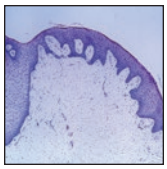
Periodontal Plastic Surgery for Reshaping the Mucogingival Junction Following Grafting Procedures: Case Reports



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The present clinical and histologic case reports describe the periodontal plastic approaches used for the correction of gingival deformities following free gingival grafting (FGG) procedures. Five patients with poor esthetic and functional outcomes following soft tissue grafting voluntarily requested corrective treatment due to differences in color, texture, thickness, and mucogingival junction (MGJ) alignment between grafted and adjacent tissue, or because of food retention apical to the grafted site. Plastic surgical approaches included eliminating the thick borders the graft, aligning the MGJ, and reducing the excessive apicocoronal dimension of the graft. Histologic images confirmed the morphologic differences between the graft and adjacent alveolar mucosa. After intervention, all treated sites achieved a satisfactory esthetic appearance and function, with a soft tissue anatomy indistinguishable from those of adjacent sites. All patients agreed that their goals for the treatment were completely fulfilled.
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The objectives of periodontal plastic therapy are focused on the treatment of mucogingival deformities and on the establishment of an optimal anatomical, functional, and esthetic state for patients.[1] The proceedings of the 1996 AAP World Workshop in Periodontics recommended gingival augmentation procedures to prevent tissue damage during natural or orthodontic tooth eruption, to improve plaque control and patient comfort during brushing, to increase insufficient gingival dimensions, and to halt progression of gingival recessions.[2] Multiple studies have elegantly shown how a thin tissue phenotype predisposes one to recession and noncarious cervical lesions.[3–5] Historically, free epithelial connective tissue grafting (FGG) was the most widely used approach to improve gingival phenotype[4,6,7] and treat recession defects.[8–13] Clinical outcomes following the use of FGG were remarkable in terms of increased gingival thickness, improved apicocoronal dimension of keratinized tissues, as well as some extent of recession reduction. However, localized gingival deformities were likely to occur after augmentation with FGG, raising patients' esthetic and functional concerns. Adequate graft thickness and width are prerequisites for graft integration and phenotype augmentation,[9,11] but the increased gin-

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gival width, localized discontinuities between the grafted area and adjacent tissues, and the apical displacement of the mucogingival junction (MGJ) are negatively perceived by patients. Alignment of the MGJ has been mentioned as one of the most influential factors impacting esthetics, together with level/contour of gingival margin, soft tissue texture, and gingival color.[14] In some cases, extensive grafting can induce the formation of mucosal undercuts between the vestibule and the thick borders of the grafted area, raising patient functional concerns due to the feeling of food retention in the vestibule. To overcome the functional and esthetic drawbacks associated with FGG, Cortellini et al[15] described the success of the "partly epithelialized free gingival graft": A deepithelialized connective tissue graft is obtained, preserving the epithelium at select areas at the margins of the graft. The epithelialized portions of the graft are then positioned between the cementoenamel junction and the ideal position of the MGJ, while the apical deepithelialized part is inserted between the alveolar mucosal flap and recipient bed periosteum.

Today's periodontal plastic surgery is dominated by high expectations for esthetic success. Social changes together with improved surgical techniques[16,17] have induced a shift in patient expectations from a central focus on maintenance of gingival health toward more esthetically driven demands. Thus, the present series of surgical cases involving correction of residual gingival deformities following previous grafting procedures successfully show *(1)* reshaping of the MGJ, *(2)* elimination of the thick edge between grafted tissue and alveolar mucosa, and *(3)* a reduction in excessive apicocoronal keratinized tissue width. Histologic images demonstrate the morphologic differences between the graft and the adjacent alveolar mucosa.

Materials and Methods

The present article was designed as a case series reporting clinical outcomes and histologic images of five patients who were treated with plastic surgical procedures to improve the esthetics and/or function of areas previously treated with FGG. All patients voluntarily asked to receive treatment and stressed how their quality of life was negatively affected by an altered postsurgical gingival phenotype. After providing detailed information on the findings, treatment options, and potential risks of mucogingival treatments, all patients signed a written consent in accordance with the Helsinki Declaration 1975 as revised in 2000 and 2008.

Case 1

A systemically healthy, nonsmoking, 19-year-old man presented to the the first author's office (G.P.P.) complaining of an unpleasant excess of keratinized tissue (KT) at the maxillary left canine and first premolar sites. The patient reported a history of canine impaction and orthodontic therapy to correct it. The tooth was aligned in the arch, but the absence of attached gingiva on the canine and the occurrence of a shallow recession on the premolar induced a previous operator to perform a large FGG. The esthetic results were not pleasing, and the young patient criticized the posttreatment outcomes for causing social embarrassment during smiling. At the clinical examination, the patient showed adequate plaque control and a large amount of KT at the left quadrant. The tissue was of a different color and texture, with an overall unpleasant esthetic appearance (Fig 1a). Surgical reduction of the apicocoronal dimension of the graft, gingivoplasty, and realignment of the MGJ were proposed to the patient with the goal of achieving a more pleasant anatomy. After administration of local anesthesia (2% lidocaine with 1:80,000 epinephrine), a beveled incision at a 45-degree angle was made from the mesial angle of the canine to the distal angle of the second premolar (Fig 1b). This scalloped incision, starting from the extremities of the physiologic MGJ of the adjacent teeth, mimicked the original morphology of the MGJ. A second incision, starting from the extremities of the first incision, was performed apically to the extension of the graft, including 1 mm of alveolar mucosa as tissue discard. Then, a third split-incision, parallel to the alveolar bone, was performed to leave the periosteum in situ and remove any remaining excess tissue. A delicate gingivoplasty was carried out to eliminate the discontinuous mucosal edge distal to the first premolar. The alveolar mucosa was

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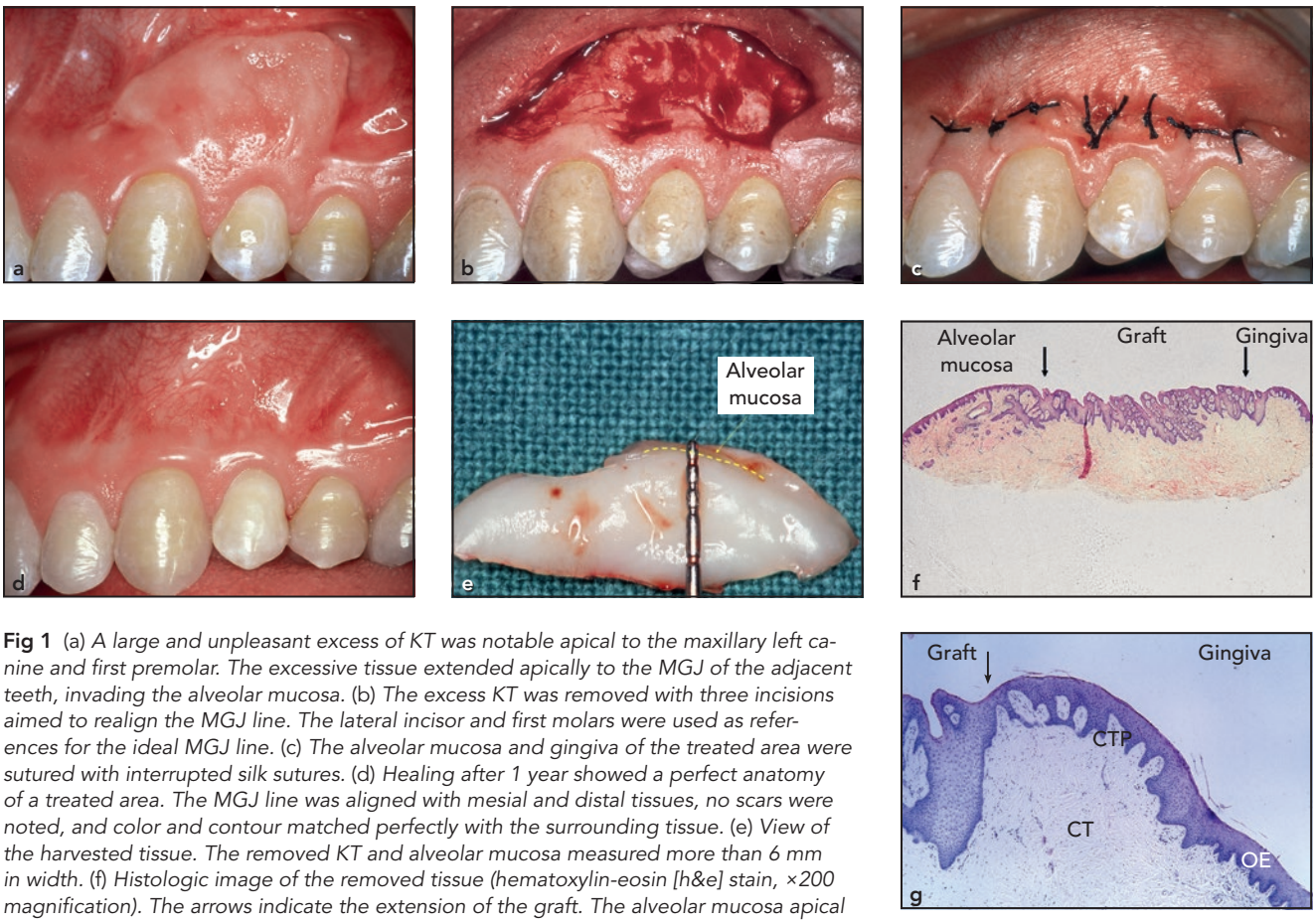


Fig 1 (a) *A large and unpleasant excess of KT was notable apical to the maxillary left canine and first premolar. The excessive tissue extended apically to the MGJ of the adjacent teeth, invading the alveolar mucosa.* (b) *The excess KT was removed with three incisions aimed to realign the MGJ line. The lateral incisor and first molars were used as references for the ideal MGJ line.* (c) *The alveolar mucosa and gingiva of the treated area were sutured with interrupted silk sutures.* (d) *Healing after 1 year showed a perfect anatomy of a treated area. The MGJ line was aligned with mesial and distal tissues, no scars were noted, and color and contour matched perfectly with the surrounding tissue.* (e) *View of the harvested tissue. The removed KT and alveolar mucosa measured more than 6 mm in width.* (f) *Histologic image of the removed tissue (hematoxylin-eosin [h&e] stain, ×200 magnification). The arrows indicate the extension of the graft. The alveolar mucosa apical to the graft is shown on the left side and KT on the right side.* (g) *High magnification (h&e stain, ×400 magnification) of the border between graft and gingiva. The thick border of the graft is responsible for the clinically detectable step. OE = oral epithelium; CT = connective tissue; CTP = connective tissue papillae, RP = rete pegs.*

sutured to the residual gingiva using silk interrupted sutures (Fig 1c). The postsurgical period was uneventful, and sutures were removed after 8 days. The postsurgical outcomes were very favorable at 1-month, 1-year, and 9-year follow-ups. An ideal posttreatment mucogingival anatomy was attained with MGJ alignment, an absence of scars, and a more physiologic color of the integrated tissue (Fig 1d). The gingival excess removed during the surgery (Fig 1e) was fixed in formalin and processed for the histologic analysis, which showed the morphologic differences between the grafted area and the adjacent tissues, including the gingiva and alveolar mucosa (Figs 1f and 1g). The patient was fully satisfied, showed sincere gratitude for the clinical results, and reported improved self-confidence.

Case 2

A systemically healthy 39-year-old woman presented to the the first author's office (G.P.P.), complaining about the unpleasant result of a previous FGG performed by a different operator. During anamnesis, the patient asked for excision of the excessive tissue and stressed how the esthetic appearance of the graft caused significant social anxiety. The clinical examination recorded outstanding plaque control and periodontal stability. The grafted area presented an exaggerated band of white KT, from the mesial surface of the canine to the distal surface of the second premolar, extending apically into the vestibule (Fig 2a). The

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Fig 2 (a) *A white irregular zone of KT presented in correspondence with the mandibular right canine and premolars, extending apically to the MGJ. The thickness was notably greater on the grafted area compared to the adjacent sites.* (b) *Three incisions allowed the removal of excess KT together with 1 mm of alveolar mucosa. A periosteal bed was exposed underneath the removed excessive tissue.* (c) *The alveolar mucosa and residual gingiva were sutured together with interrupted silk sutures.* (d) *Clinical appearance of the treated area 1 year after surgery. An adequate amount of gingiva is present in correspondence with the canine and first premolar, while free gingiva is detectable on the second premolar. Alignment of the MGJ was noted between the treated area and the mesial and distal tissues. The color appeared coral pink and perfectly integrated with the adjacent areas. No scars were noted.*

MGJ profile of the treated area was not aligned with the mesial and distal sites. Two superficial cervical caries were present on the second premolar and canine. The patient was informed of the treatment required to improve the clinical condition and agreed. After administration of local anesthesia (2% lidocaine with 1:80,000 epinephrine), an incision with a 45-degree angle was made from the distal angle of the second premolar to the mesial angle of the canine (Fig 2b). This first incision was carried out based on the positioning of the MGJ of the adjacent teeth in order to reposition the MGJ. A second incision was performed, starting from the extremities of the first and continuing apically to the extension of the graft, involving about 1 mm of alveolar mucosa. A third split-incision, parallel to the alveolar bone, was performed, maintaining the periosteum in situ (Fig 2b). The alveolar mucosa was sutured with the residual gingiva using silk interrupted sutures (Fig 2c). The postsurgical period was uneventful, and sutures were removed after 10 days. One month later, restorations of the cavities were performed. After healing, a band of attached KT was present at the canine and first premolar, while the second premolar retained only free gingiva. The esthetic outcomes were preserved 1 year after surgery, with perfect anatomical integration of the tissues in the treated area (Fig 2d). The tissue excised during the surgery was fixed in formalin and histologically processed to show the morphology of the grafted mucosa. The patient was happy with the final esthetic appearance and had decreased social anxiety related to the previous mucogingival deformity. Longitudinal monitoring for the following 10 years showed periodontal stability of the treated area.

Case 3

A 58-year-old man with a current smoking habit presented to the office (G.P.P.) complaining of an unpleasant sensation of food retention apical to a previously performed FGG. The patient had undergone a gingival augmentative procedure at a mandibular premolar site to increase the amount of keratinized gingiva (KG) and to improve access for oral hygiene. The patient was not concerned about the altered color or unpleasant esthetics of the grafted tissue; his major concern was food retention in the vestibulum between the thick apical margin of the graft and alveolar mucosa. The patient also reported discomfort induced by the trapped food. Upon clinical examination, the patient showed a thick graft, apical to the mandibular premolars, associated with misalignment of the MGJ (Fig 3a). The patient was informed about surgical remodeling at the

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Fig 3 (a) *Thick KT was notable in correspondence with the mandibular left premolars extending apically into the vestibule. Surface irregularities with appearance similar to rugae were noted. In addition, the phenotype of the grafted area did not match the adjacent tissue.* (b) *Gingivoplasty was performed to smooth and blend the coronal and apical borders of the grafted tissue with the surrounding mucosa.* (c) *Healing after 12 years showed significant morphologic and esthetic improvement of the treated area.*

area of concern, and the treatment was accepted. After administration of local anesthesia (2% lidocaine with 1:80,000 epinephrine), gingivoplasty was performed to eliminate the rugae retained within the graft. The apical margin of the graft was smoothed and blended using a surgical blade (no. 15, Bard-Parker; Fig 3b). Healing was uneventful, and the improved local anatomy was maintained at 1- and 5-year follow-ups. The unpleasant sensation of food retention apical to the previously performed FGG disappeared with great patient satisfaction. Long-term examination (12 years) showed further spontaneous morphologic and esthetic improvement of the treated area (Fig 3c).

Case 4

The patient was a nonsmoking systemically healthy 39-year-old woman who had been under care at the first author's office (G.P.P.) for many years. She was treated in 2001 with an FGG for a mucogingival deformity associated with a 3-mm RT1A+ recession[5] at the maxillary left canine (Fig 4a). Posttreatment, 2.5 mm of root coverage was achieved, and the patient was happy with the final results. During following examinations (2016 to 2018), the patient started to complain about the unpleasant esthetic situation related to the grafted site. The patient complained of a thick gingival contour and a notable step separating the graft from the surrounding mucosa. She also reported social embarrassment due to the anterior location of excessive gingiva (Fig 4b). The patient was aware of the possibility to improve her condition and spontaneously requested treatment. The treatment consisted of removing the excessive keratinized tissue apical to the ideal MGJ line, performing a delicate superficial gingivoplasty, and reshaping the profile of the baseline MGJ (Fig 4c). The final outcomes remained favorable at 6 months and 1 year. The soft tissue anatomy was comparable and indistinguishable from that of adjacent teeth (Fig 4d), and the patient was fully satisfied.

Case 5

A systemically healthy nonsmoking 28-year-old woman presented at the office (G.P.P.) for treatment of a deep recession located at the mandibular left central incisor (Fig 5a). After a detailed discussion with the periodontist (G.P.P.), FGG was chosen to treat the lesion. The patient was informed about the potential need for a second procedure to ensure complete root coverage (CRC), remove excess tissue, and achieve an ideal esthetic outcome. The patient agreed and underwent two-stage FGG treatment. Three months after the first intervention, CRC was obtained, but a large amount of KT was present apical to the central incisor, creating a severe misalignment at the MGJ (Fig 5b). As discussed, the excessive KT was eliminated during a staged intervention, and the profile of the new MGJ was reestablished. After 1 year, both CRC and gingival esthetics were achieved. The patient, who works as a professional actress, was grateful and satisfied with the esthetic and functional results (Fig 5c).

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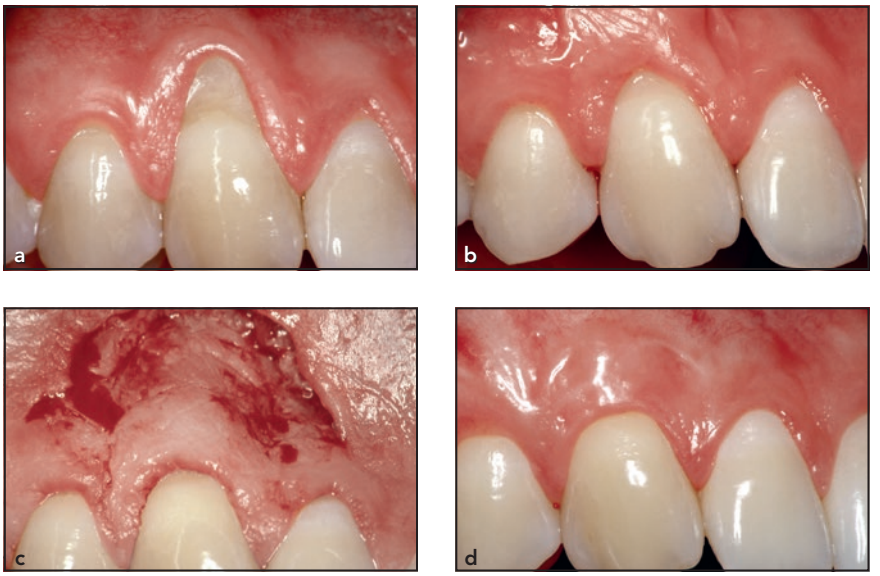


Fig 4 (a) *A maxillary right canine presented with a 3-mm RT1 recession. A noncarious cervical lesion (+) is noted apical to a detectable cementoenamel junction (A). Following the 2017 World Workshop classifications, the final diagnosis was RT1A+ recession.* (b) *Six months after recession treatment using FGG, 2.5 mm of root coverage was obtained. Part of the graft extended apically, causing severe misalignment of the MGJ lines and impairing esthetics.* (c) *A series of partial-thickness incisions were used to remove the excessive KT apical to the ideal MGJ line. A periosteal bed was prepared and was used to suture the alveolar mucosa with the attached gingiva.* (d) *One year after reintervention, the tissue phenotype of the treated area was perfectly integrated with the adjacent tissues. Complete root coverage occurred due to a slight creeping attachment.*



Fig 5 (a) *The patient's mandibular left central incisor showed a 3-mm RT1 recession. The cementoenamel junction was detectable (A) and no root steps were present (–). Following the new classification proposed by Cortellini and Bissada,[5] the final diagnosis was RT1A– recession.* (b) *Six months after FGG treatment, complete root coverage was obtained. Part of the graft extended apically to the ideal MGJ line and invaded the alveolar mucosa.* (c) *After 1 year, an excellent esthetic appearance was achieved. Notice that the gingival margin of the treated incisor shifted coronally compared with the margin of the untreated, healthy adjacent incisor.*

Discussion

For many years, FGG—either alone or followed by a coronally advanced flap approach—was the most widely utilized approach for increasing gingival dimensions and treating recession defects. For decades, despite predictable clinical outcomes in favor of FGG, localized tissue deformities were often encountered. The most common drawbacks were the appearance of scars, foreign body sensation, hyperkeratosis, and, in some cases, food retention apical to the grafted margins. Of major concern for patients was the poor esthetic outcomes, often reported as a notable overhanging step, MGJ misalignment, and excess of whitish KT (Fig 1g). Langer and Langer proposed the subepithelial connective tissue graft to overcome the disadvantages of the FGG approach.[18,19] This technique includes a coronally advanced flap covering a subepithelial connective tissue graft, and it is currently considered the gold standard for recession coverage and improved esthetics, and it is without the reported disadvantages of whitish hyperkeratosis and notable overhanging steps.

Patient-reported outcomes are gaining renewed interest as primary endpoints of modern periodontology.[20] Patient-centered therapy is largely driven by esthetics, and it is not rare for patients to ask for addi-

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tional treatment to improve esthetics after gingival augmentation with FGG. In rare and extreme cases, the esthetic impairment due to altered soft tissue esthetics can induce a state of anxiety and depression, as seen in Cases 1 and 2. Case 2 presents interesting observations, as periodontal stability was maintained despite reduced KG, resulting from the plastic intervention. As a proof-of-principle of classic literature, a combination of perfect plaque control and frequent maintenance appointments allowed maintenance of periodontal stability for more than 10 years despite the absence of attached gingiva.

Other than improved self-confidence, many other reasons push patients to seek treatment for excessive keratinized mucosa following FGG. For example, the patient in Case 3 complained about an unpleasant foreign body sensation and presence of food remnants after eating. Interestingly, spontaneous remodeling of the MGJ and cosmetic improvement of the graft texture occurred throughout the follow-up. This result is corroborated by Agudio et al, who indicated that the dentogingival unit is a dynamic apparatus that undergoes continuous remodeling over time.[4] Histologic analysis showed the key anatomical differences in phenotype between the graft collected from the palate and the gingiva of the surrounding tissues. Focus needs to be given to epithelial hyperkeratosis, presence of rugae, thickness of the connective tissue, and the overhanging step between the graft and surrounding gingiva, as all these conditions were the cause of the unesthetic appearance of the graft and, ultimately, of the patients' complaints.

Beyond the novelty of the topic and the histologic analysis, it is worth mentioning that *(1)* the described patients represent a very small sample of the whole population who have previously been treated with FGG; *(2)* esthetic considerations are case-dependent, with higher concerns associated with anterior locations; and *(3)* patient requests should be weighed together with the biologic benefit of having an healthy increased band of attached gingiva.

Conclusions

Periodontal plastic surgery based on esthetic enhancement of areas previously treated with FGG resulted in a very successful outcome and improved patient quality of life. The present case reports open the field for additional investigations on less-known plastic procedures. Reshaping the MGJ, eliminating thick edges between grafted tissue and alveolar mucosa, reducing the excessive apicocoronal dimension of the grafts, and a stringent protocol of oral hygiene and professional recalls[21] are valid approaches to satisfy the needs of compliant patients seeking esthetic improvement.

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