

Letter to the Editor

Periodontal Disease Classification: Controversies, Limitations and the Road Ahead- A Proposed New Classification

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Abstract

History teaches us that a great deal of effort is put forward in giving birth to a classification system, only to have it be quickly contradicted or condemned. Though we have made great strides towards the understanding of periodontitis in general, the bitter truth is that we have not hit the bull's eye on the true nature of etiopathogenesis. Until then any classification based on infectious etiology would be a misfit. A classification that is easy to understand and based on treatment needs would be more apt at this juncture. This article is aimed at discussing the present American Academy of Periodontology 1999 classification and to suggest a new and simplified classification.

Key words: Classification, periodontal disease, periodontitis, gingivitis, peri-implant mucositis

Introduction

The classification of periodontal diseases has come a long way over the past hundred years. Periodontitis is a complex disease of the tooth-supporting structures that has no geographic, ethnic or age barriers. Classifying periodontal diseases is essential to provide a framework to scientifically study the etiology, pathogenesis, and treatment of disease in an orderly fashion (Armitage, 1999).

Periodontal diseases have been classified based on knowledge during different time frames and various paradigms such as classical pathology, clinical manifestations of disease and infectious etiology (Armitage, 2002). All classifications proposed so far have their share of controversies and limitations. The majority of these classification systems are merely offshoots of earlier classifications that exist only in the academic domain and have little or no clinical or

practical value (Attström and van der Velden, 1994; Burchard and Inglis, 1904; McCall and Box, 1925; Thomas and Goldman, 1937; Miller and Pelzer, 1939; Hine and Hine, 1944; Lyons, 1946; Lyons *et al.*, 1950; Bernier, 1957; Ranney, 1977; Page and Schroeder, 1982; American Academy of Periodontology, 1989). The irony of evolution of newer classifications is that they are relevant even today, but incomplete (Armitage, 1999). This has led to increased confusion among the periodontal` fraternity (Van der Velden, 2000).

Today, there is no universal agreement among researchers about the existing classification (Van der Velden, 2000; Mombelli *et al.* 2002; Baelum and Lopez, 2003; Meyer *et al.*, 2004; van der Velden, 2005; Armitage and Cullinan, 2010). Keeping this in view, we believe that an analysis of the classification of periodontal diseases is timely. The objective of this paper is to discuss the American Academy of Periodontology (AAP) 1999 classification system and propose a new system based on therapeutics. The new classification has been formatted with a critical and analytical point of view and this paper intends to highlight its relevance,

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validity and utility in treating periodontal disease. Some of our comments are based on observations.

Requisites for an ideal classification system

An ideal classification system must be simple, easy to understand, easily reproducible and clinically relevant (Lopez and Baelum, 2003). Such a system can be used in various applications such as statistical analysis, treatment planning, surveillance of disease, insurance claims, etc. (Armitage, 2007).

Discussion of the 1999 American Academy of Periodontology classification system

Several classification systems have been proposed in the literature to facilitate categorization, but they have limitations. The following list highlights some queries raised regarding the presently accepted and widely used AAP 1999 classification system. Analysis of this earlier classification put forth certain questions in our mind and prompted us to format and present a new and practical classification.

1) Does the existing periodontal disease classification system meet the ideal requirements of a classification system (Murphy, 1997)?

The present classification does not meet the ideal requirements and the reasons are explained later in this commentary.

2) Is there a real need for ideal classification of periodontal diseases (Pini-Prato, 2011)?

An ideal classification system should help in diagnosis, prognosis, treatment planning and organizing health care needs in a simplified and orderly fashion.

3) Are we in synchrony with classifications from other dental specialties that serve as therapeutic guides?

G.V. Black's classification of dental caries clearly indicates the location of dental caries and acts as a therapeutic guide for clinicians to devise a possible treatment plan. This is not the case with the present periodontal classification system.

4) Has the present etiology-based classification helped us in better treatment planning? (Loesche, 1976; Loesche, 1979; Slots, 1979; Armitage, 1999; Armitage, 2002)

Our understanding of periodontal disease is not complete enough to base our classification on etiology (Armitage, 2002; van der Velden, 2005). Treatment planning to date is based on the non-specific plaque hypothesis.

5) Within the ambit of the existing classification, is it possible to diagnose the disease with certainty and place the patients in at least one of the disease categories without overlap?

The strict criteria put forward by the 1999 AAP

classification makes it difficult to categorize without overlapping.

To diagnose a case of aggressive periodontitis, the person should be systemically healthy. However, placing all patients with aggressive periodontitis under this clause is extremely challenging, as there exists a grey area in declaring a person as systemically healthy because many forms of systemic diseases exist in subclinical form (Armitage, 1999; van der Velden, 2005; Devi and Pradeep, 2009). Similarly, how can we classify a 10-year-old patient with predominant local factors and generalized attachment loss but who is systemically healthy? Is it possible to classify this condition as chronic periodontitis owing to the predominant local factors, or should it be placed under the category of aggressive periodontitis because the amount of destruction is too much for that particular age (Devi and Pradeep, 2009)? There is definite overlap and confusion in these areas that needs to be addressed.

6) Are we able to diagnose and place aggressive and chronic periodontitis disease categories within the limits of the existing classification?

No. The present classification system depends upon assessing the rate of progression spread over multiple appointments in order to diagnose aggressive periodontitis. It is not prudent on our part to subject the patient to repeated clinical visits just to place him/her under a specific disease entity such as aggressive or chronic periodontitis. Further, determining the rate of progression of the disease at any given point of time is prone to erroneous data, as evidence shows that periodontitis progresses with periods of quiescence and exacerbation because of various factors that influence how rapidly periodontal tissues are destroyed (Loe *et al.*, 1978; Axelsson and Lindhe, 1981; Lindhe *et al.*, 1983; Albandar *et al.*, 1986; Papapanou *et al.*, 1989; Brown and Loe, 1993; Gunsolley *et al.*, 1995; Schatzle *et al.*, 2003).

7) Can gingival diseases modified by medications be included as plaque-induced gingival diseases?

Gingival diseases modified by medications have been included under the category "dental plaque-induced gingival diseases," which is completely misleading as they are not dependent on dental plaque for their manifestation (Loe *et al.*, 1986; Hallmon and Rossmann, 1999; Mariotti, 1999)

8) Is it vindicated to include a gingival disease modified by medication category and simultaneously omit a parallel category on periodontal disease modified by medications?

In many instances, drug-induced gingival overgrowth is accompanied by combined pockets and attachment loss. In such cases two different diagnoses can be made: a) drug-influenced gingival

enlargement; b) chronic/aggressive periodontitis. A simple provision to include periodontal disease modified by medication could solve the confusion of two probable diagnoses.

9) The 1999 AAP classification has meticulously tried to segregate each disease under a different category, but lists periodontal abscess as a separate entity. Is this justified?

Periodontal abscesses share their etiology with periodontal pockets and are merely an exaggerated clinical manifestation. Nowhere in the field of medicine is an abscess classified as a disease. It probably got carved out as a separate entity because it required a different treatment regime. This adds muscle to our argument that a classification based on treatment needs is the order of the day (Rees, 1998; Meng, 1999)

10) Was there a necessity to separately categorize diabetes mellitus-associated gingivitis and exclude the parallel periodontitis category?

The reason cited for this was 'diabetes mellitus-associated chronic periodontitis' and 'diabetes mellitus-associated aggressive periodontitis' would unnecessarily complicate matters and could not be justified by supporting data (Armitage, 1999). This reason seems unacceptable. First, the classification by itself is very exhaustive in its current form and an addition of one more subcategory for 'diabetes-associated periodontitis' would not have really mattered. Secondly, in 1993 Loe had labelled periodontal disease as the sixth complication of diabetes, hence is logical to think that diabetes mellitus influences gingivitis and periodontitis in equal measures (Loe, 1993; Lang *et al.*, 1999; Graves *et al.*, 2007; Preshaw *et al.*, 2007).

11) Is there a separate category called 'smoking-associated gingivitis or periodontitis'?

There is no category for smoking-associated gingivitis or periodontitis even though many cross-sectional and longitudinal studies indicate a strong relationship between smoking and increased risk of periodontal breakdown (Bolin *et al.*, 1986; Soskolne and Klinger, 2001; Taylor, 2001)

12) Can we comfortably diagnose, without disjointedness, a case of plaque-induced gingival inflammation superimposed on a reduced but healthy periodontium without an iota of doubt as to whether it is periodontitis or gingivitis, within the framework of the AAP 1999 classification?

An interesting diagnostic dilemma arises when gingival inflammation occurs in a successfully treated periodontitis patient during the maintenance phase of therapy. The inflammation can be interpreted either as periodontitis or gingivitis, because at any given point of time the clinician cannot construe whether the attachment loss is progressive or stable. This compels the

clinician to inevitably rely on longitudinal records of periodontal status, including clinical attachment levels, making the diagnosis impractical (Beck *et al.*, 1997; Armitage, 1999; Rivera-Hidalgo, 2003; Newman *et al.*, 2006).

13) Does the existing classification include the peri-implant diseases?

In spite of rapid advancement in the field of implantology, there is no provision in the present classification for the diseases around implants, leaving a significant void (Armitage, 1999; Devi and Pradeep, 2009)

14) Is it clinically and practically relevant to classify 'classical gingival recession' in the scenarios mentioned below under different categories?

First scenario: "A treated periodontitis case currently showing reduced periodontal support (recession)." If it is superimposed by gingival inflammation without evidence of further attachment loss, it should be diagnosed as gingivitis; otherwise it should be diagnosed as periodontitis (Machtei *et al.*, 1997; Armitage, 1999; Rivera-Hidalgo, 2003).

Second scenario: Toothbrush trauma resulting in recession is classified under non-plaque-induced traumatic lesion physical injury (Khoct *et al.*, 1993; Armitage, 1999; Holmstrup, 1999; Rivera-Hidalgo, 2003; Wolf and Hassell, 2006).

Third scenario: Predisposition to gingival recession because of anatomical variation (proclination) is classified under mucogingival deformities and conditions (Kallestal and Uhlin, 1992; Armitage, 1999; Rivera-Hidalgo, 2003). Any soft tissue recession occurs only after some form of osseous dehiscence. Whether this condition should be classified as a disease or only as a morphological variation of healthy periodontium is irrelevant and this induces confusion (Holmstrup, 1999).

15) Is there a real need to overtly emphasize the term 'aggressive periodontitis,' especially when there have been a lot of concerns raised ever since the term was coined?

Aggressive periodontitis can be considered as merely a severe form of the same disease. There is considerable literature to show that both chronic and aggressive periodontitis have similarities in the following aspects: clinical presentation (Armitage and Cullinan, 2010), microbiology (Armitage, 2010), immunopathogenesis (Armitage *et al.*, 2010), mechanism of bone loss (Bartold *et al.*, 2010) and histopathology (Smith *et al.*, 2010). If a specific therapeutic regime is developed for aggressive periodontitis, then the use of the term is justifiable (Van der Velden, 2000; Schatzle *et al.*, 2003; Meyer *et al.*, 2004; van der Velden 2005).

16) Does the present classification system

Table 1. Proposed New Classification – Key features**Category 1 gingivitis/periodontitis/peri-implant mucositis/peri-implantitis**

Plaque-associated gingivitis/periodontitis occurring in an otherwise healthy individual not compounded by anatomic variations, environmental factors, systemic conditions or iatrogenic causes.

1. Present in adults/children. Age is not a defining criterion.
2. Purely associated with the presence of local factors, but the number of local factors is not a defining criterion.
3. Pathogenesis is mainly microbial in origin.
4. Rate of progression is not a decisive factor and is considered merely as a varied response to the situation.

Category 2 gingivitis/periodontitis/peri-implant mucositis/peri-implantitis

Plaque- or non-plaque-induced gingivitis/periodontitis/peri-implant mucositis/peri-implantitis occurring in a systemically healthy individual compounded by risk factors such as anatomic variations, environmental factors, medications and or iatrogenic factors.

1. Can be present in adults/children. Age is not a defining criterion.
2. May or may not be associated with the presence of local factors
3. Rate of progression not considered a criterion in arriving at a diagnosis
In addition to the above-mentioned clinical findings, one or more of the following factors can be present:
 - A. Anatomic factors: Cervical enamel projections, palatogingival groove, enamel pearls, proximal root grooves, severely mal-aligned/crowded teeth, root fractures, cervical root resorption, cemental tears
 - B. Iatrogenic factors: improper restorations and appliances
 - C. Environmental factors: adverse habits such as smoking, pan chewing, wedging of toothpicks between teeth, application of fingernail pressure against gingiva, etc.

Category 3 gingivitis/periodontitis/peri-implant mucositis/peri-implantitis

Plaque- or non-plaque-induced gingivitis/periodontitis occurring in a medically compromised patient wherein the systemic component may be either a sole contributing factor or a modifying factor

Contributing factors

1. Hematologic: leukemia, acquired neutropenia, others.
2. Genetic disorders: Down syndrome, Papillon-Lefevre syndrome, Chediak-Higashi syndrome, leukocyte adhesion deficiency syndromes, familial and cyclic neutropenia, histiocytosis syndromes, glycogen storage diseases, infantile genetic agranulocytosis, Cohen syndrome, Ehlers-Danlos syndrome, hypophosphatasias, etc.
3. Muco-cutaneous lesions: Lichen planus, pemphigoid, pemphigus vulgaris, erythema multiforme, lupus erythematosus
4. Diseases of viral and fungal origin: herpes virus infections, *Varicella zoster*, *Candida spp.* infections, HIV, histoplasmosis

Modifying factors

1. Female hormone association
2. Diabetes
3. Immune compromised conditions, e.g., HIV, AIDS
4. Vitamin C deficiency

Necrotizing diseases [necrotizing ulcerative gingivitis or periodontitis (NUG or NUP)]. Necrotizing diseases have a definite bacterial etiology, but they invariably require predisposing factors such as stress, nutritional deficiency, fatigue, alcohol or drug abuse, or systemic diseases for initiation and progression of the lesions. These predisposing factors are always associated with immunosuppression.

consider the multifactorial character of periodontal disease?

All the risk factors are not considered, e.g., smoking and diabetes (Armitage, 1999)

17) Can all patients be classified with precision as to whether they have either localized or generalized periodontitis?

No. The terms localized and generalized were introduced by the consensus group at the AAP 1999 classification workshop, where it was decided to use 30% involvement as the cut-off point. But it was purely an arbitrary decision and was never based on any data. The point is - does having two

names in any way benefit or alter the treatment plan? Or does it create confusion? Armitage explains it well "A situation where the 30% cut-off is rigidly used on a classic case of localized aggressive periodontitis, in which all the incisors and first molars were affected (a total of 12 teeth), and if the particular individual has only 28 teeth present, the calculation of 12/28 becomes 42.9%. So would this classic case of localized periodontitis become generalized periodontitis?" (Armitage and Cullinan 2010). Any cut-off value can only lead to contradiction and confusion. Instead, it is better to mention the teeth or areas

affected by periodontitis, and simply refer it as periodontitis.

The need for a new classification

In our view, a classification system should be simple, easy to understand, easy to reproduce and clinically relevant (Murphy, 1997; Armitage, 1999; Armitage, 2002; Merriam-Webster, 2010). Even though the present AAP 1999 classification system is widely used and has stood the test of time, it has its own limitations and has not fulfilled all the criteria required for an ideal classification system (Bernier, 1957; Armitage, 1996; Armitage, 1999; Armitage, 2002; Baelum and Lopez, 2003; Armitage, 2004). With the existing system, there is lack of clarity among dental students and general dental practitioners. It becomes difficult to categorize periodontal disease and restrict it to one type of classification as it is multifactorial (Michalowicz *et al.*, 1991; Marazita *et al.*, 1994; Grossi and Genco, 1998; Monteiro da Silva *et al.*, 1998; Tonetti, 1998; Kinane, 1999; Van der Velden, 2000; Al-Zahrani *et al.*, 2003; Hujoel *et al.*, 2005; Van der Velden, 2005; Takashiba and Naruishi, 2006; Boyapati and Wang, 2007). A classification system should take into account not only the etiologic factors but also the contributing factors, risk factors and aggravating factors. So it is a herculean task to frame a classification that satisfies all the ideal requirements.

Further, the understanding of the etiopathogenesis of periodontal disease has greatly increased with the ushering in of proteomics and genomics, changing the way we look at it. However, this newly acquired knowledge has to be incorporated into the diagnosis of periodontal disease, which to date we have failed to do. Despite our claims of better understanding of periodontal disease and its etiology, our treatment approach, based on a non-specific plaque hypothesis, has remained by and large the same over the years, making the diagnosis component redundant (Loesche, 1979; Newman *et al.*, 2006).

Classification that facilitates easy treatment planning

Periodontal disease is by and large initiated by periodontal pathogens and is immensely modulated by the host response. It is apt on our part to base the classification mainly on the microbial role. Because the progression is influenced by various factors such as systemic diseases, environmental factors and anatomical variations, these too must be taken into account to further categorize the conditions. Progression of the disease, be it chronic or aggressive, is only a reflection of varied intensity of the condition and probably represents two arms of the same disease under the influence of innumerable factors. So the very terminology depicting the rate of progression or the extent of the condition has been eliminated from this

classification and only the inciting factors have been stressed to categorize the conditions. The inclusion of the inciting factors to classify the condition makes the etiology and its role very clear, thus facilitating treatment planning. The new, simpler classification can act as a silver lining that lacks ambiguity, can be clearly understood and also facilitates treatment needs.

Periodontal disease has been classified as Category 1, 2 or 3 gingivitis/periodontitis/peri-implant mucositis/peri-implantitis.

Benefits of the proposed new classification:

This classification aims to bring a clear understanding of periodontal disease to the patient, general dentist, periodontist and insurance agencies, and to facilitate the course of treatment required.

1. The proposed classification system helps to make a clinical diagnosis for a patient with any periodontal condition. There is no overlap among the disease categories. This helps in collection of epidemiological data, giving a better insight into the periodontal problems in a given population and providing the clinician with a better image of the patient population being treated.
2. Patients will benefit from the proposed new classification, as they will understand the root cause for the periodontal status. For example, a Category 2 periodontitis patient with a palatogingival groove will understand that the anatomic variation is influencing the periodontal pocket and that it needs correction. Similarly, a complex periodontitis patient with diabetes will understand the significance of diabetes to periodontal health and will aim to control his or her glycemia.
3. A general dentist will find the new simple classification handy when it comes to devising a treatment protocol, as there is no overlapping of disease categories. This distinguishing feature of the proposed classification outlines the framework for easier treatment planning.
4. As dental insurance is gaining prominence worldwide, a clear and simplified classification will aid to a great extent in risk profiling of the patient for the settlement of claims.
5. The proposed classification encompasses the risk elements associated with periodontitis that were hitherto not included in the 1999 AAP classification.
6. This classification has a provision to include peri-implant conditions.
7. The need for multiple visits to assess the disease progression to arrive at a diagnosis is no longer required.

Summary

The search for an ideal classification of periodontal

diseases is a work in progress and the finished product still seems like a mirage. However, the void in understanding the etiopathogenesis of periodontal disease should not hamper or prevent us from having a simpler classification that facilitates the treatment needs of the patient. The whole idea of the proposed classification is to simplify the existing classification system and eliminate unnecessary confusion. As we are yet to unravel the complete etiopathogenesis of periodontal disease, any new classification is bound to raise certain questions and controversies, which are inevitable now. With the present knowledge we have aimed to classify periodontal disease in a simpler format, which is beneficial to the periodontal fraternity, general dental practitioners and the patient. To quantify or grade the progression of periodontal disease does not come under the scope or ambit of this classification system. The extent of disease is a clinical presentation at a particular stage of the disease. The sole discretion in selecting the treatment plan rests with the clinician based on clinical picture, radiological features, associated risk elements and the patient's systemic condition.

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