Mandibular Anterior Crowding and Periodontal Disease

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A short-term longitudinal study of the role of mandibular anterior crowding in inflammatory periodontal diseases. Crowded dentitions show more periodontal involvement, and the improvement after scaling disappears more rapidly.

KEY WORDS: • Crowding • Gingivitis • Malocclusion • • Periodontal Disease • Plaque •

Periodontal disease is not a single pathologic entity. It is a term describing a number of inflammatory and degenerative diseases which affect the supporting structures of the teeth.

The relationship between dental crowding and inflammatory periodontal diseases is complex, with much apparently conflicting evidence (Smith 1947, Poulton and Aaronson 1961, Beagrie and James 1962, Geiger 1962, Gould and Picton 1966, Alexander and Tipnis 1970, Ainamo 1972, Buckley 1972, Sandali 1973, Geiger et al. 1974, Geiger and Wasserman 1976, Buckley 1980, Waerhaug 1980, Buckley 1981, and Proffit and Ackerman 1985). These conflicts are at least partly due to the multitude of variables, such as individual differences in motivational patterns for oral hygiene maintenance (El-Mangoury 1981), age range and sex of the subjects, oral regions affected (maxillary versus mandibular, anterior versus posterior), systemic health conditions, experimental designs, application of statistics, and different diagnostic criteria.

Unfortunately, many periodontists, and some orthodontists, believe that orthodontic treatment is done primarily for esthetic or empirical reasons. The purpose

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of the present study is to evaluate the role of mandibular anterior crowding in the etiology of inflammatory periodontal diseases.

The following research hypotheses were formulated for experimental testing:

Hypothesis 1

The plaque index of the crowded group is greater than that of the normal group.

Hypothesis 2

The gingival index of the crowded group is greater than that of the normal group.

— Materials and Methods —

The sample consisted of two groups, one with crowding and one without. The crowded sample was made up of 30 adult male subjects with Angle Class I malocclusion (ANGLE 1899); all exhibited mandibular anterior crowding. The uncrowded sample consisted of 30 adult male subjects with normal occlusion (GRABER 1972). A histogram showing the distribution of crowding throughout the entire sample is shown in Fig. 1.

Criteria for selection of subjects included:

1 Male
2 Age 20—24 years
3 Caucasian ethnic origin
4 Middle socioeconomic class
5 No previous history of orthodontic treatment
6 Absence of known systemic disease
7 Normal nose breathing (no habitual mouthbreathing)
8 Presence of a full complement of permanent dentition through the second molars
9 Presence of Angle Class I malocclusion with >4mm of mandibular anterior crowding for the crowded sample, normal occlusion for the uncrowded sample.

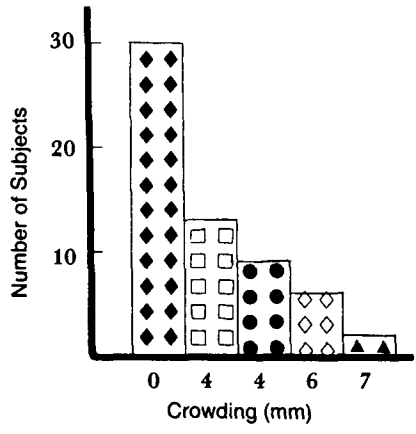

Fig. 1 Crowding histogram

Orthodontic casts were made from alginate impressions. The degree of mandibular anterior crowding was determined from the casts by measuring the combined mesiodistal widths of the mandibular incisors and cuspids and subtracting the space available for those teeth. The crowding score was independently determined by two orthodontists, resolving any discrepancies by discussion.

The plaque index (SILNESS AND LÖE 1964, AND LÖE 1967) and the gingival index (LÖE AND SILNESS 1963, AND LÖE 1967) were scored for the mandibular incisors and cuspids. This was followed by supragingival scaling, subgingival scaling, and subgingival curettage. The subjects were instructed not to change their oral hygiene habits.

The scoring was repeated three times after the periodontal treatment — one week posttreatment, two weeks posttreatment, and four weeks posttreatment. The plaque and gingival indices as well as the scaling and curettage were performed by a periodontist.

Neither the periodontist nor the subjects were told about the real purpose of this study under the double-blind quasi-

experimental research design (KENNEDY AND UPHOFF 1939, AND STANTON AND BAKER 1942).

The Mann-Whitney U test (MANN AND WHITNEY 1947) was used to analyze the data. The basic assumptions for this test were:

- The parent populations are infinite and continuous.
- The crowding score is measured on a ratio scale.
- The plaque index and the gingival index are measured on an ordinal scale.
- Two independent groups of data are present.

— Results and Discussion —

Results are summarized in Tables 1 and 2.

A few methodological aspects should be clarified before entering into discussion of the actual results. The sample was restricted to male subjects to avoid sex differences in general and fluctuating hormone levels in particular. A double-blind quasi-experimental research design was used to minimize the possibility of false significant results, and a nonparametric statistical test was employed

Table 1

Plaque and Gingival Indexes
Significance level between the normal and crowded groups
as determined by the Mann-Whitney U test

Index	Pretreatment	1 Week Posttreatment	2 Weeks Posttreatment	4 Weeks Posttreatment
Plaque	0.01	N.S.	N.S.	0.05
Gingival	0.05	N.S.	N.S.	N.S.

Table 2

Plaque and Gingival Indexes
After the Application of Pretreatment Baseline Data
Significance level between the normal and crowded groups
as obtained by the Mann-Whitney U test

Index	Pretreatment Minus 1wk posttreatment	Pretreatment Minus 2wks posttreatment	Pretreatment Minus 4wks posttreatment
Plaque	N.S.	N.S.	0.001
Gingival	N.S.	N.S.	0.05

because ordinal scale data were being used (STEVENS 1946, AND SIEGEL 1957).

Table 1 shows that the pretreatment plaque index of the crowded group is significantly greater than that of the normal group at a significance level of 0.01. Further, the pretreatment gingival index of the crowded group is significantly greater than that of the normal group at a 0.05 level of significance.

These findings are in agreement with SMITH (1947), POULTON AND AARONSON (1961), AINAMO (1972), BUCKLEY (1972, 1980 AND 1981), SANDALI (1973), AND WAERHAUG (1980). SMITH (1947) indicated that undesirable tooth position obviously perpetuates, exaggerates, and perhaps even causes periodontal pathosis. POULTON AND AARONSON (1961) noted a correlation between crowding and periodontal status. AINAMO (1972) found a small but convincing correlation between malalignment of the teeth and the loss of periodontal attachment. In a similar vein, BUCKLEY (1972) found a small but significant relationship between the crowding of mandibular incisors and periodontal disease.

SANDALI (1973) observed that the irregularities of the teeth, particularly in the lower labial segment, have deleterious effects on the periodontium.

BUCKLEY (1980) noted that, when the amount of plaque is low and when gingivitis is minimum, a statistically significant relationship was found between irregular teeth, plaque, and gingivitis.

WAERHAUG (1980) concluded that the eruption of the teeth into a crowded environment predisposes to premature loss of attachment on the adjacent teeth as well as downward progression of subgingival plaque, which causes even more damage. BUCKLEY (1981) reconfirmed his previous studies, emphasizing the significant correlation between crowding, plaque, and gingivitis.

On the other hand, the above-mentioned findings are in disagreement with BEAGRIE AND JAMES (1962), GEIGER (1962), GOULD AND PICTON (1966), ALEXANDER AND TIPNIS (1970), GEIGER ET AL. (1974), GEIGER AND WASSERMAN (1976), AND PROFFIT AND ACKERMAN (1985).

It must be noted that many of these studies used a combination of gingival inflammation, pocket depth, and tooth mobility to measure the periodontal status. However, there are no consistent correlations among those different pathologic changes (WASSERMAN ET AL. 1973), so combining them into a single measure of periodontal disease is of questionable validity in seeking the effects of a specific malocclusion on the periodontium.

Further, in many of these studies the term "irregularity of the teeth" was employed to designate crowding, spacing, rotation, depression, elongation, etc. In the present study, only the mandibular anterior crowding aspect of the malocclusion was investigated.

The age range of the sample is also very important. The strong inclination toward gingivitis in 12yr-old individuals, and toward periodontitis in the later adult years, may obscure any possible relationship with a specific malocclusion in subjects in those age groups.

Table 1 shows that the plaque index one and two weeks posttreatment, as well as the gingival index one, two, and four weeks posttreatment, were not significantly different between the normal and crowded groups. The reason might be the transient improvement of oral health in both groups following the scaling and the subgingival curettage; however, the four-week plaque index showed a difference between the crowded and normal groups at a significance level of 0.05.

Thus, in the present longitudinal study, the plaque index tended to return to its pretreatment value much faster in the crowded group than in the normal group.

Table 2 presents significance levels for the changes in plaque and gingival

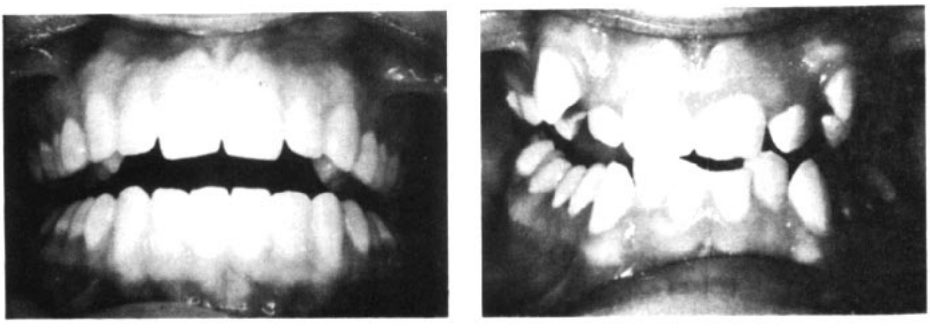

Fig. 2
Left, **Normal occlusion** *Right,* **Mandibular anterior crowding**
Note the appearance of the gingiva

indexes, after adjustment for pretreatment baseline levels. Differences between the crowded and normal groups were highly significant 4wks after the initial treatment

This longitudinal study suggests that crowding in the anterior region of the mandibular arch is a predisposing factor for the initiation and progression of periodontal pathosis. The direct cause of this difference may be conjectured to be the difficulty of oral hygiene, or the improper proximal contacts (Fig. 2).

Difficulty in maintaining oral hygiene can result in a greater accumulation of the dental plaque which is considered a primary etiologic agent in inflammatory periodontal disease. Improper proximal contact leads to narrowing of embrasures and disruption of the periodontal-disease-susceptible "col." This leads to gingivitis, periodontitis, and possibly pathologic tooth migration.

The progressive nature of these conditions presents a valid indication for the orthodontic elimination of mandibular anterior crowding as an integral part of preventive periodontics. It is the Authors' belief that "unraveling" crowded anterior teeth orthodontically improves the patient's periodontal status as well as the more noticeable dentofacial esthetics.

Nevertheless, it must be emphasized that orthodontic care is not a panacea for periodontal problems. Further studies are needed. Furthermore, it is fundamental that statistical interpretations of experimental results never "confirm" or "prove" a theory. Rather, the successful theory is tested and escapes being "disconfirmed" (CAMPBELL AND STANLEY 1966). The present results are no exception.

The next logical step in an investigation such as this would be to repeat it after orthodontic correction of the crowding, but the logistics of such an undertaking have precluded such an effort thus far.

— Summary and Conclusions —

Sixty adult male nonorthodontic subjects were studied. The sample was composed of a crowded group (Angle Class I malocclusion with mandibular anterior crowding), and a normal occlusion group. Each group contained thirty subjects. Supragingival scaling, subgingival scaling, and subgingival curettage were done as required, and plaque and gingival indexes were scored before treatment and 1, 2, and 4 weeks after.

On the basis of these results, the following conclusions could be drawn:

- The gingival index is higher in the presence of crowding.
- The plaque index tends to return to its original pretreatment value much faster in a crowded lower anterior segment.

A/O

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