

Staging and Grading of Periodontitis: Framework and Proposal of a New Classification and Case Definition

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Background

- Periodontitis is a microbe induced inflammatory disease that leads to host-mediated destruction of the attachment apparatus of teeth
- Classification of periodontal disease is necessary to properly diagnose and manage patients
- Limitations of the 1999 classification and new evidence prompted a new classification workshop
- In 2017 a world workshop on the classification of periodontal and peri-implant disease and conditions was co-sponsored by the American Academy of Periodontology and European Federation of Periodontology
- Aim of the workshop was to update the 1999 classification of periodontal diseases and conditions and develop a scheme for peri-implant disease
- 19 review papers and 4 consensus reports were commissioned

1999 Classification

- Research perspective at the time focused on different phenotypes of periodontitis based on clinical presentation
- Four different forms of periodontitis were recognized: necrotizing periodontitis, chronic periodontitis, aggressive periodontitis, periodontitis as a manifestation of systemic disease
- Aggressive periodontitis was classified based on major and minor criteria as well as distribution of disease. Cases that did not meet these criteria were classified as chronic periodontitis
- Differentiation was made between the two forms to identify cases with greater severity presenting earlier in life and in need of specific treatment approaches
- Overlap of clinical features between the two forms made proper diagnosis difficult and presented a barrier to clinicians trying to apply the classification system
- Since the 1999 classification there has been a substantial amount of new information from population studies, basic science investigations and prospective studies evaluating environmental and systemic risk factors
- Challenges differentiating aggressive periodontitis from chronic periodontitis and new evidence were major rationale for a new classification workshop

Evidence from 2017 workshop position papers

- There is sufficient evidence to consider necrotizing periodontitis a separate disease entity
- Periodontitis observed in the context of systemic disease should be considered as a periodontal manifestation of the systemic disease
- There is no evidence to suggest aggressive and chronic periodontitis are pathophysiologically distinct diseases. Multifactorial models of disease applied to periodontitis account for variations in the clinical phenotypes observed

Periodontitis case definition system

- A case definition system should facilitate identification, treatment and prevention of periodontitis
- Case definitions can be applied to patient care, epidemiological surveys and research
- 3 components are required in a periodontitis case definition system:
 1. Identification of a patient as a periodontal case
 - 2017 world workshop suggested a single definition be adopted:
 - Interdental clinical attachment loss is detectable at ≥ 2 non-adjacent teeth
 - Buccal or oral clinical attachment loss ≥ 3 mm with pocketing > 3 mm is detectable at ≥ 2 teeth
 - The CAL cannot be attributed to non-periodontal causes: gingival recession, deep dental caries, CAL on the distal aspect of a second molar associated with malposition or third molar extraction, draining endodontic lesion, vertical root fracture
 2. Identification of the form of periodontitis
 - Based on pathophysiology three different forms of periodontitis have been identified: necrotizing periodontitis, periodontitis as a direct manifestation of systemic disease and periodontitis
 3. Description of the clinical presentation and other elements that affect the clinical management, prognosis or influence oral and systemic health
 - Factors that should be considered include: severity, complexity of management, extent of disease, rate of progression, risk factors and interrelationship with general health

Periodontitis staging and grading classification system

- Staging and grading has been used for many years in oncology
- In the context of periodontitis it allows for a multidimensional diagnostic classification

- Considering all relevant dimensions of periodontal disease will help to optimize individual patient management
- Using this classification system an individual's case can be defined by a matrix of stage at presentation and grade
- Staging provides information about the severity and extent of disease as well as complexity of managing the patient
- Severity and extent of disease is based on the current measurable extent of destroyed and damaged tissue
- Complexity is determined by assessing factors that may influence disease control and managing long term function and aesthetics
- Table 3 provides more detailed information regarding the staging of periodontitis
- Staging is determined after considering: CAL, radiographic bone loss, tooth loss, probing depth, vertical bone loss, furcation involvement and ridge defects
- Staging is divided into 4 levels
 - Stage I: Early stages of attachment loss in response to persistent gingival inflammation. Early diagnosis and definition of a population of susceptible individuals offers opportunity for early intervention and monitoring. Early diagnosis provides the possibility for more cost-effective treatment at a population level. Assessment of salivary biomarkers or imaging technology may increase early detection.
 - Stage II: Established periodontitis. Application of standard treatment principles is expected to arrest disease progression. Evaluation of patient response and grade of disease may guide more intensive management for specific patients.
 - Stage III: Significant damage to the attachment apparatus. Advanced treatment is required to prevent tooth loss. Masticatory function is maintained.
 - Stage IV: Significant damage to periodontal support leading to tooth loss and loss of masticatory function. Dentition is at risk of being lost.

TABLE 3 Periodontitis stage - Please see text and appendix A (in online *Journal of Clinical Periodontology*) for explanation

Periodontitis stage		Stage I	Stage II	Stage III	Stage IV
Severity	Interdental CAL at site of greatest loss	1 to 2 mm	3 to 4 mm	≥5 mm	≥5 mm
	Radiographic bone loss	Coronal third (<15%)	Coronal third (15% to 33%)	Extending to middle or apical third of the root	Extending to middle or apical third of the root
	Tooth loss	No tooth loss due to periodontitis		Tooth loss due to periodontitis of ≤4 teeth	Tooth loss due to periodontitis of ≥5 teeth
Complexity	Local	Maximum probing depth ≤4 mm Mostly horizontal bone loss	Maximum probing depth ≤5 mm Mostly horizontal bone loss	In addition to stage II complexity: Probing depth ≥6 mm Vertical bone loss ≥3 mm Furcation involvement Class II or III Moderate ridge defect	In addition to stage III complexity: Need for complex rehabilitation due to: Masticatory dysfunction Secondary occlusal trauma (tooth mobility degree ≥2) Severe ridge defect Bite collapse, drifting, flaring Less than 20 remaining teeth (10 opposing pairs)
		Extent and distribution			
Add to stage as descriptor		For each stage, describe extent as localized (<30% of teeth involved), generalized, or molar/incisor pattern			

- Stage of periodontitis should be supplemented with information about the grade of the disease
- Objective of grading is to use whatever information is available to predict the likelihood of the case progressing at a rate greater than the general population or responding less predictably to standard therapy and to estimate the potential health impact of periodontitis
- One benefit of grading periodontitis is that it can guide the intensity of therapy and monitoring required or guide systemic monitoring and co-therapy with other medical colleges
- Grading is a flexible approach that can be adapted to emerging evidence on risk factors, biomarkers, etc.
- Grading is based on direct and indirect evidence and risk factors
 - Direct evidence is based on longitudinal observations
 - Indirect evidence is based on the assessment of bone loss at the most affected tooth at a point in time
- Periodontal grade is divided into 3 levels (A,B,C)
- Table 4 summarizes details of the grading system
- Clinicians can approach grading by assuming a moderate rate of progression (grade B) then assess direct and indirect evidence or risk factors that may shift the prognosis and modify the grade accordingly

TABLE 4 Periodontitis grade – Please see text and appendix A (in online *Journal of Clinical Periodontology*) for explanation

Periodontitis grade			Grade A: Slow rate of progression	Grade B: Moderate rate of progression	Grade C: Rapid rate of progression
Primary criteria	Direct evidence of progression	Longitudinal data (radiographic bone loss or CAL)	Evidence of no loss over 5 years	<2 mm over 5 years	≥2 mm over 5 years
	Indirect evidence of progression	% bone loss/age	<0.25	0.25 to 1.0	>1.0
		Case phenotype	Heavy biofilm deposits with low levels of destruction	Destruction commensurate with biofilm deposits	Destruction exceeds expectation given biofilm deposits; specific clinical patterns suggestive of periods of rapid progression and/or early onset disease (e.g., molar/incisor pattern; lack of expected response to standard bacterial control therapies)
Grade modifiers	Risk factors	Smoking	Non-smoker	Smoker <10 cigarettes/day	Smoker ≥10 cigarettes/day
		Diabetes	Normoglycemic / no diagnosis of diabetes	HbA1c <7.0% in patients with diabetes	HbA1c ≥7.0% in patients with diabetes
Risk of systemic impact of periodontitis ^a	Inflammatory burden	High sensitivity CRP (hsCRP)	<1 mg/L	1 to 3 mg/L	>3 mg/L
Biomarkers	Indicators of CAL/bone loss	Saliva, gingival crevicular fluid, serum	?	?	?

Summary

- The staging and grading classification of periodontitis was developed as a multidimensional approach to periodontal diagnosis that can incorporate all current evidence
- Stage of periodontitis conveys information about the severity and extent of disease as well as complexity of managing the patient
- Grade of periodontitis conveys information rate of periodontal progression, response to standard therapy and potential influence of systemic health
- The matrix of stage and grade can appropriately describe periodontal disease and can be readily communicated among practitioners
- The classification system can be reviewed and modified as new evidence emerges

References

Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. *J Clin Periodontol*. 2018;45(Supp 20):S149-S161.