J Clin Periodontol 2011; 38: 243–245 doi: 10.1111/j.1600-051X.2010.01655.x

Journal of Clinical Periodontology

Guest Editorial

The Miller classification of gingival recession: limits and drawbacks

Giovanpaolo Pini-Prato
Department of Periodontology, University of Florence, Florence, Italy

Pini-Prato G. The Miller classification of gingival recession: limits and drawbacks. J Clin Periodontol 2011; 38: 243–245. doi: 10.1111/j.1600-051X.2010.01655.x.

Accepted for publication 2 November 2010

General Comments

Classifications, defined as ''systematic arrangements in groups or categories according to established criteria'' (Merriam-Webster 2010), have been conceived to facilitate the comprehension of the great amount of factors and information involved in complex systems. Classifications have proved useful and indispensable in many fields of knowledge, particularly in medicine. In periodontology, classifications are widely used to categorize defects due to periodontitis according to their aetiology, diagnosis, treatment and prognosis. Gingival recessions are frequent lesions, and due to aesthetic reasons, patients have always requested treatment.

Several classifications have been proposed in the literature in order to facilitate the diagnosis of gingival recessions (Sullivan & Atkins 1968; Mlinek et al. 1973; Miller 1985a; Smith 1997; Mahajan 2010). Miller's Classification is still the most widely used of all the classification systems. It is based on a morphological evaluation of the injured periodontal tissues and could be useful in predicting the final amount of root coverage following a free gingival graft procedure. Four types of recession defects were categorized on the basis of the evaluation of soft and hard periodontal tissues. The original classification is reported below:

Class I: Marginal tissue recession, which does not extend to the mucogingival junction (MGJ). There is no periodontal loss (bone or soft tissue) in the inter-dental area, and 100% root coverage can be anticipated.

Class II: Marginal tissue recession, which extends to or beyond the MGJ. There is no periodontal loss (bone or soft tissue) in the inter-dental area, and 100% root coverage can be anticipated.

Class III: Marginal tissue recession, which extends to or beyond the MGJ. Bone or soft tissue loss in the inter-dental area is present or there is a malpositioning of the teeth, which prevents the attempting of 100% of root coverage. Partial root coverage can be anticipated.

The amount of root coverage can be determined presurgically using a periodontal probe. The probe is placed horizontally on an imaginary line connecting the tissue level on the mid-facial of the two teeth on either side of the tooth or teeth exhibiting recession. . . . Root coverage can be anticipated to that level.

Class IV: Marginal tissue recession, which extends to or beyond the MGJ. The bone or soft tissue loss in the inter-dental area and/or malpositioning of teeth is so severe that root coverage cannot be anticipated.

The diagnosis of the severity of gingival lesions and the prognostic evaluation of the treatment (free gingival graft) were the aims of this classification. Distinguishing recession-type defects with only soft tissue damage on the facial aspect of the teeth from those associated with inter-proximal soft tissue and bone loss was the most important value of this classification in past decades. The classification became very popular and was widely used by periodontists because it had been proposed by a recognized authority in mucogingival plastic surgery; this system enjoyed great success over the years achieving more than 100 citations of the original article in Science Citation Index (ISI 2010). This classification, which aimed at anticipating the prognosis of root coverage using free gingival graft, was superficially applied in subsequent studies to evaluate the outcomes of different mucogingival root coverage procedures; this fact has greatly influenced research in this field. Nevertheless, after 25 years, on the basis of an exact taxonomy, on the use of even more sophisticated mucogingival surgical approaches (i.e. bilaminar techniques, multiple recession treatments) and on the results of reliable studies, the classification has revealed its inadequacies.

First of all, some desirable characteristics of a system of classification (taxonomy) must be considered (Murphy 1997):

1. *Usefulness*: ''Usefulness can be construed at several different levels. Not the least is practicality, even crass practicality''.
2. *Exhaustiveness*: ''An ideal classification should be *exhaustive*, that is, accommodate naturally every member of the group''.
3. *Disjointness*: ''No particular case should fall into more than one class''.
4. *Simplicity*: ''The most convenient classifications are simple ... for practical applications a large number of subclasses may be inconvenient''.

Miller's classification may be evaluated according to Murphy's statements.

Usefulness: Miller's classification has been demonstrated useful and has been applied by the periodontal community mainly to distinguish recessions related to toothbrushing trauma (Classes I and

II) from those caused by periodontal disease with inter-proximal attachment and bone loss (Classes III and IV).

Exhaustiveness: Miller's classification is not *exhaustive* because it does not consider all the cases of recession. For example, a marginal tissue recession with inter-proximal bone loss that does not extend to the MGJ is not classified. In fact, this recession cannot be included in class I because of inter-proximal bone loss and it cannot be categorized in class III because the gingival margin does not extend to the MGJ.

In addition, palatal recessions are not mentioned in the classification system. Because of the lack of the MGJ on the palatal side, it is impossible to classify these lesions. On the other hand, even if palatal recessions do not involve aesthetic problems they may be associated with dental hypersensitivity that may require mucogingival treatment.

Disjointness: The difference between Classes III and IV is based on the position of the gingival margin of the two adjacent teeth. The author says ''The probe is placed horizontally on an imaginary line connecting the tissue level on the mid-facial of the two teeth on either side of the tooth or teeth exhibiting recession''. Classes III and Class IV can be identified if there are adjacent teeth but in case of a missing adjacent tooth there is no reference point and it is impossible to include this case in the Class III or Class IV. In addition, in the original article, the figure illustrating Class IV shows a recession associated with a missing adjacent tooth, thus generating further confusion in the classification system.

Simplicity: By definition, a clinical classification should be simple for practical application. Miller's Classification appears simple but it is not so easy when it is considered carefully. Many factors are involved such as MGJ, soft and hard inter-proximal tissues, gingival margins of the adjacent teeth, tooth malposition and tooth loss and a simultaneous evaluation of them all is difficult and generates confusion. In fact, in some textbooks the classification is reported incompletely and somewhat differently from the author's thought (Takei et al. 2006; Wennstrom et al. 2008).

In addition, a sound classification must be tested. Reliability and validity are central to determining the utility of any clinical examination. In fact, ''reliability measures the reproducibility of results with repeated trials and reflects the internal consistency of the test'', and ''validity describes a test's ability to produce results consistent with other measures of the same characteristic and requires external criteria'' (Karras 1997). Studies on the reliability and validity of Miller's classification are lacking.

Specific Comments

The Miller classification was proposed using two different criteria: diagnosis and prognosis. These issues should be carefully evaluated.

Diagnosis

From anatomical point of view, there is always a minimal amount of free keratinized gingiva around teeth and it extends from the gingival margin to the free gingival groove (if present); the attached gingiva extends from the apical portion of the free gingiva to the MGJ. The attached gingiva may not be present and the keratinized tissue is represented by the free gingiva only.

In the classification, the author does not provide information about keratinized tissue and its components (free and attached gingiva). He refers to the MGJ only and does not specify how the MGJ is identified (with a probe or with a coloured solution). The impossibility of identifying the MJG generates some classifying difficulties between Class I and II. Because a tooth with gingival recession always presents a certain amount of keratinized tissue (free gingiva), the marginal tissue recession cannot extend to or beyond the MGJ. Therefore, Class II could never exist and Classes I and II would represent a single category.

With regard to class III and IV, the bone or soft tissue losses in the interdental areas are considered the strategic issues to identify these categories. On the other hand, the amount and characteristics of bone loss (horizontal or vertical) are not reported in the original article even if these variables are very important; the techniques for diagnosing bone loss are not indicated. Another crucial point should be discussed: in fact, Class III considered tooth malposition as an alternative criterion to bone or soft tissue loss without a comprehensive explanation. It is also unclear when it comes to establishing the degree of malposition for including a recession in one or the other class. Therefore, the inclusion of a recession in a precise class may be difficult.

Prognosis

Prognostic factors are defined as ''the characteristics of a particular patient which can be used to more accurately predict the patient's eventual outcome'' (Laupacis et al. 1994).

Miller's classification has been proposed to evaluate the prognosis of root coverage following grafting procedure. The author affirms that the class of the recession is the predictive factor for anticipating complete root coverage (Classes I and II), partial root coverage (Class III) and no root coverage (Class IV). From the prognostic standpoint, Classes I and II cannot be distinguished from each other as they both anticipate 100% root coverage. The conjectural anticipation of 100% root coverage does not mean that it will occur. In fact, data in current periodontal literature reports, in Classes I and II, range from 9% (Paolantonio et al. 1997) to 90% (Miller 1985b) of complete root coverage following free gingival graft procedure, from 9% (Trombelli et al. 1996) to 89% (Zucchelli & De Sanctis 2000) following CAF and from 40% (Bouchard et al. 1997) to 80% (Harris 1992) following CAF+CTG. Therefore, this issue (anticipation) is not accurate for predicting the outcomes of root coverage in Classes I and II and this categorization is useless.

As regards class III, partial root coverage is anticipated while some recent studies demonstrate that complete root coverage can also be obtained treating class III recession-type defects (Aroca et al. 2010). In addition, the author states that ''the amount of root coverage can be determined pre-surgically using a periodontal probe'' and this theoretical affirmation has not been demonstrated by studies.

In Class IV, no root coverage is anticipated. No data are available to support this statement. It is interesting that the author published a case report of an attempt to obtain 100% root coverage in a class IV recession by coronally positioning a previously free gingival graft (Miller & Binkley 1986). It is also very surprising to notice that 1-year post-operative root coverage was slightly $<100\%$ on the facial aspect of the tooth. In addition, the illustration in this case report was the same one used in the previous classification article to demonstrate that no root coverage is anticipated in Class IV.

It is also important to point out that the inclusion of a given recession in one class cannot be absolutely considered the unique prognostic factor that can predict the amount of final root coverage. Other recognized patient-related (e.g. smoking), tooth/site-related (e.g. baseline recession depth, root abrasion) and technique-related (e.g. presence or absence of releasing incisions) prognostic factors and the operator's skill can influence the amount of root coverage.

As a consequence, the prognostic anticipation of a certain amount of root coverage is a complex process that should consider data from reliable studies and cannot be drawn from theoretical considerations.

In conclusion, on the basis of these limits, the non-critical and widespread use of the Miller classification should be evaluated carefully with sound clinical trials on gingival recessions and root coverage. New classification systems of gingival recessions should be provided on the basis of the characteristics of suitable taxonomy, on the basis of information from more recent scientific evidence and then validated by reliability studies for appropriate application in clinical practice.

References

Aroca, S., Keglevich, T., Nikolidakis, D., Gera, I., Nagy, K., Azzi, R. & Etienne, D. (2010) Treatment of class III multiple gingival recessions: randomized clinical trial. *Journal of Clinical Periodontology* **37**, 88–97.

Bouchard, P., Nilveus, R. & Etienne, D. (1997) Clinical evaluation of tetracycline HCl conditioning in the treatment of gingival recessions. A comparative study. *Journal of Periodontology* **68**, 262–269.

Harris, R. J. (1992) The connective tissue and partial thickness double pedicle graft: a predictable method of obtaining root coverage. *Journal of Periodontology* **63**, 477–486.

Karras, D. J. (1997) Statistical methodology: II. reliability and validity assessment in study design, part B. *Academic Emergency Medicine* **4**, 144–149.

Laupacis, A., Wells, G., Richardson, S. & Tugwell, P. (1994) User's guide to the medical literature V. How to use an article about prognosis. Evidence based medicine working group. *Journal of American Medical Association* **272**, 234–237.

Mahajan, A. (2010) Mahajan's modification of miller's classification for gingival recession. *Dental Hypotheses* **1**, 45–50.

Merriam-Webster (2010) Merriam-Webster Online Dictionary copyright© by Merriam-Webster Incorporated. Available at http://www.merriam-webster.com/dictionary/classification (accessed 23 September 2010).

Miller, P. D. (1985a) A classification of marginal tissue recession. *International Journal of Periodontics and Restorative Dentistry* **5**, 9–13.

Miller, P. D. (1985b) Root coverage using a free soft tissue autograft following citric acid application. III. A successful and predictable procedure in areas of deep wide recession. *International Journal of Periodontics and Restorative Dentistry* **5**, 15–37.

Miller, P. D. & Binkley, L. H. Jr. (1986) Root coverage and ridge augmentation in class IV recession using a coronally positioned free gingival graft. *Journal of Periodontology* **57**, 360–363.

Mlinek, A., Smukler, H. & Buchner, A. (1973) The use of free gingival grafts for the coverage of denuded roots. *Journal of Periodontology* **44**, 248–54.

Murphy, E. A. (1997) *The Logic of Medicine*, 2nd edition, pp. 119–136. Baltimore and London: The Johns Hopkins University Press.

Paolantonio, M., di Murro, C., Cattabriga, A. & Cattabriga, M. (1997) Subpedicle connective tissue graft versus free gingival graft in the coverage of exposed root surfaces. A 5-year clinical study. *Journal of Clinical Periodontology* **24**, 51–56.

ISI Web on Knowledge℠ (2010) Thomson Reuters©. Available at http://apps.isiknowledge.com/UA_General Search_input.do?product=UA&search_mode=General Search&SID=P2b52OF9pB@cjBbIf5P&preferences Saved (accessed 23 September 2010).

Smith, RG. (1997) Gingival recession. Reappraisal of an enigmatic condition and a new index for monitoring. *Journal of Clinical Periodontology* **24**, 201–205.

Sullivan, H. C. & Atkins, J. H. (1968) Free autogenous gingival grafts. III. Utilization of grafts in the treatment of gingival recession. *Periodontics* **6**, 152–160.

Takei, HH., Atzi, RR. & Han, TJ. (2006) Periodontal plastic and esthetic surgery. In: *Carranza's Clinical Periodontology*, 10th edition, pp. 1005–1029. St. Louis: Saunders Elsevier.

Trombelli, L., Scabbia, A., Wikesjö, UM. & Calura, G. (1996) Fibrin glue application in conjunction with tetracycline root conditioning and coronally positioned flap procedure in the treatment of human gingival recession defects. *Journal of Clinical Periodontology* **23**, 861–867.

Wennstrom, J. L., Zucchelli, G. & Pini Prato, GP. (2008) Mucogingival therapy – periodontal plastic surgery. In: Lang, N. P. & Lindhe, J. (eds). *Clinical Periodontology and Implant Therapy*, 5th edition, pp. 955–1028. Oxford: Blackwell Munksgaard RD.

Zucchelli, G. & De Sanctis, M. (2000) Treatment of multiple recession-type defects in patients with esthetic demands. *Journal of Periodontology* **71**, 1506–1514.

Address:
Giovanpaolo Pini-Prato
Department of Periodontology
University of Florence
Florence
Italy
E-mail: gpinipr@tin.it