

Occlusal imbalance and temporomandibular disorders in the elderly

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The prevalence of the anamnestic symptoms and clinical signs of temporomandibular disorders (TMD) in 76-, 81-, and 86-year-old subjects was studied, on the basis of Helkimo's anamnestic (Ai) and clinical (Di) dysfunction indexes. Occlusal status was recorded by means of the Eichner index: class A has a maximum of four supporting zones (minimum of one tooth contact between the antagonist jaws in the premolar and molar region on each side), class B has one to three supporting zones or tooth contact in the frontal area only, and class C has no supporting zones. The Eichner index was recorded with two kinds of variations: supporting zones with and without removable prostheses. In the population studied 8% were classified as Eichner class A, 22% as class B, and 70% as class C. Including occlusal supporting zones of the removable dentures, the percentages were 75% in Eichner class A, 21% in class B and 4% in class C. When the groups with and without removable prostheses were compared, no differences were found in the Ai or Di. In conclusion, among the elderly population the severity of TMD does not depend on the supporting zones of the dentition alone, and removable prostheses do not relieve the problem. □ *Aged people; craniomandibular disorders; dental occlusion*

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Knowledge about the relationship between the occlusal state and functional disorders is unclear and controversial. The need to replace all missing teeth to unload the joints (1, 2) and to prevent temporomandibular disorders (TMD) has been discussed (3). Contradictory results have been reported in studies concerning the relation between posterior support and signs and symptoms of TMD. Different methods have been used to study and classify dental occlusion. Käyser (4) utilized occlusal units (OU)—that is, pairs of occluding posterior teeth, 1 molar unit being considered equal to 2 premolar units—and recognized six classes of shortened dental arches. Gordon et al. (5) used 'good' or 'bad' quadrants depending on tooth contacts, and Österberg & Landt (6, 7) used the Eichner index. The Eichner index has also been found to serve as an indicator of the deterioration of dental state and the condition of the remaining teeth and to be a good classification of degree of functional dental incapacity in epidemiologic studies (8, 9). Österberg & Landt created a method for utilizing the Eichner index also with removable dentures (7). Their modified Eichner index helps to distinguish between subjects with and without dentures. Although all these recording systems are acceptable, comparison of various findings has been problematic.

The traditional belief has been that TMD increases both with aging and with loss of natural teeth (10). However, recent studies have shown that the prevalence of TMD decreases in older age groups (11–13). It is therefore reasonable to examine also the effect of different occlusal situations on TMD.

All types of dental status are represented in TMD patients (14), and a weak correlation between occlusal

status and dysfunction of the masticatory system has been reported by Österberg & Carlsson (15). Moreover, Pullinger et al. (16) discovered a positive correlation between TMD and lack of molar contacts. In Käyser's studies (4) the correlation was positive only when the dental arch was strongly reduced; likewise, in elderly subjects there was also a positive correlation between degree of dysfunction and loss of zones with support from natural teeth (17). Recently, Witter et al. (18) concluded that the absence of molar support is not a risk factor for TMD and that free-end removable dentures in the lower jaw do not prevent but rather increase the number of signs and symptoms of TMD.

The perception that old age is inevitably accompanied by tooth loss is no longer correct, the mean number of retained natural teeth being on the increase. Of 70-year-olds in a Swedish study in 1983, 9% of the men and 5% of the women had occlusal contacts in all four support zones in their natural dentition, whereas those without tooth contacts comprised 68% of the men and 75% of the women (9). Seven years later, in the study by Österberg et al. in Sweden (8), nearly 10% of the 70-year-olds had tooth contacts in all four supporting zones. In the United Kingdom in 1988, 2% of the more-than-65-year-olds had contacts in all four quadrants (5), and 42% had no 'good' quadrants. In The Netherlands in 1993, 13% of the subjects had at least first molars in their natural dentition, and 9% of the subjects had anterior contacts but no occlusal units (19).

The purpose of this study was to test the hypothesis that occlusal imbalance plays a role in the TMD of elderly inhabitants when Helkimo's anamnestic and

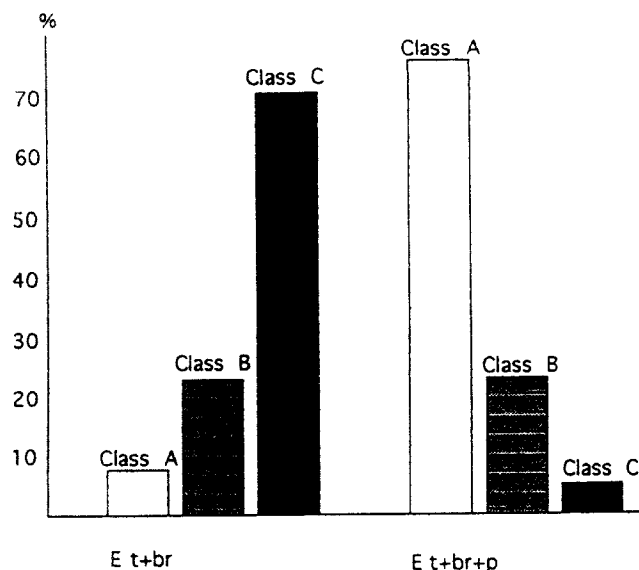


Fig. 1. Distribution (%) of subjects by Eichner classes. E t + br = support zones including contact areas of natural dentition and of fixed constructions; E t + br + p = support zones including contact areas of natural dentition, of fixed and of removable prosthetic constructions.

clinical indices are used to categorize the symptoms and signs of TMD. To obtain a more differentiated and functional distribution of the individuals among different extents of dental incapacitation, the Eichner index was utilized, as previous studies have indicated that it is suitable for this purpose (20).

Materials and methods

This investigation forms a part of a comprehensive medical survey comprising a random sample of subjects born in 1904, 1909, and 1914 (total, 8035), living in Helsinki in January 1989. Between 1989 and 1990, 651 subjects participated in the medical examination. In 1990–91, 600 subjects who were still alive were invited to the Institute of Dentistry, and altogether 364 participated in a comprehensive dental examination.

The participation rates were 69% for men and 58% for women (12).

The clinical dental examination concerning TMD and occlusal status was carried out by four teachers at the Department of Prosthetic Dentistry. The examiners were calibrated to achieve agreement on diagnostic criteria and methods used. During the clinical investigation at least two of the examiners had the opportunity to discuss and clarify with each other the uncertainties in diagnosing.

Symptoms of TMD were assessed on the basis of the anamnestic dysfunction index (Ai) (21). This index is three-graded: Ai 0 = no symptoms; Ai I = mild symptoms such as TMJ sounds, feeling of fatigue, or stiffness of the jaw; and Ai II = severe symptoms such as difficulties in opening the mouth wide, locking or luxations, and pain in the region of the mandible or in the TMJ or masticatory musculature.

The severity of clinical signs of the TMD was assessed as described by Helkimo's clinical dysfunction index (Di) (21). The index is four-graded: Di 0 = no clinical symptoms; Di I = mild dysfunction; Di II = moderate dysfunction; and Di III = severe dysfunction. The clinical dysfunction index is based on the estimation of five signs, each of which is scored as 0–5 points on the basis of the severity of the sign: impaired range of movement, impaired function of the TMJ, TMJ pain, muscle pain, and pain during movement of the mandible. The points were added to make the final gradation. The muscles palpated were the masseter, the temporal, the lateral pterygoid, the medial pterygoid, and the digastricus.

Occlusal status was evaluated by means of the Eichner index (6) and its modification (7). It was recorded for the natural dentition including fixed constructions (E t + br) and for the dentition including the support of the removable dentures (E t + br + p). The Eichner index is based on the occlusal contacts in antagonist jaws. There may be a maximum of four supporting zones. This means that there is a minimum of one tooth in contact between the upper and lower jaw in both the premolar and the molar region on each side. The molar and premolar contacts define the classification: class A contains four support zones, class

Table 1. Distribution (%) of the elderly study group by Eichner classes and by age and gender

Eichner class	Men (n = 102), years				Women (n = 262), years			
	76	81	86	All	76	81	86	All
E t + br								
A	19	6	5	12	6	8	6	7
B	23	21	30	23	29	18	12	21
C	58	73	65	65	65	74	82	72
E t + br + p								
A	75	76	50	71	77	77	75	76
B	19	18	35	21	23	22	18	21
C	6	6	15	8	0	3	7	3

Table 2. Distribution (%) of the elderly ($n = 328$) by anamnestic dysfunction index (Ai)* in Eichner classes

Eichner class							
Ai	E t + br			E t + br + p			All
	A	B	C	A	B	C	
0	64	68	66	66	63	72	66
I	12	13	14	14	16	14	14
II	24	19	20	20	21	14	20
NS							

NS = not significant.

* 36 questionnaires incompletely answered.

B contains one to three support zones or support in the frontal area only, and in class C there are no antagonist contacts in the dentition, although it is possible that a few teeth are left.

The statistical analysis was made with the chi-square test to evaluate group differences in TMD and occlusal status.

Results

In the population studied, 8% were classified as Eichner class A, 22% as class B, and 70% as class C. When the occlusal support of the removable dentures was also included in the Eichner index, 75% were classified as Eichner class A, 21% as class B, and 4% as class C (Fig. 1).

Three per cent of the women and 8% of the men had no occlusal contacts (class C) even when the removable dentures were included in the index (E t + br + p). In the present study 12% of the men and 7% of the women had tooth contacts in all four support zones, whereas 65% of the men and 72% of the women had no contact in their natural dentition (Table 1).

The group of 76-year-olds showed a significant difference between the genders: 6% of the women and 19% of the men had contacts in all four support zones of their natural dentition (class A). Such a difference was not found in the other two older age groups. When the removable dentures were included, only 6% of the 76-

year-old men and none of the women remained without occlusal contacts (class C) (Table 1).

When the groups with (E t + br + p) and without (E t + br) removable prostheses were compared, no difference was found in the anamnestic dysfunction index (Table 2) between sexes or age groups.

In the clinical dysfunction index the difference was not significant either when the occlusal support of the natural teeth was included (E t + br) or when the removable prostheses were included (Table 3). There were no significant differences between the men and women, nor between the age groups.

Discussion

Considering the high age of the present study population, the participation rate was reasonable (22). Age did, however, have an influence on answering the questionnaire, but all unclear answers were evaluated further. Because the clinical examination of TMD is based on oral communication, and 21 subjects were in poor medical condition, some answers were not distinct. The examiner tried to keep the influence as small as possible.

The Eichner classification is generally applicable to epidemiologic studies and has been found to be a suitable instrument for establishing the extent of functional dental incapacity (9). According to Österberg et al. (9) tooth mortality is highest in the molar area,

Table 3. Distribution (%) of the elderly ($n = 343$) by clinical dysfunction index (Di)* in Eichner classes

Di	Eichner class						All
	E t + br			E t + br + p			
	A	B	C	A	B	C	
0 + I	84	82	75	76	79	90	77
II + III	16	18	25	24	21	10	23
<i>n</i>	25	76	242	259	74	10	343
	NS			NS			

NS = not significant.

* Data missing for 21 cases.

followed by the premolar, incisor, and canine areas. The validity of Eichner's classification as a measure of number of teeth and intermaxillary contacts should therefore be considered good. In the present series the index also correlated strongly with the number of teeth and number of tooth contacts. The Eichner index has been found to be related to impaired chewing efficiency and inadequate nutrition (9). In the Göteborg study an association was found between functional impairment of dental health and reduced functional capacity in several organ systems (8). In the present study, as well, the most unfavorable dental state was found in the oldest population group (Table 1).

In 1970 a study of a Swedish population (9) showed similar figures for dental status as those for the present Finnish study. In this respect it seems that Finland is about 20 years behind the dental-health level of Sweden, where dental health care has been subsidized for adults since 1974. In 1990 Nordström reported that in Sweden 6% of the men and 5% of the women had intermaxillary tooth contacts in all four support zones on the basis of Eichner's classification in their eighth decade of life. A complete denture was the most common dentition, and more women (47%) than men (28%) had a complete denture (23). In the present study the findings showed, according to the Eichner index, that women seemed to have a worse occlusal state of dentition than men, but the difference was not statistically significant (Table 1). Three per cent of the women and 8% of the men had no occlusal contacts even when the removable dentures were included. The group of 76-year-olds showed a significant difference between the genders: 6% of the women and 19% of the men had contacts in all four support zones of their natural dentition.

There are few findings as to the relationship between the number of remaining teeth and the frequency of signs and symptoms of the mandibular dysfunction (2, 24–27). In the present study we did not find a correlation between dental status and the dysfunction index. Käyser (4) came to a similar conclusion: the subjects complained about masticatory function when the number of occlusal units was less than four in symmetrically shortened tooth arches and less than six in asymmetrically shortened arches. No correlation was found between temporomandibular joint problems and unilateral chewing (4). This may indicate that the number of supporting zones does not have a uniform effect on the function of the masticatory system. As TMD has a multifactorial origin, this dental variable, being only one of the factors, may be more or less masked by other etiologic components. In Table 3, in which the clinical dysfunction index (Di) is presented, four groups have been combined into two groups: mild and severe signs. This kind of division was found to be reasonable because of the low attendance by the subjects in the group with the worst occlusal status.

One common argument for replacing lost teeth is

that loss has been reported to predispose to the development of osteoarthritis of the TMJ (28). However, other results indicate that free-end removable prostheses do not contribute to the occlusal stability of shortened dental arches (29).

In conclusion, a reduction in the number of supporting zones in the dentition does not have a uniform effect on TMD among the elderly. In view of the importance often attached to stabilization of the mandible against the maxilla (21, 30, 31), the lack of such a uniform effect appears surprising. Perhaps dentists have overemphasized the value of prosthetic constructions in preventing TMD, at least among the elderly population.

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