Patient Outcomes Following Subepithelial Connective Tissue Graft and Free Gingival Graft Procedures

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**Background:** Subepithelial connective tissue grafts (CTGs) and free gingival grafts (FGGs) are common periodontal procedures with similar indications; however, they may differ regarding patient outcomes. Reports on postoperative periodontal patient outcomes are limited. The aim of this observational trial was to compare patient-based outcomes for CTGs and FGGs.

**Methods:** Patients who received CTG or FGG completed postoperative questionnaires at 3 days and 3 weeks to assess pain, number of analgesic pills taken, and number of days pills were taken. Postoperative pain was assessed using a visual analog scale (VAS).

**Results:** Twenty-three subjects (12 CTGs and 11 FGGs) completed the study. Differences between CTG and FGG groups in VAS pain scores at 3 days did not reach statistical significance. The proportion of subjects reporting pain in the palate at 3 days was significantly greater for FGG (P < 0.05). There were no significant intergroup differences at 3 weeks. For the FGG group, 3-week VAS pain scores were less than the 3-day ones (P < 0.01). For the entire study population, the number of days analgesic pills were taken, total number of analgesic pills taken, and number of pills taken from day 3 to the end of the study correlated with the 3-week pain scores.

**Conclusions:** FGG is associated with a greater incidence of donor site pain compared to CTG at the early postoperative period. Longer-term pain after soft tissue grafting is associated with greater analgesic usage. There is an opportunity to improve the postoperative protocols of soft tissue grafting, particularly for FGG. *J Periodontol* 2008;79:425-430.

**KEY WORDS**
Analgesics, non-narcotic; gingival recession/therapy; pain; pain measurement.

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T he subepithelial connective tissue graft (CTG) and free gingival graft (FGG) are commonly used periodontal plastic surgery procedures. Originally introduced by Langer and Calagna as a method of augmentation of edentulous ridges, the CTG has been described in detail as a procedure for obtaining root coverage with several variations in surgical technique. In addition to covering exposed roots, the CTG can be used to increase the width and thickness of keratinized gingiva. The FGG, which was introduced prior to the CTG, can be used for many of the same applications as the CTG, including root coverage and augmentation of keratinized gingiva. The CTG often is the graft procedure of choice for root coverage because of its greater predictability in obtaining root coverage and better aesthetic outcomes.

In addition to reported differences in clinical outcomes, there are some reports of differences in patient outcomes following CTG and FGG procedures. However, the evidence in the literature evaluating differences in patient outcomes following CTG and FGG procedures is minimal, with only one prospective study directly comparing the two procedures and one study comparing the outcomes of the palatal donor site alone following different harvesting techniques. These studies reported poorer patient outcomes, specifically a greater incidence of postoperative pain, for FGG procedures compared to CTG procedures.

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The FGG procedure uses a harvesting technique from the palate that leaves an open wound that heals by secondary intention, which can take 2 to 4 weeks. The CTG procedure can use a variety of harvesting techniques, with recent descriptions of harvesting techniques involving parallel incisions separated by 1.5 mm or a single incision to minimize the size of the palatal wound and allow for primary closure of the donor site, which may result in reduced postoperative pain.

Patient outcomes following periodontal surgery, e.g., osseous or mucogingival surgery, have been reported to be favorable overall, with postoperative complications and pain considered to be minimal. However, mucogingival surgery was shown to cause postoperative pain more frequently than osseous surgery and periodontal flap surgery. The common use of CTG and FGG procedures makes evaluation of patient outcomes an important issue in clinical periodontics.

Prospective patient outcome studies in periodontics are generally lacking, particularly regarding CTG and FGG postoperative experiences. The aim of this study was to compare patient-based outcomes, specifically postoperative pain and analgesic usage, for CTG and FGG procedures. The hypothesis for the present study was that patient-based outcomes would be more favorable for CTG than FGG procedures.

**MATERIALS AND METHODS**

**Study Population and Design**

Twenty-six subjects were recruited between May 2006 and March 2007 from the Graduate Periodontology Clinic, The Ohio State University College of Dentistry, where the study was performed. Only subjects who already had formally agreed to receive a CTG (N = 14) or FGG (N = 12) as part of their overall periodontal treatment plan were recruited. At the first visit, interested subjects were given detailed explanations about the postoperative follow-up required for study participation and all other study procedures. Interested subjects who met the inclusion criteria were required to provide signed informed consent. Inclusion criteria were ≥18 years of age, patient of record at The Ohio State University College of Dentistry, signed treatment plan for CTG or FGG procedure, signed surgical consent form for gingival augmentation surgery, and ability to provide research informed consent. Exclusion criteria were allergy to impression or acrylic stent (template) material, severe gag reflex preventing maxillary impression taking, and inability or unwillingness to provide informed consent. Exit criteria were unwillingness or inability to continue in the study and non-compliance with study procedures and appointments. The study protocol, questionnaires, and informed consent form were approved by the Institutional Review Board of The Ohio State University.

The study was of an observational parallel-group design. The total duration of the study was 21 days from the day of the surgical procedure. Recruited subjects filled out a preoperative questionnaire, which dealt with demographic and systemic health questions. Postoperative pain, number of analgesic pills taken, and number of days pills were taken were assessed using questionnaires administered at the 3-day and 3-week postoperative appointments. The postoperative questionnaires evaluated the subjects’ postoperative pain using visual analog scale (VAS) scores from 1 to 10, with 1 indicating minimal pain and 10 indicating severe pain. If a patient indicated that no pain was present, a score of 0 was given. The 3-day questionnaire assessed pain in the first 3 postoperative days, and the 3-week questionnaire assessed pain from 3 days postoperatively to 3 weeks postoperatively. Subjects also were asked to indicate the location of pain: donor site, recipient site, or elsewhere in the mouth.

**Surgical Procedures and Postoperative Care**

The CTG and FGG procedures were performed by periodontal residents. For CTG procedures, the recipient site was prepared according to the Bruno or Raetzke surgical technique, whereas harvesting of the graft was performed according to the Harris or Hurzeler and Weng surgical technique, thereby avoiding trap-door elevation in the palate. FGG procedures were performed following the surgical technique of Sullivan and Atkins or Miller, with all grafts being placed on a periosteal bed. Following alginate impression, palatal stents (templates) were provided to all FGG subjects for donor site protection. Postoperative instructions included discontinuing toothbrushing and flossing around the surgical sites for the first 3 postoperative weeks. During this period, subjects were instructed to rinse with a 0.12% chlorhexidine gluconate solution three times a day. Subjects were provided with a prescription for ibuprofen (600 mg) to take as needed for analgesia, unless contraindicated.

**Statistical Analysis**

Descriptive statistics were expressed as means ± SD and frequency distributions. Intergroup (CTG and FGG) comparisons at 3 days or 3 weeks were analyzed by the Mann-Whitney U test. The Wilcoxon signed-rank test was used for intragroup comparisons between 3 days and 3 weeks. Differences in frequency distributions between CTG and FGG groups were analyzed by the Fisher exact test. Associations between pain VAS scores and the number of analgesic pills or number of days analgesics were taken were examined by the Pearson correlation coefficient. The significance level for rejection of the null hypothesis was set at α = 0.05.
RESULTS

Of the 26 recruited subjects, three did not complete the study because of failure to comply with the study protocol (completion of all postoperative appointments). The three subjects who dropped out did not experience any untoward complications and had no complaints; they simply failed to appear for the designated study appointments. Twenty-three subjects (10 males and 13 females; aged 39.2 ± 13.9 years; age range: 21 to 70 years) completed the study, which included 12 CTG subjects (six males and six females; aged 36.6 ± 14.0 years; age range: 21 to 70 years) and 11 FGG subjects (four males and seven females; aged 42.1 ± 13.8 years; age range 22 to 65 years) who complied with study protocol. One subject (CTG group) experienced a postoperative surgical complication (donor area sloughing); the data from this subject were included in all analyses.

At 3 days postoperatively, 11 of 12 CTG subjects had experienced postoperative pain since the surgery. All 11 FGG subjects indicated experiencing pain during the same time period. The mean VAS pain score for CTG subjects was 3.5 ± 1.8 (range: 0 to 6), whereas the score for FGG subjects was 4.8 ± 1.2 (range: 3 to 6). The difference between CTG and FGG groups did not reach statistical significance (Mann-Whitney U test; tied P value = 0.0636). Among CTG subjects, 50% reported pain in the donor (palatal) site, 92% reported pain at the recipient site, and 8% reported pain elsewhere. Among FGG subjects, 90% reported pain in the donor site, 92% reported pain in the recipient site, and 8% reported pain elsewhere. Among CTG subjects, 33% reported pain in the donor site, 25% reported pain in the recipient site, and none reported pain elsewhere. Among FGG subjects, 36% reported pain in the donor site, 18% reported pain in the recipient site, and 9% reported pain elsewhere (Fig. 1). Intragroup comparisons for the FGG group showed that the VAS pain score was reduced significantly at 3 weeks compared to 3 days (Wilcoxon signed-rank test; tied P value = 0.0047), whereas the difference did not reach significance for the CTG group (P = 0.0667).

Eleven CTG subjects and 10 FGG subjects received ibuprofen (600 mg) analgesic prescriptions. Up to day 3, the CTG group reported having taken 8.6 ± 5.5 pills (range: 0 to 14), whereas the FGG group reported 11.1 ± 3.2 (range: 2 to 13) pills taken (P = 0.24). At 3 weeks, the total number of pills taken during the study was 12.5 ± 10.4 (range: 0 to 28) and 17.8 ± 10.6 (range: 2 to 40) for the CTG and FGG groups, respectively (P = 0.16). The average number of days the CTG and FGG groups took analgesic pills was 3.2 ± 2.5 (range: 0 to 7) and 4.9 ± 2.4 (range: 2 to 10), respectively (P = 0.13).

When the entire study population was considered (N = 23), the number of analgesic pills taken from day 3 to the end of the study correlated strongly with the 3-week pain scores (r = 0.696; P < 0.0005). The 3-week pain scores correlated with the total number of pills taken during the study (r = 0.534; P = 0.0125) and the number of days analgesics were taken (r = 0.535; P = 0.01 for pain scores). 

DISCUSSION

The purpose of this study was to compare patient-based outcomes for CTG and FGG. The results indicated that FGG was associated with a greater incidence of donor site pain compared to CTG during the early postoperative period. There were significant differences between early (3-day) and late (3-week) pain levels for FGG. The results also indicated that longer-term (3-week) pain levels after soft tissue grafting were associated with levels of analgesic usage.

The mean VAS pain score for the first 3 days postoperatively was 3.5 for CTG subjects. These results are similar to other reports on patient outcomes following CTG procedures. Previous studies evaluating CTG postoperative pain at 1 week reported mean VAS scores of 2.728 overall, and, more specifically, 2.3 and 2.2 for donor and recipient sites, respectively.29
The mean VAS pain score for the first 3 days postoperatively was 4.8 for FGG subjects. The respective 3-day score differences between CTG and FGG approached, but did not reach, statistical significance, suggesting that a larger sample size might have resulted in significant differences. As far as we could determine, this was the first study to use VAS scores to evaluate postoperative pain following FGG procedures.

Mean VAS pain values decreased from 3 days to 3 weeks postoperatively for CTG and FGG, although the differences were significant only for the FGG group. The present study showed a mean VAS pain level of 1.6 at 3 weeks postoperatively for CTG. Similar trends have been shown before, with a mean VAS score of 0.59 at 1 month postoperatively for CTG.28

In the present study, pain in the palatal donor site at 3 days postoperatively was reported by 90% of CTG subjects and 90% of FGG subjects; this difference was statistically significant. A previous study17 found similar results and attributed the poorer patient outcomes following FGG to differences in donor site harvesting techniques. In an 8-week observational study using a verbal descriptor scale to assess postoperative discomfort, Del Pizzo et al.17 reported postoperative discomfort at palatal donor sites during the first postoperative week in 100% of subjects treated with an FGG harvesting technique and in only 50% of subjects treated with a single-incision harvesting technique. Additionally, in a study on 228 subjects using questionnaires to assess postoperative pain, Griffin et al.16 reported FGG subjects were three times more likely than CTG subjects to develop post-surgical pain during the first postoperative week.

There was a decrease in the frequency of postoperative pain reported from 3 days to 3 weeks postoperatively for the CTG and FGG groups. At 3 weeks, the frequency of reported pain at palatal donor sites and recipient sites ranged from 25% to 33% for CTG and 18% to 36% for FGG. Previous studies17,30 indicated a complete absence of reported pain for CTG and FGG subjects at 3 weeks postoperatively. These reports used three-point verbal descriptor scales to assess patient outcomes. Differences in pain assessment methods and surgical techniques could account for the discrepancies between studies.

Although a variety of analgesic medication regimens have been evaluated following periodontal surgery,21-35 studies regarding analgesic use following periodontal plastic surgery procedures, specifically CTG and FGG, are scarce.9 In the present study, CTG and FGG subjects reported taking an average of 8.6 and 11.1 600-mg ibuprofen pills, respectively, in the first 3 postoperative days. To the best of our knowledge, this was the first study to quantify analgesic use following FGG. The only other study8 to quantify analgesic use following CTG reported a mean of 0.53 analgesic pills (sodium dipyrone, 500 mg) taken during the first 3 days postoperatively. Patients in that study were instructed specifically to take the analgesic only if they experienced pain. Differences in postoperative instructions, study populations, type of analgesic medication, and study design could explain the difference in the number of pills taken between the two studies. In the present study, the number of analgesic pills taken following CTG and FGG and the number of days analgesics were taken correlated significantly with the 3-week pain scores. Evaluation of analgesic medication use may provide a more objective method of evaluating patient outcomes following periodontal surgery and may strengthen results of future studies evaluating patient outcomes.

The present study is not without limitations. One limitation is the use of multiple operators, specifically periodontal residents. Operator experience could affect the duration of surgery, and the duration of soft tissue grafting surgical procedures has been identified as the most important risk indicator for the development of moderate or severe postoperative pain.16 Study design (parallel groups) may be another limitation. Differences in patient perceptions also can influence the levels of reported postoperative pain.36 A crossover study design, in which subjects have CTG and FGG procedures performed at different times, all by the same operator, may support the results presented here.

Improving patient outcomes is important in clinical practice. Several studies have evaluated methods to improve patient outcomes following periodontal plastic surgery procedures, including reduction of palatal wound extent, by using harvesting techniques that allow for primary wound closure17,22 and protection of palatal donor wound sites.18,36 Even with the use of palatal stents to protect FGG donor sites in the present study, a greater incidence of donor site pain was found during the early healing period compared to CTG. The choice of surgical technique may impact patient outcomes. Although a study9 reported more favorable patient outcomes following periodontal plastic surgery procedures that avoid harvesting (semilunar coronally positioned flap) compared to procedures that include harvesting (CTG), another study16 reported no significant differences in postoperative pain between procedures using allogenic (acellular dermal matrix) and autogenous soft tissue grafts (CTG and FGG). When several surgical techniques fulfill clinical objectives, the technique with the most favorable patient outcomes should be considered highly. The data from the present study, as well as from previous studies,16,17 indicated that patient outcomes are more favorable following CTG compared to FGG procedures. These findings suggest that, from a patient comfort perspective, CTG might be the procedure of choice.
when FGG and CTG can meet the patient’s surgical needs. The results of the present study also suggested that there is opportunity to improve the postoperative protocols of commonly used soft tissue grafting procedures; such improvements may include more effective analgesic protocols and donor wound protection schemes.

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