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COMMENTARY

An evidence-based system for the classification and clinical management of non-proximal gingival recession defects

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Abstract

Gingival recession defect (GRD) may be defined as an apical migration of the gingival margin respective to the cementoenamel junction resulting in partial exposure of the root surface to the oral cavity, which may have important esthetic, functional, and periodontal health implications. A novel system for the classification and management of non-proximal GRDs is proposed in this article. This evidence-based system consists of two essential components: (1) Establishment of the GRD type based on the midbuccal/midlingual attachment level respective to the interproximal bone level, and (2) Assessment of the gingival phenotype according to the width of attached gingiva and gingival thickness. Each category of this new classification system is linked with treatment recommendations substantiated by relevant literature pertaining to the outcomes of validated root coverage procedures in specific scenarios, which can be used as a guide for clinical decision-making in daily practice.

KEYWORDS

clinical decision-making, gingival recession, phenotype, plastic surgery

1 | BACKGROUND

Gingival recession defect (GRD) may be defined as an apical migration of the gingival margin respective to the cementoenamel junction (CEJ) resulting in partial exposure of the root surface to the oral cavity, which may have important esthetic, functional, and periodontal health implications. Similar to other periodontal diseases and conditions, effective management of GRDs is based on three fundamental pillars: (1) Identification and control of the causative agent(s) that lead to the onset and progression of the defect; (2) Assessment and analysis of the characteristics of the defect and surrounding tissues, and (3) Selection and execution of the most suitable treatment option, which may entail monitoring, non-surgical therapy and/or surgical correction.[1-3]

With respect to the first pillar, it is well-documented that different etiological factors (eg, periodontal and dental anatomical features, history of periodontitis, iatrogenic dentistry and sustained trauma) can contribute to the development of GRDs.[2] Among them, incorrect or traumatic toothbrushing is commonly found in patients who would benefit from root coverage (RC) procedures. These are subjects who typically do not have a history of periodontitis and adhere to high standards of oral hygiene.[2,3] The second pillar focuses on the assessment of the features of the GRD (eg, depth and width), the tooth or teeth involved (eg, root prominence, presence of non-carious cervical lesions [NCCLs], existence of furcation defects, etc.) and the surrounding periodontal tissues (eg, mucosal tissue apical and adjacent to the exposed root surface, interproximal bone levels, papilla height, and width, vestibular depth).[4,5] Ideally, such characterization should be guided by a simple classification system that is applicable and reproducible in both clinical practice and research settings. Lastly,

the third pillar pertains to the selection of the most suitable treatment option(s) for each individual clinical scenario. If surgical correction is indicated, an evidence-based approach to choose a RC procedure that would address the patient's concerns and enhance long-term periodontal health in the most conservative and predictable manner should drive the clinical decision-making process.[6]

2 | CURRENT STANDARDS FOR THE CLASSIFICATION OF GINGIVAL RECESSION DEFECTS

Among the multiple systems previously proposed for the evaluation and classification of GRDs in non-proximal sites [see Table S1 in online Journal of Periodontology],[7-14] two of them deserve special attention: P.D. Miller's classification, which was published in 1985,[10] and Francesco Cairo and collaborators' classification from 2011.[11]

Since its appearance, Miller's "Classification of Marginal Tissue Recession" has been widely used in practice and research because of its clinically-oriented approach and reproducibility.[10] Almost all well-designed clinical trials published to date in peer-reviewed journals on the topic of surgical management of GRDs used Miller's classification.[2,3] This system categorizes single gingival recessions into four classes[10]:

- Class I: Marginal tissue recession that does not extend to the mucogingival junction (MGJ). There is no periodontal loss (bone or soft tissue) in the interdental area, and 100% RC can be anticipated.
- Class II: Marginal tissue recession that extends to or beyond the MGJ. There is no periodontal loss (bone or soft tissue) in the interdental area, and 100% RC can be anticipated.
- Class III: Marginal tissue recession that extends to or beyond the MGJ. Bone or soft tissue loss in the interdental area is present or there is tooth malposition, which prevents the attempting of 100% RC. Partial RC can be anticipated.
- Class IV: Marginal tissue recession that extends to or beyond the MGJ. The bone or soft tissue loss in the interdental area and/or tooth malposition is so severe that RC cannot be anticipated.

Cairo and collaborators' system shares some similarities with Miller's, but it is based on the extent of buccal and interproximal clinical attachment loss, and also simplifies the classification by proposing three categories, as described below[11]:

- Recession Type 1 (RT1): GR with no loss of interproximal attachment. Interproximal CEJ is clinically not detectable at both mesial and distal aspects of the tooth.
- Recession Type 2 (RT2): GR associated with loss of interproximal attachment. The amount of interproximal attachment loss (measured from the interproximal CEJ to the depth of the interproximal pocket) is less than or equal to the buccal attachment loss (measured from the buccal CEJ to the depth of the buccal pocket).
- Recession Type 3 (RT3): GR associated with loss of interproximal attachment. The amount of interproximal attachment loss (measured from the interproximal CEJ to the depth of the pocket) is higher than the buccal attachment loss (measured from the buccal CEJ to the depth of the buccal pocket).

Noteworthy, this classification has gained popularity and acceptance in recent years, which lead to its incorporation in the diagnostic matrix for the management of mucogingival deformities and conditions proposed in the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions.[4,15]

Miller's system is based on the apical extent of the recession defect and the presence of bone or soft tissue loss, whereas Cairo and collaborators' primarily takes into consideration the amount of midbuccal attachment loss respective to the amount of interproximal attachment loss.[11] However, it may be argued that the position of the midbuccal/midlingual attachment level relative to the interproximal bone crest, as opposed to the amount of interproximal attachment loss, is a more reliable predictor of RC.[3] The presence of keratinized tissue (KT) is accounted for in Miller's classification, but KT per se is not a clinically relevant factor in the stability of the gingival margin unless there is a minimum amount of attached gingiva.[16,17] Furthermore, both classification systems do not consider lingual defects and overlook a critical element: the gingival phenotype. Studies reporting on the short-term outcomes[2,3,18,19] and long-term stability of the gingival margin[16,17,20,21] after RC procedures clearly indicate that baseline gingival thickness and width of attached gingiva should be factored in the clinical decision-making process. Hence, a simple and reproducible classification system for non-proximal GRDs that incorporates the assessment of the gingival phenotype and integrates the best available evidence into a treatment-oriented categorization is warranted.

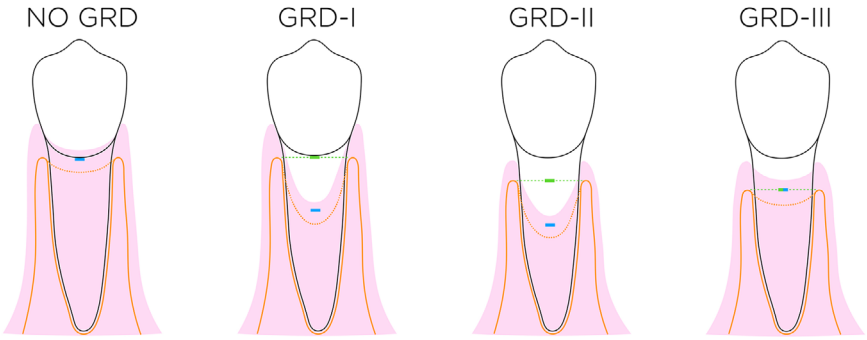

FIGURE 1 Gingival recession defect (GRD) types (Blue mark: Actual midbuccal attachment level/Green mark: Anticipated maximum attachment level after surgical intervention)

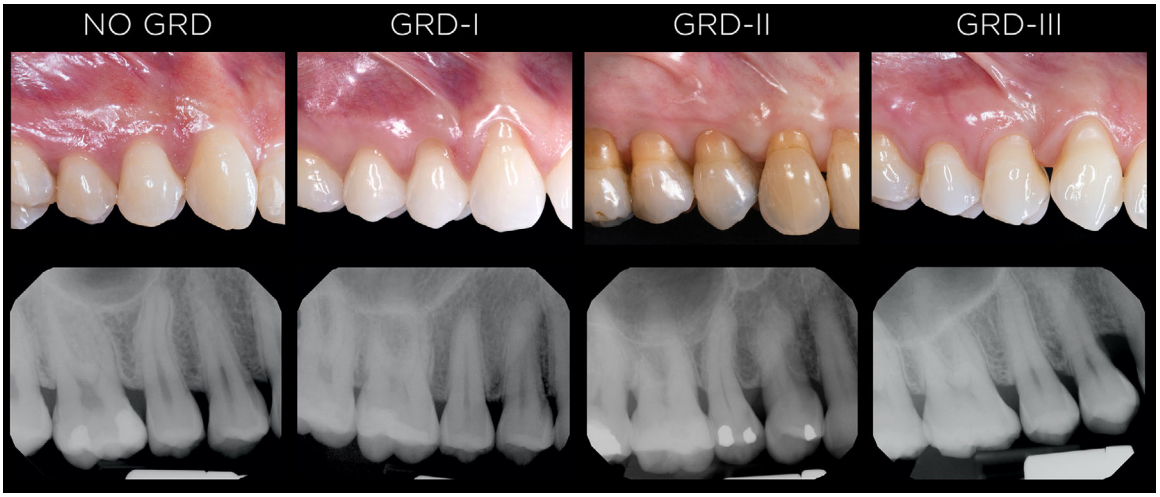

FIGURE 2 Clinical examples of different gingival recession defect (GRD) types compared with a site exhibiting no defect

3 | EVIDENCE-BASED STRATEGIES TO CLASSIFY AND MANAGE NON-PROXIMAL GINGIVAL RECESSION DEFECTS

3.1 | Classification system for non-proximal gingival recession defects

Subsequently, we propose a novel classification system consisting of two components:

1. Establishment of the GRD type (Figures 1, 2, and 3):
   - **GRD-I**: Buccal or lingual GRD in absence of adjacent interproximal attachment and bone loss.
   - **GRD-II**: Buccal or lingual GRD with adjacent interproximal attachment and bone loss—Midbuccal/midlingual clinical attachment level is apical to the interproximal bone level.
   - **GRD-III**: Buccal or lingual GRD with adjacent interproximal attachment and bone loss—Midbuccal/midlingual clinical attachment level is at the same height of or coronal to the interproximal bone level.

In GRD-II and GRD-III, the most apical midfacial attachment level and interproximal bone level dictate the classification.

2. Assessment of the gingival phenotype according to the width of attached gingiva (AG) and gingival thickness (GT), measured at ≈1 mm apical to the gingival margin. AG can be classified as adequate (≥ 1 mm) or inadequate (< 1 mm), whereas GT may be categorized as thick (≥ 1 mm) or thin (< 1 mm), which can be translated into the following subtypes (Figures 4 and 5):
   - **Subtype A**: Presence of ≥ 1 mm of AG and ≥ 1 mm of GT
   - **Subtype B**: Presence of ≥ 1 mm of AG and < 1 mm of GT
   - **Subtype C**: AG is < 1 mm, independently of GT

The threshold proposed for the categorization of subtypes A, B, and C is based on the findings from several studies that demonstrated the importance of AG and GT in the decision-making process. Satisfactory short-term RC

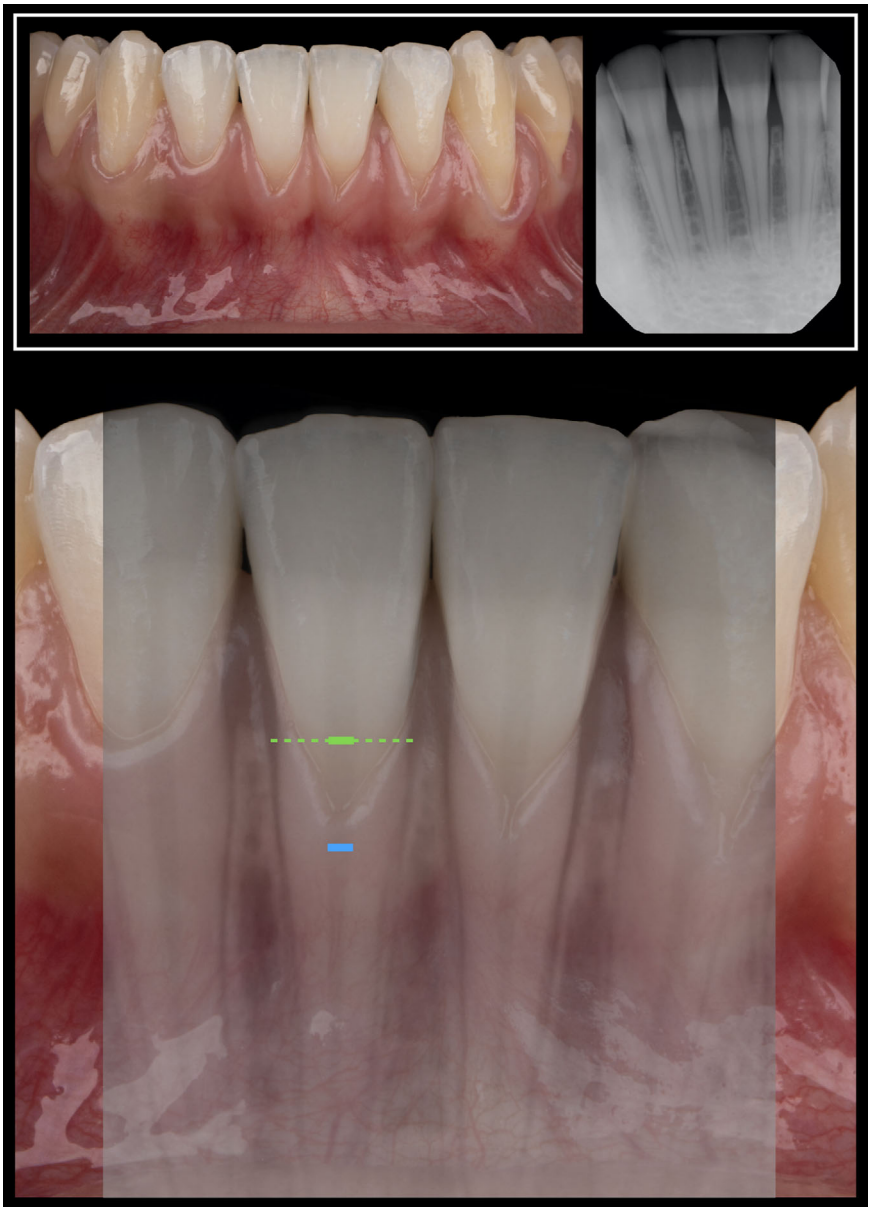

FIGURE 3 Composite superimposition of a clinical photograph and a periapical radiograph (above) depicting the relationship between the midfacial clinical attachment level and the interproximal bone level on a mandibular right central incisor presenting a GRD-I (Blue mark: Actual midbuccal attachment level/Green mark: Anticipated maximum attachment level after surgical intervention). Note that the green mark is dictated by the level of the most apical interproximal bone level

outcomes after the use of a coronally advanced flap alone are dependent of a minimum GT (> 0.8 mm),[18,19,22] as well as a minimum KT band of 2 mm, of which 1 mm should be attached.[22]

Whereas the amount of AG can be simply and reliably determined with clinical measurements using a periodontal probe, precise assessment of GT can be challenging in standard clinical settings. Different methods to quantify GT are available, including horizontal transmucosal sounding (also known as transgingival probing), digital evaluation of cone beam computed tomography (CBCT) in combination with stereolithographic (STL) files, non-ionizing ultrasonography, optical coherence tomography, or the use of a caliper after tooth extraction. Of all these methods, horizontal transmucosal sounding offers a balance between reproducibility and accuracy, whereas also being practical, as demonstrated in several preclinical and clinical investigations.[23-25]

3.2 | Therapeutic application

This new classification system has been developed not only to categorize GRDs in a simple, practical, and reproducible manner, but also with the ultimate goal of providing a clinical decision-making guide substantiated by relevant literature on the outcomes of validated RC procedures in specific scenarios.[3] In order to set up a framework for evidence-based treatment options to manage each type of non-proximal GRD, a brief overview of mucogingival surgical interventions aimed at RC, which can be categorized in three main families, is provided below:

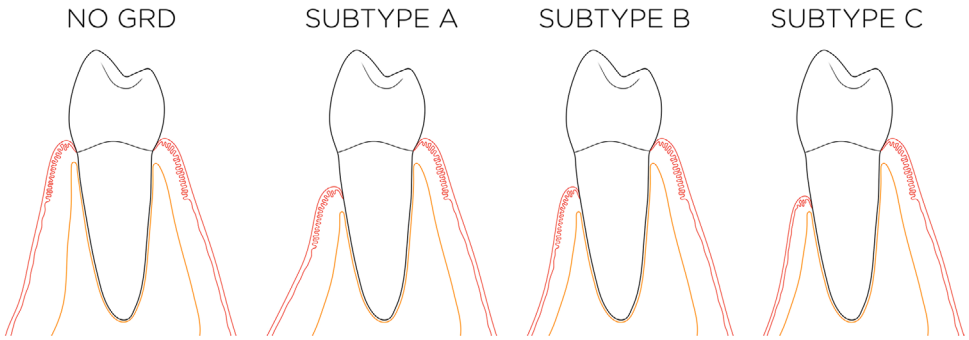

FIGURE 4 Gingival phenotype subtypes

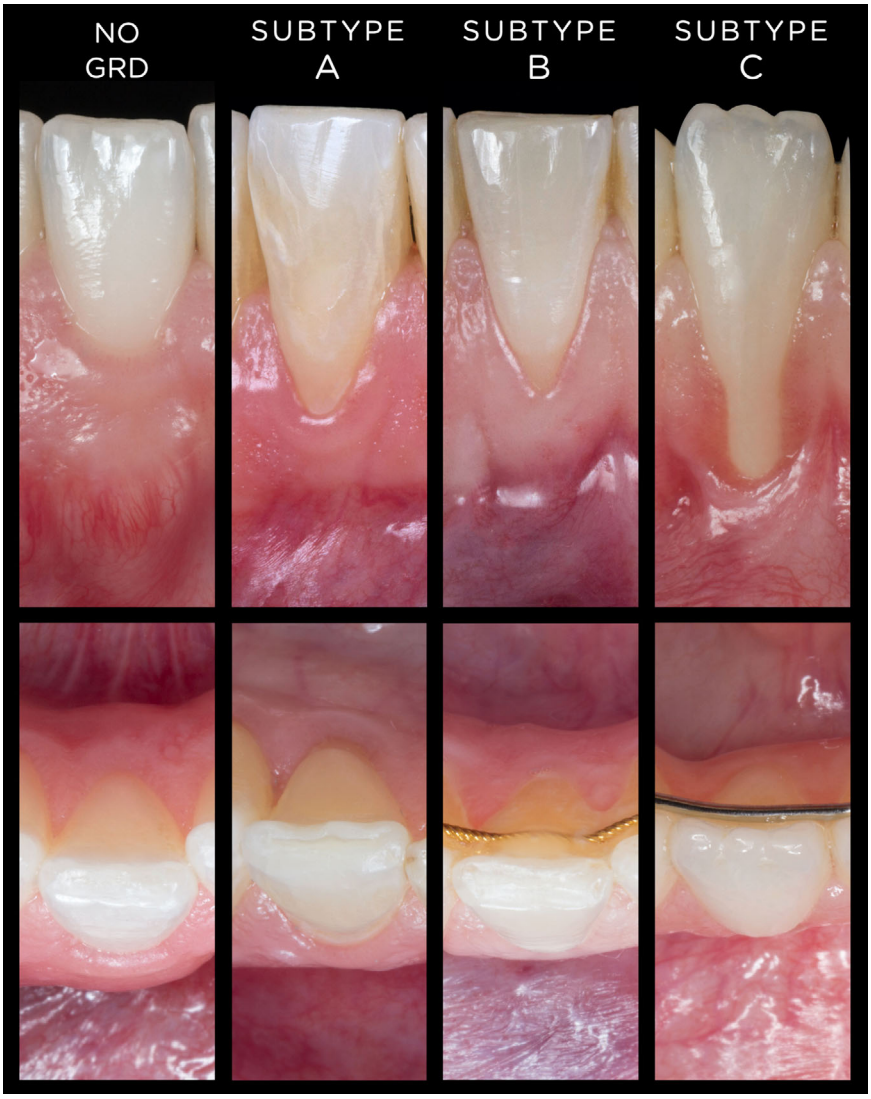

FIGURE 5 Clinical examples of different gingival phenotype subtypes compared with a site exhibiting no defect

1. **Flap procedures**: In the context of dental practice, a flap is a portion of the oral mucosa that is partially separated from its surrounding tissues while maintaining its own blood supply. Flaps may be partial thickness, if the periosteum is not involved, full thickness (*aka* mucoperiosteal), if the periosteum is included as part of the flap or combined. Depending on the final position of the flap upon completion of the surgical procedure, flaps may be repositioned or displaced. Repositioned flaps are stabilized in their original position. On the contrary, displaced flaps entail the modification of the original position of the mucosal tissue and may be further

TABLE 1 General therapeutic recommendations for the management of different types of non-proximal GR defects

	Subtype A Presence of ≥ 1 mm of AG and ≥ 1 mm of GT	**Subtype B** Presence of ≥ 1 mm of AG and < 1 mm of GT	**Subtype C** AG is < 1 mm, independently of GT
GRD-I Complete root coverage is anticipated	PRIMARY OPTION Coronally advanced or laterally positioned flap procedure	PRIMARY OPTION Bilaminar procedure	PRIMARY OPTION Free graft procedure
GRD-II Partial root coverage is anticipated	ALTERNATIVE Bilaminar procedure	ALTERNATIVE Laterally positioned flap	ALTERNATIVE (Particularly in esthetic sites) Bilaminar procedure using a tunnel approach or laterally positioned flap
GRD-III No root coverage is anticipated	Mucogingival surgery for root coverage is not recommended	GT augmentation using a bilaminar procedure may be indicated	AG augmentation using a free graft procedure may be indicated

Abbreviations: GT, gingival thickness; AG, attached gingiva, GRD, gingival recession defect.

subcategorized into 1) coronally advanced flaps (eg, split-full-split thickness[26] or semilunar flaps[27]); 2) lateral positioned flap (eg, rotational[28] or double-papilla flaps[29]) or 3) apically positioned flaps, which are not applied in RC procedures. Flaps for RC may be further divided in function of their design into pedicle,[30] semilunar,[27] envelope[26,31,32] or tunnel flaps.[33,34]

2. **Free graft procedures**: These procedures consist on the preparation of a recipient bed over which a non-attached (ie, "free") soft tissue graft is positioned and secured. These procedures may be indicated for RC purposes, gingival thickness augmentation and/or to generate new or increase the existing band of attached gingiva. Vestibular depth increase may be also accomplished simultaneously in some scenarios. Depending on their origin, free grafts may be autogenous (eg, free gingival graft or de-epithelialized connective tissue graft) or exogenous (eg, xenogenic collagen matrix or allogenic dermal matrix).
3. **Bilaminar procedures**: Bilaminar procedures are RC techniques comprising the use of a free graft, either a completely or partially de-epithelialized autologous connective tissue graft or an exogenous substitute, that is completely or partially covered by a mucosal flap.[35] Hence, bilaminar approaches are essentially the combination of a flap with a free graft procedure.

Subsequently, the following therapeutic considerations, some of which are summarized in Table 1, can be made:

• **GRD-I and GRD-II** may be effectively managed with mucogingival surgical procedures. However, although a high chance of achieving complete root coverage (CRC) may be anticipated in GRD-I, only partial RC can be expected in GRD-II, as this is primarily dictated by the interproximal bone level. Hence, the greater the vertical distance between the midbuccal/midlingual attachment level and the interproximal bone level, the greater the amount of partial RC that may be predictably achieved in GRD-II.[3]

• Given the favorable gingival phenotype exhibited around **GRD-I and GRD-II A**, coronally advanced or laterally positioned flaps represent the primary treatment option to achieve RC in these scenarios.[26] When laterally positioned flaps are considered, careful assessment of the characteristics of the mucosal tissues at the donor site adjacent to the recession defect is important to minimize the risk of causing a secondary mucogingival defect. As an alternative, particularly in sites presenting shallow vestibular depth or if additional support to the primary displaced flap with a free soft tissue graft is desired, a bilaminar procedure may be indicated (eg, tunnel approach in combination with a de-epithelialized autogenous graft),[36] but this may increase cost and surgical time, as well as donor site morbidity, if an autogenous graft is used.

• Because of the limited amount of gingival thickness associated with **GRD-I and GRD-II B**, bilaminar procedures are primarily indicated to achieve RC and GT augmentation.[19,22] Alternatively, a laterally positioned flap may be indicated in recession sites exhibiting favorable adjacent donor site characteristics. Challenging scenarios presenting deep recession defects and/or shallow vestibular depth may be also managed with a two-step approach, consisting of the performance of two separate surgical interventions (eg, a bilaminar or a free graft procedure followed by a coronally advanced flap or another bilaminar procedure upon tissue maturation).

• A minimum amount of attached KT (≥1 mm) is required to prevent significant apical displacement of the gingival margin in the long-term.[16] Hence, aside from RC, periodontal phenotype modification via augmentation of

the amount of AG is priority in the treatment of **GRD-I and GRD-II C**. The most predictable procedures to achieve this purpose are free grafts, particularly those of autogenous origin.[16,37] Bilaminar procedures consisting of a tunneled flap in combination with an autogenous graft[36] or a lateral displaced flap[38,39] have also been proven effective in these clinical scenarios, particularly in esthetic sites, to avoid the "tire-patch" appearance typically associated with the use of free gingival grafts.

If the expected amount of RC is not achieved upon tissue maturation following an initial procedure, a second surgical intervention may be indicated, provided enough AG has been obtained after the first one. In these situations, if GT is ≥ 1 mm, a simple coronally advanced flap may be indicated. On the contrary, if GT augmentation is required along with RC, a bilaminar surgical procedure should be considered.

• Different from GRD-I and GRD-II, no RC should be anticipated in **GRD-III**, mainly because of the unfavorable position of the interproximal bone crest respective to the midbuccal/midlingual attachment level. Hence, mucogingival surgery solely for non-proximal RC purposes is not recommended in **GRD-III A defects**. However, GT and AG augmentation may be indicated in **GRD-III B and C defects**, respectively, with the objective of improving the periodontal prognosis through gingival phenotype modification.

• Palatal GRDs represent an exception to these recommendations. Therapeutic options for RC are limited in palatal sites because of the absence of MGJ, which eliminates the possibility of flap displacement. Although there is insufficient evidence available in the literature to establish solid clinical guidelines, it seems that the most predictable options to manage palatal recession defects are bilaminar procedures consisting of a flap or tunnel approach in combination with a partially exposed free graft[40] or a pedicle, subepithelial connective tissue graft.[41]

• The adjunctive use of biologics, such as enamel matrix derivatives and growth factors (eg, platelet-derived growth factor), has been suggested to improve the outcomes of RC procedures.[42,43] However, current clinical evidence does not support their use to obtain periodontal phenotype modification.[2,3] As concluded in multiple clinical studies and expert consensuses, periodontal phenotype modification (ie, thin to thick) promotes long-term gingival stability.[2,3,16,20,21,44]

4 | CONCLUDING REMARKS

The proposed system for the classification and management of non-proximal GRDs is primarily based on two evidence-based critical factors that largely influence the predictability and indication of RC procedures (ie, midbuccal/midlingual attachment level respective to interproximal bone level and gingival phenotype). Our recommendations are intended for use as a general guidance, and not as strict clinical guidelines to be indistinctly applied in any situation. Clinical judgement should be thoughtfully exerted when using this and other classification systems of diseases and conditions.[45] Other important factors, such as the number (single versus multiple) and morphology of the recession defect(s) (ie, depth and width), vestibular depth, presence of aberrant frenula, characteristics of the adjacent papillae (ie, height and width), gingival phenotype of the adjacent sites (this is particularly critical when considering a lateral positioned flap), proximity of anatomical structures (eg, mental foramen), tooth crowding, root prominence, furcation defects, the presence of NCCLs and patient's preferences and anticipated compliance, among others, should be carefully assessed and considered in the decision-making process leading to the selection of a RC approach that would be associated with the highest predictability in specific clinical scenarios.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest pertaining to this commentary.

AUTHOR CONTRIBUTIONS

Both authors (Leandro Chambrone and Gustavo Avila-Ortiz) equally participated in the conception and drafting of this article. They also agree to be accountable for all aspects of work ensuring integrity and accuracy.

REFERENCES

1. Chambrone L, Ortega MAS, Sukekava F, et al. Root coverage procedures for treating single and multiple recession-type defects: an updated Cochrane systematic review. *J Periodontol*. 2019;90:1399-1422.
2. Chambrone L, Salinas Ortega MA, Sukekava F, et al. Root coverage procedures for treating localised and multiple recession-type defects. *Cochrane Database Syst Rev*. 2018;10:CD007161.
3. Chambrone L, Tatakis DN. Periodontal soft tissue root coverage procedures: a systematic review from the AAP regeneration workshop. *J Periodontol*. 2015;86:S8-51.
4. Cortellini P, Bissada NF. Mucogingival conditions in the natural dentition: narrative review, case definitions, and diagnostic considerations. *J Periodontol*. 2018;89(Suppl 1):S204-S213.

5. Rasperini G, Acunzo R, Limiroli E. Decision making in gingival recession treatment: scientific evidence and clinical experience. *Clin Adv Periodontics*. 2011;1:41-52.
6. Chambrone L, de Castro Pinto RCN, Chambrone LA. The concepts of evidence-based periodontal plastic surgery: application of the principles of evidence-based dentistry for the treatment of recession-type defects. *Periodontol 2000*. 2019;79:81-106.
7. Sullivan HC, Atkins JH. Free autogenous gingival grafts. 3. Utilization of grafts in the treatment of gingival recession. *Periodontics*. 1968;6:152-160.
8. Mlinek A, Smukler H, Buchner A. The use of free gingival grafts for the coverage of denuded roots. *J Periodontol*. 1973;44:248-254.
9. Smith RG. Gingival recession. Reappraisal of an enigmatic condition and a new index for monitoring. *J Clin Periodontol*. 1997;24:201-205.
10. Miller PD, Jr. A classification of marginal tissue recession. *Int J Periodontics Restorative Dent*. 1985;5:8-13.
11. Cairo F, Nieri M, Cincinelli S, Mervelt J, Pagliaro U. The interproximal clinical attachment level to classify gingival recessions and predict root coverage outcomes: an explorative and reliability study. *J Clin Periodontol*. 2011;38:661-666.
12. Mahajan A. Mahajan's Modification of the Miller's classification for gingival recession. *Dental Hypotheses*. 2010;1:45-49.
13. Rotundo R, Mori M, Bonaccini D, Baldi C. Intra- and inter-rater agreement of a new classification system of gingival recession defects. *Eur J Oral Implantol*. 2011;4:127-133.
14. Kumar A, Masamatti SS. A new classification system for gingival and palatal recession. *J Indian Soc Periodontol*. 2013;17:175-181.
15. Jepsen S, Caton JG, Albandar JM, et al. Periodontal manifestations of systemic diseases and developmental and acquired conditions: consensus report of workgroup 3 of the 2017 World Workshop on the classification of periodontal and peri-implant diseases and conditions. *J Periodontol*. 2018;89(Suppl 1):S237-S248.
16. Agudio G, Chambrone L, Pini Prato G. Biologic remodeling of periodontal dimensions of areas treated with gingival augmentation procedure: a 25-year follow-up observation. *J Periodontol*. 2017;88:634-642.
17. Chambrone L, Tatakis DN. Long-Term outcomes of untreated buccal gingival recessions: a systematic review and meta-analysis. *J Periodontol*. 2016;87:796-808.
18. 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.
19. Cairo F, Cortellini P, Pilloni A, et al. Clinical efficacy of coronally advanced flap with or without connective tissue graft for the treatment of multiple adjacent gingival recessions in the aesthetic area: a randomized controlled clinical trial. *J Clin Periodontol*. 2016;43:849-856.
20. Pini Prato GP, Franceschi D, Cortellini P, Chambrone L. Long-term evaluation (20 years) of the outcomes of subepithelial connective tissue graft plus coronally advanced flap in the treatment of maxillary single recession-type defects. *J Periodontol*. 2018;89:1290-1299.
21. Pini Prato GP, Magnani C, Chambrone L. Long-term evaluation (20 years) of the outcomes of coronally advanced flap in the treatment of single recession-type defects. *J Periodontol*. 2018;89:265-274.
22. Stefanini M, Zucchelli G, Marzadori M, de Sanctis M. Coronally advanced flap with site-specific application of connective tissue graft for the treatment of multiple adjacent gingival recessions: a 3-year follow-up case series. *Int J Periodontics Restorative Dent*. 2018;38:25-33.
23. Frost NA, Mealey BL, Jones AA, Huynh-Ba G. Periodontal biotype: gingival thickness as it relates to probe visibility and buccal plate thickness. *J Periodontol*. 2015;86:1141-1149.
24. Hutton CG, Johnson GK, Barwacz CA, Allareddy V, Avila-Ortiz G. Comparison of two different surgical approaches to increase peri-implant mucosal thickness: a randomized controlled clinical trial. *J Periodontol*. 2018;89:807-814.
25. Sala L, Alonso-Perez R, Agustin-Panadero R, Ferreiroa A, Carrillo-de-Albornoz A. Comparative in vitro study of two methods for gingival biotype assessment. *J Clin Exp Dent*. 2018;10:e858-e863.
26. Zucchelli G, De Sanctis M. Treatment of multiple recession-type defects in patients with esthetic demands. *J Periodontol*. 2000;71:1506-1514.
27. Tarnow DP. Semilunar coronally repositioned flap. *J Clin Periodontol*. 1986;13:182-185.
28. Grupe HE, Warren Jr RF. Repair of gingival defects by a sliding flap operation. *J Periodontol*. 1956;27:92-95.
29. Cohen DW, Ross SE. The double papillae repositioned flap in periodontal therapy. *J Periodontol*. 1968;39:65-70.
30. Bernimoulin JP, Luscher B, Muhlemann HR. Coronally repositioned periodontal flap. Clinical evaluation after one year. *J Clin Periodontol*. 1975;2:1-13.
31. Bruno JF. Connective tissue graft technique assuring wide root coverage. *Int J Periodontics Restorative Dent*. 1994;14:126-137.
32. Raetzke PB. Covering localized areas of root exposure employing the "envelope" technique. *J Periodontol*. 1985;56:397-402.
33. Zadeh HH. Minimally invasive treatment of maxillary anterior gingival recession defects by vestibular incision subperiosteal tunnel access and platelet-derived growth factor BB. *Int J Periodontics Restorative Dent*. 2011;31:653-660.
34. Allen AL. Use of the supraperiosteal envelope in soft tissue grafting for root coverage. I. Rationale and technique. *Int J Periodontics Restorative Dent*. 1994;14:216-227.
35. Zucchelli G, *Mucogingival Esthetic Surgery*. Chicago (USA): Quintessence Publishing Co.; 2012: 830.
36. Sculean A, Allen EP. The Laterally closed tunnel for the treatment of deep isolated mandibular recessions: surgical technique and a report of 24 cases. *Int J Periodontics Restorative Dent*. 2018;38:479-487.
37. Cortellini P, Tonetti M, Prato GP. The partly epithelialized free gingival graft (pe-fgg) at lower incisors. A pilot study with implications for alignment of the mucogingival junction. *J Clin Periodontol*. 2012;39:674-680.
38. 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.
39. Chambrone LA, Chambrone L. Treatment of Miller Class I and II localized recession defects using laterally positioned flaps: a 24-month study. *Am J Dent*. 2009;22:339-344.
40. Harris RJ. Root coverage of a palatal recession defect: a case report. *J Periodontol*. 2001;72:1103-1107.

41. Weinstein BF, Pham CM, Nguyen TT. The Reverse Palatal Pedicle Graft (RPPG) for maxillary molar palatal recessions: two case reports. *Clin Adv Periodontics*. 2020. https://doi.org/10.1002/cap.10096. Online: Feb 19, 2020.
42. Tonetti MS, Jepsen S. Working Group 2 of the European Workshop on P. Clinical efficacy of periodontal plastic surgery procedures: consensus report of Group 2 of the 10th European Workshop on Periodontology. *J Clin Periodontol*. 2014;41(Suppl 15):S36-43.
43. McGuire MK, Scheyer ET, Snyder MB. Evaluation of recession defects treated with coronally advanced flaps and either recombinant human platelet-derived growth factor-BB plus beta-tricalcium phosphate or connective tissue: comparison of clinical parameters at 5 years. *J Periodontol*. 2014;85:1361-1370.
44. Kao RT, Curtis DA, Kim DM, et al. American Academy of Periodontology best evidence consensus statement on modifying periodontal phenotype in preparation for orthodontic and restorative treatment. *J Periodontol*. 2020;91:289-298.
45. Kornman KS, Papapanou PN. Clinical application of the new classification of periodontal diseases: ground rules, clarifications and "gray zones". *J Periodontol*. 2020;91:352-360.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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