Comparative Clinical Evaluation of Semilunar Coronally Positioned Flap Alone and Semilunar Coronally Positioned Flap in Conjunction with Free Gingival Graft for Root Coverage

Gingival recession accounts for apical migration of the gingival margin, resulting in exposure of the cementoenamel junction and root surface, with exposure of the root surface linked to deteriorated esthetic appearance and increased dentinal hypersensitivity. Various surgical techniques have been used to correct labial gingival recession defects. The present study evaluated and compared the results of semilunar coronally positioned flap (SCPF) alone and in conjunction with free gingival graft (FGG) for the treatment of Miller Class I and II gingival recession defects in maxillary anterior teeth. A total of 20 bilateral Miller Class I and II gingival recession sites were included and randomly allocated (n = 10 sites/group) to either the semilunar coronally positioned flap technique alone (SCPF group; control) or with FGG (SCPF+FGG group; test). Longitudinal alterations in probing depth (PD), recession width (RW), recession height (RH), width of keratinized tissue (WKT), and clinical attachment level (CAL) were measured and analyzed for both groups at 1-, 3-, 6-, and 12-month follow-ups. Both groups saw a significant decrease in RH, RW, and CAL and a significant increase in WKT. No statistically significant difference was observed in the final root coverage outcome between both groups in terms of RH, RW, and CAL, but a significant increase in WKT was seen with SCPF+FGG. Both techniques demonstrated optimal results without significant differences in the final root coverage outcomes except for WKT, which had a statistically significant increase in the SCPF+FGG group. Int J Periodontics Restorative Dent 2021;41:599–608. doi: 10.11607/prd.3975

Gingival recession is the apical migration of the gingival margin that results in exposure of the cementoenamel junction (CEJ) and the root surface. It is a matter of concern for both patients and dental professionals, especially when exposure of the root surface is linked to a deteriorated esthetic appearance and increased dental hypersensitivity. Therefore various surgical techniques have been proposed and used to correct labial gingival recession defects, including periodontal plastic surgery. These surgical procedures (including free gingival autografts, laterally and coronally positioned flap, semilunar flap, guided tissue regeneration, subepithelial connective tissue graft, and a combination of procedures) aim to correct the recession defects and remove or control the etiologic factors that result in mucogingival problems.

Among these surgical techniques, the selection of a specific technique depends on several factors, including the anatomy of the defect site, size of recession defect, presence or absence of keratinized tissue adjacent to the defect, width and height of the interdental soft tissue, and depth of the vestibule or the presence of frenula. It also depends on the objective of the treatment outcome which varies, between the maxilla and
mandible. In the maxilla, esthetics are the desired outcome, whereas with mucogingival problems in the mandible, restoring normal function is the primary goal. Because of the existing controversies over different root coverage techniques and their disadvantages, there are only a few documented reports about an esthetic outcome, which is important in cases of maxillary defects, that can be gained through an increased width of keratinized tissue.

The semilunar coronally positioned flap (SCPF) procedure is one of the esthetic techniques introduced by Tarnow⁶ for treatment of gingival recessions; its use is confined to the maxilla for esthetic purposes,¹⁰ and no attempt is made to increase the width of keratinized tissue. Alternatively, free gingival autograft (FFG) predictably increases the keratinized tissue width or gingival thickness but may result in compromised color match due to the lighter graft color.¹⁰ Thus, simultaneous use of SCPF and FGG was performed to combine their desirable outcomes.

As there are no documented comparative clinical evaluations of SCPF and simultaneous use of SCPF and FGG for covering the exposed root surface in Miller Class I and II gingival recessions, the present study evaluated and compared the results of SCPF alone and in combination with FGG for covering the exposed root surface. The goal of treatment was to improve esthetics, increase keratinized tissue levels and clinical attachment levels, and hopefully achieve root coverage in anterior maxillae.

Materials and Methods

Study Design and Selection Criteria

Systemically healthy subjects who desired treatment for a gingival recession in the maxillary incisor or premolar area were consecutively recruited from the outpatient Department of Periodontology, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda (Dist) for this study (age range: 20 to 45 years). A total of 20 bilateral Miller Class I and II recession sites in anterior maxillae were included. The study design was approved by the Institutional Ethical Committee, Kamineni Institute of Dental Sciences. The nature and purpose of the study were explained to the patients in their native language, and informed consent was obtained.

Patients were excluded if they met the following criteria: having systemic conditions known to interfere with periodontal healing, a history of addiction or drinking alcohol, a smoking habit, or systemic or local bone diseases; using anticoagulant or immune suppressor drugs; unable to maintain oral hygiene; presence of Type II and V caries; pregnant or lactating.

The 20 bilateral recession defects in the 10 patients were randomly divided into two groups via coin toss (n = 10 defects/group): SCPF+FGG (test group) or SCPF alone (control group). Each patient received both treatments, one on each side.

Measurements

At baseline and 1-, 3-, 6-, and 12-month follow-ups, the following clinical parameters were recorded (rounded to the nearest millimeter) using UNC-15 probe along the long axis of the tooth, over the mid-root surface of gingival recession: probing depth (PD), recession width (RW), recession height (RH), and clinical attachment level (CAL). Keratinized tissue width (WKT) was assessed using Lugol’s iodine. An acrylic occlusal stent was used as the fixed reference point to determine changes in the clinical parameters during follow-ups.

Initial Therapy

Prior to surgery, all subjects received oral prophylaxis, which included scaling and root planing with ultrasonic instruments and Gracey curettes (Hu-Friedy), crown polishing, and oral hygiene instructions. Only when the patient demonstrated the ability to maintain a good level of oral hygiene was the surgical phase initiated.

Surgical Procedure

Bilateral defects were treated at the same appointment, and all defects were treated by the same operator (R.B.J.).

Control Group: SCPF

Before treatment (Fig 1a), the surgical area is anesthetized using local anesthesia (2% lidocaine with
The exposed root surface is planed to remove altered cementum and to flatten it, permitting a more intimate adaptation of the flap to the recipient bed. A semilunar incision is made with a no. 15 blade, following the curvature of the free gingival margin. The incision should (1) curve apically and far enough midfacially to ensure that the flap’s apical portion rests on bone after it is brought down to cover the exposed root, and (2) end by extending into the papilla on each end of the tooth, but not all the way to the tip. At least 2 mm of the papillary tip must be left on either side of the flap (Fig 1b), as this is the main source of blood supply. Later, a sulcular split-thickness incision is made: Using microsurgical blades (Lance tip blade 150 and Slit blade 2.8 mm; Sharpedge), a split-thickness dissection is made coronally from the initial incision line. This is connected with an intrasulcular incision, made midfacially. The midfacial tissue is then coronally positioned to the CEJ or to the height of the adjacent papilla (Fig 1c). The tissue is held in place with moist gauze against the tooth for 5 minutes, then sutured with sutured using Vicryl 5-0 (Ethicon, Johnson & Johnson; Fig 1d). A thin layer of periodontal dressing (Coe-Pak, GC America) was applied over the site.

Test Group: SCPF+FGG

Pretreatment (Fig 2a) procedures are the same as in the SCPF group. After creating an initial semilunar coronally positioned flap (similar to SCPF group, Fig 2b), the denuded area between the initial incision and the apical margin of the coronally positioned flap is made to be the recipient site for the FGG (Figs 2c and 2d). A tin foil is placed on the recipient site, and a template is prepared. The tin foil template is then placed over the palatal area, and an incision is made all around the template, 2 mm deep and 1 mm larger than the tin foil outline to accommodate graft shrinkage. The harvested graft (Figs 2e and 2f) is placed on gauze soaked in normal saline solution. The underside of the graft is inspected for overhanging tissues, and the donor area is then closed with continuous sutures. The graft is adapted to the recipient site and immobilized using holding sutures (Vicryl 5-0; Fig 2g), then firmly held in place using digital pressure for 5 minutes to reduce dead space, permit fibrin clot formation, and prevent bleeding, as the hematoma formed under the graft may result in subsequent necrosis. Periodontal dressing (Coe-Pak) is placed at the donor site and over the graft.

Postoperative Care

Patients were advised not to brush the treated site for 2 weeks, and using 0.2% chlorhexidine rinse was prescribed for 4 weeks. Antibiotics and analgesics were administered as needed. Patients were then examined after 2 weeks to remove sutures and assess healing. After, patients were instructed to gently brush around the surgical site with an ultra-soft toothbrush, using the roll technique. Routine oral health care was used in other sites. Subjects were enrolled in a follow-up...
program at 1, 3, 6, and 12 months postsurgery (Figs 3 and 4). Complete plaque elimination was performed every 3 months.

**Statistical Analysis**

Statistical analysis was performed using a commercially available software program (SPSS version 16.0, IBM). Repeated-measures analysis of variance was used to investigate whether data were normally distributed or not. Wilcoxon signed-rank test was used for intragroup comparisons and Mann-Whitney non-parametric U test was used for intergroup comparisons of the clinical findings.

**Fig 2** SCPF+FGG technique. (a) Preoperative view of the recession. (b) A semilunar incision was made. (c) The semilunar flap was coronally positioned and (d) sutured. (e and f) The palatal FGG was harvested, then (g) placed apical to the coronally positioned flap, over the denuded area, and sutured.

**Fig 3** Results of the SCPF technique after (a) 6 months and (b) 12 months.

**Fig 4** Results of the SCPF+FGG technique after (a) 6 months and (b) 12 months.
Results

The effects of two root coverage procedures (SCPF and SCPF+FGG, used for the treatment of Miller Class I and II gingival recessions) on clinical parameters PD, RW, RH, CAL, and WKT were evaluated (Table 1). All participants completed the 12-month study period and follow-up visits with no patient reporting any discomfort. Longitudinal changes in clinical parameters during a follow-up period of 1, 3, 6, and 12 months were recorded. Midsurface root coverage results were rounded to the nearest millimeter.

No statistically significant difference in baseline values was observed between groups (P > .05) in RH, RW, CAL, and WKT (Table 1). Intragroup analysis of both treatment modalities resulted in significant changes in RH, RW, CAL, and WKT at all time periods compared to baseline (Figs 5 to 9). Intergroup analysis showed nonsignificant decreases in RH, RW, and CAL, whereas a significant increase in WKT was observed in the SCPF+FGG group (P < .05; Figs 5 to 9).

Probing Depth

The intergroup comparison of PD in SCPF+FGG and SCPF groups showed nonsignificant reductions in PD at all study intervals, as shown in Fig 5. The PD reduction was not statistically significant between SCPF+FGG and SCPF groups (P = .745).

Recession Height

SCPF+FGG and SCPF groups both showed a statistically significant decrease in RH from baseline to 6 months (P = .001 and P = .0001, respectively). In the SCPF+FGG group, there was a nonsignificant increase in RH from 6 to 12 months. In intergroup comparison, SCPF+FGG showed a nonsignificant reduction in RH at all study intervals (P = .720; Fig 6).

Recession Width

SCPF+FGG and SCPF groups both showed a statistically significant decrease in RW from baseline to 12 months (P = .001 and P = .0001, respectively). In the intergroup comparison, SCPF+FGG showed a nonsignificant reduction in RW at all study intervals (P = .988; Fig 7).

Clinical Attachment Level

Statistically significant improvements in CAL from baseline to...
**Fig 5** Evaluation and comparison of mean probing depth (PD) between the SCPF+FGG and SCPF groups at all time points.

**Fig 6** Evaluation and comparison of mean recession height (RH) between the SCPF+FGG and SCPF groups at all time points.

**Fig 7** Evaluation and comparison of mean recession width (RW) between the SCPF+FGG and SCPF groups at all time points.
6 months were seen in both the SCPF+FGG and SCPF groups (P = .002 and P = .0001, respectively). There was a nonsignificant increase in CAL from 6 months to 12 months in the SCPF+FGG group. In the intergroup comparison, the SCPF+FGG group’s nonsignificant CAL improvement was seen at all study intervals (P = .798; Fig 8).

**Width of Keratinized Tissue**

The SCPF+FGG and SCPF groups showed statistically significant increases in WKT from baseline to 6 months (P = .003 and P = .001, respectively). A nonsignificant decrease in WKT was seen in the SCPF+FGG group from 6 months to 12 months. In the intergroup comparison, the SCPF+FGG group showed a significant increase in WKT at all study intervals (P = .002; Fig 9).

**Discussion**

The presence of site-related conditions like gingival recession, thin periodontium, and root prominence, combined with a reduced or missing amount of attached gingiva, may indicate the need for a gingival augmentation procedure. Lang and Löe reported that despite tooth surfaces being free of plaque, “all surfaces with less than 2.0 mm of keratinized gingiva exhibited clinical...
inflammation and varying amounts of gingival exudates.” Gingival augmentation procedures are indicated primarily to increase an insufficient amount of gingiva and sometimes to halt the progression of gingival recession.

Much controversy exists regarding mucogingival surgical procedures, the objective of which is to establish an adequate zone of attached gingiva, as it provides stability to the gingival margin position.

Currently, numerous surgical techniques are proposed to correct labial gingival recession defects and can be divided broadly into pedicle flaps and free soft tissue grafts. Esthetic concerns are usually the reason to perform such procedures. Various clinical studies have evaluated many root coverage techniques. According to a review by Bouchard et al, there seems to be no clear difference in the effectiveness of the various techniques. The advantage of pedicle flaps over free soft tissue grafts is the retention of flap vascularity. However, they require periosteal and vertical releasing incisions for tension-free flap mobilization; this may result in shallowing of the vestibule, depending on the gingival phenotype, and scarring of the vertical incisions, which could detract from esthetics. In the SCPF+FGG group in the present study, the donor FGG was placed apical to the coronally positioned flap and on the periosteum and alveolar bone, which was cleared of any elastomeric fibers, and sutured with Vicryl 5-0 sutures. This engaged the periosteum to create immobility and eliminate dead space to ensure the best blood supply.

Only maxillary anterior teeth were treated in the present study, and increasing WKT with a stable esthetic outcome is a desired effect of decreasing the possibility of gingival recession recurrence. Whether the root surface is covered is determined with regard to RW and RH. A significant degree of root coverage was achieved using both the techniques, and the difference between the two groups failed to reach a level of significance. However, nonstatistically significant greater root coverage was observed in the SCPF+FGG group. As CAL is measured from PD and RH values, significant improvements in PD and RH thus achieved significant CAL improvement in both SCPF+FGG and SCPF groups at the 12-month follow-up; when compared between groups, nonsignificant improvement was observed with SCPF+FGG. These results are similar to other studies using various flap and graft techniques. However, minor differences exist in the results, probably due to variations in measurement techniques of clinical parameter, magnification and illumination of the surgical site (which offers advantages such as enhanced visual acuity and more accurate and atraumatic manipulation of the soft tissue), and using different kinds of blades.

The significant reduction in marginal tissue recession and the gain in attachment observed 1 month after graft placement confirm the “creeping attachment” observed by Goldman et al. Even if only slight root coverage is possible (based on individual anatomy and physiology), this may be a significant esthetic improvement for the patient, and it increases the chances of additional root coverage. A nonsignificant increase in recession observed after 6 months might be due to graft shrinkage.

Longitudinal evaluations have shown FGGs to be a predictable means of increasing the width of attached keratinized gingiva and, in some circumstances, decreasing recession. Similarly, in the present study, comparison of the bilateral recession sites (10 test and 10 control) at the 6- and 12-month evaluations showed no significant differences between the two groups for any parameters, with the exception of the greater quantity of WKT at test sites (ie, with FGG; P < .05). Placement of a soft tissue autograft may have permitted its fixation to the underlying tissue, possibly providing a more stable position for the new mucogingival junction (MGJ).

The point at which movement was dissipated became the MGJ. Thus, the apical shift in MGJ may also have played a minor role in increasing the amount of attached gingiva with the FGG. When coronally positioned flap (CPF) plus connective tissue graft (CTG) is compared to CPF procedures alone regarding root coverage, the two surgical procedures resulted in similar degrees of root coverage, but the CPF alone reverted to presurgical MGJ levels. Ainamo et al reported that the MGJ will regain its original apical position over time, resulting in unstable root coverage. The present study reestablished a new MGJ.
by adding keratinized FGG apically, similar to a study by Preety.27

Historical comparisons and meta-analytic data of various studies28–31 indicate that the potential for recession reduction and complete root coverage using FGG is inferior to the potential using coronally advanced flap (CAF) alone or combined with a graft (CAF+CTG). However, it should be noted that these studies refer to treatment of recessions allocated mostly in the maxilla.30 The application of CAF alone or in combination with a CTG is seldom reported in the mandible, where, contrarily, the FGG is frequently proposed. Coronal positioning of existing gingiva may be used to enhance esthetics,32 but FGG for root coverage is avoided in esthetic zone (anterior maxilla) due to its compromised color match. In the present SCPF+FGG technique, FGG is placed apical to the coronally positioned, existing gingiva, enhancing esthetics in a single-stage surgical procedure in the anterior maxilla.

The limitation of the SCPF+FGG technique mainly lies with the stabilization of the donor graft, which is done using sutures over the recipient bed and apical to the coronally positioned flap. As the size of the graft is determined by the size of the recipient site, it requires an exceedingly small section of donor tissue to be placed over the denuded area, after the coronally positioned flap; the FGG placed apical to the flap may undergo shrinkage, affecting long-term root coverage.

Conclusions

Within the limitation of the present clinical study, both SCPF alone and SCPF+FGG show optimal results, without a significant difference in the final outcome of root coverage but with statistically significant WKT increases with the SCPF+FGG technique. Thus, the new single-stage SCPF+FGG procedure is an effective and predictable method to increase the WKT. It can also increase root coverage in Miller Class I and II cases, fulfill the needs of the patient, and reduce the number of appointments and patient costs. It is suggested that the SCPF+FGG technique be utilized in order to achieve the beneficial effects of increased WKT and root coverage, while SCPF alone can be indicated where only recession is the primary concern in the maxillary anterior region.

Further long-term clinical and histologic investigations are needed to confirm these results. It is also necessary to evaluate the outcomes of root coverage surgeries with regard to patient-related variables, such as esthetics, intensity of postoperative pain, and root hypersensitivity.

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References


