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## Esthetic Evaluation of Root Coverage Outcomes: A Case Series Study



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*The aim of this study was to conduct a 1-year full esthetic evaluation of the treatment outcomes of gingival recession using the root coverage esthetic score (RES) system. One hundred patients with 195 single or multiple recessions were treated using different techniques. One year after surgery, the clinical outcomes were evaluated. Only 21 of 195 (11%) treated recessions obtained the maximum RES score (10), while 68 recessions (35%) showing complete root coverage obtained lower scores. Both single and multiple recessions treated with a coronally advanced flap with or without connective tissue grafting achieved similar RES scores. Free gingival grafts showed the lowest score. (Int J Periodontics Restorative Dent 2011;31:603–610.)*

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Gingival recessions are treated to reduce root sensitivity and to improve esthetics.<sup>1</sup> During the last 3 decades, clinicians have proposed several surgical techniques for treating gingival recessions. Modifications of the original techniques and new approaches have been developed over time to meet the increasing esthetic demands of patients.

In the 1970s and 1980s, the treatment of gingival recessions aimed at reducing the recession and increasing the amount of keratinized tissue. The surgical techniques used were pedicle flaps (positioned laterally<sup>2</sup> or coronally<sup>3</sup>) and free gingival grafts<sup>4</sup> in cases of inadequate keratinized tissue. The prognosis of these techniques showed low root coverage and frequent poor esthetic outcomes resulting from white scarring and irregular outlines of the mucogingival junction.

During the next 2 decades, the aim of root coverage procedures changed and focused on trying to achieve complete root coverage (CRC) using new approaches such as bilaminar techniques<sup>5</sup> or regenerative procedures.<sup>6</sup> However,

when treating single recessions, scars or different tissue thicknesses impaired the esthetic results even if CRC was achieved.

Over the past 10 years, as a result of increased esthetic demands, surgical techniques have been further developed to obtain CRC associated with good integration of the grafted tissues with the adjacent tissue in the recession area.<sup>7</sup> Today, less aggressive surgical techniques, the use of an operative microscope, and the availability of microsurgical materials make it possible to attain outstanding clinical outcomes,<sup>8,9</sup> especially in the treatment of multiple recessions.<sup>10</sup>

In the past, the outcomes of root coverage procedures were evaluated on the basis of the percentage of achieved recession reduction. Later, together with recession reduction, CRC was reported as the main goal of root coverage procedures.<sup>11-14</sup> However, this variable is not always adequate for evaluating the overall final esthetic outcome of the treatment. Therefore, the ideal outcome of root coverage procedures can be considered fully achieved when complete coverage is associated with soft tissue integration that is indistinguishable from the adjacent tissue.

Recently, evaluation score systems have been proposed for esthetic assessment of root coverage procedures. A 5-point ordinal improvement scale (poor, fair, good, very good, and excellent) was suggested in a before-after panel scoring system.<sup>15,16</sup> The root coverage esthetic score (RES) system was introduced for evaluating the over-

all esthetic outcome following root coverage procedures.<sup>17</sup> The RES system was validated in a recent multicenter study.<sup>18</sup> Five variables are considered: level of the gingival margin, marginal contour, soft tissue surface, mucogingival junction position, and gingival color. RES values vary from 0 (final residual recession equal to or higher than baseline recession) to 10 (CRC associated with fulfillment of the other four variables).

The aim of this study was to perform a 1-year full esthetic evaluation of the outcomes of root coverage procedures using the RES system.

## Method and materials

Patients (age, > 18 years) showing gingival recessions were referred to four private practices for root coverage procedures. The patients did not show any clinical signs of periodontal disease (clinical attachment level,  $\leq 3$  mm in each site), they had good oral hygiene (full-mouth plaque and bleeding scores, < 25%), and had no history of mucogingival periodontal surgery in the treated sites. Patients with Miller Class<sup>19</sup> I, II, and III single or multiple recessions underwent root coverage procedures and gave their written informed consent in accordance with the Helsinki Declaration of 1975. Patients showing recessions associated with prosthetic crowns, restorations, and a non-identifiable cemento-enamel junction (CEJ) were excluded.

Following professional oral hygiene procedures/instructions, patients were treated by four periodontists according to specific indications. Different root coverage procedures were used to treat single recessions: a coronally advanced flap (CAF), a coronally advanced flap and connective tissue graft (CAF + CTG), and a free gingival graft (FGG). Multiple recessions were treated by means of CAF and CAF + CTG.

Recession depth, probing depth, and width of the keratinized tissue were recorded at baseline and 1 year after surgery using a periodontal probe (PCP UNC 15, Hu-Friedy).

One year after surgery, the outcomes were esthetically evaluated by one operator according to the RES system.<sup>17,18</sup> The RES system assessed the following five variables at 1 year following surgery: level of the gingival margin, marginal tissue contour, soft tissue texture, mucogingival junction alignment, and gingival color. The esthetic evaluation was performed clinically without magnification. A score of 0, 3, or 6 was used for evaluation of the gingival margin position, while a score of 0 or 1 was used for each of the other variables.

- Gingival margin level: 0 = failure of root coverage (gingival margin apical or equal to the baseline recession), 3 = partial root coverage, and 6 = CRC with no detectable CEJ
- Marginal tissue contour: 0 = irregular gingival margin (did not

follow the CEJ) and 1 = proper marginal contour/scalloped gingival margin (follows the CEJ)

- Soft tissue texture: 0 = presence of scar formation and/or keloid-like appearance and 1 = absence of scar or keloid formation
- Mucogingival junction: 0 = mucogingival junction not aligned with that on adjacent teeth and 1 = mucogingival junction aligned with that on adjacent teeth
- Gingival color: 0 = color of tissue varies from gingival color on adjacent teeth and 1 = normal color and integration with the adjacent soft tissues

The maximum esthetic score was 10. A score of 0 was assigned in cases showing the final gingival margin position equal or apical to the previous recession depth (failure of root coverage procedure), irrespective of color, presence of scar, gingival margin, or mucogingival junction. A score of 0 was also assigned when a partial or total loss of interproximal papillae (black triangle) occurred following treatment.

Descriptive statistics were performed using means and standard deviations for quantitative variables/frequency and percentages for qualitative variables. Two multilevel models were used to test the influence of age, sex, surgical procedures, single/multiple recessions, position in multiple recession (central vs extreme), Miller class, and baseline recession depth on the RES score and CRC. A four-level model with operators, patients, interventions, and sites was used. CRC was

<b>Table 1</b>		<b>RES score and CRC for each treatment technique</b>				
<b>Technique</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Minimum</b>	<b>Maximum</b>	<b>CRC</b>
Single CAF	51	6.7	2.4	0	10	28 (55%)
Multiple CAF	67	7.3	1.7	4	10	28 (42%)
Single CAF + CTG	25	6.3	2.4	0	10	15 (60%)
Multiple CAF + CTG	43	7.0	1.8	3	10	16 (37%)
Single FGG	9	4.1	2.1	0	6	2 (22%)

SD = standard deviation; CAF = coronally advanced flap; CTG = connective tissue graft; FGG = free gingival graft; RES = root coverage esthetic score; CRC = complete root coverage.

evaluated using a similar multilevel model. MLwiN software (MLwiN v. 2.02, University of Bristol) was used for the statistical analyses.

## Results

One hundred patients (37 men, 63 women; age range, 18 to 52 years; mean age, 35.4 years) who had been treated with root coverage procedures in four private practices in Florence, Italy, were enrolled in this study. The operators treated 121, 37, 19, and 18 recessions at the four private practices, respectively. Different surgical procedures were used to treat the recession defects. Of 122 surgical interventions, 73 (60%) were CAF, 40 (33%) were CAF + CTG, and 9 (7%) were FGG. Eighty-five (70%) surgical interventions were performed to treat single recessions, while 37 (30%) were performed on multiple recessions. One hundred ninety-

five teeth were treated: 37 maxillary incisors, 69 maxillary canines, 81 maxillary premolars, 3 maxillary molars, 2 mandibular incisors, and 3 mandibular premolars. One hundred sixty recessions (82%) were Class I, 32 (16%) were Class II, and 3 (2%) were Class III. The mean baseline gingival recession depth was  $2.92 \pm 1.04$  mm, ranging from 0.5 to 6 mm. The mean recession reduction was  $2.41 \pm 0.99$  mm. CRC was achieved in 89 recessions (46%). The mean RES score was 6.8 (range, 0 to 10); 21 cases of CRC (24%) attained an RES score of 10. In 3 cases, the RES score was 0. Forty-three recessions (41%) obtained a score of 7, even though none of these showed CRC.

Table 1 shows the techniques with relative RES score and CRC.

In the 25 multiple recessions with 3 or more sites treated, the recessions at the extreme position (mesial and distal) had mean RES scores of  $7.38 \pm 1.66$ , and the



**Fig 1a** (left) Baseline gingival recession at a maxillary lateral incisor.

**Fig 1b** (right) A CAF was used to treat the recession. The RES score was 10: complete root coverage = 6, marginal profile = 1, texture = 1, color = 1, and mucogingival alignment = 1.



**Fig 2a** (left) Baseline gingival recession at a maxillary canine.

**Fig 2b** (right) The bilaminar technique was used as treatment. The RES score was 8: complete root coverage = 6, marginal profile = 1, texture = 0, color = 1, and mucogingival alignment = 0.



**Fig 3a** (left) Baseline gingival recession at a mandibular canine.

**Fig 3b** (right) An FGG was used to treat the recession. The RES score was 7, obtained by complete root coverage (6) plus a regular gingival profile (1). No additional score was added because of the unpleasant tissue texture (0), misalignment of the mucogingival junction (0), and unesthetic color of the graft (0).



recessions in the inner position had RES scores of  $7.17 \pm 1.75$ .

A multilevel model using the RES score as the outcome variable showed that the greater the baseline recession depth, the lower the score ( $P < .0001$ ). Root coverage

procedures performed with FGGS had the lowest scores ( $P < .0001$ ).

A multilevel model using CRC as the outcome variable showed that the greater the baseline recession depth, the lower the probability of obtaining CRC ( $P < .0001$ ).

The probability of obtaining CRC was lower in the case of treating multiple recessions ( $P < .0027$ ). Some RES evaluations are shown in Figs 1 to 5.



**Fig 4a** (above left) Multiple baseline recessions at a maxillary left incisor, canine, and premolar.



**Fig 4b** (above right) The multiple recession technique was performed. Lateral incisor, RES = 6: partial root coverage = 3, marginal profile = 0, texture = 1, color = 1, and mucogingival alignment = 1. Canine, RES = 9: complete root coverage = 6, marginal profile = 1, texture = 1, color = 0, and mucogingival alignment = 1. Premolar, RES = 10: complete root coverage = 6, marginal profile = 1, texture = 1, color = 1, and mucogingival alignment = 1.



**Fig 5a** (above left) Baseline gingival recession at a maxillary canine.



**Fig 5b** (above right) A CAF was used to treat the recession. The RES score was 9: complete root coverage = 6, marginal profile = 1, texture = 0, color = 1, and mucogingival alignment = 1.

With regard to treatment of multiple recessions, no RES and CRC differences were observed between the recessions located in the middle and at the extremity of the flap ( $P = .6843$  and  $P = .3879$ , respectively).

## Discussion

Esthetics has become an important part of general dentistry. In periodontology, treating gingival recessions to obtain CRC is no longer sufficient for defining the complete success of treatment; it should always be associated with an optimal integration of the adjacent tissues. More sophisticated techniques have been proposed for obtaining

complete success, and several authors<sup>15-18</sup> have suggested different esthetic scores for evaluating the outcomes of root coverage procedures. Patient questionnaires for self-evaluation have also been used in some studies.<sup>20</sup>

In this study, the RES<sup>17,18</sup> was used to assess the treatment outcome of 195 gingival recessions in 100 patients 1 year after treatment. RES score gives more importance

to CRC (6 points) when the CEJ is completely undetectable; even a minimal visual exposure of the CEJ is not considered CRC. Evaluation of the cases in this study was accomplished while taking into account the above presupposition. However, it is interesting to note that only 21 recessions (11%) showed complete success and achieved the best score (10), while 68 recessions (35%) showing CRC obtained lower scores because they were associated with an irregular profile of the gingival margin, misalignment of the mucogingival junction, presence of scars, and unsightly soft tissue integration. It is also interesting to note that 43 recessions (22%) showing partial root coverage associated with optimal soft tissue integration achieved RES scores higher than cases with CRC that were associated with scars, misalignment, or unsightly tissue integration. This means that even if CRC was achieved, it cannot be automatically considered a completely successful root coverage procedure.

Among the different procedures for the treatment of gingival recessions evaluated in this study, the FGG obtained the lowest RES score. This confirms the fact that this technique in itself is not indicated for the esthetic treatment of gingival recessions because even if CRC can be achieved, the presence of scars and an irregular mucogingival junction negatively impact the esthetics of the graft area. The other techniques (CAF or CAF + CTG) showed similar RES values in the treatment of single recessions.

In the treatment of multiple recessions, the RES value was similar to that for single recessions. The CRC of multiple recessions was slightly lower with respect to single recessions; on the other hand, the other variables of the RES showed a higher score. This could be explained by the fact that releasing incisions are not performed in multiple recession approaches. This has been confirmed recently by a randomized clinical study comparing a CAF with and without vertical releasing incisions.<sup>21</sup>

As far as the depths of the initial recessions are concerned, two systematic reviews<sup>13,22</sup> and one study<sup>23</sup> showed that the greater the baseline recession depth, the less likely it is to attain CRC. The data in the present study also show that the greater the baseline recession depth, the lower the probability of obtaining CRC and, consequently, the final RES scores are lower.

## Conclusion

The results of this study show that CRC, even though important, cannot be considered the only goal of root coverage procedures. In fact, partial root coverage associated with perfect soft tissue integration may result in a better RES evaluation than CRC with poor integration of the adjacent tissue. The RES should be recommended for assessing the full esthetic outcomes of root coverage procedures.

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