

ORIGINAL ARTICLE

Long-term comparison of root coverage procedures at single RT2 maxillary gingival recessions: Ten-year extension results from a randomized, controlled clinical trial

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Abstract

Aim: The purpose of the present study was to assess root coverage outcomes 10 years after connective tissue graft plus coronally advanced flap (CTG + CAF) or CAF alone, at single RT2 maxillary gingival recession.

Materials and Methods: Twenty-one of the original 29 patients (11 treated with CAF + CTG and 10 with CAF alone) were available for the 10-year follow-up. A blinded and calibrated examiner performed all the measurements. Outcome measures included complete root coverage (CRC), recession reduction (RecRed), root coverage aesthetic score (RES), and keratinized tissue (KT) gain. A visual analogue scale was used to evaluate patient satisfaction.

Results: CRC was maintained in 63% of the test group and 20% of the control group after 10 years, with a significant difference favouring CAF + CTG ($p = .030$). Furthermore, the addition of CTG was associated with greater KT gain ($p = .0002$) and greater papilla tip recession ($p = .023$) than with CAF at the last follow-up. No difference was detected regarding RecRed, RES, and patient satisfaction.

Conclusions: Adding CTG under CAF improved the probability of maintaining complete root coverage 10 years after single maxillary RT2 recession treatment.

KEYWORDS

connective tissue graft, coronally advanced flap, gingival recession, randomized clinical trial, root coverage

Clinical relevance

Scientific rationale for study: Long-term stability of root coverage outcomes at RT2 recessions is poorly investigated.

Principal findings: After 10 years of supportive periodontal care programme, coronally advanced flap + connective tissue graft (CAF + CTG) resulted in higher stability of the gingival margin compared with CAF alone. Higher papilla recession was observed after bilaminar procedure.

Practical implications: CAF + CTG offers excellent long-term stability at single RT2 recession.

1 | INTRODUCTION

Large evidence shows that root coverage is highly predictable in patients with minimal inflammation (Tonetti et al., 2014; Cairo, 2017). Different types of pedicle flaps with or without connective tissue grafts (CTGs) or replacement biomaterials may be used to treat single gingival recessions (Cairo et al., 2008). Systematic reviews show that the coronally advanced flap (CAF) covering a connective tissue graft can be considered the gold standard in terms of probability for complete root coverage (CRC) and keratinized tissue (KT) gain at single gingival recession with no loss of interdental attachment (RT1, Cairo et al., 2014; Chambrone et al., 2018).

Evidence regarding the clinical performance of root coverage procedures at recessions with interproximal loss of clinical attachment (ICAL) is very limited (Tonetti et al., 2014). Classical paradigms suggest that CRC is not possible when a recession (REC) is associated with loss of interdental bone: in fact, this condition has been considered to be one of the most significant limitation for root coverage (Miller, 1985). Conversely, more recent randomized controlled trials (RCTs) have demonstrated that CRC is feasible at both single and multiple recessions associated with loss of interdental attachment (RT2, Aroca et al., 2010; Cairo et al., 2012; Fernández-Jiménez et al., 2021; Fernández-Jiménez et al., 2022). This outcome seems to be highly predictable when using CTG under CAF for REC with ICAL ≤ 3 mm (Cairo et al., 2012). The 6-month favourable outcomes were confirmed after 3 years of follow-up (Cairo et al., 2015). The shift of the classic paradigm into a more modern vision of the root coverage potential might be explained at least in part by an increase of both biological knowledge (Tonetti et al., 2014; Cairo et al., 2020) and surgical skills (Nieri et al., 2009).

Very few RCTs report long-term outcomes of root coverage procedures; only 8% of RCTs were included in a systematic review (SR; Cairo et al., 2014), mainly reporting recurrences of gingival recession. This finding is frequently associated with the observation of new recessions at untreated sites, suggesting the possible impact of traumatic toothbrushing (Leknes et al., 2005). A recent 9-year RCT on a sample of 25 patients with single RT1 showed a satisfactory stability over time of both CAF + CTG and CAF alone, while the application of CTG provided a greater KT increase (Rasperini et al., 2018).

The aim of the present study was to assess root coverage outcomes at single RT2 maxillary gingival recessions treated with CAF with or without CTG, 10 years after surgical treatment.

2 | MATERIALS AND METHODS

2.1 | Participants

The present paper is written according to the CONSORT statement for improving the quality of reports of parallel-group randomized trials (<http://www.consort-statement.org/>). It reports the 10-year follow-up of a parallel-arm, randomized, single-centre clinical trial on the treatment of single gingival recession associated with interdental clinical

attachment loss (ICAL) (Cairo et al., 2011). Two different treatment modalities were compared: CAF and CAF with a CTG (CAF + CTG). Details of the study protocol are reported in the 6-month paper (Cairo et al., 2012).

Patients were enrolled at the Department of Periodontology, University of Florence, Florence, Italy, between January 2010 and November 2010. Details of inclusion and exclusion criteria and settings have been reported in the original paper. The original protocol was peer-reviewed and received a waiver from the full ethical committee (Ref. 1/42-2009). A specific ethics approval for long-term observation was also obtained (Ref. Prot. 4089/2022).

The present report follows the principles of the update of the Declaration of Helsinki (2003) on experimentation involving human subjects. The trial registration was done retrospectively (ClinicalTrials.gov Identifier: NCT05460182) since the study was initiated prior to the requirement for prospective registration (<https://clinicaltrials.gov/ct2/show/NCT05460182?term=NCT05460182&draw=2&rank=1>).

2.2 | Interventions

2.2.1 | Operator, institution, and investigators

All surgical procedures were performed by an expert operator (FC) with more than 10 years of experience in periodontal plastic surgery in the Department of Periodontology, University of Florence. The examiner (JM), blinded with respect to the surgical procedures, assessed all treatment clinical and aesthetic outcomes. Details of calibration for clinical measurements/aesthetic outcomes were presented in a previous paper (Cairo et al., 2012).

2.3 | Data collection

Clinical measurements were taken at the treated tooth by a blinded examiner using a PCP UNC 15 (Hu-Friedy) periodontal probe. All measurements were rounded to the nearest millimetre.

The following measurements were collected at baseline:

- Rec Buc 0: recession depth at the central buccal site measured from CEJ to the gingival margin;
- PD Buc 0: probing depth at the central buccal site;
- CAL Buc 0: clinical attachment level at the central buccal site as the distance between detectable CEJ and the tip of the probe in the sulcus;
- Rec Mes 0: recession depth at the mesial site measured from CEJ to the gingival margin;
- PD Mes 0: probing depth at the mesial site;
- CAL Mes 0: clinical attachment level at the mesial site as the distance between detectable CEJ and the tip of the probe in the sulcus;
- Rec Dis 0: recession depth at the distal site measured from CEJ to the gingival margin;

- PD Dis 0: probing depth at the distal site;
- CAL Dis 0: clinical attachment level at the distal site as the distance between detectable CEJ and the tip of the probe in the sulcus;
- IM-CEJ: distance from incisal margin (IM) to the CEJ;
- IM-GM: distance from gingival margin (GM) to incisal margin (IM);
- IM-GMJ: distance from IM to mucogingival junction (MGJ);
- KT: keratinized tissue measured from the most apical point of the gingival margin to the MGJ at the middle buccal point;
- CP-pap mes 0: distance between the mesial contact point and the papilla tip at baseline;
- CP-pap dis 0: distance between the distal contact point and the papilla tip at baseline;
- Dental hypersensitivity: tested using the air-spray and quantified by the patients using a visual analogue scale (VAS).

2.4 | X-ray measurements at baseline

The following measurements were taken on a periapical X-ray of the treated tooth at baseline:

- CP-BC X-ray Mes: distance between the mesial contact point and the bone crest at X-ray examination;
- CEJ-BC X-ray Mes: distance between the cemento-enamel junction and bone crest at X-ray examination at the mesial site;
- CP-BC X-ray Dis: distance between the distal contact point and bone crest at X-ray examination;
- CEJ-BC X-ray Dis: distance between cement enamel junction and bone crest at X-ray examination at the mesial site.

Variations for Rec, PD, CAL, IM-GM, IM-GMJ, KT, CP-pap mes, and CP-pap dis were collected at 6-month and 1-, 3-, and 10-year follow-up.

The final aesthetic outcome of the surgical procedure was evaluated using the root coverage aesthetic score (RES) (Cairo et al., 2009, 2010). Patients were asked for sensitivity at the treated tooth (Sens) and for overall aesthetic satisfaction using a VAS (VAS Est Paz).

2.5 | Treatment procedures

Details of experimental treatments are reported in the original paper (Cairo et al., 2012). Briefly, patients received professional oral hygiene instructions including motivation for home care at least 2 months before surgery. The control group was treated with CAF alone, while the test group received CAF + CTG (Cairo et al., 2012). At the test group, the graft was positioned on the instrumented root surface immediately apical or at the level of the CEJ using stabilizing and/or compressive suture, anchored to the apical periosteum. The flap was coronally advanced, 1–2 mm above the CEJ in both test and control groups. Patients were instructed to rinse with chlorhexidine and resume mechanical tooth cleaning 2 weeks after surgery using a soft toothbrush. Patients were recalled 1, 3, and 6 months after surgery

for professional oral hygiene treatment and measurements. After the 6-month recall, patients were enrolled in a maintenance programme (2–4 times/year) and recalled for clinical measurements 1, 3, and 10 years after treatment. A patient-tailored supportive periodontal care programme (SPC) was strictly followed in order to minimize possible mechanical trauma at the surgically treated site and to maximize plaque control using a delicate roll technique for toothbrushing and the gentle use of interproximal cleaning devices.

2.6 | Randomization/allocation concealment

Details of sample size calculation and randomization/allocation concealment are reported in the original manuscript (Cairo et al., 2012). Allocation concealment was performed by opaque, sequentially numbered, sealed envelopes. The opaque envelope was opened immediately after flap elevation, and the treatment assignment was communicated to the operator (FC). The blinding of the examiner was maintained throughout all experimental procedures.

3 | STATISTICAL ANALYSIS

Statistical analysis was performed with the JMP 9.0 package (SAS Institute Inc.) Descriptive statistics were performed using mean and standard deviation for quantitative variables, and frequencies and percentage for qualitative variables. The primary outcome variables were CRC and recession reduction (RecRed). RecRed was calculated as the difference between baseline distance between IM-GM0 and IMGJ at follow-up. Secondary variables included RES values, KT, and VAS Est Paz representing final patient satisfaction of the achieved outcomes considering VAS scale.

General linear models and logistic regressions were applied to investigate the possible influence of baseline recession (Rec 0) and ICAL (namely the deepest loss of interdental attachment comparing mesial and distal sites of involved tooth) (explicative variables) on the type of treatment. Analyses of covariance were created for KT gain, the difference in ICAL, and difference in CP PAP-mean. Analyses of variance was performed for VAS Est Paz and RES. Regarding dentin hypersensitivity and patient satisfaction, Fisher's exact test was applied. An intention-to-treat analysis with the imputation of missing values (last observation carried forward) was also planned as a sensitivity analysis.

4 | RESULTS

4.1 | Experimental population, patients, and defect characteristics at baseline

Details of the experimental population are reported in the original manuscript (Cairo et al., 2012). Briefly, a total of 29 patients were enrolled, 15 allocated to CAF + CTG (test) while 14 to CAF alone (control group) (Figure 1).

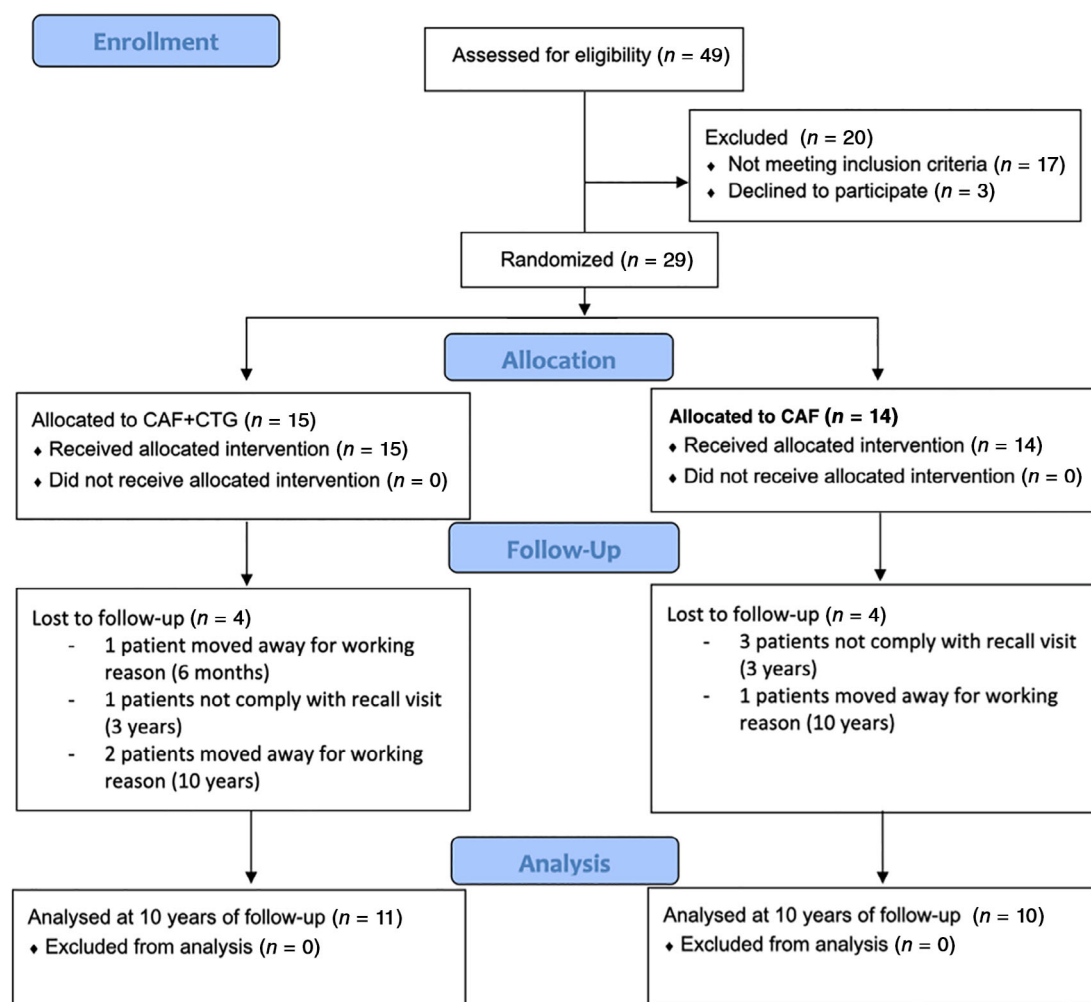


FIGURE 1 CONSORT flow-chart of the study

In the test group (87% female, mean age 45.9 ± 10.3 years, five light smokers), Rec Buc 0 was 2.9 ± 0.7 mm (2–4) while mean ICAL was 1.9 ± 1.2 mm (0–4) mesially and 2.6 ± 1.2 mm (1–5) distally. The mean distance between CP-BC on X-ray at the mesial site was 5.3 ± 0.7 mm, while at the distal site it was 6.5 ± 1.1 mm. The mean CEJ-BC X-ray Mes was 2.6 ± 1.1 mm and 4.1 ± 1.5 mm at the distal site.

In the control group (64% females, mean age 53.1 ± 8.4 years, seven light smokers), Rec Buc 0 was 2.6 ± 0.6 mm (2–4), mean ICAL was 2.6 ± 0.9 mm (1–4) mesially, and 2.6 ± 0.6 mm (2–4) distally. The mean distance between CP-BC on X-ray was 5.8 ± 0.6 mm mesially and 5.6 ± 0.6 mm distally. The mean CEJ-BC X-ray was 3.0 ± 0.6 mm at the mesial site and 3.1 ± 0.8 mm at the distal site.

4.2 | Six-month outcomes

At the first follow-up, RecRed was 2.6 ± 0.7 mm in the CAF + CTG group and 2.0 ± 0.7 mm in the CAF group. CAF + CTG resulted in better outcomes in terms of CRC (adjusted OR = 15.51, $p = .0325$)

than CAF alone. There was one dropout in the test group for personal reasons (Cairo et al., 2012).

4.3 | One- and three-year outcomes

Four dropouts (one in the test and three in the control group) were registered for not complying with recall visits. RecRed was 2.8 ± 0.9 mm in the CAF + CTG group and 2.4 ± 0.9 mm in the CAF group. CAF + CTG resulted in better outcomes in terms of CRC ($p = 0.0054$) than CAF alone (Cairo et al., 2015).

4.4 | Ten-year outcomes

Between 3 and 10 years Of follow-up, three additional dropouts could not reach the University Department for follow-ups for distance reasons. The final sample consisted of 11 patients in the test group and 10 in the control group (see Figure 1). Details of clinical outcomes at

TABLE 1 Descriptive statistics at the 10-year follow-up

Variable	CAF + CTG, n = 11	CAF, n = 10	p-Value
Rec Buc	0.5 (0.7)	1.3 (0.8)	-
PD Buc	1.9 (0.5)	1.6 (0.5)	-
PD Mes	3.0 (0.0)	2.9 (0.3)	-
CAL Mes	2.3 (0.9)	2.2 (0.8)	-
PD Dis	3.0 (0.0)	3.0 (0.0)	-
CAL Dis	3.8 (1.0)	3.1 (1.1)	-
ICAL	3.8 (1.0)	3.2 (1.0)	-
KT	4.7 (1.3)	2.4 (1.3)	-
KT Diff baseline	2.1 (1.4)	-0.5 (1.2)	<.001 ^a
ICAL difference	-0.7 (0.8)	-0.3 (0.7)	<i>p</i> = .124 ^a
Mean CP-PT	2.4 (0.7)	2.2 (0.9)	<i>p</i> = .023 ^a
CP-PT difference	-0.8 (0.5)	-0.2 (0.6)	<i>p</i> = .023 ^a
RecRed	2.7 (1.0)	2.2 (0.8)	<i>p</i> = .345 ^b
CRC	7 (63%)	2 (20%)	<i>p</i> = .030 ^c
Sens	1 (9%)	0 (0%)	<i>p</i> = 1.0 ^a
VAS Est Paz	95 (11)	87 (10)	<i>p</i> = .127 ^e
RES	7.6 (1.4)	7.0 (1.7)	<i>p</i> = .364 ^d

Abbreviations: CAL Dis, distal clinical attachment level; CAL Mes, mesial clinical attachment level; CP-PT difference, difference in distance contact point to papilla tip; CRC, complete root coverage; ICAL difference, difference considering deepest interdental clinical attachment level; ICAL, deepest interdental clinical attachment level; KT Diff baseline, difference in KT comparing baseline and final follow-up; KT, keratinized tissue; Mean CP-PT, mean distance contact point to papilla tip; PD Buc, buccal probing depth; PD Mes, mesial probing depth; Rec Buc, buccal recession; RecRed, recession reduction; RES, root coverage aesthetic score; Sens, root sensitivity; VAS Est Paz, patient satisfaction rated by VAS scale.

^aAnalysis of covariance.

^bGeneral linear model.

^cLogistic regression.

^dAnalysis of variance.

^eFisher's exact test.

10 years are reported in Table 1. Figures 2 and 3 show two representative clinical cases.

At the 10-year follow-up, RecRed was 2.7 ± 1.0 mm in the CAF + CTG group and 2.2 ± 0.8 mm in the CAF group. The general linear model (Table 2) shows no significant difference in term of RecRed between treatments (adjusted difference between treatment was 0.4 mm favouring test group [95% confidence interval [CI]: -0.4 to 1.2]; *p* = .345). Difference within the CAF + CTG group for the variable Rec Red (2.7 mm) considering baseline and 10-year follow-up was significant ([95% CI: 2.0-3.4]; *p* < .001). Similarly, the difference within CAF group for the variable Rec Red (2.2 mm) considering baseline and 10-year follow-up was significant ([95% CI: 1.6-2.8]; *p* < .001).

Complete root coverage was maintained in 63% (seven cases) of test group and 20% (two sites) of the control group. Logistic regressions with number of sites with CRC at 10 years as outcome variable showed that add of CTG was associated with higher long-term stability of CRC and the corresponding OR was 39 (Table 3). Similarly, CAF + CTG was associated with a larger KT amount (*p* = .0002) than CAF, with a significant difference of 2.4 mm [95% CI: 1.3-3.6]; *p* = .0002). Difference in positions of the gingival margin at different time frames is shown in Figure 4.

Analysis of covariance was also applied to explore a possible difference between groups in term of ICAL variations, showing a mean difference of 0.5 mm (95% CI: -0.1 to 1.1 mm) favouring CAF, even though this was not significant (*p* = 0.124). A modification of the distance between contact point and papilla tip (mean CP-PT) over time was assessed: the distance was 2.4 ± 0.7 mm in the test group and 2.2 ± 0.9 mm in the control group, with a tendency in papilla recession over time of 0.8 ± 0.5 mm in the CTG group and 0.2 ± 0.6 mm in the CAF group. Analysis of covariance showed a significant difference of 0.6 mm favouring CAF alone (*p* = 0.023) (95% CI: 0.1-1.1 mm).

Regarding dentin hypersensitivity and patient satisfaction, the difference was not significant (*p* = 1.0).

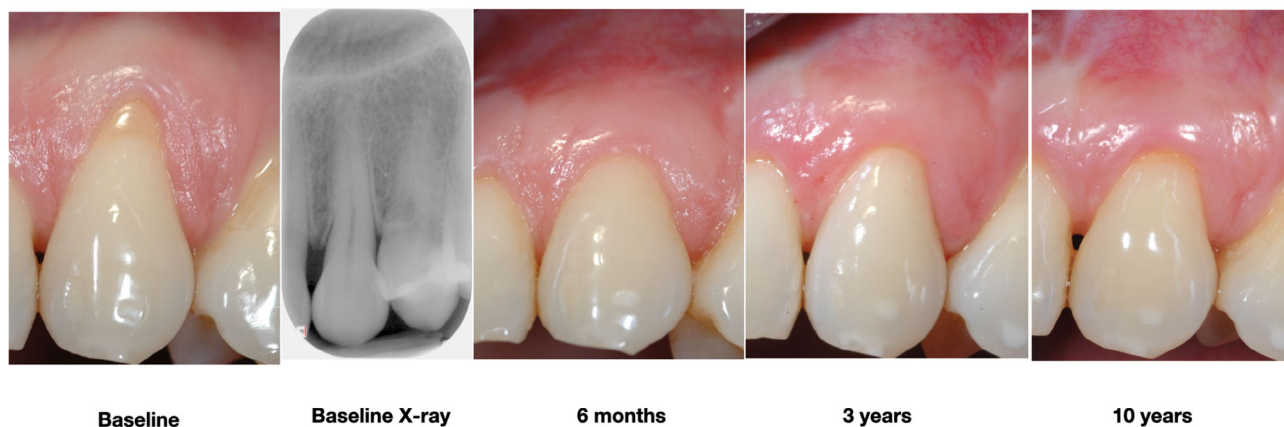
**FIGURE 2** Clinical case allocated to CAF alone treatment at different time frames.



FIGURE 3 Clinical case allocated to CAF + CTG treatment at different time frames.

TABLE 2 General linear model with recession reduction (RecRed) at 10 years as outcome variable comparing the two treatment modalities.

Term	Estimate	Std. Err.	p-Value
Treatment (CAF + CTG vs. CAF)	0.37	0.38	.345
RecBuc0	0.73	0.33	.042
ICAL0	−0.31	0.22	.181

Abbreviations: ICAL, the highest loss of clinical attachment at the interdental site; Rec Buc 0, buccal recession at baseline; Treatment, coronally advanced flap (CAF) + connective tissue graft (CTG) versus CAF.

Finally, no significant difference was found in term of RES score (0.6 favouring CAF + CTG; [95% CI: −0.8 to 2.1]; $p = .364$) between treatments.

Intention-to-treat analysis (last observation carried forward) performed as sensitivity analysis confirmed the reported outcomes, showing 0.1 mm of mean root coverage difference in favour of CAF + CTG ([95% CI: −0.6 to 0.8]; $p = .786$) while difference in CRC between groups was significant ($p = .026$).

5 | DISCUSSION

The present paper is a 10-year extension follow-up of a randomized clinical trial comparing CAF with or without CTG at single RT2 maxillary gingival recessions. Data regarding outcomes for root coverage procedures beyond the 5-year follow-up is minimal, and no information is available on the long-term effects of root coverage at a gingival recession with ICAL (Cairo et al., 2014).

The present report shows that root coverage outcomes at single recession with loss of interdental attachment can be predictably maintained for 10 years. CRC was detected in 63% of CTG group and 20% of the control group at the final follow-up. Logistic regressions showed that CTG was associated with significantly higher probability to maintain full root coverage than CAF-treated sites (OR = 39 [95% CI: 1.4–1076.5]; $p = .030$).

The final mean difference in terms of RecRed was 0.4 mm favouring the test group, even though this difference was not significant. This data is in accordance with the reported greater long-term stability of CTG-treated sites in RT1 single and multiple recessions (Cairo et al., 2014; Rasperini et al., 2018).

When interpreting the outcomes of this study, it should be kept in mind that enrolled patients were part of a group of successfully treated periodontal patients with request of root coverage at maxillary teeth at baseline. All patients were highly compliant and adherent to a supportive periodontal care programme (3–4 times/year), thus maintaining excellent plaque control over time and instructed to avoid traumatic toothbrushing. Experimental sites presented also with minimal probing depth at the time of surgery as the entry criterion. The present study supports the findings that professional periodontal care with stringent monitoring of gingival inflammation and traumatic toothbrushing is critical for the stability of root coverage outcomes (Tavelli et al., 2019). Conversely, the lack of regular SPC and/or the recurrence of traumatic toothbrushing may be associated with the recurrence of the apical shift of the gingival margin in the long term (Leknes et al., 2005; Moslemi et al., 2011; Pini Prato, Franceschi, et al., 2018). Recently, a network meta-analysis showed the effect of geographic centre on the changes of root coverage outcomes in the long term, suggesting that treatments in European countries was associated with greater long-term stability (Tavelli et al., 2019). Even though no scientific explanation is available, it might be related at least in part with different setting systems of SPC among different countries.

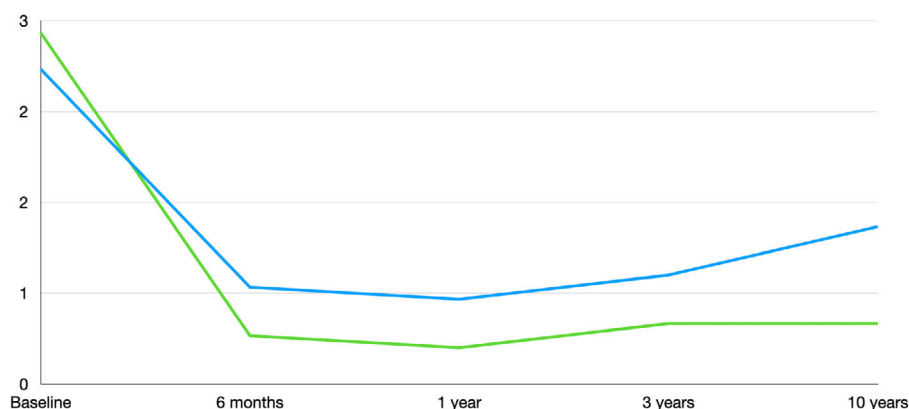
When assessing the position of GM in the experimental population at different time frames, residual recession is almost double while comparing 1-year with 10-year follow-up in the CAF-treated sites (0.6 mm increase), with a progressive increase from 3 to 10 years. Conversely, in the test group, the GM position seems to be more stable also at earlier observations. The mean difference in residual Rec between 1 year and 10 years is 0.2 mm, and there is no significant mean Rec increase comparing 3- and 10-year observations. The observed greater stability of the gingival margin in the test sites

TABLE 3 Logistic regressions with number of sites with complete root coverage at the 10-year follow-up as outcome variable

Term	OR	95% confidence interval	p-value
Treatment (CAF + CTG vs. CAF)	39.0	1.4; 1076.5	.030
RecBuc0	0.1	0.01; 1.3	.077
ICAL0	0.7	0.2; 2.9	.655

Abbreviations: ICAL, the highest loss of clinical attachment at the inter-dental site; Rec Buc 0, buccal recession at baseline; Treatment, coronally advanced flap (CAF) + connective tissue graft (CTG) versus CAF.

FIGURE 4 Residual recessions at different time points. Y-axis is the residual recession (in mm), X-axis is the different time of observation; the blue line is the CAF alone, and the green line is CAF + CTG



supports the hypothesis of a possible role of CTG as a biological filler under CAF able to modify the original phenotype, improving the clinical outcomes at shorter follow-up (Cairo et al., 2012) and also in the long term. In facts, sites treated with CAF + CTG presented with a significantly greater KT width (difference 2.4 mm) compared to CAF-treated sites at the last follow-up, confirming the findings of a recent long-term trial on single RT1 recessions (Rasperini et al., 2018). When assessing the longitudinal changes in soft tissue, (CAF + CTG)-treated sites showed a tendency of increase in average KT width of 0.5 mm between 1 and 3-years follow-up and 0.2 mm between 3 and 10 years. Conversely, 0.4 mm loss of KT width was detectable between 1 and 10 years at CAF-treated sites. These observations corroborate the findings from a recent meta-analysis showing that the higher stability of CTG-treated sites in the long term was associated with the amount of detectable KT 6 months after surgery (Tavelli et al., 2019). It could be hypothesized that KT may play a critical role in the long term at previously covered roots, facilitating plaque control by the patient him/herself. Sites with less KT may be more suitable for the recurrence of gingival margin in the presence of traumatic toothbrushing (Pini Prato, Magnani, & Chambrone, 2018). Interestingly, both the baseline recession depth and the baseline ICAL predicted not the long-term root coverage outcomes but only the type of treatment. These elements corroborate the hypothesis that the quality of SPC and the amount of 6-month KT influenced the stability of GM more than the pre-surgical periodontal parameters (Tavelli et al., 2019).

The present study found some loss in the height of the interdental papilla in both test and control groups, even though no specific stent to monitor papilla tip position was applied throughout the study. At the last follow-up, the papilla recession, monitored as the distance

between the contact point and papilla tip, was 0.8 ± 0.5 mm in the CTG group and 0.2 ± 0.6 mm in the CAF group, with a significant difference (0.6 mm; [95% CI: 0.1–1.1]; $p = .023$) for CAF-treated sites. Since the analysis showed no progression of periodontitis at the experimental sites, it could be hypothesized that this increase in papilla recession may be due to the interproximal cleaning in the long term. Interestingly, CTG-treated sites were susceptible to 0.6 mm higher papilla recession at the 10-year follow-up than CAF. Even though this finding is open to possible speculations, it could be hypothesized that thicker and flatter gingival areas after CTG may lead to more difficult interdental cleaning than thinner and more scalloped tissue. However, further analyses on this issue are necessary.

The limitations of the present study may be related to the reduced sample size at the final follow-up. Eight patients (27% of the original sample of patients) were lost over the 10 years of follow-up, leading to an underpowered follow-up study compared with the initial sample size. Furthermore, it should be noted that only patients with specific RT2 single recession at upper maxilla showing minimal ICAL were treated and followed in the present study. In addition, no data concerning KT thickness was measured in this study and no clinical stents were used for measurements. These limitations may affect the generalizability of these results in more extensive studies.

6 | CONCLUSION

In conclusion, this study showed that

- root coverage outcomes may be maintained 10 years after treatment at a single RT2 maxillary recession;

- the addition of CTG to CAF provided a better probability of maintaining CRC than CAF alone; and
- while CAF-treated sites tended to apical repositioning of the gingival margin during this longitudinal study, adding CTG promoted stability of the gingival margin and increased the KT width.

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CONFLICT OF INTEREST

The authors have nothing to disclose related to this manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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