

Classification of Gingival Recession: Evolution from Miller's 1985 Classification to the 2018 Revisited System

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ABSTRACT

Gingival recession is a widely prevalent mucogingival deformity with esthetic and functional consequences. Since Sullivan and Atkins first proposed a classification in 1968, numerous systems have attempted to standardize diagnosis and prognosis, including Miller's widely adopted marginal tissue recession (1985) classification. As Miller's system expanded the horizon of recession classification beyond shape and size, it also provided prognostic guidance for root coverage. However, limitations such as difficulty in identifying the mucogingival junction and ambiguity between classes had prompted further refinements. Cairo's 2011 Recession Type system improved prognostic accuracy by incorporating interproximal attachment loss, and the 2017 World Workshop extended the treatment-oriented classification by integrating recession type, gingival phenotype, and root surface features into a 4×5 matrix. In 2018, Miller revisited his classification system again after 3 decades, incorporating papilla dimensions and emphasizing the role of attached gingiva, cautioning against oversimplification in then newer popular systems. Together, the evolution of these classification systems also portrays the evolution of periodontology from mucogingival surgery to perioplastic surgery era. This article outlines the basis, drawbacks and limitations of various classification systems proposed to classify gingival recession over time.

Keywords: classification, etiology, gingival recession, interdental papilla, mucogingival junction, prevalence

INTRODUCTION

Gingival recession is one of the most common mucogingival defect encountered in periodontal practice. It is defined as an apical shift of the gingival margin caused by different conditions/pathologies, is associated with clinical attachment loss and may apply to all surfaces (buccal/lingual/interproximal).¹ Since the soft tissue margin may not always be composed of gingiva, the terms "soft tissue recession" or "marginal tissue recession" are also commonly used.² The term "marginal tissue recession" is preferred to be more accurate than "gingival recession", since the marginal tissue may be alveolar mucosa, however it is not commonly used in literatures.³ Besides the obvious compromised esthetics; as the root surface gets partially exposed

to the oral environment, patients with gingival recession often complain of dentin hypersensitivity, root caries, plaque retention, and, in severe cases, progressive attachment loss leading to tooth loss.^{4,5}

ETIOLOGY

The etiology of gingival recession is multifactorial, and is considered a clinical marker of periodontal breakdown and result of cumulative traumatic insults to the periodontium. The most common cause of gingival recession is traumatic toothbrushing habit, where external trauma from overzealous brushing on facially placed teeth can lead to the loss of gingival tissue.⁶ It may also arise from the cumulative effect of periodontal disease, chronic marginal inflammation, tooth malposition, aberrant frenum attachments, or iatrogenic factors related to restorative or orthodontic procedures.^{7,8}

PREVALENCE

More than two-thirds of the population worldwide is found to be affected by GR.⁹ Even in developed country like United States, gingival recession seems to be present in almost the entire population.¹⁰ In

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Nepal, gingival recession is common, with all of the epidemiological studies documenting a prevalence of more than 50% of study population which corresponds to presence of gingival recession in more than half of the entire population.¹¹⁻¹⁴ Such prevalence of recession defect seems to increase with age.¹¹⁻¹⁴

CLASSIFICATION SYSTEM

Given the high prevalence of gingival recession, a standardized classification system is essential to

support accurate diagnosis, prognosis, treatment planning, and effective communication among clinicians. Several classification systems have been proposed since decades starting from probably the first Sullivan and Atkins's classification in 1968 till present that aid in diagnosis and prognosis of gingival recession. However, no classification system can be complete and everlasting; and with time and its continual use, one realizes the advantages and disadvantages of each system. The following are the commonly used classification systems for gingival recession.

Table 1: Various Classification of Gingival Recession and their drawbacks

Classification (Author, Year)	Basis of Classification	Groups / Categories (Expanded)	Drawbacks / Limitations
Sullivan and Atkins (1968) ¹⁵	Depth and width of gingival defect	Deep wide Shallow wide Deep narrow Shallow narrow	Lacks anatomical landmarks; poor reproducibility; High inter-examiner variability
Mlinek et al. (1973) ¹⁶	Recession Depth threshold (3 mm)	Shallow narrow: recession depth <3 mm Deep wide: depth >3 mm	No horizontal reference; still subjective
Liu and Solt (1980) ¹⁶	Visibility of attachment loss	Visible Recession: CEJ to gingival margin Hidden Recession : attachment loss apical to margin	Sheds light on attachment loss, doesn't classify visible recession further; limited clinical utility
Bengue et al. (1983) ¹⁸	Morphology and root coverage Prognosis	U-type: poor prognosis V-type: fair prognosis I-type: good prognosis	Prognosis-based only; lacks anatomical or dimensional criteria
Miller's Classification of marginal tissue recession (1985) ¹⁹	Extent of marginal tissue recession(MTR) to/ beyond Mucogingival Junction(MGJ) and soft/hard tissue loss in interdental area. Prognosis of root coverage (RC%)	Class I: MTR that doesn't extend to MGJ, no periodontal loss in interdental area, 100% RC Class II: MTR that extends to/beyond MGJ, no periodontal loss in interdental area, 100 % RC Class III: MTR that extends to or beyond MGJ. Bone or soft tissue loss in interdental area, tooth malposition prevents complete RC Class IV: MTR that extends to or beyond MGJ with severe interdental soft/hard tissue loss and/or malposition making root coverage impossible.	MGJ hard to identify; no keratinized tissue or papilla information; cannot classify palatal or isolated papillary recession; ambiguity between Class III and IV; does not consider interproximal clinical attachment loss, leading to inaccurate prognostic assessment, especially in cases with hidden interproximal bone loss or combined defects.
Smith's index of Recession (1997) ²⁰	Two digits system. Horizontal and vertical extent of root exposure	Horizontal extent : Score 0-5 (% CEJ exposed) Vertical: Score 0-9 (mm from CEJ) Asterisk(*) denotes MGJ involvement	Complex scoring; limited adoption requires calibration; does not specify horizontal landmark, variable measurement at variable distances,
Nordland & Tarnow classification system for loss of papillary height. (1998) ²¹	Papillary height using interdental contact point, coronal most interproximal CEJ and facial CEJ	Normal: papilla fills embrasure Class I: tip between contact and interproximal CEJ Class II: tip at/apical to interproximal CEJ but above facial CEJ Class III: tip at/apical to facial CEJ	Only for papillary loss; not applicable to facial/palatal recession; no guidance for root coverage

Classification (Author, Year)	Basis of Classification	Groups / Categories (Expanded)	Drawbacks / Limitations
Mahajan's modification of Miller's Classification (2010) ²²	Extent of recession and extent of hard and soft tissue loss in interdental area with prognosis	Class I: recession above MGJ Class II: recession at/beyond MGJ Class III: interdental loss up to cervical 1/3 or mild malposition Class IV: interdental loss > cervical 1/3 or severe malposition)	Still lacks MGJ and keratinized tissue consideration; does not cover palatal or papillary recession
Cairo et al. classification of gingival recession (2011) ²³	Clinical Attachment Loss at buccal and interproximal sites	RT1: gingival recession without interproximal attachment loss. RT2: interproximal attachment loss ≤ buccal attachment loss RT3: interproximal attachment loss > buccal attachment loss	No information regarding keratinized tissue, gingival thickness, MGJ involvement or tooth malposition; limited surgical guidance
Rotundo et al. (2011) ²⁴	KT, NCCL, and interproximal attachment loss	AAA to BBB: 8 combinations based on KT ≥/ < 2 mm, NCCL presence, and interproximal loss	Complex taxonomy; requires multiple clinical parameters; limited generalizability
Kumar & Masamatti (2013) ²⁵	Combines Miller's and Nordland-Tarnow's criteria	Class I (IA, IB): no interdental bone/soft tissue loss; subclassified by MGJ and attached gingiva Class II (IIA, IIB, IIC): papilla tip between contact and CEJ; with/without marginal tissue recession on Facial/Lingual aspect Class III (IIIA, IIIB): papilla tip at/apical to CEJ; with/without marginal tissue recession	More comprehensive but complex; requires radiographic and clinical correlation; not widely validated
Palatal Recession (2013) ²⁵	Papilla position and recession depth on palatal aspect	PR-I (IA, IB): no interdental loss; ≤3 mm or >3 mm PR-II (IIA, IIB): papilla tip between contact and CEJ; mild bone loss PR-III (IIIA, IIIB): papilla tip at/apical to CEJ; significant bone loss	Only for maxillary palatal sites; requires radiographs; not integrated with buccal systems
Dental surface defects in areas of gingival recession: Pini-Prato G. et al. (2010) ²⁶	CEJ visibility and cervical step(> 0.5mm)	A-: CEJ visible, no step A+: CEJ visible, with step B-: CEJ not visible, no step B+: CEJ not visible, with step	Focuses on cervical morphology; ignores soft tissue and interdental loss; limited treatment relevance

Although the Miller's Classification was simple, practical, useful and reproducible, the widely acclaimed classification system has also been deeply criticized over time. In 2010, Giovanpaolo Pini-Prato published an editorial in the same journal volume where Cairo et al. introduced a new recession classification type to the world, highlighting the following limits and drawback of Miller's classification and evaluated it against Murphy's criteria for ideal classification systems.^{23,27}

a) Usefulness: Miller's classification helps mainly to distinguish recessions from tooth brushing trauma (Classes I & II) versus those caused by periodontal disease with interproximal loss (Class III & IV). Despite failing to account for

gingival profile, which is crucial for prognosis, the classification remains useful for its crass practicality in quick clinical decisions.^{22,27}

b) Exhaustiveness: Miller's classification is not comprehensive as variations such as recession with interproximal bone loss not reaching the mucogingival junction, or palatal recessions cannot be included in either class. Palatal/lingual recessions, though do not arise aesthetic concerns, can cause hypersensitivity and need recognition.²⁷

c) Disjointness: Miller's Class III and IV differentiation rely on adjacent teeth as reference points. In cases of missing teeth, classification becomes confusing, compromising clarity.²⁷

d) Simplicity: Though seemingly simple, it requires evaluating multiple factors (MGJ, interproximal tissues, adjacent gingival margins, malposition, tooth loss), making it complex in practice.²⁷

e) Reliability and validity: Studies on its reliability and validity are lacking.^{22,27}

PiniPrato criticized Miller's classification as limited and unreliable, since it ignores the width of keratinized tissue and relies on the poorly defined mucogingival junction. As gingival recession is always clinically present with a band of keratinized tissue (free gingiva) apically, a defect cannot truly be said to extend beyond the mucogingival junction; consequently, Class II recession would not exist, and Classes I and II would effectively merge into a single category. This critique formed the basis for Cairo's classification, which instead uses interproximal attachment loss as a clearer and more prognostically relevant criterion. Even in Miller's Classes III and IV, although interproximal bone/soft tissue loss and tooth malposition are considered, the absence of clear diagnostic criteria makes accurate classification difficult. Similarly, the prognostic anticipation of a certain amount of root coverage cannot be drawn from a theoretical consideration as prognosis is a complex process based on variable factors.²⁷

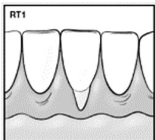
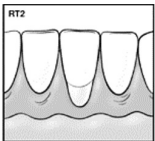
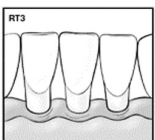
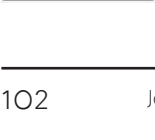
However, this widely acclaimed criticism doesn't take into consideration the time in which it was introduced. When Miller's original recession classification was published in 1985, emphasis in periodontics was on

disease treatment rather than esthetics. With limited treatment modalities available then, free gingival graft was the graft of choice to augment the gingiva; as subepithelial Connective tissue graft, which is now considered to be gold standard in root coverage was just introduced in 1985, yet to be popularized. The era of Mucogingival surgery then was aimed at function, while emerging periodontal plastic surgery field now seeks both function and esthetics.²⁸

The newer and popular Cairo's classification also comes with major limitations that includes; while it improves prognostic accuracy compared to Miller's, it does not provide information regarding mucogingival junction involvement, tooth malposition, or keratinized tissue width, which are clinically relevant for treatment planning. Also Combining Miller's Class I and Class II into a single classification could be difficult to the understanding of the clinician attempting root coverage as different treatment modalities may be indicated.²⁸

2017 classification of phenotype and gingival recession represents the most updated and comprehensive diagnostic system for recession in the literature on plastic surgery.²⁹ This classification incorporates three clinical domains (recession, phenotype and root surface characteristics) in 4x5 matrix aimed for treatment planning.¹

Recession is categorized as RT1, RT2, or RT3 based on interproximal attachment loss according to Cairo et.al 2011.²³ Recession depth is measured from

	Gingival Site			Tooth Site	
	Rec. Depth	GT	KTW	CEJ(A/B)	Step(+/-)
	No Recession				
	RT1				
	RT2				
	RT3				

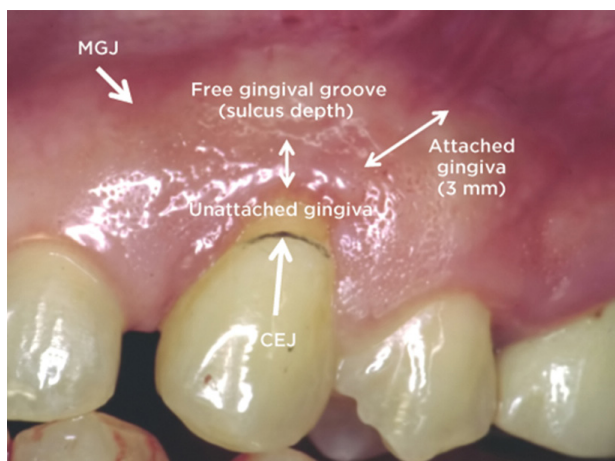
the CEJ in mm. Gingival phenotype is defined by probe visibility when placed in gingival sulcus: thin if probe is visible (≤ 1 mm), thick if not visible; and keratinized tissue width (adequate when ≥ 2 mm, inadequate when less). Root surface features include CEJ detectability: Class A when detectable otherwise Class B; and cervical step presence (Class + or -).¹ These parameters are combined into a 4x5 matrix table to guide root coverage decisions.³⁰

Miller's classification of Marginal Tissue Recession, 2018²⁸: Miller revisited his older classification after 35 years in 2018 with addition of a newer papillae classification that emphasizes the significance of the width and height of the papilla and major refinements as follows:

Miller's Class I and Class II Recession: The difference between Class I and II would be the presence or absence of attached gingiva. In sites where gingiva is present on the facial, it is necessary to probe to determine whether the gingiva is attached or unattached. If the gingiva is unattached i.e there is "hidden recession", and that would actually be a

Class II recession. There is no periodontal loss (bone or soft tissue) in the interdental area, and 100% root coverage can be anticipated in both classes, as stated in old classification as well.

Miller also commented on the new classification of recession presented at the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions¹ and stated that Combining his Class I and Class II into a single classification type RT1, while overlooking the role of MGJ and Keratinized gingiva could be detrimental to the understanding of the clinician attempting root coverage. Even though complete root coverage is attainable in both Miller's Class I and Class II recession, different treatment modalities may be indicated in the same Cairo's classified group. For example, if adequate keratinized tissue is present in a Miller's Class I recession, the simplest root coverage procedure, Coronally Positioned Flap may be indicated, whereas in a Class II recession some type of soft-tissue grafting would be required and coronally positioned flap alone would not be enough.²⁸



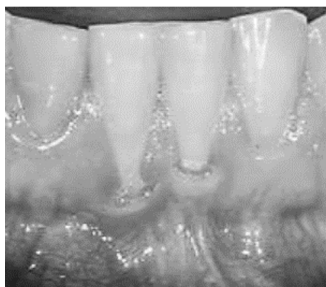
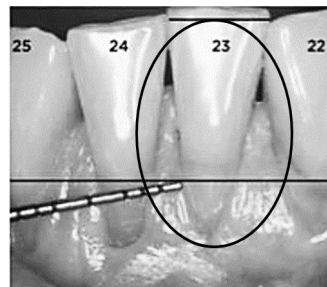
Class I recession:
presence of attached gingiva and on probing, probe doesn't extend to MGJ



Class II recession:
presence of keratinized gingiva but on probing, probe extends beyond MGJ (absence of attached gingiva)

Fig 1-228: Class I-II Miller's marginal tissue recession

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	Type A papilla	Type B papilla	Type C papilla
Interdental Bone Loss	There is no interdental bone loss.	There is no interdental bone loss.	There is interdental bone loss, or the tooth is extruded.
Height of Papillae to crest	Papilla extends 5 mm coronal to the interdental bone crest.	Papilla extends 5 mm coronal to the interdental bone crest.	If there is interdental bone loss, the papilla may or may not fill the interdental space.
Width of Papillae at Base	Papilla is ≥ 3 mm wide at its base at the level of adjacent CEJs.	Papilla is <3 mm wide at its base at the level of adjacent CEJs.	Papilla may be <3 mm wide at its base at the level of adjacent CEJs.
Illustration ²⁷			
Prognosis	Complete root coverage is expected.	Predictability of complete root coverage is compromised.	Complete root coverage is not expected but may be achieved under certain circumstances

The only way to accurately determine between I and II is to probe and see if the probe goes beyond the MGJ.

Class III recession

It was also defined by interdental loss of bone and/or soft tissue or extrusion of the tooth, thus defining the degree of malposition as compared to the old classification. Complete root coverage can be attainable in certain class III recession if the papilla is undermined and elevated using tunneling like technique, taking into consideration the classification of papilla as above:

Class IV Recession: Marginal tissue recession, which extends to or beyond the MGJ. The bone or soft tissue loss in the interdental area and/or malpositioning of teeth is so severe that root coverage cannot be anticipated. There is absence of Interdental Papillae

Despite strong diagnostic and therapeutic precision offered by the 2017 World Workshop classification¹, many studies still continue to use Miller's 1985

classification¹⁹. This persistence is largely due to its simplicity, widespread familiarity, and historical heritage in periodontal literature.²⁹ It is noteworthy to commend Dr. P.D miller for continuing to update a classification so renowned even after 35years.

SUMMARY

This evolution of classification system captures the growth of periodontology in itself. Miller's system emphasized recession as a defect requiring keratinized tissue augmentation while Cairo's framework incorporated interproximal attachment loss, aligning prognosis and different parameters with modern surgical predictability. This newer shift reflects the discipline's journey from functional coverage of mucogingival era towards esthetics and biologics driven minimally invasive modern perioplastic era. However, no classification system can remain complete or everlasting. As clinical practice evolves and new evidences emerge, limitations of older classifications are exposed, prompting the development of newer updated classification systems.

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