Can presence or absence of periodontal pathogens distinguish between subjects with chronic and aggressive periodontitis: a systematic review

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Authors' objectives
To assess the diagnostic performance of the presence or absence of specified periodontal microorganisms in distinguishing between chronic periodontitis (ChP) and aggressive periodontitis (AgP).

Searching
MEDLINE was searched; the keywords were stated. The Journal of Dental Research, Journal of Clinical Periodontology, Journal of Periodontal Research and Journal of Periodontology were handsearched from 1990 to July 2001. The reference lists of reports included in the review were checked.

Study selection

Study designs of evaluations included in the review
Cross-sectional and longitudinal studies with at least two cohorts were eligible for inclusion. Studies were subsequently excluded due to inadequate reporting of data at a subject level or lack of specific microbiological data.

Specific interventions included in the review
Studies that reported the presence or absence of any of the following five microorganisms were eligible for inclusion:

- Actinobacillus actinomycetemcomitans (AA) with separate consideration of subtypes with deletion of the leukotoxin promoter gene (leukotoxic variant of AA) or the presence or absence of serotype b;
- Porphyromonas gingivalis (P. gingivalis);
- Prevotella intermedia (P. intermedia);
- Bacteroides forsythus (B. forsythus);
- Campylobacter rectus (C. rectus).

Where reported, the included studies generally used detection levels of 100 to 1,000 and the following detection methods: indirect immunofluorescence, polyclonal antibodies, culture, polymerase chain reaction, DNA-probes, and anaerobic culture. Microbiological data had to be available for at least two cohorts: one with ChP and one with AA.

Reference standard test against which the new test was compared
Studies had to compare the presence or absence of the specified microorganism with a clinical diagnosis of ChP or AgP. The diagnosis of ChP was considered secure if there was documented slow to moderate loss of clinical attachment or bone destruction, and no documented loss of attachment (more than 2 mm) or severe bone destruction before the age of 30 years. The diagnosis of AgP was considered secure if the patients were generally healthy, there was a documented family history, or if before the age of 18 years there was documented rapid loss of attachment (more than 2 mm) in one year, documented rapid bone destruction, or documented severe bone destruction. The review also reported definitions for uncertain and insecure diagnoses of ChP and AgP.

Participants included in the review
Studies of otherwise healthy people with clinically diagnosed ChP or AgP were eligible for inclusion. In most of the included studies, the patients with AgP were reported as having localised or generalised juvenile periodontitis, or early onset periodontitis; patients with ChP were described as having adult periodontitis.

Outcomes assessed in the review
Studies that presented microbiological data from both people with ChP and people with AgP were eligible for inclusion. The presence or absence of the target microorganism had to be evaluated at the participant level. Sensitivity and specificity were reported, and receiver operating characteristic (ROC) diagrams were presented.

How were decisions on the relevance of primary studies made?
Two reviewers independently screened the titles and abstracts; they resolved any disagreements on study inclusion through discussion. Then, three reviewers independently selected studies according to the inclusion criteria. Interreviewer agreement for both stages of the selection process was assessed using the kappa statistic.

Assessment of study quality
The studies were assessed on:

- the independence of the clinical and microbiological assessments (test evaluated in appropriate spectrum of patients, microbiological testing blinded to clinical diagnosis);
- the criteria used for the clinical diagnosis (classified as providing secure, uncertain or insecure diagnoses; definitions provided); and
- the quality of the microbiological data (classified as secure, uncertain, or insecure; definitions provided).

The authors did not state how the papers were assessed for validity, or how many reviewers performed the validity assessment.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

For each study, the numbers of patients diagnosed as AgP positive and negative and ChP positive and negative were presented. Sensitivity and specificity were calculated for each study reporting AA, P. gingivalis or P. intermedia, assuming the clinical diagnosis to be the true diagnosis. Patients diagnosed as not AgP were considered to be ChP.

Methods of synthesis
How were the studies combined?
The study characteristics were summarised with respect to the quality of the clinical diagnosis. The studies were grouped according to the type of microorganism and the results were discussed. The following were estimated:

- the overall percentages of AgP patients and ChP patients that were AA, P. gingivalis or P. intermedia positive or negative;
- the percentages of AA positive patients that were positive for the leukotoxic AA variant and for serotype b AA; and
- the percentage of AA and P. gingivalis positive patients who had been clinically diagnosed as AgP or ChP.

Data on the sensitivity and specificity of AA, P. gingivalis and P. intermedia in diagnosing AgP were plotted for each study on ROC diagrams. The data were not pooled in a meta-analysis. The results for B. forsythus and C. rectus were described in the text.

How were differences between studies investigated?
Differences between studies of AA, P. gingivalis and P. intermedia were illustrated by ROC diagrams of the sensitivity and specificity results for each separate study. Differences between studies of B. forsythus and C. rectus were discussed in the text.
Results of the review
Eleven studies assessed AA (2,038 patients), 2 studies assessed the leukotoxic variant of AA (155 patients), 3 studies assessed the subtype b of AA (381 patients), 7 studies assessed P. gingivalis (401 patients), 6 studies assessed P. intermedia (1,758 patients), 2 studies assessed B. forsythus (83 patients) and 2 studies assessed C. rectus (155 patients).

In the first stage of the study selection process (2 reviewers), inter-reviewer agreement on study inclusion was 0.82. In the final stage (3 reviewers), there was full agreement between the reviewers on studies for inclusion in the review.

Quality of clinical diagnosis: none of the studies reported a secure method of diagnosing AgP. Three studies used an uncertain method of diagnosis, while in the other studies the diagnosis was insecure.

AA: discrimination using the test was poor. The sensitivity ranged from 0.21 (specificity 0.02) to 0.96 (specificity 0.2).

AA leukotoxic variant: not all AgP patients had this variant. The leukotoxic variant was present in about 50% (41 out of 86) of AA positives in one study and in 16% (3 out of 19) patients in the second study.

AA subtype b: the test was unable to discriminate AgP and CgP. About one third of AA positives with either AgP or CgP tested positive for the AA subtype.

P. gingivalis: discrimination using the test was limited. The sensitivity ranged from about 0.5 (specificity about 0 and 0.45) to 1.0 (specificity 1).

P. intermedia: discrimination using the test was poor. The sensitivity ranged from about 0.42 (specificity 0.45) to 0.81 (specificity 0.95).

B. forsythus: no analysis was possible. One study showed more AgP patients were positive for B. forsythus while the other showed the opposite.

C. rectus: no analysis was possible. One study showed more AgP patients were positive for C. rectus while the other showed the opposite.

Authors’ conclusions
The presence or absence of AA, P. gingivalis, P. intermedia, B. forsythus or C. rectus could not distinguish between patients with AgP or CgP.

CRD commentary
The review question was clear in terms of the study design, intervention, participants and outcomes. Several relevant sources were searched and the search terms were stated, but it was not stated whether any language restrictions had been applied. No attempt was made to locate unpublished studies, thus raising the possibility of publication bias. More than one reviewer independently selected the studies and this reduced the potential for bias and errors. The methods used to assess validity and extract the data were not described; hence, the efforts made to reduce errors and bias cannot be judged. Validity was assessed using three defined criteria, but the results were only reported for the quality of the clinical diagnosis. None of the studies appeared to use adequate methods to diagnose the patients clinically, suggesting that the studies were of poor quality and, therefore, that any evidence was of limited validity. Given the considerable differences in results between the studies, plotting sensitivity and specificity on ROC diagrams seemed an appropriate method of summarising the data and provided support for the authors’ conclusions.

Implications of the review for practice and research
The authors did not state any implications for practice or further research.

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