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Postoperative Complications Following Gingival Grafts: A Prospective Cohort Study

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Abstract
Aim: Treating gingival recessions (GRs) is a challenge for the practitioner who must take into consideration objective clinical factors, subjective symptoms and also factors related to the patient's expectations. The aim of this study was to evaluate the postoperative complications associated with connective tissue graft (CTG) plus coronally advanced flap (CAF) and free gingival graft (FGG) used to cover GRs and to compare post-operative morbidities for the two groups of procedures. *Material and Methods:* A total of 17 patients diagnosed with Miller class 1 to 3 GRs ≥2mm were surgically treated using CTG plus CAF or FGG. When minimum 2 mm of keratinized gingiva was present apically to GR, CTG plus CAF was used. FGG was chosen to cover GRs when keratinized gingiva was absent. Post-operative complications were evaluated with a questionnaire with six questions given to the patients at 14 days follow-up visit. The study used a 1 to 10 visual analogic scale (VAS) and the levels of outcomes were classified as "none to minimum" "moderate" and "very important/severe". *Results*: A total of 21 procedures, 10 CTG plus CAG and 11 FGG were included in the analysis. No palatal bleeding and no severe pain or swelling were recorded. The patients experienced more pain in the grafted area than in the donor area, for both surgical techniques, with a mean value of 3.09 (1.3 standard deviation sd) versus 2.27 (1.4 sd) for CTG plus CAF group and of 3.7 (2.21 sd) versus 2.9 (1.7 sd) for FGG group, respectively. CTG plus CAF generated significantly higher scores of tumefaction than FGG, the mean values being 2.45 (0.93 sd) and 4 (2.21 sd) (t-value=2.12, $p<0.05$) respectively. *Conclusion*: The complications associated with the two periodontal surgical approaches seem manageable and clinically acceptable.

Keywords: Gingival recession; Treatment; Outcome.

Introduction

Gingival recession (GR) is a term that designates the oral exposure of the root surface because of a displacement of the gingival margin apical to the cement-enamel junction. The height and the width of the root surface exposure are objective clinical factors used to diagnose GR. GR is regularly linked to subjective symptoms such as the deterioration of dental esthetics, fear of tooth loss and dentin hypersensitivity [1].

In the case of an objectionable modification in aesthetics, in progressive recessions or in situations of increased hypersensitivity, the surgical treatment must be considered [2] in order to cover the exposed areas. Treating GRs is a challenge for the dental practitioner who must take into consideration objective clinical factors and subjective symptoms; factors related to the patient's expectations regarding the outcome of the therapy such as minimal post-operative discomfort and esthetics must be considered. Complete root coverage, the thickness and color of the surgically treated area must be taken into consideration in order to fulfill all the esthetic expectations of the patients.

Available surgical techniques are chosen depending on the presence of adequate or inadequate keratinized tissue. In clinical situations in which the existing keratinized gingiva is adequate but a GR is present, usually a displacement flap associated or not with a subepithelial connective tissue graft (CTG) is used to treat the recession. However, coronally advanced flap (CAF) associated with CTG may be considered the gold standard to cover GRs [1,3].

For covering the recession defects associated with a deficient attached gingiva, the procedures involve or demand a free gingival graft (FGG) [4]. FGG is also recommended for treating mandible incisors with recessions and a very fine gingiva which makes almost impossible the realization of a resistant flap for sustaining a SCTG [5].

When appreciating a treatment, the medical community and the research groups focus on the standard measurements related to survival and physiological outcomes. The patient centered outcomes research focuses on outcomes important to patients including post-operatory complications. Thus, the care experience must be viewed through the eyes of patients, to ensure that their concerns are also addressed [6]. The hardship of a procedure may negatively influence the future choice of that type of intervention. The evidence in the literature evaluating differences in patient outcomes following the CTG plus CAF and FGG, used for root coverage, is minimal [7,8].

The aim of this study was to evaluate the postoperative complications associated with CTG plus CAF and FGG used to cover GRs and to compare post-operative morbidities for the two groups of procedures.

Material and Method

Study Population

A total of 17 patients diagnosed with GRs from November 2008 to December 2010 participated in this study. The subjects were selected from a group of patients referred for periodontal treatment to the Department of Periodontology of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca. After enrollment of the patients, the study protocol, the risks, the estimated benefits, and the procedural details were explained and written informed consents were obtained from all subjects. In obtaining informed consent and conducting the study, the study adhered to the principles outlined in the Declaration of Helsinki on experimentation involving human subjects. The study was approved by the Ethical Board of "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca.

Inclusion criteria were as follows:

- age ≥ 18 years;
- absence of any uncontrolled local or systemic disease where periodontal plastic surgery might be contraindicated;
- smoking ≤ 10 cigarettes/day;
- full-mouth plaque score ≤ 30% [9];
- presence of one tooth with Miller class I (marginal recession not extending to the muco-gingival gingival junction, no loss of interdental bone and soft tissue), II (marginal recession extends to or beyond the muco-gingival gingival junction, no loss of interdental bone and soft tissue) or III (marginal recession extends to or beyond the muco-gingival gingival junction, some loss of interdental bone and soft tissue but coronal to the apical extent of the recession) GR ≥ 2mm [10];

- presence of clinical probing depths ≤ 3mm;
- absence of clinically appreciable gingival inflammation in the affected teeth.

The patients were selected by a single examiner (RC). A patient might receive two surgeries, in two different moments.

Pre-Treatment

All patients received oral hygiene instructions to modify the habits related to the etiology of the GRs at least 1 month before surgery. Initial therapy consisting of ultrasonic scaling and polishing was done 1 month before surgery by a single practitioner (CC).

Surgical Procedures

All the surgical procedures were carried out by one trained operator (AR), using CTG plus CAF [11] or FGG [12].

CTG plus CAF: Briefly, a full/split-thickness flap was reflected beyond the mucogingival junction, in the recipient area. A connective tissue graft was obtained from the palatal area of the two premolars using a single incision technique, in order to minimize post-surgical complications [13]. The graft was placed over the exposed root surfaces and the flap was coronally positioned to completely cover the graft and secured using a 5-0 resorbable suture (Vicryl®, Ethicon Inc., Johnson& Johnson, USA).

***FGG*:** FGG was performed in one surgical step [12]. Using sharp dissections, a split thickness flap was elevated around GR in order to prepare the recipient site. A minimum distance of 3 mm between the apical end of the GR and the recipient site preparation was left. The epithelio-connective tissue graft was harvested from the palatal area of the two premolars. The graft was secured in the recipient area with interrupted sutures. Horizontal mattress stabilizing sutures anchored around the cervical constriction of the tooth were placed over the FGG to assure intimate contact between the graft and the bed. Sutures (4-0 resorbable) and an acrylic palatal stent were used to protect the donor area.

Clinical Measurements

Clinical measurements and photographs were taken at baseline and at 14 days post-surgery. The clinical measurements were made by a single investigator (AS), with the following parameters being recorded: recession depth and width, probing depth, clinical crown height, and keratinized tissue width of the experimental tooth.

Evaluation of Patient-Centered Outcomes

Post-operative complications were evaluated post-surgically with a questionnaire given to the patients at 14 days follow-up visits. The study used a 1 to 10 visual analogic scale (VAS) to evaluate palatal and grafted area pain, palatal and grafted area bleeding and swelling, but also the other possible complications such as palatal or grafted area necrosis, abscess, or cyst. The levels of outcomes were classified as "none to minimum" if the score was 1 to 3, "moderate" if the score was 4 to 6, and "very important/severe" if the score was 7 to 10 [14]. The questionnaire contained one question for each evaluated morbidities (palatal and grafted area pain, palatal and grafted area bleeding and tumefaction) and a question which evaluated the other possible complications. Patients were indirectly evaluated for the pain experienced in the post-operative period, by the mean cumulated amount of analgetic and anti-inflammatory medication.

Post-Surgical Instructions

The following post-operative regimen was prescribed to all patients: intermittent application of an ice bag to the operated area for the first 5–6 hours to control the swelling; control of the post-operative pain with Ibuprofen, 400 mg, 2 times/day; the patients were instructed to record the dosage used; rinses with 0.2% chlorhexidinedigluconate (Corsodyl®, GlaxoSmithKline, GB), twice

a day for 3 weeks. Patients were told to discontinue tooth brushing and avoid trauma and food impaction at the surgical site for the next 3 weeks. Sutures were removed after 14 days.

Data Analyses

The unit of statistical analysis was considered to be a GR or multiple GRs treated with a single surgical procedure. The percentage of cases belonging to each severity level of the scale (low, medium and high) was calculated for each morbidity type. Given the small sample size, before applying a parametric analysis (independent sample t-test) we have computed the Shapiro-Wilk normality test for each measured variable. All the obtained results were no significant which means that the distribution does not significantly deviate from normality. As a consequence using t-independent test is appropriate. We also computed Cohen's d effect size coefficient using SPSS (Statistical Package for Social Sciences, v. 16) and GPower 3.1.

Results

All the patients (8 males and 9 females; age range, 19 to 42 years) completed the study. A total of 21 procedures, 10 CTG plus CAG and 11 FGG were included in the analysis. Healing was uneventful for all the patients.

The prevalence and the severity of the recipient area and palatal pain, bleeding and swelling associated with both surgical procedures are revealed in the Figures 1 to 3.

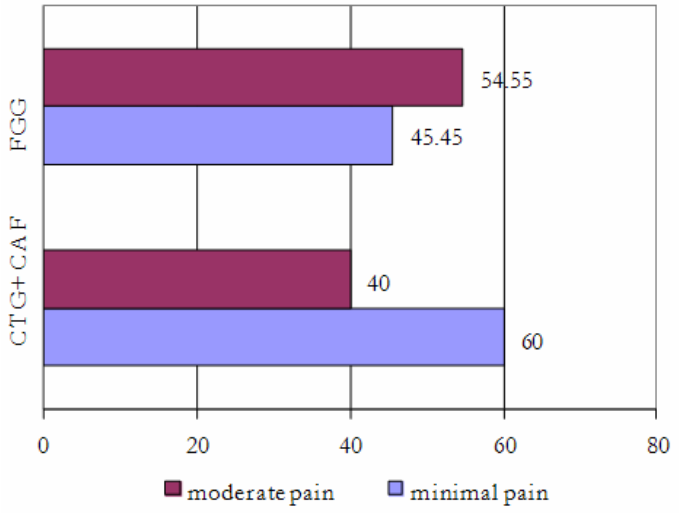

Figure 1. Frequency and intensity of pain in grafted area

For all presented frequencies we estimated the limits of confidence interval (fig.1-for FGG moderate pain 75.84-33.25; FGG minimal pain 66.74-24.15; CTG+CAF moderate pain 60.95-19.04; CTG+CAF minimal pain 80.95-39.04; 95% confidence interval).

For all presented frequencies we estimated the limits of confidence interval (fig.1-for FGG moderate pain 21.40-3.2; FGG minimal pain 66.74-24.15; CTG+CAF moderate pain 103.20-78.59; 95% confidence interval).

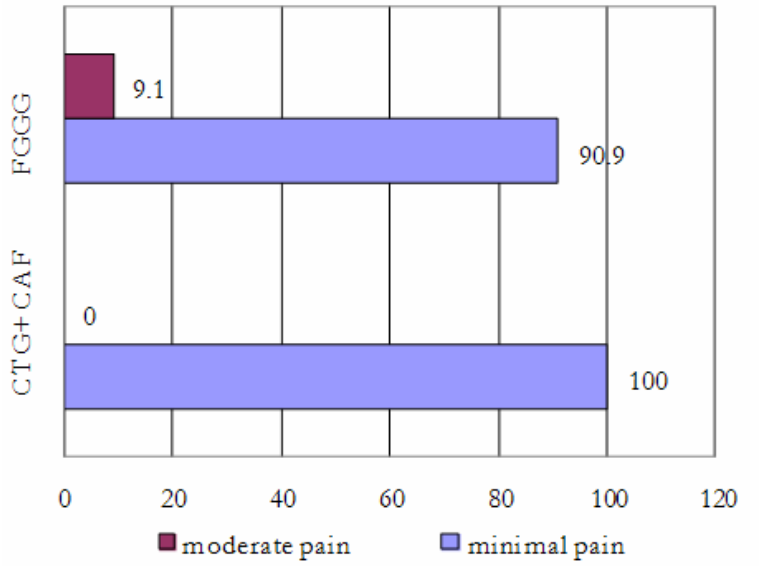

Figure 2. Frequency and intensity of palatal pain

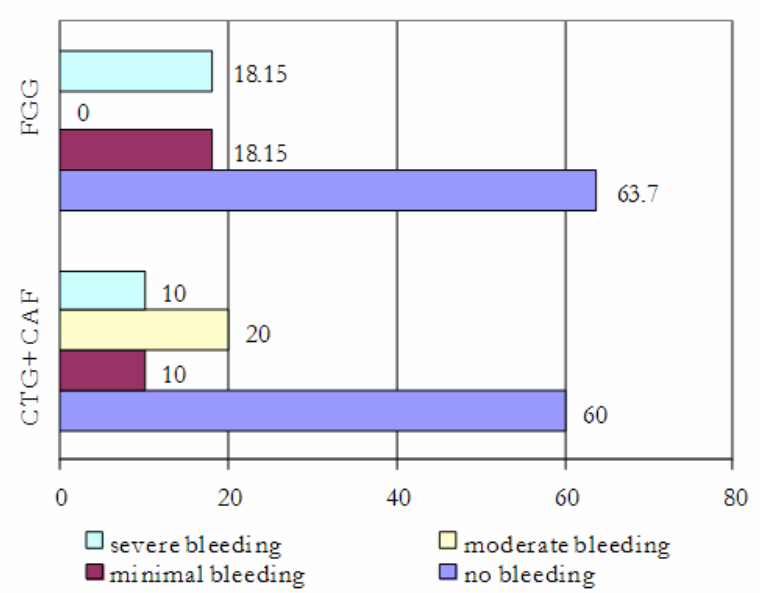

Figure 3. Frequency and intensity of postoperative bleeding

For all presented frequencies we estimated the limits of confidence interval (Figure 1-for FGG severe bleeding 35.10-1.89; FGG minimal bleeding 35.1-1.89; CTG+CAF severe bleeding 22.83-2.83; CTG+CAF moderate bleeding 37.1-2.89; CTG+CAF minimal bleeding 22.83-2.83; CTG+CAF no bleeding 80.95-39.04; 95% confidence interval).

All the patients experienced pain and swelling. The palatal pain was minimal for all CTG plus CAF patients. No palatal bleeding and no severe pain or swelling were recorded. The mean values of each followed-up parameter are revealed in Table 1.

The patients experienced more pain in the grafted area than in the donor area, for both surgical techniques, with a mean value of 3.09 (1.3 sd) versus 2.27 (1.4 sd) for CTG plus CAF group and of 3.7 (2.21 sd) versus 2.9 (1.7 sd) for FGG group, respectively.

For CTG plus CAF patients and for FGG patients, the measured mean total Ibuprofen dose at one week was 1640 mg and 1564 mg, respectively.

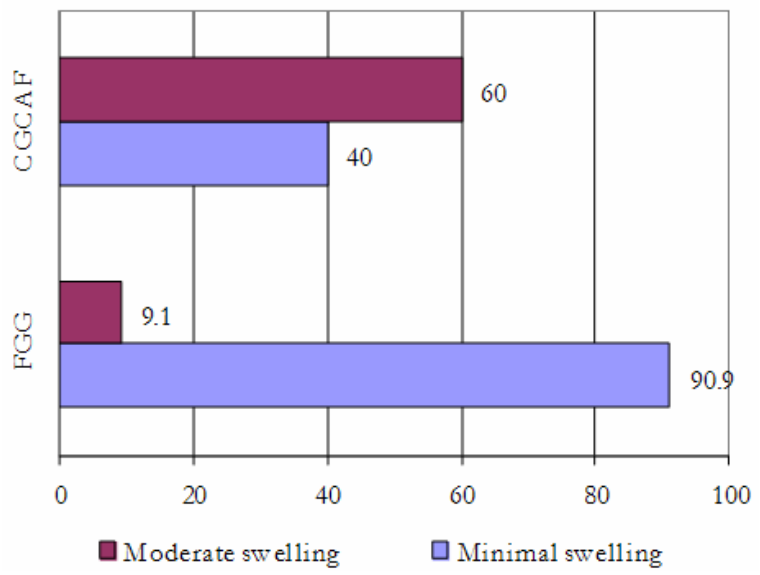

Figure 4. Frequency and intensity of swelling

Table 1. Mean values of patient-centered outcomes

Group Statistics					
	Muco-gingival approach	**n**	**Mean**	**Std.Deviation**	**Std. Error Mean**
Palatal pain	Free gingival graft	11	2.2727	1.42063	0.42834
	Connective tissue graft	10	2.9000	1.72884	0.54671
Receptor Area Pain	Free gingival graft	11	3.0909	1.30035	0.39207
	Connective tissue graft	10	3.7000	2.21359	0.70000
Tumefaction	Free gingival graft	11	2.4545	0.93420	0.28167
	Connective tissue graft	10	4.0000	2.21108	0.69921
Bleeding	Free gingival graft	10	1.6000	0.69921	0.22111
	Connective tissue graft	10	1.6000	0.84327	0.26667

Generally, the effect size for all measured variables except bleeding reached a high level (d=0.64-1.48).

CTG plus CAF generated higher scores on a scale of unpleasantness. However, the only statistical significant difference between the two techniques was recorded for tumefaction (Table 2). The non significant results obtained for the first two variables in the table should be interpreted with caution because for these comparisons the magnitude of the statistical power achieved only the value of 0.28 for pain graft and 0.05 for bleeding. The rest of the applied statistical tests reached the minimal value of the acceptable statistical power (0.8).

Table 2. The comparison of the followed-up parameters (equal variances assumed)

	t-test for Equality of Means						
	t-value	**df**	**p-value**	**Mean Difference**	**Std.Error Difference**	**95% Confidence Interval of the Difference**	
						Lower	**Upper**
Palatal pain	-0.912	19	0.373	-0.62727	0.68780	-2.06686	0.81231
Receptor Area Pain	-0.778	19	0.446	-0.60909	0.78295	-2.24782	1.02964
Tumefaction	-2.123	19	0.047	-1.54545	0.72787	-3.06891	-0.02200
Bleeding	0.000	18	1.000	0.00000	0.34641	-0.72778	0.72778

Discussion

Patient perceptions of the hardship of the surgical procedures were moderate. At 14 days, only 9.1% (1 patient) of the FGG patients reported moderate palatal pain and 54.5% (6 patients) of these patients reported moderate pain in the recipient area. In GTG plus CAF group, no patients reported moderate palatal pain and 40% (4 patients) of this group reported moderate pain in the recipient area. Comparison to other studies reported in the literature was difficult, since our study evaluated pain separately for two surgical areas - the grafted and the donor area. However, none of our patients reported severe pain, in comparison with the value of 1.4% reported by Harris et al. [15], or the value of 4.6% reported by Curtis et al. [16], possible due to the small sample size of our study.

The medium-VAS score for palatal pain of 2.9 ± 1.7 in GTC plus CAF group was a slightly greater than the value of 2.65 ± 2.18 (VAS-100 mm scale) reported by Zucchelli et al. [7] who analyzed 50 clinical cases.

Since the post-surgical bleeding for two separate surgical locations was considered in the present study, comparison with the outcomes reported by other studies must be taken with caution. However, a greater proportion of our patients (10%-1 patient for CTG plus CAF group and 18.15%-2 patients for FGG group) reported severe bleeding in the recipient area compared to the proportion of patients (0.6%) reported by Harris et al. [15] who analyzed 500 clinical cases.

No severe swelling associated with CAF plus CTG was recorded in our patients, compared to 0.4% severe swelling reported by Harris et al. [15] (who analyzed 500 clinical cases) and with 0.7% reported by Curtis et al. [16] (who analyzed 304 clinical cases).

No other complications such as bone exposure, necrosis of the graft or infection cited by other studies[14] were recorded

In opposition to existent evidence, our results showed that CTG plus CAF was associated with more severe complications than FGG, even if only for tumefaction the difference was significant. In some situations, CTG plus CAF was used to cover multiple adjacent GRs in the same surgery, whereas FGG covered for the majority of the cases only one GR. So, the operatory traumatism and the prolonged intervention time might be responsible for the more intense complications in CTG plus CAF group. The use of the palatal stent minimized the post-surgical pain in the palatal area and might explain the mildness of this symptom in FGG patients.

Having in view that surgeries were performed by the same operator, the psychological specific attributes of the patients might also influence the results.

The limits of this study may be related to the small sample size. Studies with a large number of patients and the use of more uniform clinical criteria are needed to confirm the present data. Another limitation might be the lack of the double evaluation of the treatment results, clinical and patient-centered, but the present research wanted to emphasize the importance of patient opinion on the therapy.

Conclusions

The complications associated with the two periodontal plastic surgery techniques seem manageable and clinically acceptable. The present study revealed that FGG may be associated with good patient-centered outcomes when is thoroughly managed.

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgements

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