This study evaluated the use of a xenogeneic acellular dermal matrix (XADM) combined with a modified coronally advanced flap (MCAF) and partial resin composite filling (anatomic crown plus 1 mm of the root surface) to treat multiple Type 1 gingival recessions associated with B+ noncarious cervical lesions (NCCLs). The study included 24 recessions in 10 patients. Bleeding on probing, probing depth, combined defect height, relative gingival recession, clinical attachment level, esthetics, and dentin hypersensitivity were recorded. After 6 months, the treatment provided statistically significant outcomes: It reduced the combined defect height by 2.02 ± 0.65 mm, increased clinical attachment level by 1.96 ± 0.83 mm, and increased keratinized tissue thickness by 0.46 ± 0.47 mm, and shallow probing depths were seen. Significant dentin hypersensitivity reduction and esthetic improvements were observed. Therefore, XADM associated with MCAF and partial restoration might be a promising alternative to autogenous grafts used to treat multiple gingival recessions associated with B+ NCCLs. Int J Periodontics Restorative Dent 2022;42:817–824. doi: 10.11607/prd.5260

Gingival recession defects (GRs) constitute a rather prevalent problem, especially in patients older than 50 years. In addition, almost 50% of GRs are associated with noncarious cervical lesions (NCCLs), creating a combined defect (CD). This condition has a different prognosis when compared to a GR without associated dental wear and frequently requires a surgical-restorative approach to achieve better functional and esthetic results.

Initial randomized clinical trials evaluated various multidisciplinary (ie, surgical-restorative) approaches to treat single CDs. The NCCLs were fully restored either with resin-modified glass ionomer or resin composite, and a coronally advanced flap (CAF) alone or with an associated connective tissue graft (CTG). These studies demonstrated that the presence of a restoration (regardless of the material used) does not impair the root coverage achieved using CAF or CAF+CTG. In addition, the presence of the restoration does not harm gingival health, and the combination of the restorative treatment with the root coverage surgical procedure was highly efficient in reducing dentin hypersensitivity (DH).

Although the aforementioned approaches were associated with good and stable clinical outcomes after 2 years, loss of cervical
fillings during the longitudinal follow-up is expected, as almost 40% of Class V restorations fail or are lost after 5 years of follow-up.15 Thus, to facilitate restoration replacement or repair, new restorative protocols were developed. These protocols recommended either designing a restoration to repair only the enamel destroyed by the NCCL (ie, the apical margin of the restoration placed at the same level of the lost cementoenamel junction [CEJ]).6,16 or designing the restoration to repair the enamel and up to 1 mm of the root surface.12,17

Although the literature has described the evolution of multidisciplinary protocols for treating single CDs, only a few studies on multiple CDs exist. Cairo et al18 compared the use of CAF alone or associated with CTG to treat partially restored CDs (1 mm beyond the CEJ) and found no significant difference between the treatments for recession reduction (RecRed) and complete root coverage (CRC) after 12 months. Further, a relationship between baseline gingival thickness and the type of procedure was observed, suggesting that CAF+CTG is more effective than CAF alone in CDs with a thin gingival phenotype (< 0.8 mm).18 In addition, de Sanctis et al19 evaluated the performance of a modified coronally advanced flap (MCAF) + CTG for the treatment of multiple GRs with or without associated NCCLs. At 12 months, no significant difference was observed regarding RecRed and CRC between restored (crown restoration plus 1 mm apical to estimated CEJ) and nonrestored (anatomical CEJ preserved) teeth. Moreover, the percentage of root coverage was statistically higher in restored teeth than at sites without associated NCCLs (98.5% ± 6.6% and 92.12% ± 18.46%, respectively; P = .002), demonstrating that extending the apical margin of the restoration 1 mm from the estimated CEJ could decrease the likelihood of root exposure if flap shrinkage occurs during the healing phase.

However, no other surgical technique or graft materials have been evaluated to treat multiple CDs. Thus, the present study aimed to evaluate the 6-month outcomes of a surgical-restorative protocol using a porcine collagen matrix and partial crown-resin composite restoration for the treatment of multiple GRs associated with NCCLs.

Materials and Methods

Ten patients (seven women, three men) with a mean age of 52.5 ± 8.54 years (range: 41 to 68 years) and a total of 24 recessions were enrolled according to the following eligibility criteria: (1) the presence of two or more adjacent recession type 1 (RT1) GRs5 associated with B+ NCCLs20 (loss of cementoenamel junction and presence of a ≥ 0.5-mm step) in incisor, canine, and premolar teeth of the same quadrant; (2) probing depth (PD) ≤ 3 mm without bleeding on probing (BoP); (3) tooth vitality; (4) absence of a restoration in the cervical area; (5) no previous periodontal surgery in the area; (6) no smoking habit; (7) systematically healthy; (8) no contraindication for periodontal surgery; and (9) no consumption of medications known to interfere with periodontal tissue health and healing. Informed consent was given from all patients (ethical committee approval no.: 84051318.0.0000.077).

Prior to the restorative and surgical procedures, patients underwent a plaque control program consisting of oral hygiene instructions with a nontraumatic brushing technique using a soft toothbrush. Patients were advised to avoid excessive consumption of acidic beverages or foods. When required, selective grinding to remove occlusal interferences; scaling and root planing; and crown polishing were performed. As previously described,10 the following clinical parameters were recorded after completion of this initial therapy (baseline): full-mouth visible Plaque Index;21 presence or absence of visible plaque at the included sites (VPS); full-mouth Bleeding Index; presence or absence of BoP at included sites; PD; relative gingival recession (RGR); relative clinical attachment level (CAL; determined as PD + RGR); combined defect height (CDH); and DH, which was measured using an air spray for 2 seconds over the included sites. Patients were asked to use a 10-cm visual analogue scale (VAS) to assess their discomfort after the air spray application (0 = no discomfort; 10 = extreme discomfort). Moreover, patient-centered esthetic evaluations were performed using a 10-cm VAS on which patients were asked to score their satisfaction with the site before and 6 months after restorative-surgical treatment.
(0 = extreme dissatisfaction; 10 = extreme satisfaction). PD, RGR, CAL, DH, VPS, and BoP were recorded at baseline and at 3 and 6 months postsurgery.

Restorative and Surgical Procedures

The restorative treatment of NCCLs was conducted by a single restorative dentistry specialist (I.F.M.S.), as previously described. All restorations were performed in a single appointment before the surgical procedure. In summary, after estimating the CEJ using a previously described method, the apical margin of the restoration was determined to be 1 mm apical to the estimated CEJ, guiding the reconstruction of 1 mm of the root surface and the anatomic crown destroyed by the NCCL, as previously described (Fig 1). Following local anesthesia, rubber dam isolation was performed. To facilitate correct composite resin stratification (and thus, an adequate tooth emergence profile) and to reduce the step of lesions, a bevel was performed at the coronal border of the NCCL. Selective acid etching with 35% phosphoric acid (Ultra-Etch, Ultradent) was carried out and washed for 30 seconds with a water-air jet. The lesion was dried carefully using sterile cotton pellets to avoid dehydration, and adhesive (Single Bond Universal, 3M ESPE) was actively applied following the manufacturer’s instructions. The adhesive was light cured for 20 seconds, and the resin composite restoration (GrandioSO, Voco) was placed according to the manufacturer’s specifications. Polishing was carried out with diamond paste and felt discs 48 hours after the restorative procedure. A week after the restorative treatment, the periodontal root-coverage plastic surgery was performed (Fig 2). After local anesthesia administration, the MCAF proposed by Zucchelli et al was performed with care to fully cover the porcine xenogeneic acellular dermal matrix (XADM; Mucoderm, Botiss Dental). After flap elevation, the exposed root surface was carefully scaled and planed with curettes to smooth
Then, the XADM was adapted and sutured with the flap approximately 2 mm coronal to the apical restoration border.

Figure 3 shows an additional clinical case.

Amoxicillin was prescribed (500 mg, three times daily for 7 days), and dipyrone sodium was prescribed in case of pain (500 mg, three times daily). All patients were instructed to discontinue tooth brushing and flossing around the surgical sites for 14 days postsurgery. During this period, plaque control was achieved using 0.12% chlorhexidine solution mouthwash twice a day. Sutures were removed at 10 to 14 days, and patients were scheduled for follow-ups and dental prophylaxis every 3 months.

Descriptive statistics were expressed as mean ± standard deviation, and Shapiro-Wilk test was used to test data normality. When normally distributed, changes in PD, RGR, CAL, DH, and esthetic VAS values were assessed using paired t tests, and non-normally distributed data were assessed using Mann-Whitney rank sum test. A significance level of .05 was adopted.

Results

All patients completed the study follow-up. Healing was uneventful in all cases, and no complications were observed during the healing period. A good standard of supragingival plaque control was maintained, and all patients maintained full-mouth visible Plaque Index and sulcus Bleeding Index scores < 20% throughout the study period. In addition, none of the included sites exhibited BoP or VPS throughout the 6-month follow-up period. Table 1 shows the clinical measurements at baseline and at 6 months postoperative. The patient-centered outcomes are shown in Table 2.

The treatment was effective in terms of defect coverage and resulted in a statistically significant reduction in RGR after 6 months. Mean CDH was 3.72 ± 0.99 mm (range: 2 to 5.36 mm) at baseline. After 6 months, mean RecRed was 2.02 ± 0.65 mm, and 54.35% ± 22.6% of the CDH was covered by soft tissue. A statistically significant CAL gain was also observed. In addition, mean PD remained stable (1.66 ± 0.48 to 1.72 ± 0.46 mm; \( P = .7 \)). KTW showed no significant difference (2.21 ± 1.08 mm to 2.51 ± 0.94 mm; \( P = .3 \)), and a significant KTT gain was observed (0.87 ± 0.33 mm to 1.33 ± 0.45 mm; \( P = .001 \)). Regarding the
patient-centered outcomes (Table 2), a statistically significant reduction of DH was observed (4.6 ± 2.7 mm to 0.1 ± 0.3 mm; \( P = .001 \)), as were statistically significant esthetic improvements (3.2 ± 2.4 to 9.6 ± 0.5; \( P = .001 \)).

**Discussion**

This study evaluated the 6-month clinical and patient-centered outcomes of a surgical-restorative approach using a collagen matrix for the treatment of multiple CDs, and a partial composite resin restoration (crown zone plus 1 mm of the root surface) was performed.\(^{12,17}\) The porcine collagen matrix can significantly reduce multiple partially restored CDs. Although the presence of a restoration does not impair the clinical outcomes obtained by root-coverage procedures with or without CTG and does not harm the periodontal tissues,\(^{4,7-9,12-14,18,23}\) there is no evidence regarding the performance of xenogeneic grafts for root coverage of restored CDs. Several studies have assessed coverage of multiple recessions using various types of collagen matrices, but there is limited evidence related to the clinical efficacy of XADM. Nevertheless, the mean RGR reduction (2.02 ± 0.65 mm) and CAL gain (1.96 ± 0.83 mm) achieved in the present study corroborate the results of other studies that used the same collagen matrix to treat multiple gingival recessions without associated NCCLs. Cosgarea et al\(^ {24} \) evaluated the clinical efficacy of XADM associated with the modified coronally advanced tunnel technique (MCAT) and observed a similar mean RecRed (2.06 ± 1.18 mm) and CAL gain (2.30 ± 1.02 mm) at 12 months. Suzuki et al\(^ {25} \) obtained a mean RecRed of 2.09 ± 1.01 mm at 6 months using an extended CAF for root coverage. In addition, Vincent-Bugnas et al\(^ {26} \) used MCAT and achieved greater mean RecRed (3.16 ± 0.75 mm) and CAL gain (3.26 ± 1.83 mm) at 12 months postoperative. Pietruska et al\(^ {27} \) used MCAT and achieved less-desirable RecRed outcomes (1.00 ± 0.69 mm) compared to the other mentioned studies. Therefore, the presence of multiple resin composite restorations might not influence the clinical efficacy of this XADM in terms of RecRed. In addition, although the apical margin of restoration was located close to the gingival margin or within the sulcular space in the present cases, the PD

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**Fig 3** Representative clinical case. (a) Baseline view. (b) Clinical view after partial composite resin restoration (the apical border of the restoration was placed 1 mm apical to the estimated CEJ level) of the combined defects (premolars) before surgery. (c) The XADM was positioned and sutured. (d) The flap was coronally advanced and sutured. (e) Clinical outcome at 6 months.
remained shallow and stable, and all sites showed an absence of BoP, as previously reported.12

In the present study, KTW gain was not statistically significant between baseline and 6 months. These results seem to differ from those of Cosgarea et al,24 Vincent-Bugnas et al,26 and Pietruska et al,27 in which a statistically significant increase was observed. However, those studies used a different type of flap, the modified advanced tunnel technique, and measured their outcomes at 12 months. Regarding KTT in the present study, a significant gain was observed between baseline and 6 months, which is in accordance with Cosgarea et al.24 The increase in keratinized tissue dimension after adding a soft tissue graft might improve the long-term stability of the gingival margin and might prevent GR recurrence.26 Therefore, this could be a potential benefit of adding XADM to CAF.

The major indication for GR treatment is the patient demand,29,30 which includes esthetic and DH complaints. After 6 months, a statistically significant reduction in DH (4.6 ± 2.7 to 0.1 ± 0.3) and an esthetic improvement (VAS scores from 3.2 ± 2.4 to 9.6 ± 0.5) were observed. These outcomes suggest that the adopted surgical-restorative approach worked as expected. In one instance, the presence of the partial restoration (crown zone plus 1 mm of root surface) was associated with a lower risk of DH persistence and esthetic complaints, even if CRC was not achieved.12

### Table 1 Clinical Measurements

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>6 mo</th>
<th>Change</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>CDH, mm</td>
<td>3.72 ± 0.99</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>CD coverage, %</td>
<td>–</td>
<td>54.35 ± 22.6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>RGR, mm</td>
<td>11.1 ± 1.9</td>
<td>9.1 ± 1.8</td>
<td>2.02 ± 0.65</td>
<td>.004a</td>
</tr>
<tr>
<td>RecRed, mm</td>
<td>–</td>
<td>–</td>
<td>2.02 ± 0.65</td>
<td>.7b</td>
</tr>
<tr>
<td>PD, mm</td>
<td>1.66 ± 0.48</td>
<td>1.72 ± 0.46</td>
<td>0.05 ± 0.72</td>
<td>.7b</td>
</tr>
<tr>
<td>CAL, mm</td>
<td>13.66 ± 2.24</td>
<td>11.72 ± 2.19</td>
<td>1.96 ± 0.83</td>
<td>.01b</td>
</tr>
<tr>
<td>KTW, mm</td>
<td>2.21 ± 1.08</td>
<td>2.51 ± 0.94</td>
<td>0.29 ± 0.54</td>
<td>.3b</td>
</tr>
<tr>
<td>KTT, mm</td>
<td>0.87 ± 0.33</td>
<td>1.33 ± 0.45</td>
<td>0.46 ± 0.47</td>
<td>.001b</td>
</tr>
</tbody>
</table>

CDH = combined defect height; CD = combined defect; RGR = relative gingival recession; RecRed = reduction of gingival recession; PD = probing depth; CAL = relative clinical attachment level; KTW = keratinized tissue width; KTT = keratinized tissue thickness.

Values are listed as mean ± SD of data from 10 patients (24 teeth). Baseline is the time point after completion of initial therapy (scaling and root planing).

*aMann-Whitney rank sum test.

*bPaired t test.

### Table 2 Patient-Centered Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>6 mo</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentin hypersensitivity</td>
<td>4.6 ± 2.7</td>
<td>0.1 ± 0.3</td>
<td>.001a</td>
</tr>
<tr>
<td>Esthetics</td>
<td>3.2 ± 2.4</td>
<td>9.6 ± 0.5</td>
<td>.001a</td>
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</table>

Dentin hypersensitivity and esthetic outcomes were analyzed on a visual analog scale (VAS), ranging from 0 to 10 cm. The dentin hypersensitivity VAS was scored as follows: 0 = no discomfort; 10 = extreme discomfort. The esthetics VAS was scored as follows: 0 = extreme dissatisfaction with appearance; 10 = extreme satisfaction with appearance. Baseline is the time point after completion of initial therapy (scaling and root planing).

Values are listed as mean ± SD VAS scores from 10 patients (24 teeth).

*aMann-Whitney rank sum test.
Conclusions

Within the limitations of the present study, it can be concluded that MCAF associated with XADM provided a significant reduction of multiple partially restored CDs using a composite resin. In addition, patient-centered outcomes were improved. However, randomized clinical trials with longer follow-up periods are required to evaluate the clinical efficacy of this biomaterial compared to other approaches.

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References


