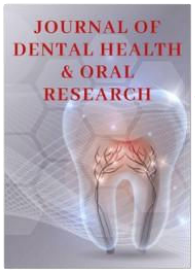

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Research Article

NASA: A Proposed Classification System for Gingival Recession

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Abstract

Introduction: Periodontal disease affects a vast majority of individuals worldwide but is often neglected or overseen by general practitioners and patients alike. Gingival recession which is a prominent clinical feature of periodontitis is not properly diagnosed or treated owing to the difficulty in categorizing the recession and assessing the suitable ones for treatment. Although various classifications have been proposed for gingival recession, Miller's classification system is most widely used by many clinicians till date.

Materials and Methods: A literature search was done using search engines Pubmed, Google scholar to identify all proposed classification systems for gingival recession. All the classification systems were assessed for their merits and demerits.

Result and Discussion: The proposed classification for gingival recession uses numerical values and Cementoenamel Junction (CEJ) as the reference point which is easier to identify. Also it takes into consideration the interdental papillary height and incorporates lingual / palatal recession in the classification

Conclusion: Barring the limitations of various proposed classifications, an attempt has been made by the authors to design a new classification system that is clinician friendly and addresses the drawbacks of the existing ones.

Keywords: Classification; Gingival Recession; Periodontitis

Introduction

Periodontal disease is the second most common oral disease affecting, majority of the population worldwide. An important clinical finding in periodontal disease is Gingival Recession (GR) which is seldom assessed. It is defined as the apical shift of the Gingival Margin (GM) from its position at the Cementoenamel Junction (CEJ) causing exposure of the root surface to the oral environment [1].

GR can occur as a result of varying etiologies such as anatomical, pathological and physiological factors and can be localized or generalized in occurrence [2]. Common etiological factors for recession are chronic mechanical trauma from tooth brushing, iatrogenic damage from unfavourable restorations and repeated scaling and root planning. Although GR does not cause tooth loss it changes the aesthetic outlook of the person and may also exhibit some damaging effects on the periodontium when treatment is compromised.

Various classifications have been proposed for GR over the years which have been highlighted with their merits and demerits. Among these, Miller's classification is still widely accepted and followed worldwide barring its few limitations. In this article we have proposed a new classification system for GR aimed at addressing the drawbacks of some existing classification systems focussing on achieving the following three objectives:

1. A classification that addresses both buccal and lingual/ palatal recession
2. To give adequate importance to Keratinized tissue in the classification
3. To incorporate numerical values that make it more clinician friendly for planning of periodontal treatment

The proposed classification system has been titled NASA after the authors and allows the clinician to classify gingival recessions based on the CEJ as the reference point. Also, the classification system makes use of numerical measurements to more accurately categorize the type of recession by non- specialists as well. An extended version of the classification has also been designed in order to narrow down the exact type of recession.

Material and Methods

All proposed classifications on Gingival Recesion were searched on search engines such as pubmed, Google scholar using relevant search terms. They were then arranged in accordance to the year of publication from the oldest to the newest. Each classification system was summarized and their merits and demerits noted (Table 1). The demerits of the various classification systems were analysed by the authors and those that needed to be addressed were filtered from the rest. The common observation was there was no numerical measurement used in most of the classifications. Also, lingual and palatal recessions were not included in most of them.

Classification	Description	Merits	Demerits
1. Sullivan and Atkins [3]	The basis for the classification was depth and width of the defect. The four categories were: i)Deep wide ii)Shallow wide iii)Deep narrow iv)Shallow narrow.	Simple	This classification though simple is subjected to open interpretation of the examiner and inter examiner variability and is therefore not reproducible [4,8]
2. Mlinek, et al., [4]	Shallow narrow: Recession <3mm Deep wide: Recession >3 mm [9]	This modification reduced subjective variation	It does not specify the landmark for horizontal measurement as variable measurement may be present at variable distances.

4. Bengue, et al., [5]	Classified the recessions according to the coverage prognosis: U-type - poor prognosis V-type - fair prognosis I-type - good prognosis	**Nil**	**Nil** (11)
5. Miller [6]	Classification is based on following aspects: A. Extent of gingival recession defects B. Extent of hard and soft tissue loss in interdental areas surrounding the gingival recession defects [12,13] Four types of recession defects were categorized as follow [14] • 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 interdental 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 interdental 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 interdental area is present	Easy, simple, acceptable and widely followed	The reference point for gingival recession is MGJ. There is no mention of presence of keratinized tissue. The amount and type of bone loss is not specified. The cases, which have interproximal bone loss and the marginal recession that does not extend to MGJ cannot be classified either in Class I because of interproximal bone or in Class III because the gingival margin does not extend to MGJ.

	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 • Class IV: 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.		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. . It does not specify facial (F) or lingual (L) involvement of the marginal tissue. 5. Recession of interdental papilla alone cannot be classified according to the Miller's classification. The difficulty of the applicability of Miller's criteria on the palatal aspect of the maxillary arch can be reasoned out to the fact that there is no MGJ on palatal aspect.

			7. Estimates the prognosis of root coverage following grafting procedure [15]
6. Smith, et al., [7]	He proposed index of recession that consists of two digits separated by a dash. The first digit denotes the horizontal and the second digit denotes the vertical component of a site of recession. Horizontal Extent of Recession Score 0 - No clinical evidence of root exposure. Score 1 - No clinical evidence of root exposure and there is also a subjective awareness of dentinal hypersensitivity in response to air blast is reported, and/or there is clinically detectable exposure of the CEJ for up to 10% of the estimated mid-mesial to mid-distal distance. Score 2 - Horizontal exposure of the CEJ more than 10% but not exceeding 25% of the estimated mid-mesial to mid-distal distance. Score 3 - Exposure of the CEJ more than 25% of the mid-mesial to mid-distal distance but not exceeding 50%.	In cases of extensive vertical component further horizontal component may be allotted at an intermediate distance between CEJ and base of the defect, which is not clearly specified	Leads to overestimation of the conditions it utilizes the subjective awareness of sensitivity.

	Score 4 - Exposure of the CEJ more than 50% of the mid-mesial to middistal distance but not exceeding 75% Score 5 - Exposure of the CEJ more than 75% of the mid-mesial to middistal distance up to 100%. Vertical Extent of Recession Score 0 - No clinical evidence of root exposure Score 1 - No clinical exposure of root exposure plus a subjective awareness of dentinal hypersensitivity is reported and/or there is clinically detectable exposure of the CEJ not extending more than 1 mm vertically to the gingival margin Score 2-8 - Root exposure 2-8 mm extending vertically from the CEJ to the base of the soft tissue defect Score 9 - Root exposure more than 8 mm from the CEJ to the base of the soft tissue defect Score * - An asterisk is present next to the second digit whenever the vertical component of the soft tissue defect encroaches into the MGJ or extends beyond it into alveolar mucosa; the absence of an asterisk implies either absence of MGJ		

	involvement at the indexed site or its non-involvement in the soft tissue defect .(10)		
7.Nordland WP and Tarnow DP [8]	The system utilizes three identifiable landmarks: the interdental contact point, the facial apical extent of the CEJ, and the interproximal coronal extent of the CEJ. Normal: Interdental papilla fills embrasure space to the apical extent of the interdental contact point/area. • Class I: The tip of the interdental papilla lies between the interdental contact point and the most coronal extent of the interproximal CEJ. Class II: The tip of the interdental papilla lies at or apical to the interproximal CEJ but coronal to the apical extent of the facial CEJ • Class III: The tip of the papilla lies level with or apical to the facial CEJ.		
8. Mahajan [9-12]	Mahajan proposed a modified classification of gingival recession in 2010 which is [13]: • Class I: Gingival recession defect not extending to the MGJ • Class II: Gingival recession defect extending to the MGJ/ beyond it		This modification still does not accommodate all clinical conditions. For example, a tooth with gingival recession not extending up to MGJ

	• Class III: Gingival recession defect with bone or soft tissue loss in the interdental area up to cervical 1/3 of the root surface and/or malpositioning of the teeth • Class IV: Gingival recession defect with severe bone or soft tissue loss in the interdental area greater than cervical 1/3 of the root surface and/or severe malpositioning of the teeth. Prognosis as per Mahajan's classification: • Best: Class I and Class II with thick gingival profile • Good: Class I and Class II with thin gingival profile • Fair: Class III with thick gingival profile • Poor: Class III and Class IV with thin gingival profile [13]		but with interdental soft and hard tissue loss can neither be placed in Class I nor in Class III since there is no mention of involvement of MGJ in Class II [13].
9. Cairo, et al., [13]	Classified gingival recession based on the assessment of CAL at both buccal and interproximal sites. • Recession Type 1: Gingival recession with no loss of interproximal attachment. Interproximal CEJ was clinically not detectable at both mesial and distal aspects of the tooth	This classification provides a simplified method of categorizing gingival recession and also emphasizes the role of interproximal attachment level, one of the important site-related prognostic, factor	However, it does not consider the remaining width of attached gingiva, relationship of gingival margin, and MGJ, which play a very important role and govern the choice

	• Recession Type 2: Gingival recession associated with loss of interproximal attachment. The amount of interproximal attachment loss (measured from the interproximal CEJ to the depth of the interproximal pocket) was less than or equal to the buccal attachment loss (measured from the buccal CEJ to the depth of the buccal pocket) • Recession Type 3: Gingival recession associated with loss of interproximal attachment. The amount of interproximal attachment loss (measured from the interproximal CEJ to the depth of the pocket) was higher than the buccal attachment loss (measured from the buccal CEJ to the depth of the buccal pocket) [17]		of treatment procedure; and tooth malposition which greatly affects the treatment outcome.
10.Pini-Prato [14-16]	Stated that anticipation of 100% root coverage does not mean that it will occur. Root coverage percentage ranging from 9% to 90% has been reported by different authors in Class I and II recessions using different techniques. Outcome of treatment may depend on other prognostic factors and categorization to predict the outcomes of root coverage in Classes I and II are not correct.	Nil	Nil

11. Rotundo, et al., [17]	Classified gingival recession taking into consideration both soft and hard dental tissues. For this classification, specific taxonomic variables have been considered, and in particular, the amount of Keratinized Tissue (KT = 2 mm); the presence/absence of Non-Carious Cervical Lesion (NCCL), with a consequent unidentifiable CEJ; and the presence/absence of interproximal attachment loss. Considering these variables, the following method of assessment is suggested: A. KT ≥2 mm • NCCL - absent • Interproximal attachment loss - absent. B. KT <2 mm NCCL - present and Interproximal attachment loss - present As a consequence, the following classes may be identified within the population: • KT ≥2 mm - no NCCL - no interproximal attachment loss (AAA) • KT ≥2 mm - NCCL - no interproximal attachment loss (ABA)		

	• KT ≥2 mm - no NCCL - interproximal attachment loss (AAB) • KT ≥2 mm - NCCL - interproximal attachment loss (ABB) • KT [18]		
12.Kumar and Masamatti [18]			
Classification of Palatal Gingival Recession	Palatal recession-I There is no loss of interdental bone or soft tissue. This is subclassified into two categories(19): • Palatal recession-IA (PR-IA): Marginal tissue recession ≤3 mm from CEJ • PR-IB: Marginal tissue recession >3 mm from CEJ Palatal recession-II The tip of the interdental papilla is located between the interdental contact point and the level of the CEJ midpalatally. Interproximal bone loss is visible on the radiograph. This is subclassified into two categories(19): • PR-IIA: Marginal tissue recession ≤3 mm from CEJ PR-IIB: Marginal tissue recession >3 mm from CEJ Palatal recession-III The tip of the interdental papilla is located at or apical to the level of the CEJ mid-palatally.		

	Interproximal bone loss is visible on the radiograph. This is subclassified into two categories [12]: • PR-IIIA: Marginal tissue recession ≤3 mm from CEJ • PR-IIIB: Marginal tissue recession >3 mm from CEJ.		

Table 1: Classification systems for gingival recession.

Results and Discussion

Our classification system (Table 2,3) is aimed at simplifying identification of GR by young clinicians as it uses numbers as reference values which is more predictable and reproducible for the purpose of research studies as well. The system also helps communication easy between clinicians.

CLASS I	Gingival recession extending upto 3 mm from CEJ without interdental soft tissue loss or bone loss. (Labial / Buccal recession to be considered.) KT ≥2 mm
CLASS II	Gingival recession extending beyond 3 mm from CEJ without interdental soft tissue loss or bone loss. (Labial / Buccal recession to be considered.) KT<2mm
CLASS III	Gingival recession upto 3 mm from CEJ with reduced height of interdental papilla-Level of IDP coronal to gingival margin. KT<2 mm
CLASS IV	Gingival recession beyond 3 mm from CEJ with reduced height of interdental papilla. Level of IDP same/ apical as gingival margin . KT<2 mm
CLASS V	Any of the above classes* with presence of lingual/palatal recession *(Class of recession to be mentioned) eg, Class V with class I
CLASS VI	In cases of missing adjacent tooth with interdental papilla recession, reference point to calculate the interdental papilla recession is considered as mesial / distal CEJ. Note the level of receded interdental papilla from mesial /distal CEJ. Normal height of interdental papilla till MGJ is found to be 6-7 mm. *(Class of interdental papilla recession to be mentioned)

Table 2: Proposed classification system-NASA.

CLASS I A	Normal gingival phenotype with features of Class I
CLASS I B	Thin gingival phenotype with features of Class I
CLASS II A	Normal gingival phenotype with features of Class II
CLASS II B	Thin gingival phenotype with features of Class II

Table 3: Extended classification for treatment needs.

It addresses the drawbacks of the previous classification system as follows -An arbitrary reference value is given for gingival recession and the presence of keratinized tissue is taken into consideration. In cases with class III and class IV recessions, the amount of interdental papillary loss is also mentioned. According to miller's 3rd demerit wherein a case arises which has both gingival recession and interdental papilla loss that does not extend till the MGJ, classifying the case as either as 3 or 4 becomes

difficult, hence a modified classification is proposed for the ease of clinicians. In cases with missing adjacent tooth noted with gingival recession either the mesial CEJ or the distal CEJ is to be considered as the reference point which was not mentioned in Miller's classification. A separate class has been dedicated for lingual/ palatal recessions which can be added along with the labial/ buccal class. The classification takes into consideration keratinized tissue as well as gingival phenotype which has never been addressed before. The authors in future, hope to incorporate a treatment based approach into this classification system to guide dental students and general dentists to seek specialist care for appropriate cases.

Limitations

Although the classification system has been designed to ease the classification of GR, only a preliminary pilot study applying this classification system has been conducted. The feasibility and response from clinicians needs to be collected and studies using larger cohorts need to be conducted before establishing the benefits of this classification system.

Conclusion

Barring the limitations of various proposed classifications, an attempt has been made by the authors to design a new classification system that is clinician friendly and addresses the drawbacks of the existing ones.

Conflict of Interest Statement

All authors declare that there are no conflicts of interest.

Informed Consent Statement

Informed consent was obtained from each participant involved in this study.

Authors' Contributions

All authors contributed equally to this work and approved the final version of the manuscript for publication.

Financial Disclosure

The authors received no external financial support for this study.

Ethical Statement

Not applicable.

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