# Mandibular dysfunction and periodontitis

## A comparative study of patients with periodontal disease and occlusal parafunctions

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Fifty-one patients (mean age, 47.3 years) with moderate to severe periodontal disease and 40 patients (mean age, 48.9 years) with symptoms related to bruxism (occlusal parafunctions such as grinding and/or clenching of the teeth) were compared with regard to periodontal conditions and signs and symptoms of mandibular dysfunction. The bruxists reported more symptoms of pain and dysfunction of the masticatory system than the periodontal patients. The clinical dysfunction index was significantly higher among the bruxists, while there was a similarity between the groups in the variation of occlusal conditions, except for occlusal wear, which was more pronounced in the bruxist group. Attrition was in general positively correlated to alveolar bone height. This correlation was stronger (and statistically significant) for the canines than for other teeth. Attrition was negatively correlated to tooth mobility. It is concluded that patients with moderate to severe periodontal disease and patients with bruxism/occlusal parafunctions are distinctly different with regard to signs and symptoms of mandibular dysfunction. The results support the opinions that there is no or only weak correlation between periodontal disease and bruxism, and between bruxism and occlusal status. □ *Attrition; bruxism; periodontal status; temporomandibular joint syndrome*

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It is generally accepted that the etiology of mandibular dysfunction is multifactorial, but muscular hyperactivity is particularly important (1, 2). The possible relationship between bruxism and periodontal conditions has been extensively discussed in the dental literature. Karolyi (3), at the very beginning of this century, was probably the first to postulate that nocturnal hyperactivity of the masseter muscles might be a main factor in the etiology of periodontal disease ('pyorrhea alveolaris'). After that, numerous clinical investigations and experimental studies have been performed to analyze the correlations among bruxism, trauma from occlusion, and periodontal lesions, but the interpretations and conclusions of the findings have differed widely. It is no exaggeration to say that this issue, especially with regard to clinical significance, continues to be highly controversial in the literature and among clinicians in the middle of the 1980s (for review, see Refs. 4–8). There are also divergent concepts with regard to the role of occlusal factors in bruxism and in periodontal disease (1, 5). The prevailing controversies in this field indicate that more clinically oriented research should be performed.

The aim of the present study was, therefore, to examine two groups of patients, one with periodontal disease and another one with functional disturbances of the masticatory system, using current methods and criteria for diagnoses of periodontal and occlusal conditions and mandibular dysfunction. The hypothesis was that such patients represent two different groups with regard to periodontal conditions and signs and symptoms of mandibular dysfunction. In this paper, findings related to periodontal disease and mandibular dysfunction will be reported, whereas periodontal con-

ditions and bruxism have been presented elsewhere (9).

## Materials and methods

Patients referred to the Department of Periodontology and Stomatognathic Physiology, University of Gothenburg, were selected for this investigation in accordance with the following criteria.

1. General characteristics: a) Patients with at least 10 natural teeth in each jaw without removable dentures and cross-arch bridges; b) Age: 40–65 years old.

2. Patients referred to the Department of Periodontology for treatment of moderate to severe periodontal disease.

3. Patients referred to the Department of Stomatognathic Physiology, diagnosed as having occlusal parafunctions, which was certified by extensive dental wear, awareness of bruxism or other parafunction, combined with manifest signs and symptoms related to grinding and clenching of the teeth or other occlusal habits. Patients with signs and symptoms probably more related to temporomandibular joint (TMJ) disorders than to occlusal parafunction were not included.

Fifty-one patients (26 men, 25 women) with a mean age of 47.3 years from the Department of Periodontology (perio group) and 40 patients (19 men, 21 women) with a mean age of 48.9 years from the Department of Stomatognathic Physiology (bruxism group) were selected in accordance with the above-mentioned criteria. The perio group showed significantly more marginal alveolar bone loss, probing attachment loss, and tooth mobility than the bruxism group (9). The examination included the following assessments:

### *Questionnaire*

A questionnaire was used to collect information about general health status, symptoms of mandibular dysfunction, occlusal parafunction, oral comfort, and chewing ability.

### *Radiographic examination*

The height of the proximal alveolar bone of each tooth was assessed in radiographs as a percentage of the root length (9).

### *Clinical examination*

The clinical examination comprised a general oral examination and a special examination of periodontal conditions, dental wear, and functional state of the masticatory system.

### *Dental wear*

Attrition was recorded for each tooth in accordance with the following scale: 0 = no visible wear; 1 = wear of enamel only; 2 = wear exposing a dentine area $<1 \times 2$ mm; 3 = wear exposing a dentine area $>1 \times 2$ mm.

### *Functional status of the masticatory system*

The examination included palpation of muscles and TM joints and assessment of mandibular mobility for signs of mandibular dysfunction, in accordance with routine procedures used at the Department of Stomatognathic Physiology (10, 11). The observations were used to record the clinical dysfunction index (Di) in accordance with Helkimo (12).

Occlusal factors were recorded with routine procedures as described in detail previously (13).

All clinical examinations were performed by the two first authors (F. Houston and H. Hanamura).

### *Statistical methods*

Statistical analysis of the differences between the two groups have been performed with Pitman's permutation test, a non-parametric statistical method (14). Correlation between variables have been analyzed by means of Spearman's rank correlation test, $r_s$ (15). The following denotations have been used for levels of statistical differences: *** $p < 0.001$; ** $0.001 > p < 0.01$; * $0.01 > p < 0.05$; NS = non-significant.

Table 1. Percentage distribution of symptoms reported by 51 patients with periodontal disease and by 40 bruxism patients who were asked to mark all current alternatives on a list of 12 symptoms

| | Periodontal patients | Bruxism patients | Statistical differences |
|---|---|---|---|
| 1. Pain in face and jaws | 2 | 30 | *** |
| 2. Pain on movement of mandible | 0 | 10 | NS |
| 3. Difficulties in opening the mouth wide | 0 | 28 | *** |
| 4. Chewing difficulties | 6 | 8 | NS |
| 5. Locking or dislocation of mandible | 6 | 8 | NS |
| 6. Clicking of TMJ | 29 | 35 | NS |
| 7. Crepitation of TMJ | 2 | 13 | NS |
| 8. Feeling of fatigue in jaws or cheeks | 8 | 33 | ** |
| 9. Headache | 15 | 48 | ** |
| 10. Clenching of teeth | 15 | 50 | *** |
| 11. Grinding of teeth | 13 | 35 | * |
| 12. Extensive wear of teeth | 8 | 20 | NS |

## Results

### *Questionnaire*

The bruxism group reported symptoms of pain and dysfunction of the masticatory system more frequently than the perio group (Table 1). This was also true for headache and awareness of occlusal parafunctions. However, TMJ sounds and locking or dislocation of the TMJ were as frequent in the perio as in the bruxism group. The patients' own evaluation of the pain-dysfunction symptoms differed significantly ($p < 0.001$) between the groups, with greater severity among the bruxists (Fig. 1). The perio patients considered their general health as good more often than the bruxists (Table 2). The question whether one or both sides were used in chewing was answered similarly by the two groups; about one-third said both sides, a few did not know, and the others preferred the right or left side.

Table 2. Percentage distribution of self-assessed general state of health in 51 patients with periodontal disease and in 40 patients with bruxism

| | Periodontal patients | | Bruxism patients |
|---|---|---|---|
| 1. Good | 79 | | 64 |
| 2. Not so good | 8 | | 21 |
| 3. Bad | 4 | | 13 |
| 4. Do not know | 0 | | 3 |
| 5. No answer | 8 | | 0 |
| Statistical difference | | ** | |

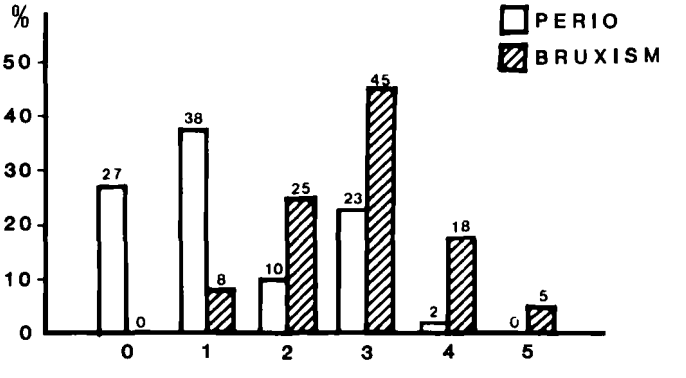


Fig. 1. Percentage distribution of self-evaluated severity of mandibular dysfunction in 51 periodontal disease and 40 bruxism patients. 0 = no problems; 1 = negligible; 2 = mild; 3 = moderate; 4 = severe; 5 = very severe ($p < 0.001$).

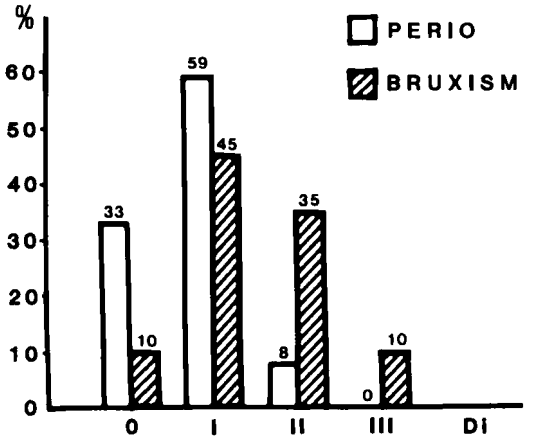


Fig. 2. Percentage distribution of 51 periodontal disease and 40 bruxism patients in accordance with Helkimo's clinical dysfunction index (Di) ($p < 0.001$).

*Clinical examination*

The clinical dysfunction index of Helkimo differed significantly ($p < 0.001$) between the groups (Fig. 2); 45% of the bruxists and only 8% of the perio patients were classified as having moderate or severe dysfunction (Di II + III). These differences in signs of clinical dysfunction were especially found with regard to muscle tenderness on palpation and pain on mandibular movements (Table 3). The maximum mouth opening did not differ between the groups: the perio patients had a mean value of 44.9 mm (maximum, 61 mm; minimum, 35 mm) and the bruxists 44.1 mm (maximum, 62 mm; minimum, 28 mm).

Occlusal conditions did not differ significantly between the groups. The distance between the retruded contact position (RCP) and the intercuspal position (IP), registered by direct visual inspection, was generally small in sagittal, vertical, and lateral direction. More than 90% of the patients in both groups had a distance of 0–1 mm in vertical and sagittal direction and 0–0.5 mm in lateral direction. Only one bruxist showed a distance of more than 2 mm sagittally and more than 1 mm laterally. The mean overbite was 3.3 mm in the perio patients and 3.2 mm in the bruxists. The mean overjet was 3.6 mm in the perio patients and 3.2 mm in the bruxist group.

The distribution and types of occlusal contact in lateral and protrusive excursions differed markedly among the patients (Tables 4 and 5). There was, however, no statistically significant difference between the groups. Instead, the occlusal pattern seemed to vary equally in the two groups.

The distribution of missing teeth was similar in both groups (Fig. 3), whereas attri-

Table 3. Percentage distribution of the 51 patients with periodontal disease and the 40 patients with bruxism in accordance with degree of clinical dysfunction in accordance with Helkimo (12)

| | Clinical dysfunction score | | | Statistical difference |
|---|---|---|---|---|
| | 0 | 1 | 5 | |
| Impaired range of mandibular movement | | | | |
| Periodontal patients | 71 | 27 | 2 | NS |
| Bruxism patients | 58 | 40 | 3 | |
| Impaired function of TMJ | | | | |
| Periodontal patients | 63 | 37 | 0 | NS |
| Bruxism patients | 60 | 38 | 3 | |
| Muscle pain on palpation | | | | |
| Periodontal patients | 75 | 20 | 6 | *** |
| Bruxism patients | 30 | 38 | 33 | |
| TMJ pain on palpation | | | | |
| Periodontal patients | 94 | 6 | 0 | NS |
| Bruxism patients | 83 | 18 | 0 | |
| Pain on movement of the mandible | | | | |
| Periodontal patients | 90 | 10 | 0 | *** |
| Bruxism patients | 65 | 18 | 18 | |

Table 4. Percentage distribution of the 51 patients with periodontal disease and 40 bruxism patients in accordance with type of occlusal contacts in laterotrusion 3 mm from IP

| | Right side | | Left side | |
|---|---|---|---|---|
| | Periodontal | Bruxism | Periodontal | Bruxism |
| Group function | | | | |
| Incisors, cuspid and at least one premolar or molar | 20 | 23 | 18 | 25 |
| Anterior teeth only | 20 | 15 | 6 | 15 |
| Posterior teeth only | 0 | 8 | 2 | 3 |
| Canine protection | 21 | 18 | 19 | 8 |
| Single tooth contact | | | | |
| Anterior tooth | 4 | 0 | 4 | 0 |
| Posterior tooth | 4 | 3 | 2 | 3 |
| Bilateral tooth contacts | 24 | 26 | 37 | 43 |
| Non-working side contacts only | 4 | 8 | 6 | 3 |
| Other | 4 | 0 | 6 | 0 |
| Statistical difference | NS | | NS | |

Table 5. Percentage distribution of the 51 patients with periodontal disease and 40 bruxism patients in accordance with type of occlusal contacts in protrusion 3 mm from IP

| | Periodontal | Bruxism |
|---|---|---|
| Bilateral contacts | | |
| On incisors/canines | 33 | 37 |
| On premolars/molars | 15 | 13 |
| Unilateral contacts | | |
| On incisors/canines | 21 | 18 |
| On premolars/molars | 19 | 13 |
| Other | 13 | 20 |
| Statistical difference | NS | |

tion was significantly ($p < 0.01$) more pronounced in the bruxism group (Table 6). For all canines attrition showed a significantly positive correlation to bone height, whereas the coefficients were low and insignificant for the other teeth (Table 7). The relationship between attrition and tooth mobility was negative and was greater for canines than for the other teeth.

Table 6. Frequency distribution (%) of teeth with different extent of attrition in the group with periodontal disease ($n = 1070$) and the bruxism group ($n = 782$)

| Degree | Periodontal group | Bruxism group |
|---|---|---|
| 0 | 11.7 | 4.6 |
| 1 | 27.4 | 26.6 |
| 2 | 32.3 | 31.6 |
| 3 | 28.6 | 37.2 |
| | $p < 0.01$ | |

## Discussion

The patients investigated in this study represent two distinctly separate groups with regard to periodontal conditions and signs and symptoms of mandibular dysfunction, respectively. The frequencies of reported symptoms of mandibular dysfunction in the perio patients are similar to figures presented in epidemiologic studies, whereas those in the bruxism patients corroborate data from

Table 7. Correlation ($r_s$) for individual teeth (in the upper right quadrant and the canines) between attrition and bone height (A) and between attrition and mobility (B)

| Tooth number | A | B |
|---|---|---|
| 17 | 0.11 | −0.18 |
| 16 | −0.11 | −0.15 |
| 15 | 0.06 | −0.11 |
| 14 | 0.16 | −0.17 |
| 13 | 0.38*** | −0.25 |
| 12 | −0.04 | −0.08 |
| 11 | 0.14 | −0.26 |
| 23 | 0.22* | −0.27* |
| 33 | 0.29** | −0.23 |
| 43 | 0.30** | −0.17 |

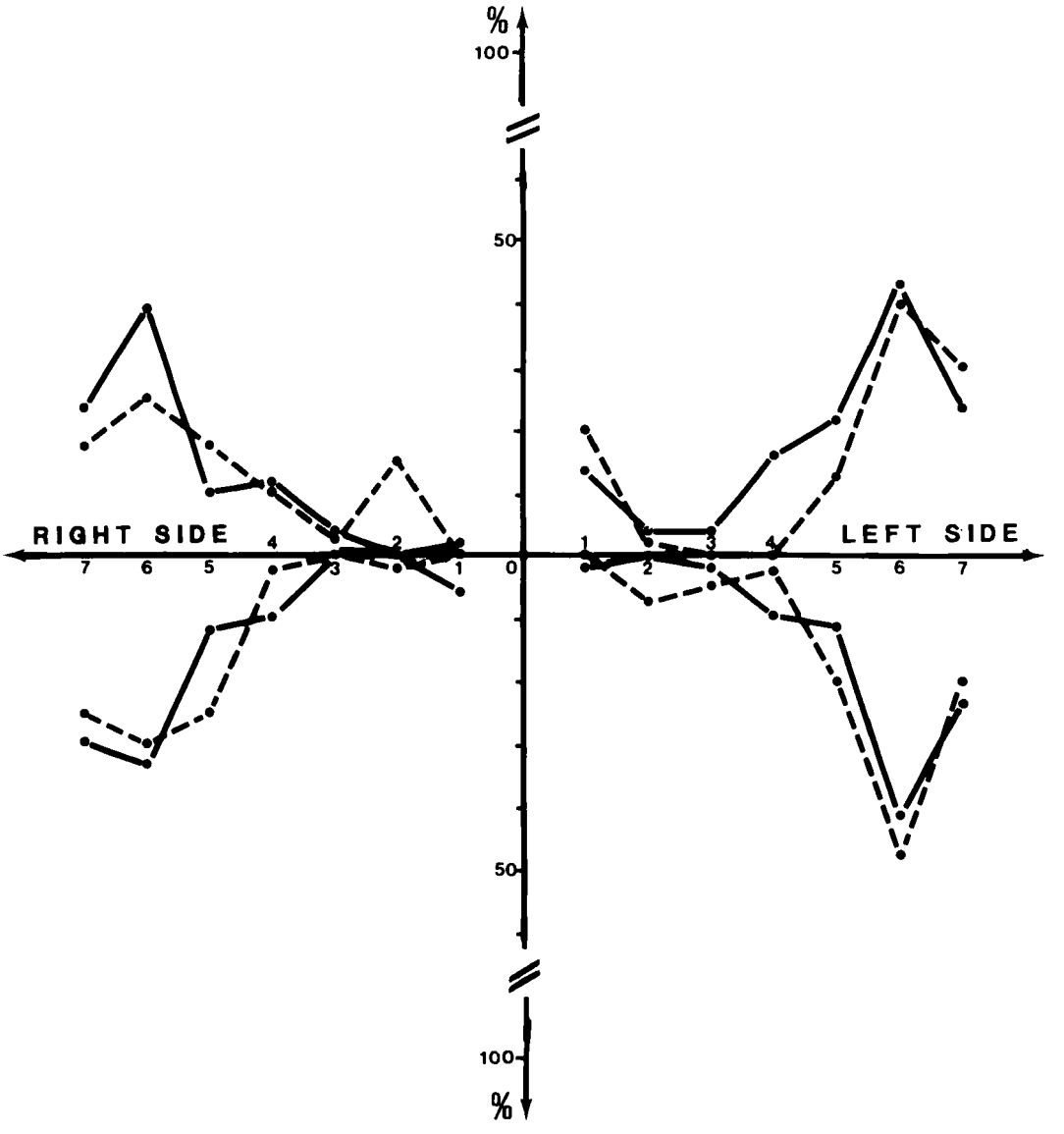


Fig. 3. The distribution of missing teeth in 51 periodontal disease (unbroken line) and 40 bruxism (broken line) patients. Note the similarity between the groups.

clinical studies (16, 17). Even though single dysfunction symptoms were reported by some of the perio patients, they did not consider them so severe that they had requested treatment. The different severities of dysfunction were also evident in the clinical examination, and only a few perio patients were assessed to have a moderate (and none a severe) degree of clinical dysfunction by Helkimo's index (Fig. 2). There was, however, an obvious similarity between the groups with regard to such occlusal conditions as number of teeth, overjet and overbite, the relation between RCP and IP, and occlusal contacts in these positions and in excursive movements. Only with regard to occlusal wear did the bruxists have more pronounced changes than the perio patients.

The perio patients had in general no severe signs and symptoms of mandibular dys-

function and no demand and very little need for treatment for such problems. It should be emphasized then that clicking and locking of the TMJ, when not associated with other signs of pain and dysfunction, are benign findings that should not be dramatized (17–19). The frequencies of clicking and locking of the TMJ were similar in the two groups, but in the bruxists these findings were often associated with pain and dysfunction, making them functional problems for some patients. However, even then the long-term prognosis has been shown to be good (20).

It has been shown that bruxists develop more tooth contacts of longer duration and greater forces than controls (21). The bruxists had more dental wear and better periodontal conditions (9) than the perio patients in this study. Bruxism was thus correlated with dental wear but not with periodontal disease. This finding corroborates the statement that 'trauma from occlusion cannot induce periodontal tissue breakdown' (7). Periodontal mechanoreceptors seem to serve a powerful feedback system that is important during both function and dysfunction of the masticatory system (22–23). According to such neurophysiological studies, it is logical to expect less bruxism in patients with loss of periodontal structures and thus a possible handicap of periodontal-mechanoreceptor function. The results of this study seem to corroborate such a hypothesis, and they contradict suggestions that periodontal disease may initiate bruxism (24).

The opinion that bruxism is associated with occlusal factors, especially so-called occlusal interferences, has often been expressed in the dental literature (5, 6). There is no support for this concept in this study, as the occlusal conditions varied similarly in the two groups. A recent literature survey also concluded that occlusal factors are only weakly or not at all associated with prevalence and intensity of bruxism (25). Nor were occlusal disturbances significantly associated with the periodontal status in the two groups. Similar results have recently been reported from a study of the relationship between occlusal factors and periodontal status in 66 adults (26). No significant deleterious influence of occlusal disharmonies on the periodontium was found.

This study supports the following conclusions: Patients with moderate to severe periodontal disease in the present study had signs and symptoms of mandibular dysfunction to a lesser extent than patients with bruxism/occlusal parafunctions. This is in spite of the fact that the number of teeth and occlusal conditions varied similarly in the two groups.

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