as root dehiscences, bone loss, a thin gingival phenotype, loss of interproximal clinical attachment, frenal pull, or other anatomic factors such as the presence of non-carious cervical lesions.<sup>4,5</sup> This unpredictability necessitates a different approach to the treatment of these defects that are also common in a private dental practice. Thicker-free gingival grafting and CTG have been reported as having greater success in these types of defects.<sup>6</sup> There are still many anatomical limitations to the use to these thicker grafts that will necessitate a different approach in many challenging cases.<sup>7</sup>

The use of mediators and growth factors is well established in periodontal surgery and is used daily in our practice. Human histology has shown that when compared to traditional grafting techniques, the use of biologic modulators increases the likelihood of obtaining root coverage in challenging defects, and it aids in true periodontal regeneration during these procedures.<sup>8</sup> Biologic modulators work by prompting the body to induce growth factors from the surrounding environment, helping the natural regenerative processes that occur during healing.<sup>9</sup> The use of enamel matrix derivative (EMD) induces a true regeneration of the connective tissue attachment, alveolar bone, and cementum.<sup>10–12</sup> In many studies, the use of EMD has been shown to help cover recession defects in conjunction with both coronally advanced flaps (CAF) alone, and in conjunction with a subepithelial connective tissue (SECT) graft.<sup>13,14</sup> The mechanism of action involves the enamel matrix protein amelogenins promoting both proliferation and migration of different cells of the periodontium.<sup>15</sup>

Knowing the potential benefits of EMD to induce periodontal regeneration, two challenging cases were chosen to represent common clinical scenarios that often present themselves in a private clinical practice. In lieu of the use of a subepithelial CTG alone, EMD was applied to the root surfaces to increase predictability and stability. These case reports demonstrate the capability of biologic growth factors to achieve stability in complex gingival graft cases. Therefore, the aim of this case report was to demonstrate the use of EMD in the treatment of multiple gingival recession defects in the maxillary area and the mandibular anterior lingual recession.

## MATERIALS AND METHODS

Two healthy patients were referred to our private practice for gingival recession defects. Based on the Cairo classification, the recession defects were classified as type I in the maxillary buccal and interproximal area and lingual recession in the mandibular anterior.<sup>4</sup> There were areas of no attached gingiva, loss of enamel, and the presence of non-carious cervical lesions. Some of them were pre-

viously restored. Autogenous tissue grafting was used in conjunction with the application of EMD to attempt root coverage.

## Case 1

A 55-year-old female patient was referred by her general dentist to our private practice with a chief complaint of recession. She reported general sensitivity to cold throughout the mouth. The patient denies having been diagnosed with sleep apnea, denies snoring, waking during the night, or feeling fatigue in the morning. Clinically the patient tested negative for temporomandibular joint disorder, was negative in a complete oral cancer screening, and had a facial symmetry within normal limits. An anterior open bite exists between #6 and #11, and there was a presence of gingival asymmetries between #5–7 and #10–12 in the upper maxilla (Figure 1A). The etiology of the patient's bruxism was airway disease, and the etiology of the attrition and recession was the bruxism. The etiology of the periodontal disease was the impacted #17 along with bacterial plaque and a susceptible host.

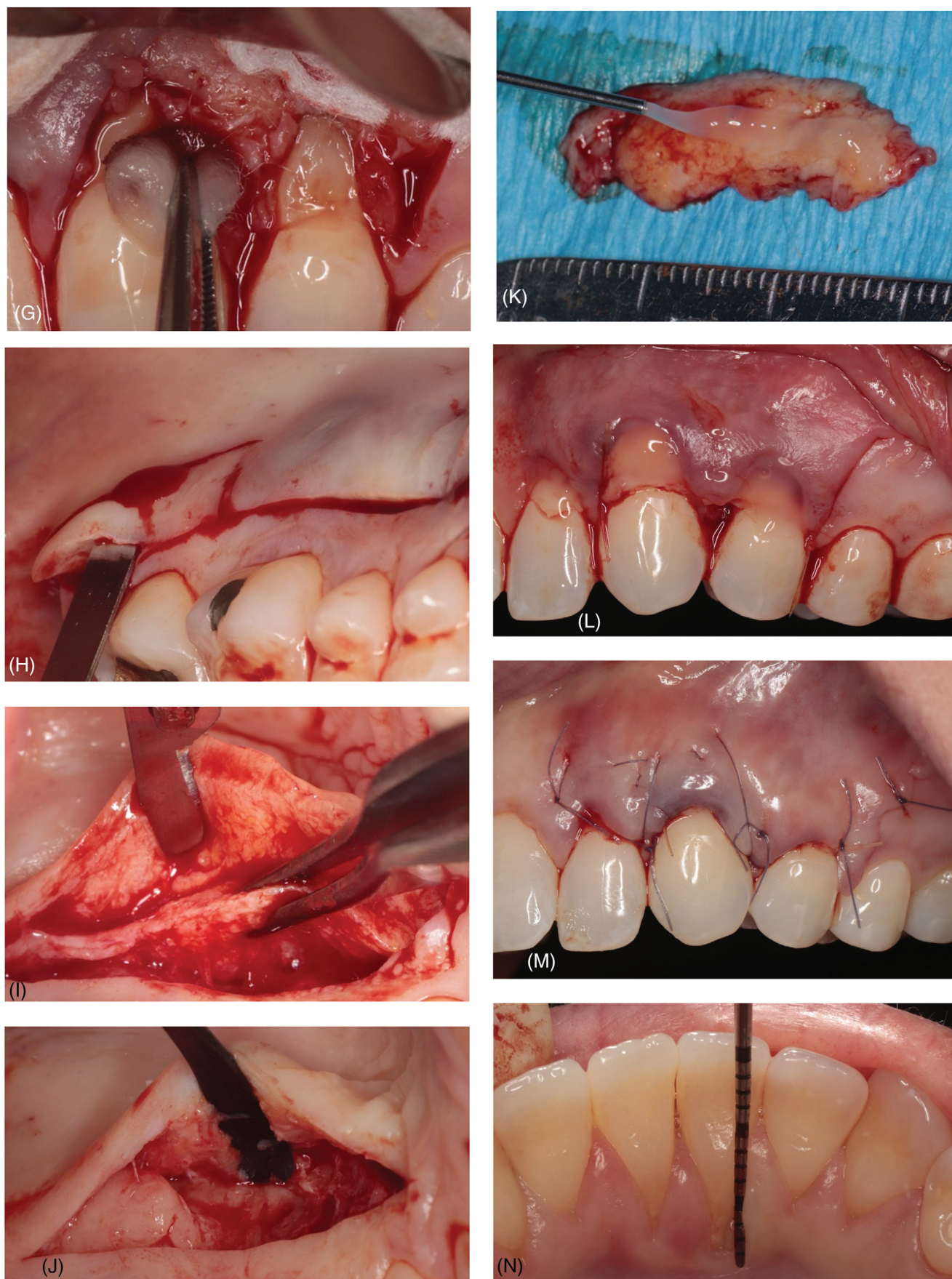
The surgical procedure was performed by one trained and skilled periodontist (ETS). The patient was premedicated with amoxicillin 500-mg tid starting the day before the procedure. After nitrous oxide sedation and local anesthesia (2% lidocaine with 1:100k epinephrine and 0.5% marcaine with 1:100k epinephrine), the recession defects were between #10 and #12 (Figure 1B). A coronal advanced flap was raised on the distal of #12 (Figure 1C). A tunnel technique was performed (Figure 1D). Root planings with hand instruments were used to eliminate root defects (Figure 1E). Tooth recession defect underwent thorough root planing with diamond finishing burs and de-epithelialization of the papillae was also performed (Figure 1F). The root surfaces were further cleaned and etched with citric acid to open the dentinal tubules (Figure 1G). A single palatal incision utilizing a microscalpel to dissect the connective tissue was performed (Figure 1H). A SECT graft was then harvested via the trapdoor technique (Figure 1I). There is a presence of exostoses on the palatal area (Figure 1J). The SECT graft was coated with EMD (Figure 1K). The EMD was also applied to the exposed root surfaces (Figure 1L). The subepithelial CTG was sutured to the root surfaces with resorbable sutures, and then the flap was advanced and closed utilizing polylactic acid sutures using an interrupted and mattress technique (Figure 1M). Palatal donor site was closed with 6-0 chromic suture.

Clinical evaluation of the lingual recession of the anterior mandible between #23 and #26 was performed (Figure 1N). A partial thickness flap on the lingual surfaces was elevated, and the papillae were de-epithelialized (Figure 1O). Scaling and root planing with hand instruments were performed. A free gingival graft was harvested from the tuberosity area



**FIGURE 1** (A) Patient #1, clinical evaluation of the upper maxilla with gingival asymmetries between #5–7 and #10–12 (B) The clinical buccal view shows multiple gingival recession defects on teeth #s 10–12 with Class V composites placed on teeth #s 11 and 12. (C) Coronally advanced flap design with a modified vertical release on the distal of #12 (D) Tunnel technique underneath the papilla between teeth #s 10 and 11. (E) Root planing with a chisel after the removal of Class V restorations. (F) Tooth recession defect underwent thorough root planing with high-speed rotary instrumentation and diamond finishing burs. De-epithelialization of the papillae was also performed. (G) The root surfaces were further cleaned and etched with citric acid. (H) Single palatal incision utilizing a microscalpel to dissect the connective tissue. (I) Subepithelial connective tissue was harvested via the “trapdoor” technique. (J) Please note the exostoses that were reduced on the palatal area. (K) The subepithelial connective tissue graft was coated with enamel matrix derivative. (L) The enamel matrix derivative was applied to the exposed root surfaces prior to the placement of the connective tissue. (M) The subepithelial connective tissue graft was sutured to the root surfaces with resorbable sutures, and then the flap was advanced and closed utilizing poly(lactic acid) sutures using an interrupted and mattress technique. (N) Miller Class I lingual recession defects on tooth #s 23–26, most severe on tooth # 25. (O) A split-thickness flap on the lingual surfaces was elevated and the papillae were de-epithelialized. Please note the severe bony fenestrations on teeth #s 24 and 25 that extend close to the apex. These roots are significantly outside the alveolar housing. (P) A free gingival graft was taken from the tuberosity area, and it was de-epithelialized before placement. (Q) Enamel matrix derivative was applied to the exposed root surfaces. (R) The de-epithelialized free gingival graft was placed upon the root surfaces and sutured with 6.0 resorbable chromic gut sutures. (S) The flap was then coronally advanced and closed with 6.0 Glycogen sutures. (T) One-week post-operative view of the lingual graft. (U) One-week post-operative view of the facial graft teeth #s 10–12. (V) Two-week post-operative view of the lingual graft. (W) Two-week post-operative view of the facial graft prior to suture removal. (X) Healing 2-month post-treatment. (Y) Healing 3-month post-treatment. (Z) Healing 3-month post-treatment.





**FIGURE 1** Continued



**FIGURE 1** Continued



**FIGURE 1** Continued

and de-epithelialized before placement, creating another SECT graft (Figure 1P). After irrigation, the EMD was also applied to the exposed root surfaces (Figure 1Q). The de-epithelialized free gingival graft was placed upon the root surfaces lingual to tooth #s 23 through 26 with resorbable chromic 6-0 chromic gut (Figure 1R). The flap was then coronally advanced and secured with 6.0 Glycogen sutures (Figure 1S). The donor site was also closed using interrupted sutures with 6.0 chromic gut. Postoperative medications included amoxicillin 500-mg tid, ibuprofen 600-mg prn 4–6 h, tramadol 50-mg prn 4–6 h, and 0.12% chlorhexidine gluconate mouth rinse to be used bid.

The patient was seen at a 1-week post-op appointment at which point oral hygiene instructions were given, includ-

ing to brush with a soft toothbrush (Figure 1T,U). Flossing was also resumed at the 2-week postop as well as a discontinuation of the chlorhexidine gluconate rinse. Post-op photographs were taken at 2 weeks (Figure 1V,W), 2 months (Figure 1X), and 3 months (Figure 1Y,Z), after mucogingival surgery.

## Case 2

A 65-year-old female patient was referred by a referral to our private practice for gingival recession in the upper right quadrant (Figure 2A). The patient denied allergies, sleep apnea, smoking, and is a self-reported grinder who wears an





**FIGURE 2** (A) Patient #2—associated deep non-cervical carious lesions that are quite deep including the loss of some of the enamel from the CEJ. (B) Tooth recession defects underwent thorough root planing with curettes and contouring of the non-carious cervical abfraction lesions with flame-shaped finishing carbide burs. (C) A long subepithelial connective tissue (SECT) graft was then harvested via the trapdoor technique and sutured in place with 6.0 chromic gut. (D) The enamel matrix derivative was applied to the exposed root surfaces underneath the connective tissue that was sutured to the connective tissue in the interproximal area. (E) The subepithelial connective tissue graft was coated with enamel matrix derivative before the flap was advanced. (F) The subepithelial connective tissue graft was sutured to the root surfaces with interrupted sutures using 5.0 chromic gut sutures. The released flap was then coronally advanced and sutured with 5.0 Glycogen sutures in an interrupted fashion along with 5.0 chromic gut sutures to close the area of the vertical release. (G) Healing 2-week post-treatment. (H) Healing 1-month post-treatment. (I) Healing 3-month post-treatment. (J) Healing 6-month post-treatment. (K) When considering the use of different materials for gingival grafting, especially alternatives to the gold standard, we must consider the evidence base that supports the use of such materials and other factors. Most important are patient factors, such as airway issues, bruxism, and systemic maladies, the actual defect factors that are noted, and the surgical factors such as surgeon experience and training that the clinician must consider before implementing care. All of these combined with what the patient desires out of treatment and what the patient values from treatment, patient-related, will help us create the best treatment option and outcome for our patients.



**FIGURE 2** Continued

occlusal guard daily. She was being treated for high blood pressure by her primary care physician and taking 50 mg of losartan per day. A clinical exam revealed attrition, severe abfraction lesions in the upper right quadrant, and malocclusion. A suspected diagnosis of obstructive sleep apnea was identified. A diagnosis of Cairo type I recession in the maxillary area was made with recession ranging from 1 to 6 mm.

The prognosis for the gingival recession is fair with treatment due to the presence of deep non-carious cervical lesions. A treatment plan of CTG with the addition of biologic growth factors, specifically EMD, was proposed prior to final restorations in the maxilla.

The surgical procedure was performed by the same periodontist (ETS). After nitrous oxide sedation and local anesthesia (2% lidocaine with 1:100k epinephrine and 0.5% Marcaine with 1:100k epinephrine), tooth recession defects underwent thorough root planing with curettes and contouring of the non-carious cervical abfraction lesions with flame-shaped finishing carbide burs. This established the location of a new cemento-enamel junction as well as reduced dead space in between the connective tissue graft and root surfaces (Figure 2B). The root surfaces were fur-

ther etched with citric acid in order to open the dentinal tubules. A full-thickness flap was raised 1 tooth beyond each defect and is a vertical releasing incision done at the canine area to prevent a flap from being raised in the anterior area as well as to ensure the ability to release the flap properly. A SECT graft was then harvested via the trap-door technique (Figure 2C). The SECT graft was coated with EMD and was also applied to the exposed root surfaces (Figure 2D). The subepithelial CTG was coated with EMD before the flap was advanced (Figure 2E). The SECT graft was sutured to the root surfaces with interrupted sutures using 5.0 chromic gut sutures. The released flap was then coronally advanced and sutured with 5.0 Glycogen sutures in an interrupted fashion along with 5.0 chromic gut sutures to close the area of the vertical release (Figure 2F). Care was taken to suture the flap above the expected cemento-enamel junction as shrinking of the flap was expected. Post-operative medications included amoxicillin 500-mg tid, ibuprofen 600-mg prn 4–6 h, tramadol 50-mg prn 4–6 h, and 0.12% chlorhexidine gluconate mouth rinse to be used bid. Post-op photographs were taken at 2 weeks (Figure 2G), 1 month (Figure 2H), 3 months (Figure 2I), and 6 months (Figure 2J), after mucogingival surgery.



## RESULTS

At 3-month post-treatment in case #1 and 6-month post-treatment in case #2, satisfactory esthetic results for the patients and clinician were achieved. At 2-week post-treatment, both patients reported satisfaction with the esthetic and functional outcomes that were achieved and reported minimal pain and discomfort. This short-term follow-up showed favorable root coverage and soft tissue healing, especially at the 1-week visit. There was noticeably less edema and erythema. This result could be associated with the use of EMD and its inflammation on the early stages of wound healing. Additionally, dental hypersensitivity was no longer reported for both patients.

## DISCUSSION

Miller presented a classification for gingival recessions that defines the design of the defect and the prognosis of the coverage based on the presence or absence of intact interproximal periodontal tissues. However, it is not only the presence of interproximal bone that should be considered in order to achieve good results. It has been shown that Miller Class I and II gingival recessions can achieve complete root coverage with ~100% success because they present interproximal, blood, and structural support for the flap.<sup>16</sup> The presence of the interproximal bone is not the only factor that should be considered to obtain favorable results. Different coating techniques and several systemic, environmental, and local aspects can influence the final result.<sup>17</sup> The factors that predispose a case to not being successful include the loss of interproximal attachment greater than 3 mm, CTG thinner than 2 mm, and recession width greater than 3 mm. The literature also demonstrates the effectiveness of using growth factors such as EMD to augment the usage of CTG to help in more challenging recession cases.<sup>18</sup> These cases show not only how challenging cases can be managed in a private practice setting, but the steps necessary to take in order to treat anatomic abnormalities in patients with recession. For example, in the first patient, there is a challenge to treatment due to the anterior open bite and the buccal inclination of the teeth outside of the alveolar housing. This loss of bone on the facial aspect could arguably bring the patient from a Miller Class I classification to a Miller Class III. Pino Prato demonstrated the 20-year mean root coverage of a Miller Class III case to be 58.18%.<sup>19</sup> In a private practice setting in which referrals are often based on the success of treatment, anything the practitioner can do to increase the chances of success is necessary.

In this case report, both patients were treated with a hard acrylic occlusal splint, as well as a baseline evaluation for obstructive sleep apnea, which is a known compensatory trigger for oral bruxism. This is expected to reduce the recurrence of gingival recession and cervical lesions.

The treatment of gingival recession has become an important therapeutic issue, such as dental hypersensitivity and the prevention of caries in areas of non-carious cervical lesions.<sup>20</sup> However, tooth surfaces associated with gingival recession are frequently damaged, with the presence of a non-carious cervical lesion, resulting in a combined defect that reduces the probability of achieving complete root coverage through treatment.<sup>21,22</sup> It is essential to analyze the defects and address any etiology. It is known that one major cause of non-cervical carious lesions is oral bruxism and the lateral stresses it places upon the dentition.<sup>23</sup>

These present case reports demonstrated in our study agree with other published studies. A systematic review and meta-analysis that evaluated the use of EMD in the treatment of maxillary Miller Class I and II gingival recession concluded that EMD developed additional benefits in terms of reduction in gingival recession and gain of clinical attachment at 6 and 12 months in maxillary teeth either with CAF or CTG. However, the effect of the EMD on the increase in keratinized tissue band height showed very low evidence for its use.<sup>24</sup>

Different surgical techniques have been reported for the treatment of gingival defects. However, the treatment of gingival recession either with CAF or CTG provided the best clinical outcomes in root surfaces. EMD has been proposed as an additional clinical approach in the treatment of root coverage.<sup>25</sup> The usage of EMD should be considered as it has been demonstrated that the use of this biologic mediator can not only histologically induce true regeneration and increase the interproximal attachment, but it can also make recession defects treatments more predictable, an important factor to the private practitioner. In a 10-year follow-up study, McGuire and Scheyer found that the positive results obtained from EMD plus a CAF were not statistically significantly different than the use of a CTG and CAF.<sup>26</sup> Although these case reports are anecdotal, they provide support for the use of biologic modulators in challenging soft tissue cases that are seen and treated daily.

## CONCLUSION

By using biologic mediators such as an EMD combined with CTG, both multiple recession defects with non-carious cervical lesions and lingual recession cases can be treated successfully in a private practice setting. Using an EMD provides no additional risks to patients, may result in faster healing, and would afford stability of long-term success by influencing true periodontal regeneration. However, further clinical trial studies with long-term observations of the clinical healing process of soft tissue grafts with an EMD must be conducted.

## AUTHOR CONTRIBUTIONS

Scheyer: Conceptualization; directed the implementation; study design; performed the surgical procedure;

manuscript preparation; wrote and revised the manuscript. Gomes: Conceptualization; study design; manuscript preparation; wrote and revised the manuscript. Rossi: Conceptualization; study design; manuscript preparation; wrote and revised the manuscript. All authors reviewed and approved the submitted manuscript.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

## CONSENT STATEMENT

Both patients provided informed consent for the publication of this case report and accompanying images. The clinical cases followed the CARE statement for description of clinical cases.<sup>27</sup>

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