Long-Term Follow-up on Root Coverage with a Double Pedicle Flap and Connective Tissue Graft

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Partial-thickness double pedicle flap and connective tissue graft (CTG) is a procedure to treat single gingival recession in the anterior mandible. However, long-term data have not been reported. Patients who had been treated by the same periodontist in a private practice in Belgium between 2002 and 2009 were invited to return for a clinical examination in 2017. Seventeen patients (15 females, 2 males; mean age: 34.6 years) with a total of 23 treated single recessions were reexamined after 8 to 15 years of follow-up. Between 1 and 8 to 15 years of follow-up, mean and complete root coverage did not differ and amounted to 75% and 44% at study termination, respectively (P = .204). The esthetic outcome was mediocre, given a final mean root coverage esthetic score of 6.52. The Mucosal Scarring Index demonstrated a significant reduction in scarring between 1 and 8 to 15 years of follow-up; however, 31% of the cases still demonstrated some scarring in the end. Patients were less critical than clinicians, as they expressed high esthetic (mean: 81) and low scarring (mean 14) scores on visual analog scales. Partial-thickness double pedicle flap and CTG is an effective root-coverage procedure. However, alternative techniques may need to be considered for esthetically demanding patients. Int J Periodontics Restorative Dent 2019;39:829–835. doi: 10.11607/prd.4297

Gingival recession can be described as the apical shift of the gingival margin below the cementoenamel junction (CEJ), resulting in exposure of the root surface to the oral cavity.1 Recent systematic reviews have indicated that gingival recession can be successfully treated with various root coverage procedures.2,3 The partial-thickness double pedicle flap, initially described by Wainberg in 19644 as the double lateral repositioned flap, was refined by Cohen and Ross in 19685 as the double papilla flap. The technique evolved further with the addition of a subepithelial connective tissue graft (CTG)6 and is still performed in the mandibular incisor/canine area. Long-term clinical and esthetic data on the technique have not been reported. In addition, patient-reported outcomes following root coverage procedure are scarce. Hence, the aim of this retrospective study was to evaluate clinical, esthetic, and patient-reported outcomes of treatment with a partial-thickness double pedicle flap and subepithelial CTG after at least 8 years.

Materials and Methods

Patient Selection

Patients treated between 2002 and 2009 at a private practice for a single gingival recession in the mandibular incisor/canine area.
incisor/canine area were invited to return for a clinical examination in 2017. The procedure was performed when patients met the following criteria: nonsmoker, not pregnant, good general health (no systemic diseases), periodontally healthy, having good oral hygiene (full-mouth plaque score ≤ 25%),7 and presence of at least 5 mm of keratinized tissue mesial and distal to the recession.

Surgical Procedure

Following oral disinfection and local anesthesia, the exposed root surface was scaled. Vertical incisions were made at the mesial and distal aspects of the defect (Fig 1). Incisions started approximately 0.5 mm coronal to the CEJ and extended to the alveolar mucosa. Thereupon, an intrasulcular incision was performed along the soft tissue margin of the defect. The apical cuff of epithelialized tissue apical to the defect was removed by sharp dissection. A split-thickness flap was reflected on both sides of the recession and sutured in the middle (Vicryl 5/0, Ethicon, or Seralon 5/0, Serag-Wiessner). CTG was harvested from the palate using the single-incision technique and positioned over the recession using single sutures. The pedicle flap was then positioned over the recipient site following elimination of muscle insertions. Coronal mobilization was found to be sufficient when the marginal portion of the flap was able to reach 2 mm coronal to the CEJ.

Postoperative Instructions and Follow-up

At-home oral care instructions included chlorhexidine spray, analgesics as needed, and no mechanical cleaning of the site for the first 2 weeks. After 2 weeks, sutures were removed, teeth were polished, and mechanical plaque control was initiated with an ultra-soft toothbrush. Patients continued to use this brush during a 3-month period and were seen for follow-ups at 3, 6, and 12 months. Patients returned for evaluation 8 to 15 years later.

Outcome Parameters

The following linear parameters were registered with a periodontal probe at T0 (prior to surgery), T1 (1 year of follow-up), and T2 (8 to 15 years of follow-up): recession depth (RD), defined as the vertical distance between the CEJ and the most apical aspect of the soft tissue margin of the defect; recession width (RW), defined as the horizontal dimension of the recession at the level of the CEJ; and width of keratinized tissue (KTW), defined as the vertical distance between the most apical aspect of the soft tissue margin of the gingival recession and the mucogingival junction.

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Fig 1  (a) Outline of the flap design. (b) Elevated split-thickness flap. (c) CTG sutured into its final position with the use of resorbable suture material. (d) Elimination of muscle insertion following an apical superficial incision. The coronally advanced flap that fully covers the CTG is sutured into position without tension.
The following esthetic parameters were registered on the basis of clinical pictures at T1 and T2: root coverage esthetic score (RES) and Mucosal Scarring Index (MSI).

The following clinical parameters were recorded at T2: Gingival Index (GI), Plaque Index (PI), bleeding on probing (BoP), and probing depth (PD).

The following patient-reported outcome measures (PROMs) were registered on the basis of a 0-to-100 visual analog scale (VAS) at T2: esthetics, scarring, hypersensitivity, and willingness to undergo the surgery again.

### Statistical Analysis

The surgical site was considered the unit of analysis, and descriptive statistics were calculated for all outcome parameters. Wilcoxon signed rank test was used to compare the data between T1 and T2. Correlations between objective evaluations by clinicians (RES and MSI) and subjective assessments by the patients (esthetic and scarring evaluations) were assessed by means of Spearman correlation coefficient. The level of significance was set at .05.

### Results

Between 2002 and 2009, 17 patients (15 females, 2 males; mean age: 34.6 years) with 23 single gingival recessions in the mandibular incisor/canine area had been treated with a partial-thickness double pedicle flap and CTG by the same investigator (J.C.). Fifteen out of 17 patients were evaluated at T1. All 17 patients could be followed up after 8 to 15 years of function. In total, 13 central incisors, 4 lateral incisors, and 6 canines were treated. Seven recessions were classified as Miller Class I, 15 as Miller Class II, and 1 as Miller Class III.

### Outcome Parameters

Table 1 depicts RD, RW, and KTW at the different time points. At T0, RD was on average 3.86 mm, and mean RD had reduced by 80% to 0.79 mm at T1. At T2, RD averaged 1.02 mm, pointing to a 75% reduction in RD from baseline. The difference in RD between T1 and T2 was not statistically significant ($P = .204$).

At T0, the average RW was 3.26 mm. At T1, the mean RW had reduced by 49% to 1.67 mm. At T2, RW was on average 1.37 mm, indicating a 58% reduction in RW from baseline. The difference in RW between T1 and T2 was statistically significant ($P = .029$).

At T0, the mean KTW was 0.76 mm, and this increased to 3.95 mm at T1. All 17 patients could be followed up after 8 to 15 years of function. In total, 13 central incisors, 4 lateral incisors, and 6 canines were treated. Seven recessions were classified as Miller Class I, 15 as Miller Class II, and 1 as Miller Class III.

Table 2 denotes the RES at T1 and T2. At final reassessment, 44% of the cases achieved complete root coverage (CRC), 52% achieved partial root coverage, and one case was diagnosed as a failure. The total RES remained stable between T1 and T2, with a mean of 6.33 and 6.52, respectively ($P = .680$).
Table 2 Esthetic Outcomes Assessed by the RES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scores reported for study sites</th>
<th>Total</th>
<th>Mean (SD)</th>
<th>Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GM</td>
<td>MTC</td>
<td>STT</td>
<td>MGJ</td>
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<tr>
<td>T1 Index</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>No. (%)</td>
<td>(0)</td>
<td>(52)</td>
<td>(48)</td>
<td>(38)</td>
</tr>
<tr>
<td>Total score</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>6.33</td>
<td>6.00</td>
<td>(2.15)</td>
<td>(5.00–8.50)</td>
</tr>
<tr>
<td>T2 Index</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No. (%)</td>
<td>(4)</td>
<td>(52)</td>
<td>(44)</td>
<td>(44)</td>
</tr>
<tr>
<td>Total score</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>6.52</td>
<td>6.00</td>
<td>(2.71)</td>
<td>(4.00–9.00)</td>
</tr>
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</table>
| RES = root coverage esthetic score; GM = gingival margin; MTC = marginal tissue contour; STT = soft tissue texture; MGJ = mucogingival junction alignment; GC = gingival color; SD = standard deviation; IQR = interquartile range; T1 = 1 year follow-up; T2 = 8- to 15-year follow-up. Ten points is the highest-possible total score. GM scoring index: 0 = failure of root coverage; 1 = partial root coverage; 2 = complete root coverage. Scoring index for all other parameters: 0 = unsatisfactory result; 1 = ideal result. Fifteen patients (21 sites) were evaluated at T1, and 17 (23) were evaluated at T2. Wilcoxon signed rank test comparing T1 to T2.

Table 3 Esthetic Outcomes Assessed by the MSI

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scores reported for study sites</th>
<th>Total</th>
<th>Mean (SD)</th>
<th>Median (IQR)</th>
</tr>
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<tr>
<td></td>
<td>Width</td>
<td>Height</td>
<td>Contour</td>
<td>Color</td>
</tr>
<tr>
<td>T1 Index</td>
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<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>No. (%)</td>
<td>(10)</td>
<td>(90)</td>
<td>(0)</td>
<td>(29)</td>
</tr>
<tr>
<td>Total score</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>4.29</td>
<td>5.00</td>
<td>(2.70)</td>
<td>(2.00–6.50)</td>
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<tr>
<td>T2 Index</td>
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<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>No. (%)</td>
<td>(39)</td>
<td>(61)</td>
<td>(0)</td>
<td>(31)</td>
</tr>
<tr>
<td>Total score</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2.96</td>
<td>3.00</td>
<td>(2.08)</td>
<td>(1.00–4.00)</td>
</tr>
<tr>
<td>P*</td>
<td>.014</td>
<td>.739</td>
<td>.285</td>
<td>.002</td>
</tr>
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</table>

MSI = Mucosal Scarring Index; SD = standard deviation; IQR = interquartile range; T1 = 1 year follow-up; T2 = 8- to 15-year follow-up. Ten points is the highest-possible total score. Scoring index: 0 = best possible outcome; 1 = neutral outcome; 2 = worst outcome. Fifteen patients (21 sites) were evaluated at T1, and 17 (23) were evaluated at T2. Wilcoxon signed rank test comparing T1 to T2.

Table 3 describes the MSI at T1 and T2. A statistically significant reduction between T1 and T2 was found for width (P = .014) and suture/hatch marks (P = .002) related to scarring. A statistically significant reduction between T1 and T2 was also observed for the total MSI, pointing to a final score of 2.96.
However, only 31% of cases were completely free of scarring at 8 to 15 years of follow-up (Figs 2 and 3).

Healthy clinical conditions were observed after 8 to 15 years of follow-up, showing low mean scores for GI (0.62), PI (0.72), BoP (22%), and PD (2.23 mm).

The final VAS score for patient-perceived esthetics was 81, which is generally high. There was no significant correlation between the esthetic evaluation by patients and the total RES evaluated by the examiner (Spearman correlation: –0.103; \( P = .640 \)). The patient-perceived presence of scarring was generally low (mean VAS score: 14). A moderate correlation was found between scarring evaluated by patients and the total MSI evaluated by the examiner (Spearman correlation: 0.443; \( P = .039 \)). Patients reported negligible dentine hypersensitivity in the long term, as illustrated by a mean VAS score of 25. Seventy percent of the patients indicated that they would have the surgery performed again.

Discussion

Root-coverage procedures are considered complex and technique-sensitive interventions.\(^\text{12}\) A number of recent systematic reviews have demonstrated the effectiveness of such procedures, but mainly in the short term.\(^\text{2,13,14}\) Long-term follow-up is needed since recession relapse has been described.\(^\text{15,16}\) The present study reports on the 8- to 15-year follow-up of root coverage for single recessions and demonstrated on average 2.84 mm recession reduction.
(75%) in the long term. Interestingly, there was no statistically significant difference between 1-year and 8- to 15-year follow-up RD values. The stability of the gingival margin in the long term may be explained by the use of a CTG: In terms of CRC, long-term clinical studies have shown superior outcomes when a CTG is used.\textsuperscript{17,18}

In 1992, Harris introduced the partial-thickness double pedicle flap with a CTG for root coverage.\textsuperscript{6} Achieving CRC seems unpredictable\textsuperscript{19} and may be supported by the present study, since it was only found in 44% of the cases. On the other hand, mandibular incisors and canines may be considered the most challenging areas for achieving CRC. Therefore, comparative studies are particularly interesting in this area. In one clinical study using a CTG as an adjunct to various flap designs, the partial-thickness double pedicle flap and the tunneling procedure demonstrated greater mean root coverage than the coronally advanced flap.\textsuperscript{20} Additionally, the partial-thickness double pedicle flap produced a greater increase in keratinized tissue than the other techniques. Additionally, earlier findings support a larger increase in the amount of keratinized tissue following the partial-thickness double pedicle flap procedure when compared to that of the coronally advanced flap.\textsuperscript{21} These findings should be interpreted with some caution as they relate to short-term observations.

Long-term data are available on the tunneling technique and the coronally advanced flap, both in combination with a CTG. Rossberg et al.\textsuperscript{22} described the outcome of the tunneling technique and reported final mean root coverage and CRC in 90% and 82% of the cases, respectively, whereas the results were 90% and 78%, respectively, for the coronally advanced flap.\textsuperscript{23} In the present study, the final mean root coverage and CRC amounted to 75% and 44%, respectively. These findings are somewhat lower than aforementioned data on other techniques, yet they exclusively pertain to the anterior mandible.

A final RES of 6.52 suggests the esthetic outcome of the surgical treatment was mediocre in the long term. Results were slightly inferior compared to alternatives; however, only short-term results are available on these procedures.\textsuperscript{24–29} Overall, the stability of the esthetic outcome between 1- and 8- to 15-year follow-ups is the most important finding.

To the best of the authors’ knowledge, this is the first clinical study reporting on scarring following root coverage. The MSI scores demonstrated a significant reduction in scarring between 1 and 8 to 15 years of follow-up. However, an interesting finding was that scars had not disappeared completely in 31% of cases. This should be taken into account when determining a treatment protocol, especially when esthetics is the main reason for treatment.\textsuperscript{30} In esthetically demanding cases, alternative techniques should be considered, whereby the use of vertical-releasing incisions can be omitted.

Objective and subjective evaluations on the esthetic outcome showed no significant correlation. This is in accordance with a survey by Kim et al.\textsuperscript{31} Patient perceptions related more to the integration of soft tissue to the adjacent tissue. However, professional assessment was more heavily influenced by the amount of root coverage. The survey suggested that factors like scar tissue formation might influence patient satisfaction more than just the root coverage outcomes.

**Conclusions**

Partial-thickness double pedicle flap and CTG is an effective root-coverage procedure. However, clinicians may need to consider alternative techniques for esthetically demanding patients, given mediocre esthetic scores and the presence of scarring in about one-third of the cases after 8 to 15 years of follow-up.

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References