02. Periodontitis

Guidance for clinicians

- Attempts to classify periodontitis have struggled to decide if there are different diseases or variations of a single disease.
- There is no evidence to support differentiating "chronic" and "aggressive" periodontitis.
- Three forms of periodontitis have been identified: (1) periodontitis, (2) necrotising periodontitis, (3) periodontitis as a direct manifestation of systemic diseases.
- A classification system must include complexity and risk factors as well as disease severity.
- Individual cases of periodontitis should be characterised according to the stage and grade of the disease.
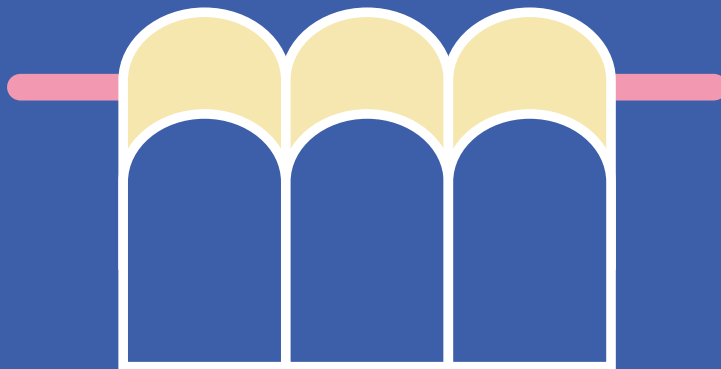
Authors **Mariano Sanz and Maurizio Tonetti**

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Introduction: classifying periodontitis

Previous attempts to classify periodontitis have revolved around the question of whether phenotypically different case presentations represent different diseases or variations of a single disease.

The internationally accepted classification of periodontitis, published in 1999, provided a workable framework that has been used extensively in both clinical practice and scientific investigation. But this system suffers from significant shortcomings, including substantial overlap, the lack of a clear pathobiology-based distinctions between categories, diagnostic imprecision, and difficulties in implementation.

The New Classification from the 2017 World Workshop on Periodontal and Peri-implant Disease and Conditions ("the World Workshop") reviewed the scientific evidence and reached four main conclusions:

1. There is no evidence of a specific pathophysiology that enables the differentiation of cases as "aggressive" or "chronic" periodontitis or provides guidance for different kinds of intervention.
2. There is little consistent evidence that aggressive and chronic periodontitis are different diseases. But there is evidence that multiple factors, and the interactions between them, influence clinically observable disease outcomes (phenotypes) at the individual level.
3. On a population basis, the average (mean) rates of periodontitis progression are consistent across all observed populations in the world. However, there is evidence that specific segments of the population exhibit different levels of disease progression.
4. A classification system based only on disease severity fails to capture important dimensions of an individual's disease, including complexity (which influences approaches to therapy) and risk factors (which influence disease outcomes).

Based on these findings, a new periodontitis classification scheme has been adopted. The forms of the disease previously described as "chronic" and "aggressive" are now described under the single category of "periodontitis". Three forms of periodontitis have been identified:

1. Periodontitis;
2. Necrotising periodontitis;
3. Periodontitis as a direct manifestation of systemic diseases.

A multidimensional system of stages and grades has been devised to further describe the different manifestations of periodontitis in individual cases. Stages describe the severity and the extent of the disease, grades describe the likely rate of progression.

There is no evidence of a specific patho-physiology that enables differentiation between 'aggressive' and 'chronic' periodontitis

Clinical definition of periodontitis

Periodontitis is a chronic multifactorial inflammatory disease associated with dysbiotic plaque biofilms and characterised by the progressive destruction of the tooth-supporting apparatus. Periodontitis is characterised by inflammation that results in the loss of periodontal attachment. While the formation of bacterial biofilm initiates gingival inflammation, the disease of periodontitis is characterised by three factors:

- The loss of periodontal-tissue support, manifested through clinical attachment loss (CAL) and radiographically assessed alveolar bone loss;
- The presence of periodontal pocketing;
- Gingival bleeding.

Current evidence supports multifactorial disease influences – including smoking – on multiple immunoinflammatory responses. This makes dysbiotic microbiome changes more likely for some patients than for others and may well influence the severity of disease for such individuals.

A periodontitis classification system should include three components:

- Identification of a patient as a periodontitis case;
- Identification of the specific type of periodontitis;
- Description of the clinical presentation and other elements that affect clinical management, prognosis, and potentially broader influences on both oral and systemic health.

A classification system must include complexity and risk factors

In the context of clinical care, a periodontitis case is defined when loss of periodontal-tissue support through inflammation is the primary feature. Clinical attachment loss (CAL) is calculated by a circumferential assessment of the erupted dentition with a standardised periodontal probe with reference to the cemento-enamel junction (CEJ).

A patient is a periodontitis case when:

- Interdental CAL is detectable at ≥2 non-adjacent teeth, or
- Buccal/oral CAL of ≥3mm with pocketing of >3mm is detectable at ≥2 teeth, and
- The observed CAL cannot be ascribed to non-periodontal causes such as:
    1. Gingival recession of traumatic origin;
    2. Dental caries extending in the cervical area of the tooth;
    3. The presence of CAL on the distal aspect of a second molar and associated with malposition or extraction of a third molar;
    4. An endodontic lesion draining through the marginal periodontium;
    5. The occurrence of a vertical root fracture.

Measuring CAL
Given the measurement error of CAL with a standard periodontal probe, a degree of misclassification of the initial stage of periodontitis is inevitable and this affects diagnostic accuracy. It is recognized that "detectable" interdental attachment loss

may represent different magnitudes of CAL according to the skill of the operator (e.g. specialist or general practitioner) and local conditions that may facilitate or impair detection of the CEJ (most notably, the position of the gingival margin in relation to the CEJ, the presence of calculus, and restorative margins).

Bleeding on probing
Clinically meaningful descriptions of periodontitis should include the proportion of sites that bleed on probing, and the number and proportion of teeth with probing depth above certain thresholds (commonly ≥4mm and ≥6mm). It should be noted that periodontal inflammation – generally measured as bleeding on probing (BOP) – is an important clinical parameter in relation to the assessment of periodontitis treatment outcomes and the residual disease risk after treatment. However, BOP itself does not change the initial case definition as defined by CAL or change the classification of the severity of periodontitis.

Severity of disease
The degree of periodontal breakdown present at diagnosis describes the severity of the disease, which is measured by the degree of attachment loss or periodontal bone loss. Severity must incorporate the tooth loss attributable to periodontitis. Another dimension of disease severity is the complexity of treatment. Factors such as probing depths, type of bone loss (vertical and/or horizontal), furcation involvement, tooth mobility, number of missing teeth, bite collapse, and increased treatment complexity need to be incorporated into the diagnostic classification. Similarly, the extent of the disease – defined by the number and the distribution of teeth with detectable periodontal breakdown – should also be incorporated in the classification.

Forms of periodontitis

Based on pathophysiology, three clearly different forms of periodontitis have been identified:

1. Periodontitis;
2. Necrotising periodontitis;
3. Periodontitis as a direct manifestation of systemic diseases.

Differential diagnosis to establish which form of the disease is present is based on patient history, the specific signs and symptoms of necrotising periodontitis, and the presence or absence of an systemic disease that definitively alters the immune response of the host.

Necrotising periodontitis is characterised by a history of pain, the presence of ulceration of the gingival margin, and/or fibrin deposits at sites with characteristically decapitated gingival papillae and, in some cases, exposure of the marginal alveolar bone.

With periodontitis as a direct manifestation of systemic disease, the recommendation is that the clinician should follow the classification of the primary disease according to the International Statistical Classification of Diseases and Related Health Problems (ICD) codes.

A multi-dimensional system of stages and grades has been devised

Staging concerns the severity of disease at presentation and the complexity of disease management, while grading provides additional information on the disease's biological features
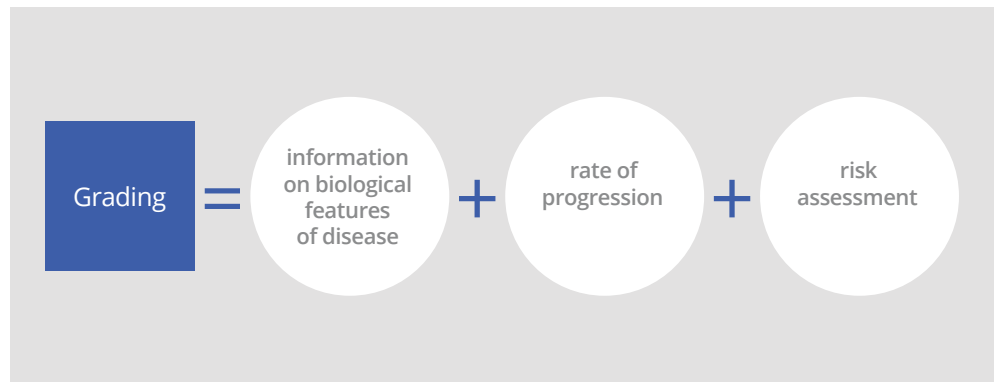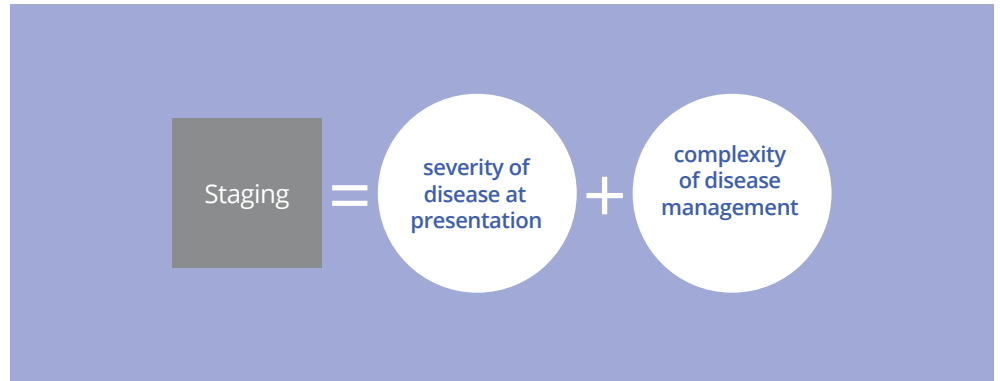
Staging and grading

An individual case of periodontitis should be further characterised using a simple matrix of four steps (see: *Periodontitis: clinical decision tree for staging and grading,* part of this toolkit) that describes the stage and grade of the disease. There are four stages and three grades.

Staging relies on the standard dimensions of the severity and extent of periodontitis at presentation but adds the complexity of managing the individual patient.
The information derived from assessing the stage of periodontitis should be supplemented by information on the inherent biological grade of the disease. This relies on three sets of parameters:

1. The rate of periodontitis progression;
2. Recognised risk factors for periodontitis progression;
3. The risk of an individual's case affecting their systemic health.

Within this classification framework, staging is largely dependent upon the severity of disease at presentation and on the complexity of disease management, while grading provides supplemental information about biological features of the disease. These features include a history-based analysis of the rate of periodontitis progression, assessment of the risk for further progression, analysis of possible poor outcomes of treatment, and assessment of the risk that the disease or its treatment may negatively affect the patient's general health.

Staging

There are two dimensions in the process of assessing the stage of periodontitis in a patient: severity and complexity.

Severity:
The primary goal is to classify the severity and extent of destroyed and damaged tissue caused by periodontitis. This is done by measuring CAL by clinical probing and bone loss by radiographic examination. These measurements must include the number of teeth whose loss can be attributed to periodontitis.

Complexity:
The secondary goal is to determine the complexity involved in controlling the disease and managing the long-term function and aesthetics of the patient's dentition.

Scoring the stages:
The severity score is based primarily on interdental attachment loss attributable to periodontitis (CAL) and marginal bone loss. It is assigned based on the worst-affected tooth. The complexity score is based on the complexity of treating the case. It considers factors including the presence of deep probing depths, vertical defects, furcation involvement, tooth hypermobility, drifting and/or flaring of teeth, tooth loss, ridge deficiency, and loss of masticatory function.

The two dimensions in assessing the stage of periodontitis are severity and complexity

Stage I:

Initial periodontitis

Stage II:

Moderate periodontitis

Stage III:

Severe periodontitis with potential for additional tooth loss

Stage IV:

Advanced periodontitis with extensive tooth loss and potential for loss of dentition

Grading

Grading a periodontitis patient involves estimating the future risk of periodontitis progression and the likely responsiveness to standard therapeutic principles. This estimate guides the intensity of therapy and secondary prevention after therapy. Grading adds another dimension and allows the rate of progression to be considered, using direct and indirect evidence.

Direct evidence is based on the available longitudinal observation: for example, in the form of older diagnostic-quality radiographs.

Indirect evidence is based on the assessment of bone loss at the worst-affected tooth in the dentition as a function of age (measured as radiographic bone loss in percentage of root length divided by the age of the subject). The periodontitis grade can then be modified by the presence of risk factors.

Clinicians should approach grading by assuming a moderate rate of progression (grade B) and look for direct and indirect measures of whether there is a higher disease progression that would justify the application of grade C. Grade A is applied once the disease is arrested.

If the patient has risk factors that have been associated with greater disease progression or lesser responsiveness to bacterial-reduction therapies, the grade score should be raised independently of the primary criterion represented by the rate of progression.

For example, a case could be characterised by moderate attachment loss (stage II), where the assumption of a moderate rate of progression (grade B) is modified by the presence of poorly controlled Type-2 diabetes, which is a risk factor that could shift the grade definition to rapid progression (grade C).

Grading involves estimating the future risk of periodontitis progression and the likely responsiveness to therapy

Grade A:
Slow rate of progression

Grade B:
Moderate rate of progression

Grade C:
Rapid rate of progression

Further reading

Proceedings of the World Workshop on the Classification of Periodontal and Peri-implant Diseases and Conditions,
co-edited by Kenneth S. Kornman and Maurizio S. Tonetti.
Journal of Clinical Periodontology, Volume 45, Issue S20, June 2018.

Proceedings include:

- Papapanou PN, Sanz M, et al. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-implant Diseases and Conditions, S162-S170.
- Herrera D, Retamal-Valdes B, Alonso B, Feres M. Acute periodontal lesions (periodontal abscesses and necrotising periodontal diseases) and endo-periodontal lesions, S78-S94.
- Fine DH, Patil AG, Loos BG. Classification and diagnosis of aggressive periodontitis, S95-S111.
- Needleman I, Garcia R, Gkranias N, et al. Mean annual attachment, bone level, and tooth loss: A systematic review, S112-S129.
- Billings M, Holtfreter B, Papapanou PN, Mitnik GL, Kocher T, Dye BA. Age-dependent distribution of periodontitis in two countries: Findings from NHANES 2009 to 2014 and SHIP-TREND 2008 to 2012, S130-S148.
- Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition, pages S149-S161.

Tonetti, MS & Sanz M. Implementation of the New Classification of Periodontal Diseases: Decision-making Algorithms for Clinical Practice and Education. *Journal of Clinical Periodontology*, 2019.

Authors

Mariano Sanz

Maurizio Tonetti

Mariano Sanz is professor and chair of periodontology at the University Complutense of Madrid and a professor in the faculty of odontology at the University of Oslo (Norway). He is chair of the EFP workshop committee, a member of the EFP executive committee, and president of the Osteology Foundation.

Maurizio Tonetti is clinical professor of periodontology at the Faculty of Dentistry of Hong Kong University and executive director of the European Research Group on Periodontology (ERGOPerio). He is the editor-in-chief of the *Journal of Clinical Periodontology* and a member of the EFP executive committee.

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New Classification
of periodontal and peri-implant diseases
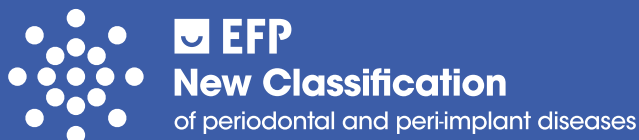
New Classification of periodontal and peri-implant diseases and conditions

The New Classification is the product of the World Workshop on the Classification of Periodontal and Peri-implant Diseases and Conditions, held in Chicago in November 2017. The World Workshop was organised jointly by the American Academy of Periodontology (AAP) and the European Federation of Periodontology (EFP) to create a consensus knowledge base for a new classification to be promoted globally. The New Classification updates the previous classification made in 1999. The research papers and consensus reports of the World Workshop were published simultaneously in June 2018 in the EFP's *Journal of Clinical Periodontology* and the AAP's *Journal of Periodontology*. The new classification was presented formally by the two organisations at the EuroPerio9 congress in Amsterdam in June 2018.

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Periodontology**

About the EFP

The European Federation of Periodontology (EFP) is an umbrella organisation of 35 national scientific societies devoted to promoting research, education, and awareness of periodontal science and practice. It represents more than 14,000 periodontists and gum-health professionals in Europe alone. In addition to 31 European members, the EFP has recently welcomed four international associate members from Asia, the Middle East, and Latin America.

www.efp.org
www.efp.org/newclassification

European Federation of Periodontology
Avenida Doctor Arce, 14. Office 38
28002 Madrid
Spain