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Letter to the Editor

Definitions of periodontal disease in research

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Dear Editor,

Defining exactly what constitutes periodontal disease for the purpose of periodontal research is a contentious problem, and is, of course, quite distinct from the diagnosis of periodontitis during clinical management of patients, for which classification criteria have previously been published (Armitage 1999). Review of the periodontal literature confirms that a multiplicity of definitions are used for assigning a diagnosis of periodontitis in research studies. Typically, these definitions are based on the extent and severity of disease, for example, patients must have *x* pockets of *x* mm or greater. However, there are wide variations in the definitions applied, some of which have a very low threshold for defining periodontitis whereas others have a much higher threshold (indicating that the patients recruited to the research have a significant periodontal problem).

A cursory review of a recent issue of the *Journal of Clinical Periodontology* (June 2008) highlights the difficulties. In one article, patients with chronic periodontitis were recruited if ''*⩾30% of the teeth were affected* (with) *probing depths ⩾4 mm and* (the) *amount of clinical attachment loss was consistent with the presence of mineralized plaque*'' (Schulz et al. 2008). In another paper, patients with chronic periodontitis were recruited to the study if they had ''*at least 12 non-molar teeth with ⩾3 non-molar teeth per quadrant with two or more periodontal sites with bleeding on probing and one or more sites with probing depth ⩾6 mm*'' (Hellstrom et al. 2008). In a third paper in the same issue, periodontitis was defined as ''*the presence of at least four sites in different teeth with clinical attachment loss ⩾3 mm*'' (Brito et al. 2008).

To mention these three specific articles (which all had very different aims) is not to criticize them, and indeed, most periodontal researchers would admit that they too have used non-standard criteria for defining disease in their own research studies. Rather, these three articles serve to illustrate that definitions of periodontal disease vary widely in the literature and this renders comparisons between studies impossible and greatly compromises our ability to draw meaningful conclusions from a body of published research. The corollary of this is that meta-analyses of periodontal research studies are compromised as the number of studies that can be included in such analyses is restricted by the different inclusion criteria (and study designs) employed in different research projects.

Another recent publication in the *Journal of Clinical Periodontology* revealed, in a rather startling fashion, the problems caused by the use of different criteria for defining periodontal disease. The authors reanalysed their data from a cohort study of 1296 pregnant women in which they had investigated whether there is an association between periodontitis and the incidence of adverse pregnancy outcomes. The original publication identified a modest association between periodontitis and preterm birth (Agueda et al. 2008). In their secondary analysis of the same data, the authors applied 14 different periodontitis definitions identified from 23 published studies to test for associations with adverse pregnancy outcomes (Manau et al. 2008). Six of the 14 tested definitions of periodontitis resulted in statistically significant associations with adverse pregnancy outcomes in the data set, whereas no significance was found when using the other eight case definitions. The clear implication from this reanalysis is that the association between periodontal disease and pregnancy outcomes is determined by the periodontal disease definition used.

This finding raises concerns regarding the validity of conclusions from publications that have investigated associations between periodontal disease and other systemic conditions. Periodontal diagnostic tools are crude (a blunt metal probe with millimetre increments) and/or indicate a historical perspective (attachment loss and alveolar bone loss). We do not (yet) have the luxury of accurate, precise and reproducible indicators of periodontal disease such as the biochemical parameters commonly used for diagnosis in medical disciplines. However, until such tools do become available to us, we should try to reach consensus on the thresholds used to define a periodontal case in research studies.

The debate is not new. At the 2005 European Workshop on Periodontology, it was recognized that ''it is not possible (in epidemiological studies) to ascertain whether the reported variance in odds ratios or relative risk is because of a varying biological impact of the factor under investigation in different populations or merely reflects the inconsistency in case definitions or thresholds for progression used across studies'' (Tonetti & Claffey 2005). The working group that addressed this issue proposed criteria for a two-level periodontitis case definition: (i) a sensitive case definition including incipient cases (''presence of proximal attachment loss of ⩾3 mm in ⩾2 non-adjacent teeth'') and (ii) a definition to identify only cases with substantial extent and severity of disease (''presence of proximal attachment loss of ⩾5 mm in ⩾30% of teeth present'').

Notwithstanding debate about the merits of these particular criteria, a review of the contemporary periodontal literature reveals that they seem to have been largely ignored.

In 2007, the outcomes of a collaboration between the US Centre for Diseases Control and Prevention (CDC) and the American Academy of Periodontology (AAP) that also addressed this issue were published (Page & Eke 2007). This working group also lamented the extreme variation and lack of uniformity of case definitions for periodontitis in the published literature. They provided two case definitions for use in population-based studies: (i) a case definition for moderate periodontitis (''*two or more interproximal sites with attachment loss* $\geqslant$*4 mm, not on the same tooth, or two or more interproximal sites with probing depths* $\geqslant$*5 mm, not on the same tooth*'') and (ii) a case definition for severe periodontitis (''*two or more interproximal sites with attachment loss* $\geqslant$*6 mm, not on the same tooth, and one or more interproximal sites with probing depth* $\geqslant$*5 mm*''). The CDC/AAP working group publication did not include reference to the 2005 European Workshop case definitions.

It is striking that the moderate and severe case definitions from both the 2005 European Workshop and the 2007 CDC/AAP collaboration are actually quite similar to each other. Perhaps consensus is not beyond our reach! Open discussion is now necessary to firmly establish criteria for defining a periodontitis case in research. The criteria used to assign a diagnosis of periodontitis should be carefully assessed when papers are reviewed before publication, and if inadequate, manuscripts may be rejected. Adoption of such criteria by the editorial boards of journals would certainly improve the quality of published research, though it is recognized that this may be (at this stage) an overly idealistic stance. Nonetheless, we should strive to improve the validity and transferability of information generated in periodontal research studies, and this becomes increasingly important with the recognition of possible links between periodontal and systemic diseases.

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