

Decision Making in Gingival Recession Treatment: Scientific Evidence and Clinical Experience

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Focused Clinical Question: What are the key considerations for selecting the best surgical approach in mucogingival plastic surgery?

Summary: Treatment of gingival recession has become an important therapeutic issue due to the increasing number of cosmetic requests from patients. The dual goals of mucogingival treatment include complete root coverage, up to the cemento-enamel junction, and blending of tissue color between the treated area and non-treated adjacent tissues. Even though the connective tissue graft is commonly considered the "gold standard" for treatment of recession defects, it may not always be the best surgical option for every case.

Conclusions: Under non-experimental conditions, all root coverage procedures may be effective in terms of complete root coverage and excellent esthetics. Careful analyses of patient- and defect-related factors, however, are key considerations prior to selecting an appropriate surgical technique. *Clin Adv Periodontics* 2011;1:41-52.

Key Words: Connective tissue graft(s); gingival recession; mucogingival surgery; periodontitis; plastic surgery, periodontal.

Background

In periodontal practice, root coverage requires daily clinical decisions. Randomized clinical trials support the potential clinical value of all proposed mucogingival plastic surgery techniques, both in terms of mean (MRC) and complete root coverage (CRC), but fail to demonstrate a clear superiority of any of the tested surgical procedures.^{1,2} In addition, the clinical trials do not provide clear guidance on when to use the different procedures.

While concerns about facial appearance have obsessed humans for centuries, the systematic assessment of esthetic outcomes after surgical treatment of gingival recession is a relatively recent proposal.^{3,4}

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The ultimate goal of root coverage procedures should be complete coverage of the recession defect with a pleasing color and tissue blend between the treated area and adjacent tissues, thereby achieving both biologic and esthetic success. Thus, it is important to select the most predictable and easy-to-perform surgical technique according to a careful evaluation of the following factors:

1. Patient;
2. Single or multiple gingival recession defects;
3. Mucogingival defects localized in esthetically or non-esthetic sensitive sites;
4. Defect anatomic morphology (amount of keratinized tissue, periodontal biotype, and vestibule depth);
5. Ability to enhance periodontal wound healing and stabilize the flap with optimal suture technique;
6. Biomaterials (connective tissue graft [CTG], enamel matrix derivative, acellular dermal matrix).

Factors Affecting Complete Root Coverage

Miller Class

Miller's classification⁵ is based on morphologic evaluation of the injured periodontal tissue, giving the diagnosis of the severity of gingival lesions and the prognostic evaluation of the treatment. According to this classification system, which is still the most widely used, the loss of interproximal bone (Class III and IV) is identified as a condition involved in preventing CRC.

Post-Surgical Position of Gingival Margin (GM)

Soft tissue healing pattern after root coverage procedures is usually linked to a shrinkage of the surgical wound. The location of the GM relative to the cemento-enamel junction (CEJ) after the surgery seems to affect the probability of CRC;⁶ the more coronal the GM after suturing, the greater the probability of achieving CRC. A coronal displacement of 2 mm of the GM relative to the CEJ is suggested.

Flap Tension

Enhanced periodontal wound healing is one of the most important issues for the clinical success of root coverage procedures. Even considering the different abilities of various surgeons in tissue management, attention to blood supply and suturing technique may influence the clinical outcome. In particular, the use of surgical approaches that make the

flap passive plays a major role in enhancing an optimal wound healing to achieve an adequate coronal displacement of the flap. Pini Prato et al.⁷ showed that the greater the flap tension (suggested flap tension should not exceed 4 g), the less successful the recession improvement. Thus, periosteal incisions should be used to eliminate tension from the flap, and in the maxillary jaw, the periosteal incision should also include careful dissection of the muscle insertions from the flap.

Flap Thickness

The survival of the flap, and particularly the marginal gingiva, depends on the residual vascular system after surgical incisions. Because of the caudo-cranial pattern of vascularization, we suggest a full-thickness dissection, when possible, to avoid interrupting the supraperiosteal vessels that enhance the survival of the flap on the avascular root surface. Thus, the thicker the flap, the greater the vascularization of the marginal gingiva and the probability of CRC (suggested flap thickness >0.8 mm).⁸

Interdental Papilla Height

According to Saletta et al.,⁹ CRC is more likely to be achieved in sites with a lower height of interdental papilla. Olsson et al.¹⁰ demonstrated that individuals with a long-narrow form of the central incisors (N biotype, scalloped-thin) show a thin free gingiva, a narrow zone of gingiva, and a wider height of the interdental papilla, while individuals with short-wide crowns (W biotype, flat-thick) show a thicker free gingiva, a wider zone of keratinized tissue, and a lower papilla height. Thus, it is possible that the thicker gingiva of the flat-thick biotype allows a thicker flap, which may result in a greater success rate of CRC.

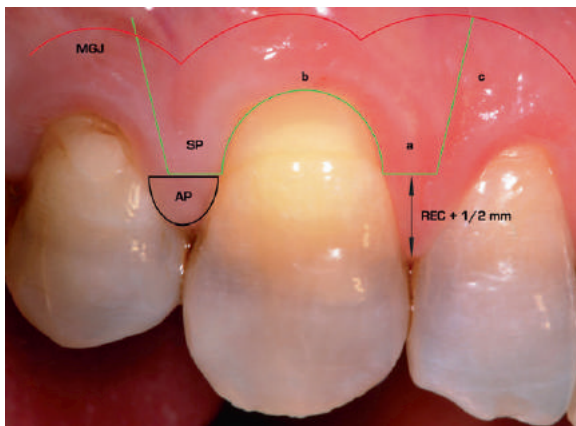


FIGURE 1 CAF procedure: flap design. Perform two horizontal beveled incisions (a), mesial and distal to the recession defect, and an intrasulcular incision (b). Execute two beveled oblique incisions (c) coming from the two horizontal incisions, extending to the alveolar mucosa. Locate the two horizontal incisions at a distance equal to the recession depth plus 1/2 mm from the tip of anatomic papillae (AP) to predefine the surgical papillae (SP). a = horizontal incision; b = intrasulcular incision; c = vertical releasing incision; REC = recession depth.

Cemento-Enamel Junction Predetermination

CRC is not always achievable, even in gingival recession with no loss of interproximal attachment and bone. The CEJ is the most widely used reference parameter to evaluate root coverage results; however, such conditions as 1) cervical abrasion, 2) traumatic loss of the tip of the interdental papilla, 3) tooth rotation, and 4) tooth extrusion with or without occlusal abrasion may lead to diagnostic mistakes

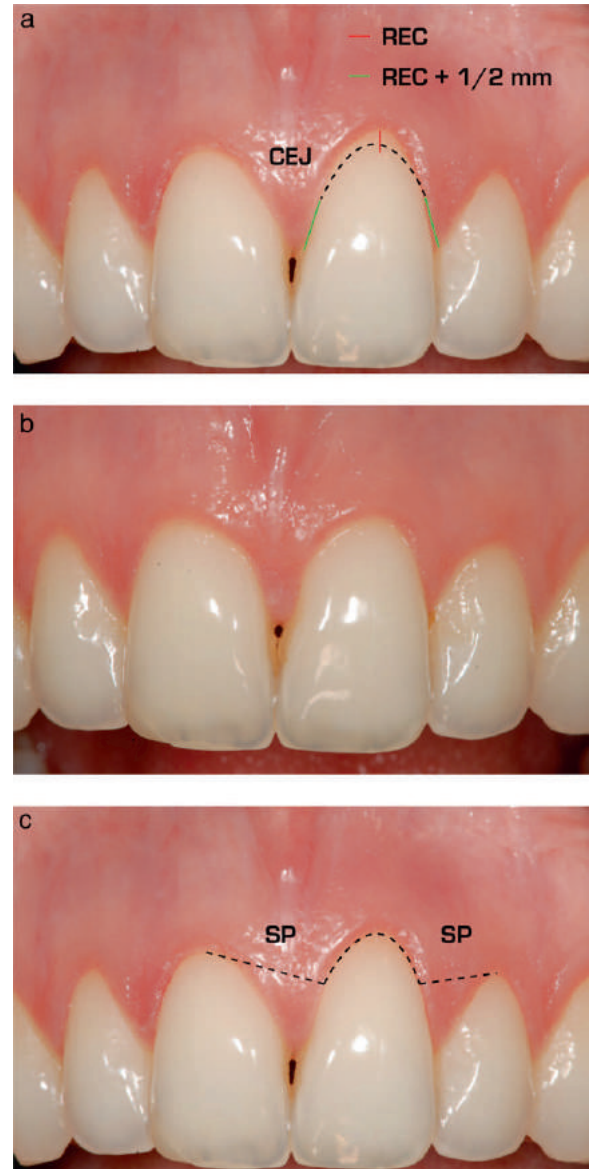


FIGURE 2 CAF procedure: suggested flap design in esthetic area. When a single recession-type defect is present in the esthetic area, we suggest using an envelope flap technique, avoiding vertical releasing incisions to reduce the probability of scar tissue formation. To facilitate the coronal repositioning of the flap, make a horizontal incision that extends mesiodistally to include three teeth. The horizontal incision of this modified envelope technique consists of oblique submarginal incisions in the interdental areas, which continue the intrasulcular incision at the recession defect. Locate the starting point of oblique incisions at a distance from the tip of the anatomic papilla equal to the recession depth plus 1/2 mm. A number of disadvantages of this surgical technique can be pointed out: the need to involve healthy adjacent teeth in the procedure and the smaller dimension of the flap. **2a** before surgery; **2b** after surgery; **2c** flap design. REC = recession depth; SP = surgical papillae.

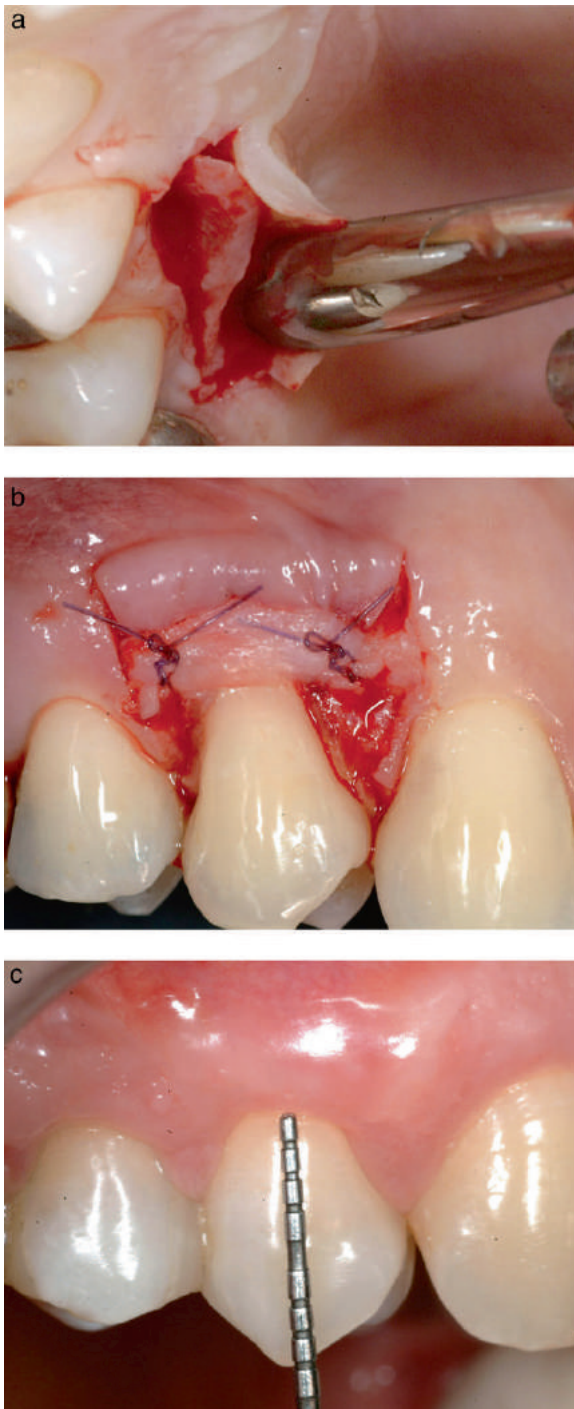


FIGURE 3 CAF+CTG procedure: suggested flap design and harvesting technique. Using a trap door technique (a) to harvest the CTG will allow a primary wound closure of the donor palatal site, reducing patient postoperative morbidity. Secure the graft over the exposed root surface using a resorbable sling suture passing through the connective tissue of the interdental papilla. **3a** CTG harvesting from palate; **3b** suture of the graft; **3c** 6-month postoperative evaluation.

preventing CRC. Thus, in such clinical conditions, the line of root coverage may be considered the clinical CEJ, because it may substitute for the anatomic CEJ when it is no longer clinically visible or when ideal conditions to obtain CRC are not fully represented.^{11,12}

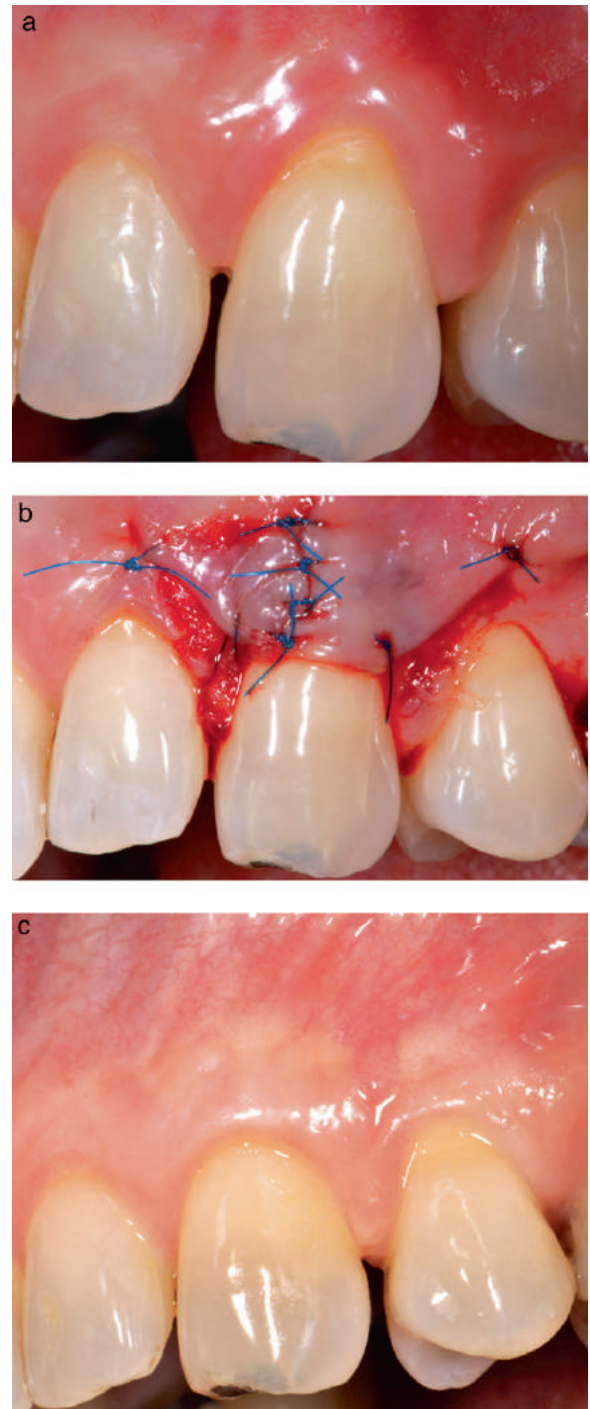


FIGURE 4 DPF procedure: flap design. Mucogingival defect affecting tooth #11. An inadequate amount of keratinized tissue is present apically to the recession, and the presence of well-represented interdental papilla suggest a double papillae procedure. **4a** baseline; **4b** DPF; **4c** 12-month follow-up.

Preparation of Exposed Root Surface

To the best of our knowledge, no study has been reported in the literature that shows one technique to be superior to all others. The clinician may treat the exposed root surface mechanically, by means of curets, sonic devices, polishing or rotary instruments, or chemically using tetracycline, sodium hypochlorite, or EDTA. According to our clinical

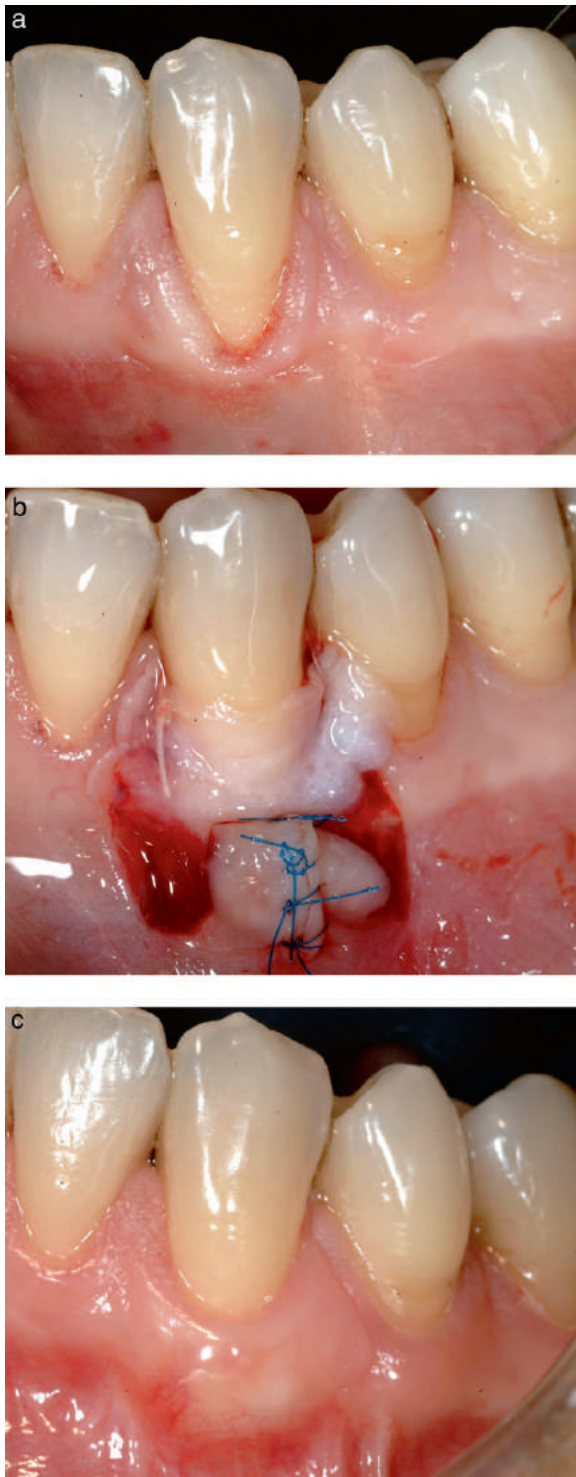


FIGURE 5 DPF+CTG procedure: surgical technique. To modify the quality and amount of keratinized tissue over the exposed root surface, a DPF in conjunction with a CTG is performed. Use a trap door technique (Figure 3a) as described previously to harvest the CTG and secure the graft over the exposed root surface using a resorbable sling suture passing through the connective tissue of the interdental papilla. **5a** baseline; **5b** CTG positioned on the root surface; **5c** 12-month follow-up.

experience, we suggest using simple root preparation procedures such as scaling and root planing with sonic devices and curets. The need to flatten prominent roots may represent a clinical indication for the use of rotary instruments.

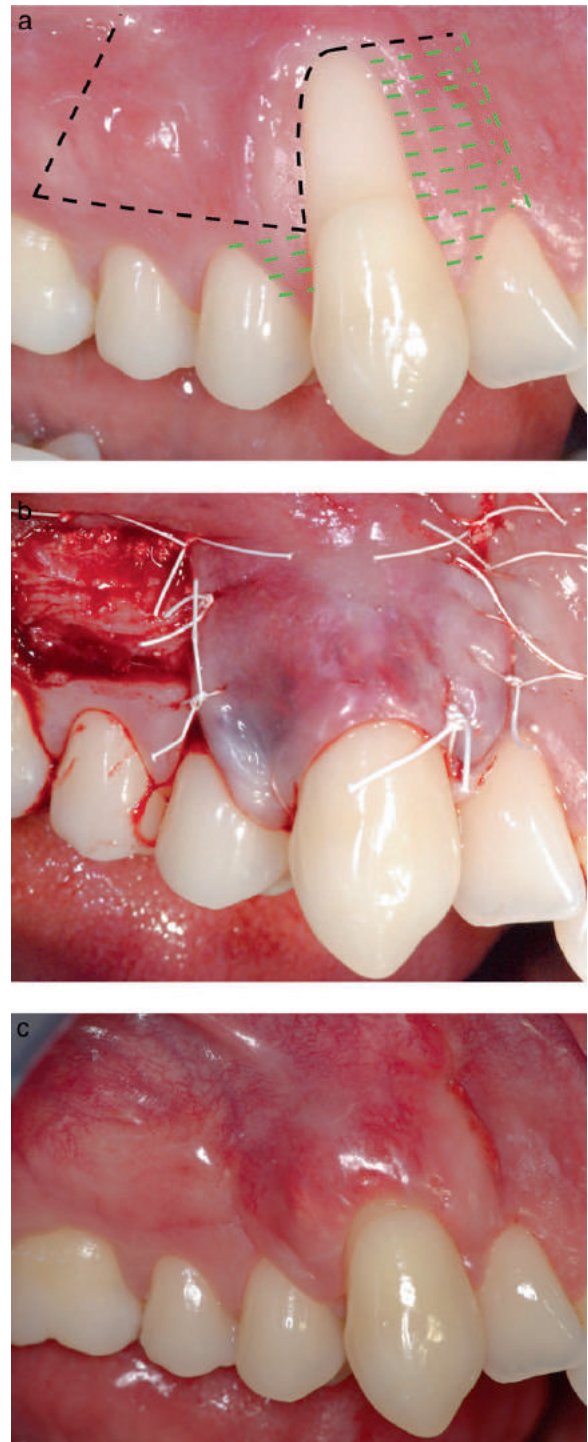
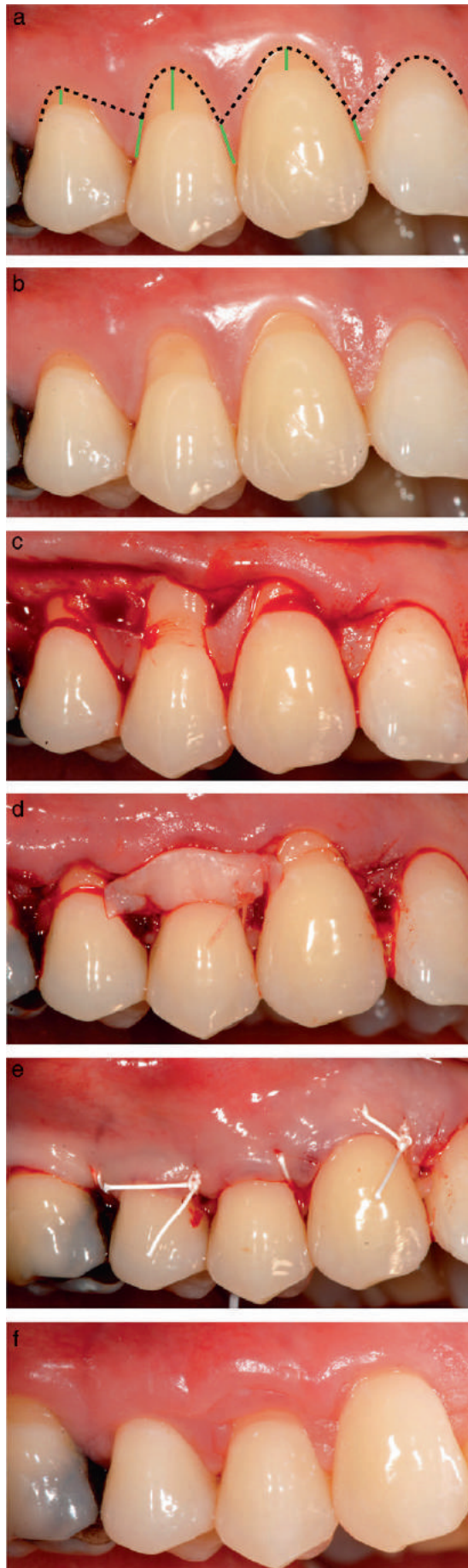


FIGURE 6 LAF procedure: flap design. **6a** Flap design and areas needing to be deepithelized. An adequate amount of keratinized tissue is located distally to the canine; **6b** the LAF plus CTG correctly repositioned upon the exposed root surface and stabilized with sutures; **6c** 3-month follow-up.

Moreover, to avoid damaging any connective tissue fibers still embedded in cementum, it might be convenient to prepare the exposed root surface prior to raising the flap, especially if a mechanical root preparation procedure is to be used.



Restorative Approach in Mucogingival Therapy

Gingival recession may be associated with dental abrasion due to toothbrushing or cervical caries. In this situation, the lack of a definable anatomic CEJ may present clinicians with difficulties during the diagnostic phase that prevent complete coverage of the exposed root surface. A classification of such dental defects has been recently proposed by Pini Prato et al.¹³ In cases where there is an identifiable CEJ, we suggest predetermining the line of root coverage as described by Zucchelli et al.¹¹ and treating the portion of the tooth coronal to the CEJ using a restorative approach. To avoid damaging the gingival margin, we suggest restoration of the dental abrasion prior to the surgical phase or during the surgery.

Treatment Strategy

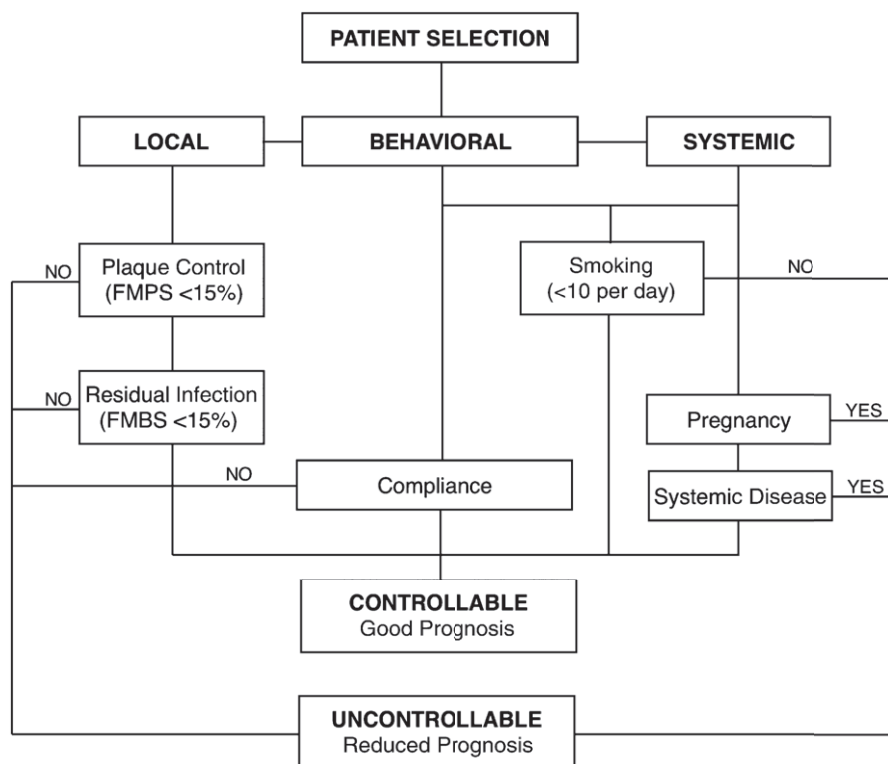
Gingival recession treatment can no longer be considered as a single treatment approach. In fact, there is evidence to consider mucogingival plastic surgery as a multifactorial treatment approach comprising careful selection of patients (see Decision Tree 1) and defects, different surgical techniques, many suturing approaches, and various types of adjunctive materials. All the cited components should be variously combined to develop different treatment strategies with different degrees of technical difficulties (see Decision Tree 2).

Clinical Condition 1: Coronally Advanced Flap (CAF) – Table 1

Selection of surgical flap

A distance from GM to mucogingival junction (MGJ) of at least 2 mm should be present to enhance the stability of the surgical flap after suturing. A CAF procedure alone should be performed when a thick and flat periodontal biotype is present to avoid a relapse. A moderate or deep vestibule will allow coronal displacement of the flap without tension; a shallow vestibule does not prevent the use of a CAF technique but requires an extensive partial-thickness

FIGURE 7 Multiple gingival recessions: surgical technique 7a Flap design; 7b multiple gingival recessions affecting teeth #4-6 (note the amount of keratinized tissue apically to tooth #14 equal to 1.5 mm); tooth #4 is extruded; 7c the horizontal incision of the flap consists of oblique submarginal incisions in the interdental areas, which continue with the intrasulcular incision at the recession defects. The oblique incisions must be drawn starting from the mesial and distal side of the tooth to be treated at a distance from the tip of the anatomic papilla equal to the recession depth plus 1/2 mm; 7d the envelope flap is raised with a split-full-split approach in the coronal-apical direction. Deepithelize the anatomic papilla and mobilize the flap with a sharp dissection into the vestibular lining mucosa; 7e displace coronally the flap and suture with sling suturing technique; 7f 3 months postoperatively tooth #4 presents a residual exposed root surface due to the extrusion condition; the patient's perception of an unpleasant esthetic result may be avoided by predetermining the line of root coverage and performing a restoration of the portion of the root that will not be completely covered. Moreover, the non-optimal overall esthetic result due to the presence of visible tissue merging lines can be corrected by performing a gingivoplasty at the end of the tissue maturation period, about 3 to 6 months after the surgical phase.



DECISION TREE 1 Selection of the patient. Adapted with permission from Quintessence Publishing Co. (In: Cortellini P, Bowers GM. Periodontal regeneration of intrabony defects: An evidence-based treatment approach. *Int J Periodontics Restorative Dent* 1995;15:128-145.) According to the evidence, patients with <15% of sites presenting with plaque and residual infection, non-smokers, with a high degree of compliance, and systemically healthy are the best candidates for root coverage procedures. FMPS = full-mouth plaque score; FMBS = full-mouth bleeding score.

dissection apically to the MGJ to make the flap tension free.

Suggested surgical management

The surgical procedure was originally described by Allen and Miller¹⁴ in 1989, and further modifications have been proposed over the years. Perform a horizontal incision and two beveled and slightly divergent releasing incisions (Fig. 1). Using a small periosteal elevator, raise a full-thickness flap and treat the exposed root surface with thorough scaling and root planing using curets and/or ultrasonic devices (Video 1: root surface conditioning by means of root planing). Deepithelize the anatomic papilla (Video 2: anatomic papilla deepithelization using a surgical blade [15c]; Video 3: use scissors to remove all the epithelium when the roots are prominent) and expose the underlying connective tissue. Extend the dissection of the flap apically to the MGJ proceeding with a split-thickness approach (Video 4: release residual muscle tension, keeping the surgical blade [15] parallel to the flap); pay close attention to releasing the residual muscle tension as this will enhance the coronal displacement of the flap (Video 5: cover the recession defect only when a completely passive coronal displacement of the flap can be achieved). Advance the flap coronally using a sling suture technique and single interrupted sutures to close the releasing incisions.

Surgical advice

1. Locate the horizontal incision at a distance from the tip of anatomic papilla equal to recession depth + 1/2 mm (Fig. 1).

2. Avoid making releasing incisions across the MGJ during the initial phase of the surgical procedure; this will reduce postoperative swelling and pain.
3. Try to avoid releasing incisions when recession defect is located in esthetic area (Fig. 2).¹⁵

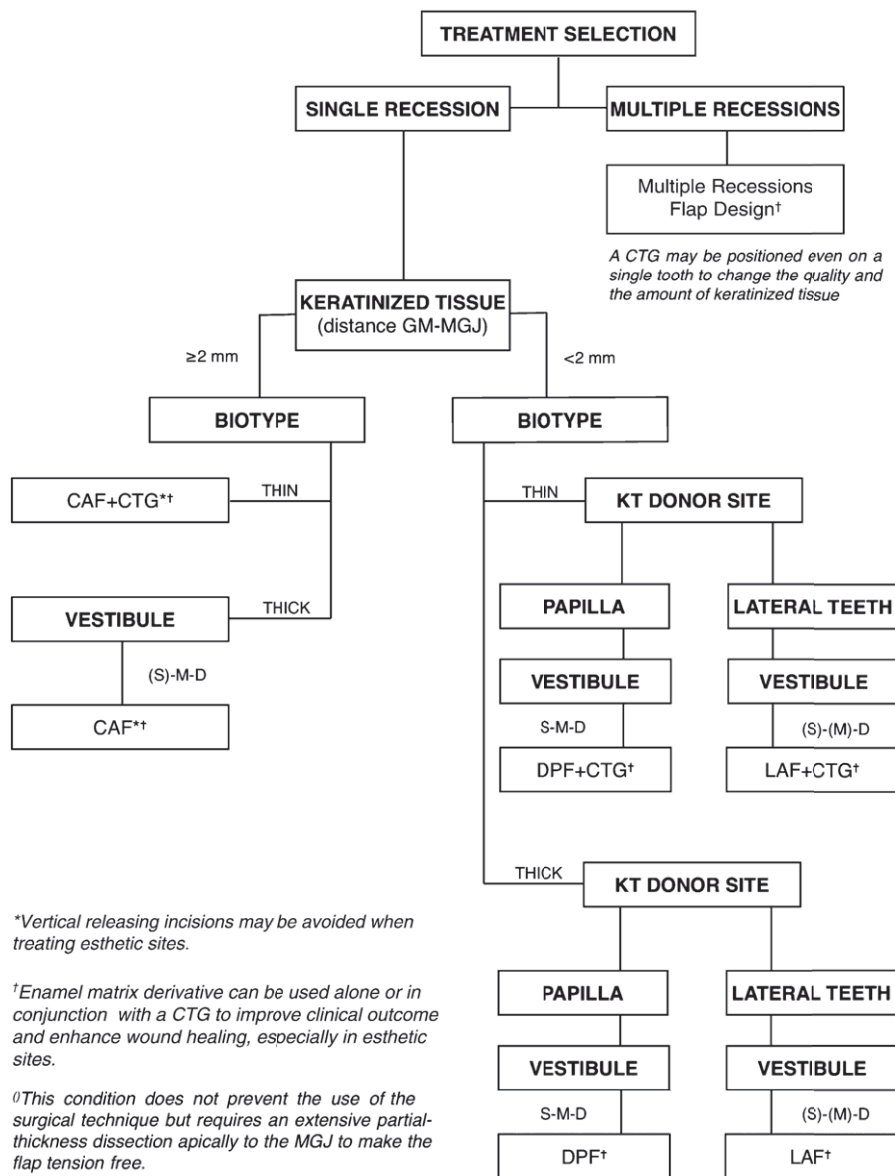
Clinical Condition 2: Coronally Advanced Flap + Connective Tissue Graft (CAF+CTG) – Table 2

Selection of surgical flap

A distance from GM to MGJ of at least 2 mm should be present to enhance the stability of the surgical flap after suturing. A CAF procedure in conjunction with a CTG is the technique of choice when a thin and scalloped periodontal biotype is present, so that both the amount and quality of marginal soft tissue may be appropriately transformed. In the case of a thick biotype, the placement of CTG can create an impaired esthetic due to irregular gingival profile or scar tissue.⁴ A moderate or deep vestibule will allow coronal displacement of the flap without tension; a shallow vestibule does not prevent the use of a CAF+CTG technique but requires an extensive partial-thickness dissection apical to the MGJ to make the flap tension free.

Suggested surgical management

Langer and Langer¹⁸ introduced the use of subepithelial CTGs for root coverage, and several modifications to the original technique have been published over the years. Perform the CAF procedure as described above. Harvest the



DECISION TREE 2 Selection of the treatment strategy. Root coverage procedure should be selected according to a careful anatomic analysis of the recession defect; this will allow a higher probability of complete root coverage. LAF, laterally advanced flap; LAF+CTG = laterally advanced flap + connective tissue graft; KT = keratinized tissue; S = shallow vestibule; M = moderate vestibule; D = deep vestibule.

CTG from the palate using a trapdoor technique (Fig. 3a); be sure to preserve a band of keratinized tissue at least 1 to 2 mm from the palatal GM. To keep the graft moist, place it on gauze soaked in physiologic saline solution. Close the palatal wound with interrupted suture. Suture the CTG at the recipient site using resorbable sling sutures passing through the interdental papilla connective tissue (Fig. 3b).

Surgical advice

1. Locate the horizontal incision at a distance from the tip of anatomic papilla equal to recession depth + 1/2 mm (Fig. 1).
2. Avoid making releasing incisions across the MGJ during the initial phase of the surgical procedure; this will reduce postoperative swelling and pain.
3. Try to avoid releasing incisions when recession defect is located in esthetic area (Fig. 2).¹⁵ A de-

epithelialized graft technique can be used instead of a trap-door procedure to reduce the chair time and simplify the harvesting procedure.

4. Close the palatal wound using collagen sponges (to enhance secondary intention wound healing) and criss-cross suture technique after a deepithelialized graft procedure.

Clinical Condition 3: Double Papillae Flap (DPF) – Table 3

Selection of surgical flap

To perform a DPF technique, an alternative keratinized tissue donor-site must be represented by adjacent interdental papillae. Periodontal biotype should be classified as thick and flat. This surgical technique is not affected by vestibule

TABLE 1 Key Point References for CAF Technique

Reference	Aim	Findings	Predictor
Olsson et al. ¹⁰ (1993)	Periodontal biotype classification	Thin: high triangular-shaped interdental papilla, thin and narrow KT. Thick: small interdental papilla, wide and thick KT.	Thin = recession Thick = pocket
Baldi et al. ⁸ (1999)	Thickness flap	Flap thickness is a significant predictor for root coverage after CAF procedure.	Thickness >0.8 mm enhances CRC
Pini Prato et al. ⁷ (2000)	Flap tension	The higher the flap tension, the smaller the recession reduction.	Tension <4 g enhances CRC
Saletta et al. ⁹ (2001)	Papilla height and area	CRC is not correlated to the papilla area but to papilla height.	Lower papilla height enhances CRC
Pini Prato et al. ⁶ (2005)	Distance between GM and CEJ	The location of GM relative to the CEJ following CAF procedure seems to affect CRC.	GM-CEJ ≥2 mm enhances CRC
Hwang and Wang ¹⁶ (2006)	Thickness flap	A positive association exists between flap thickness and MRC and CRC.	
Zucchelli et al. ¹¹ (2006)	CEJ determination	Localization of CEJ is influenced by tooth rotation, extrusion, and cervical abrasion.	
Santamaria et al. ¹⁷ (2010)	Local anatomy	The depth of non-carious cervical lesion may influence the reduction of gingival recession when CAF is performed.	Reduced root convexity enhances CRC

CRC = complete root coverage; MRC = mean root coverage; GM = gingival margin; KT = keratinized tissue; CEJ = cemento-enamel junction.

TABLE 2 Key Point References for CAF+CTG Technique

Reference	Aim	Findings
Cairo et al. ¹⁹ (2008)	Outcome of CAF procedure	CTG or EMD in conjunction with CAF enhances the probability of obtaining CRC in Miller Class I and II single gingival recession.
Cortellini et al. ²⁰ (2009)	CAF versus CAF+CTG	Adjunctive application of CTG under a CAF increases the probability of achieving CRC in maxillary Miller Class I and II defects.
Zucchelli et al. ²¹ (2010)	Morbidity and clinical outcomes	No differences are demonstrated in the postoperative pain and root coverage using CAF+CTG or CAF plus deepithelized gingival graft.

CTG = connective tissue graft; EMD = enamel matrix derivative; CAF = coronally advanced flap.

TABLE 3 Key Point References for DPF Technique

Reference	Aim	Findings	Predictor
Kerner et al. ²³ (2008)	Factors that may affect the clinical outcome in non-experimental patients	Under non-experimental conditions, root coverage procedures are effective.	Miller Class, maxillary teeth, smoking, donor-site

TABLE 4 Key Point References for DPF+CTG Technique

Reference	Aim	Findings
Harris et al. ²⁴ (2005)	Compare CAF, DPF, and tunneling technique	All three techniques are effective in obtaining CRC.

TABLE 5 Key Point References for LAF Technique

Reference	Aim	Findings
Zucchelli et al. ²⁶ (2004)	Surgical technique	The laterally moved CAF is very effective in treating isolated gingival recessions. The ideal gingival conditions must be present lateral to the defect to be treated.

TABLE 6 Key Point References for Multiple Gingival Recessions Technique

Reference	Aim	Findings
Zucchelli and De Sanctis ²⁷ (2000)	Surgical technique	The proposed surgical technique is effective for the treatment of multiple gingival recessions affecting teeth in esthetic areas of the mouth. This result may be achieved irrespective of both the number of recessions simultaneously treated and the presence of minimal keratinized tissue prior to surgery.
Zucchelli and De Sanctis ²⁸ (2005)	Long-term outcome	At the 5-year examination, 94% of the initially exposed root surfaces are still covered, and 85% of the treated recession defects showed CRC. CRC in all recessions is maintained in 15 of 22 patients (68%).

depth due to the small coronal displacement required to cover the recession defect.

Suggested surgical management

Cohen and Ross²² introduced the method in which bilateral interdental papilla is used as donor tissue for localized root coverage. Perform a V-shaped incision at the buccal aspect of the involved tooth, with an internal bevel on one side of the V-shaped incision and an external bevel on the other. Make horizontal and vertical incisions as described for the CAF technique, locating the horizontal incisions closer to the tip of interdental papilla as much as possible to include more tissue in the flap. Raise a full-thickness flap and condition the root surface by means of scaling and root planing using curets and/or sonic devices. Suture together the two surgical papillae with interrupted sutures (Fig. 4b). Extend the dissection of the flap apically to the MGJ, proceeding with a split-thickness approach (Video 4: release residual muscle tension, keeping the surgical blade [15] parallel to the flap) and paying attention to release the residual muscle tension (Video 5: cover the recession defect only when a completely passive coronal displacement of the flap can be achieved). Cover the recession defect using a sling suture technique and use single interrupted sutures to close the releasing incisions (Fig. 4b).

Surgical advice

1. Avoid making releasing incisions across the MGJ during the initial phase of the surgical procedure; this will reduce postoperative swelling and pain.
2. Once the interdental papillae have been dissected, join them using interrupted sutures before proceeding with the next steps of the surgical procedure; this will make flap manipulation simpler.

Clinical Condition 4: Double Papillae Flap + Connective Tissue Graft (DPF+CTG) – Table 4

Selection of surgical flap

As described for the DPF technique, an alternative keratinized tissue donor site must be represented by adjacent

interdental papillae to perform DPF in conjunction with CTG. Periodontal biotype should be classified as thin and scalloped. This surgical technique is not affected by vestibule depth due to the small coronal displacement required to cover the recession defect.

Suggested surgical management

Clean the root surface, perform the surgical flap, and harvest the CTG as described previously (Fig. 5).

Surgical advice

1. Avoid making releasing incisions across the MGJ during the initial phase of the surgical procedure; this will reduce postoperative swelling and pain.
2. Once the interdental papillae have been dissected, join them using interrupted sutures before proceeding with the next steps of the surgical procedure; this will make flap manipulation simpler.
3. A deepithelialized graft technique can be used instead of a trap-door procedure to reduce the chair time and simplify the harvesting procedure.
4. Close the palatal wound using collagen sponges (to enhance secondary intention wound healing) and criss-cross suture technique after a deepithelialized graft procedure.

Clinical Condition 5: Laterally Advanced Flap (LAF) – Table 5

Selection of surgical flap

To perform a LAF technique, an alternative keratinized tissue donor site must be represented by adjacent teeth. Periodontal biotype should be classified as thick and flat. This surgical technique is not affected by vestibule depth due to the small coronal displacement required to cover the recession defect. However, a shallow or moderate vestibule may require more surgical operator skill to obtain a completely tension-free flap; an inadequate dissection of periosteum and muscle insertions may lead to a relapse.

Suggested surgical management

LAFs have been widely used since Grupe and Warren²⁵ introduced this method for the treatment of localized gingival recession. In this procedure, the adjacent keratinized gingiva is positioned laterally and the exposed root surface covered. Over the years, several further modifications of this technique have been proposed to avoid bone loss and gingival recession on the donor site, the most frequent adverse events related to this surgical procedure. Recently Zucchelli et al.²⁶ proposed a modified approach that appears to be more reliable and safe (Fig. 6).

Surgical advice

1. According to muscle insertion orientation, the LAF should be preferably performed when the donor site is localized mesial to the gingival recession defect.
2. When the flap is moved in the distal-mesial direction, another short horizontal incision should be performed at the most apical extension of the distal vertical releasing incision in order to facilitate mesial mobilization of the flap.
3. Use collagen sponges, stabilized with criss-cross sutures, to promote wound healing of the keratinized tissue donor site adjacent to the recession defect.

Clinical Condition 6: Laterally Advanced Flap + Connective Tissue Graft (LAF+CTG)

Selection of surgical flap

As described for the LAF technique, an alternative keratinized tissue donor-site must be available at adjacent teeth to perform LAF in conjunction with CTG. The periodontal biotype and vestibule depth for the LAF+CTG should be the same as described for the laterally advanced flap alone.

Suggested surgical management

Clean the root surface, perform the surgical flap, and harvest the CTG as described previously.

Surgical advice

1. According to muscle insertion orientation, the LAF should be preferably performed when the donor site is localized mesial to the gingival recession defect.
2. When the flap is moved in the distal-mesial direction, another short horizontal incision should be performed at the most apical extension of the distal vertical releasing incision in order to facilitate mesial mobilization of the flap.
3. Use collagen sponges, stabilized with criss-cross sutures, to promote wound healing of the keratinized tissue donor site adjacent to the recession defect.
4. A deepithelialized graft technique can be used instead of a trap-door procedure to reduce the chair time and simplify the harvesting procedure.
5. Close the palatal wound using collagen sponges (to enhance secondary intention wound healing) and criss-

cross suture technique after a deepithelialized graft procedure.

Clinical Condition 7: Multiple Gingival Recessions – Table 6

Another factor to consider in the surgical treatment of gingival recession is that mucogingival-type defects are very seldom localized to a single tooth. More frequently, gingival recessions affect groups of adjacent teeth. Thus, to minimize the number of surgeries and to optimize the esthetic result, all of the contiguous recessions should be treated simultaneously. Patient-related esthetic considerations would suggest the use of a surgical technique that predictably obtains CRC in all present recessions by using the soft tissue adjacent to the defects.

Suggested surgical management

Zucchelli and De Sanctis²⁷ proposed a new surgical approach for the treatment of multiple recession defects (Fig. 7). This modified design of the envelope flap consists of an oblique submarginal incision in the interdental area, which continues with an intrasulcular incision at the recession defects.

Surgical advice

1. When performing an envelope-type flap, avoid vertical releasing incisions to help maintain adequate blood flow to the flap and reduce the formation of visible white scars.
2. Use “split-full-split” flap elevation, with full thickness for that portion of the flap residing over the previously exposed root surface, to increase the potential to achieve CRC.
3. The absence of a wide zone of keratinized tissue apical to the defects is not considered a limitation; a CTG may be used at one single specific recession defect if necessary.
4. Suture the flap using a sling suture technique passing through the connective tissue of the anatomic papilla.

Conclusions

Due to an increasing public demand for cosmetic dentistry, the treatment of gingival recession has become an important therapeutic and esthetic issue for the contemporary periodontal practice. While the efficacy of using CTGs to obtain full coverage of root surface exposure is well supported in the literature, this cannot be the only worthy treatment goal; surgeons must also use their skills to fulfill the demand for the improved esthetics their patients expect.

Furthermore, even as CTG is considered the gold standard treatment for single and multiple areas of recession, a simpler, less invasive approach, such as a CAF, may yield an equally acceptable result. Each clinical situation must be evaluated to determine the most appropriate surgical

approach to achieve the esthetics expected by the patient. Therefore, to achieve the best clinical and esthetic success, a careful assessment of existing anatomic parameters, such as the amount of keratinized tissue, the periodontal bio-type, and vestibule depth, is a vital part of the surgical decision-making process. ■

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References

1. Rocuzzo M, Bunino M, Needleman I, Sanz M. Periodontal plastic surgery for treatment of localized gingival recessions: A systematic review. *J Clin Periodontol* 2002;29(Suppl. 3):178-194, discussion 195-196.
2. Oates TW, Robinson M, Gunsolley JC. Surgical therapies for the treatment of gingival recession. A systematic review. *Ann Periodontol* 2003;8:303-320.
3. Cairo F, Rotundo R, Miller PD, Pini Prato GP. Root coverage esthetic score: A system to evaluate the esthetic outcome of the treatment of gingival recession through evaluation of clinical cases. *J Periodontol* 2009;80:705-710.
4. Cairo F, Nieri M, Cattabriga M, et al. Root coverage esthetic score after treatment of gingival recession: An interrater agreement multicenter study. *J Periodontol* 2010;81:1752-1758.
5. Miller PD Jr. A classification of marginal tissue recession. *Int J Periodontics Restorative Dent* 1985;5(2):8-13.
6. Pini Prato GP, Baldi C, Nieri M, et al. Coronally advanced flap: The post-surgical position of the gingival margin is an important factor for achieving complete root coverage. *J Periodontol* 2005;76:713-722.
7. Pini Prato G, Pagliaro U, Baldi C, et al. Coronally advanced flap procedure for root coverage. Flap with tension versus flap without tension: A randomized controlled clinical study. *J Periodontol* 2000;71:188-201.
8. Baldi C, Pini-Prato G, Pagliaro U, et al. Coronally advanced flap procedure for root coverage. Is flap thickness a relevant predictor to achieve root coverage? A 19-case series. *J Periodontol* 1999;70:1077-1084.
9. Saletta D, Pini Prato G, Pagliaro U, Baldi C, Mauri M, Nieri M. Coronally advanced flap procedure: Is the interdental papilla a prognostic factor for root coverage? *J Periodontol* 2001;72:760-766.
10. Olsson M, Lindhe J, Marinello CP. On the relationship between crown form and clinical features of the gingiva in adolescents. *J Clin Periodontol* 1993;20:570-577.
11. Zucchelli G, Testori T, De Sanctis M. Clinical and anatomical factors limiting treatment outcomes of gingival recession: A new method to predetermine the line of root coverage. *J Periodontol* 2006;77:714-721.
12. Zucchelli G, Mele M, Stefanini M, et al. Predetermination of root coverage. *J Periodontol* 2010;81:1019-1026.
13. Pini-Prato G, Franceschi D, Cairo F, Nieri M, Rotundo R. Classification of dental surface defects in areas of gingival recession. *J Periodontol* 2010;81:885-890.
14. Allen EP, Miller PD Jr. Coronal positioning of existing gingiva: Short term results in the treatment of shallow marginal tissue recession. *J Periodontol* 1989;60:316-319.
15. Zucchelli G, Mele M, Mazzotti C, Marzadori M, Montebugnoli L, De Sanctis M. Coronally advanced flap with and without vertical releasing incisions for the treatment of multiple gingival recessions: A comparative controlled randomized clinical trial. *J Periodontol* 2009;80:1083-1094.
16. Hwang D, Wang HL. Flap thickness as a predictor of root coverage: A systematic review. *J Periodontol* 2006;77:1625-1634.
17. Santamaria MP, Ambrosano GM, Casati MZ, Nociti FH Jr, Sallum AW, Sallum EA. The influence of local anatomy on the outcome of treatment of gingival recession associated with non-carious cervical lesions. *J Periodontol* 2010;81:1027-1034.
18. Langer B, Langer L. Subepithelial connective tissue graft technique for root coverage. *J Periodontol* 1985;56:715-720.
19. Cairo F, Pagliaro U, Nieri M. Treatment of gingival recession with coronally advanced flap procedures: A systematic review. *J Clin Periodontol* 2008; 35(Suppl. 8):136-162.
20. Cortellini P, Tonetti M, Baldi C, et al. Does placement of a connective tissue graft improve the outcomes of coronally advanced flap for coverage of single gingival recessions in upper anterior teeth? A multicenter, randomized, double-blind, clinical trial. *J Clin Periodontol* 2009; 36:68-79.
21. Zucchelli G, Mele M, Stefanini M, et al. Patient morbidity and root coverage outcome after subepithelial connective tissue and de-epithelialized grafts: A comparative randomized controlled clinical trial. *J Clin Periodontol* 2010;37:728-738.
22. Cohen DW, Ross SE. The double papillae repositioned flap in periodontal therapy. *J Periodontol* 1968;39:65-70.
23. Kerner S, Borghetti A, Katsahian S, et al. A retrospective study of root coverage procedures using an image analysis system. *J Clin Periodontol* 2008;35:346-355.
24. Harris RJ, Miller LH, Harris CR, Miller RJ. A comparison of three techniques to obtain root coverage on mandibular incisors. *J Periodontol* 2005;76:1758-1767.
25. Grupe J, Warren R. Repair of gingival defects by a sliding flap operation. *J Periodontol* 1956;27:92-95.
26. Zucchelli G, Cesari C, Amore C, Montebugnoli L, De Sanctis M. Laterally moved, coronally advanced flap: A modified surgical approach for isolated recession-type defects. *J Periodontol* 2004;75:1734-1741.
27. Zucchelli G, De Sanctis M. Treatment of multiple recession-type defects in patients with esthetic demands. *J Periodontol* 2000;71:1506-1514.
28. Zucchelli G, De Sanctis M. Long-term outcome following treatment of multiple Miller Class I and II recession defects in esthetic areas of the mouth. *J Periodontol* 2005;76:2286-2292.