Occlusal adjustment in patients with craniomandibular disorders including headaches

A 3- and 6-month follow-up

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The aim of this study was to evaluate the therapeutic effect of occlusal adjustment on symptoms and signs of craniomandibular disorders (CMD), including headaches, after 3 and 6 months. Fifty patients were selected and randomly assigned to a treatment (T) or a control (C) group. All patients in the treatment group were subjected to occlusal adjustment, whereas the controls were comforted only. Pre- and post-treatment assessment of subjective symptoms and clinical signs was made by a dentist not performing the occlusal adjustment. There was significant improvement in overall subjective symptoms within the T group at the 3- and 6-month follow-up visits, but a statistically significant difference between groups was found at the 3-month follow-up only. With regard to changes in frequency of facial pain a significant deterioration was reported within the C group, which resulted in a significant difference between groups at the 6-month follow-up. No other significant differences were found within or between groups at the follow-ups with regard to the variables investigated. In conclusion, the results from this study show that occlusal adjustment is a treatment modality with a statistically significant short-term effect on symptoms of CMD of muscular origin and superior to counseling. □ *Dental occlusion; facial pain; temporomandibular joint syndrome; treatment outcome*

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Over the years, occlusal adjustment has been used by the dental profession to improve masticatory function, reduce individual tooth trauma, and protect the temporomandibular joint (TMJ) and muscles from excessive load (1). Different occlusal adjustment procedures have been evaluated, and theories have been put forward to explain the rationale behind occlusal adjustment (2). According to one theory, occlusal adjustment reduces harmful local effects of traumatic occlusion by altering the sensory input at a peripheral level. Another theory is that occlusal adjustment corrects the dysfunction created, because the neuromuscular system controlling jaw movements perceives occlusal disturbances as noxious and adapts and alters the normal pattern of mandibular movement to avoid the harmful tooth contact. Occlusal adjustment has also been suggested to improve neuromuscular function (3). In addition, the placebo effect is a factor to consider (4).

The therapeutic effect of occlusal adjustment has been compared with that of biofeedback training (5), occlusal splint therapy and other stomatognathic treatment modalities (6), and mock equilibration (4, 7). Few controlled clinical studies are available to show the effect of occlusal adjustment on symptoms and signs of craniomandibular disorders (CMD) (8–11).

The aim of this paper was to evaluate the effect of occlusal adjustment on symptoms and signs of CMD including headaches in a single-blind design and with a time perspective of 3–6 months.

Patients and methods

Patients

Sixty-four patients with signs and symptoms of craniomandibular disorders, including headache, were selected among 1980 consecutive patients referred to the Department of Stomatognathic Physiology at the Faculty of Odontology in Malmö from August 1985 to October 1988. The criteria for selection and the age and sex distribution have been presented earlier (11).

The aims and design of the study were described to the patients orally and in writing. The patients were free to reject participation in the study, which had been approved by the Ethics Committee of Lund University. Fifty of sixty-four patients agreed to participate in the study and were randomly allocated to a treatment (T) and a control (C) group. Twenty-five patients, 4 men and 21 women, were assigned to the treatment group, and 25 patients, 2 men and 23 women, to the control group (11).

At a 3-month and a 6-month follow-up, the groups

Table 1. Development of overall subjective symptoms in the treatment (T) and control (C) groups during the follow-up periods

	T group ($n = 25$)				C group ($n = 25$)				
	3-month follow-up		6-month follow-up		3-month follow-up		6-month follow-up		
Completely well	—		1		—		—		
Much better	10		6		6		1		
Somewhat better	6		3		—		5		
Unchanged	3	3^R	5	9^R	10	7^R	3	15^R	
Somewhat worse	2		1		—		1		
Much worse	1		—		2		—		
P	< 0.01		< 0.05		NS		NS		Diff T–C (0–3) $P < 0.01$ Diff T–C (0–6) NS

[R] Indicates number of patients given rescue treatment.

initially comprising 25 patients each had been reduced to 22 and 16, respectively, in the treatment and to 18 and 10, respectively, in the control group. The reason for the reduction was demands from the patients in both groups to receive other kinds of stomatognathic or other treatment. The commonest rescue treatment was splint therapy and occlusal adjustment. Medication, physiotherapy, and biofeedback training were other kinds of additional treatment. Some patients consulted physicians, and in a few cases even paramedical therapies were tried. The representativeness of the patients in the T group (16) and C group (10) at the 6-month follow-up was tested against the dropouts in the two groups with regard to the initial values of the following variables: age, duration of headache and/or facial pain, frequency of headache, frequency of facial pain, intensity of pain (VAS), maximal opening capacity, number of tender muscles, and dysfunction score. There were no statistically significant differences in pre-treatment values of the investigated variables between the remaining patients and the dropouts.

Methods

This study comprised three visits: before treatment (I) and 3 months (II) and 6 months (III) after treatment and included assessment of subjective symptoms and clinical signs at each visit.

The subjective symptoms and clinical findings were assessed in accordance with a standardized examination protocol (11) by an observer who did not know to which group the patient had been assigned and who was not involved in the performance of the treatment. At the post-treatment visits the patients were asked about changes in the severity of their subjective symptoms. These changes were expressed by means of a 6-stage scale: symptom-free (0), much better (1), slightly better (2), unchanged (3), slightly worse (4), and much worse (5). Self-assessment of pain intensity was made at each visit, pre- and post-treatment, on a visual analogue scale of 100 mm (VAS) with the end points representing negligible and unbearable pain, respectively (12).

The severity of clinical signs was estimated with the clinical dysfunction score of Helkimo (13).

Treatment

Occlusal adjustment was given to the T group in accordance with principles described earlier—that is, bilateral occlusal contacts in the retruded contact position (RCP), no lateral slide between RCP and intercuspal position (IP), canine guidance alone or in group function on the working side with no balancing side interference on the mediotrusion side during lateral movements, and, finally, no predominant posterior contacts during protrusive movements (11).

Statistics

Changes in subjective symptoms and clinical findings between the initial visit and follow-ups were tested for significance with the paired *t* test for variables measured on a ratio scale and the Wilcoxon matched-pairs signed rank test for variables measured on an ordinal scale. Differences in treatment effects between groups were tested with the *t* test and the chi-square or median test (14). *P* values are given when statistical significance reached a level of $P < 0.05$.

Results

At the 3-month follow-up, improvement of subjective symptoms was reported by 16 of 25 patients (64%) in the T group ($P < 0.01$), compared with 6 of 25 patients (24%) in the C group (NS). Corresponding values at the 6-month follow-up were 10 of 25 patients (40%) ($P < 0.05$) and 6 of 25 patients (24%) (NS). A statistically significant difference was found between the groups at the 3-month follow-up ($P < 0.01$) (Table 1).

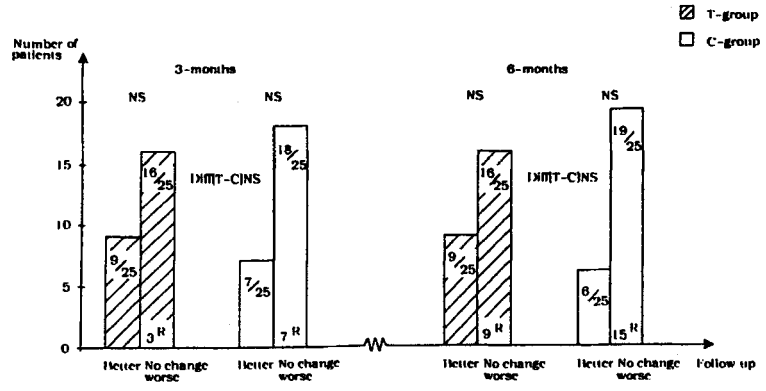

Fig. 1. Distribution of changes in frequency of headaches at the 3-month and 6-month follow-ups in the treatment (T) and control (C) groups. The reduction in frequency was not significant within or between groups at follow-up. R indicates number of patients given rescue treatment.

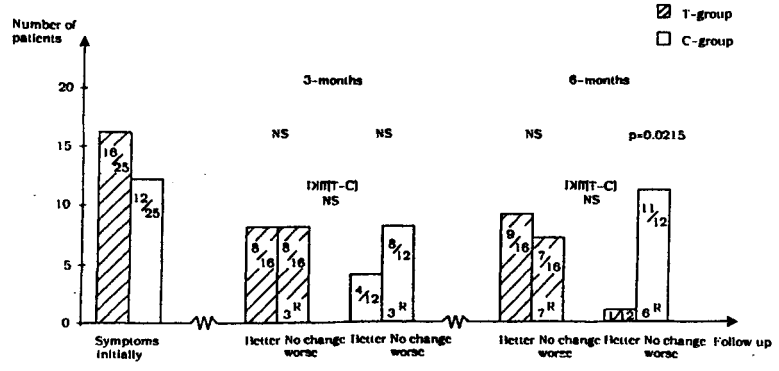

Fig. 2. Percentage distribution of changes in frequency of facial pain at the 3-month and 6-month follow-ups in the treatment (T) and control (C) groups. The C group deteriorated significantly at the 6-month follow-up ($P < 0.05$), and the differences between groups reached a significant level ($P < 0.01$). R indicates number of patients with reported facial pain initially who were given rescue treatment.

Nine patients in the T group reported decreased frequency of headaches, one of them being completely free from headaches, at the 3-month follow-up. Thirteen of the patients reported no improvement, and three patients had been given rescue treatment. Seven patients in the C group reported improvement, and 11 did not report any improvement. Seven patients had had rescue treatment before the 3-month follow-up (Fig. 1).

At the 6-month follow-up 9 patients in the T group still reported reduced frequency of headaches, and 5 of these patients were completely free from symptoms. Seven of the remaining 16 patients did not improve, nor did the 9 patients who were given rescue treatment. At this follow-up only 10 patients without rescue treatment remained. Six reported improvement, and the other four did not. No statistically significant difference was found within or between groups at the 3- or 6-month follow-up with regard to frequency of headache (Fig. 1).

With regard to facial pain at the 3-month follow-up, 8 of the 16 patients with facial pain initially in the T group reported improvement, and 7 of these were completely free from facial pain. No improvement was found in the other eight patients. One patient who had no facial pain initially reported facial pain at the 3-month follow-up. Twelve patients in the C group reported facial pain initially. Four of these reported improvement at the 3-month follow-up. Two patients with no facial pain initially reported facial pain at the 3-month follow-up (Fig. 2).

In the T group one more patient improved with regard to facial pain at the 6-month follow-up; thus 9 of 16 patients improved, and 7 did not. Only 1 patient of 12 in the C group reported improvement at the 6-month follow-up. The C group was found to have deteriorated significantly at the 6-month follow-up ($P < 0.05$). A statistically significant difference between groups was also found at the 6-month follow-up ($P < 0.01$) (Fig. 2).

No further statistically significant differences within

Table 2. Dysfunction index (D_i): distribution of patients in T group and C group before and at 3-month and at 6-month follow-ups

	T group					C group			
D_i	0	I	II	III		0	I	II	III
Before	2	12	6	5		2	9	11	3
3-month follow-up	3	15	3	1	*	0	8	8	2
6-month follow-up	3	8	3	2		1	5	1	3

* Chi-square = 6.078; $P < 0.02$.

or between groups were noted at follow-ups with regard to the other subjective variables investigated. No significant changes at follow-ups were found with regard to the clinical variables investigated (pain on mandibular movements, maximal opening capacity, number of tender muscles, TMJ sounds, and dysfunction score) with one exception. When the DS sum was grouped in accordance with the Helkimo index, a significant difference between groups was found at the 3-month follow-up, at which more patients in the T group than in the C group showed reduced D_i values (chi-square = 6.078; $P < 0.02$) (Table 2).

Discussion

The aim of this study was to evaluate the treatment effect of occlusal adjustment as compared with no other treatment than counseling on patients with CMD of mainly muscular origin. The usual contraindications for occlusal adjustment were considered, as were several inclusion criteria. The study population (64) therefore became a small part (3.2%) of the total number of patients screened (1980), but the total percentage of patients with CMD of muscular origin was in fact 29.5%, because most patients with CMD of muscular origin were not considered suitable for our study during the selection procedures, since splint therapy was at the patient's request. This percentage is lower than that found in other studies (15, 16), but this only reflects the difficulties in grouping patients on the basis of signs and symptoms, since overlaps between diagnostic groups occur and 'more carefully designed diagnostic groups are lacking', according to Clark et al. (16).

To reduce the number of dropouts during the follow-up periods, the patients requesting immediate splint therapy (26.3%) with CMD of mainly muscular origin were excluded. This reflects one problem with the sampling of a homogeneous group of patients to perform long-term clinical trials. In a study by List et al. (17) 950 patients from the waiting list were considered, to sample 110 patients (12%) with CMD of primarily muscular origin to perform their clinical trial. In spite of all these considerations when designing the study, the number of dropouts was considerable at the 6-month follow-up. Thus 16 patients in the T group, compared with only 10 patients in the C group, completed the study with no other treatment than counseling and occlusal adjustment. A physical treatment might have decreased the number of dropouts in the C group.

The occlusal adjustments in the treatment group were made by one investigator, who was not involved in the evaluation of the treatment outcome. In the information given to the patients occlusal adjustment was presented as a treatment modality commonly used but still controversial with regard to treatment outcome. The two groups were treated identically with regard to number of visits and length of follow-up periods to evaluate the treatment effect of occlusal adjustment.

An important problem with such reduced groups is their questionable representativeness for interpretation of the results. However, the completed patients in the T group (16) and C group (10) did not differ significantly from the rescue treatment patients with regard to initial values of duration, frequency of headache, and facial pain. No differences were found with regard to initial VAS values, maximal opening capacity, number of tender muscles, DS, and occlusal state.

The overall subjective improvement rate in our study decreased from 64% to 40% in the T group and remained at the 24% level in the C group during the follow-up period. A 60% overall subjective improvement was found by Kopp (8) among two groups of patients 6 weeks after initial counseling. Occlusal adjustment was then given to one of the groups, which after 6 more weeks showed clinical improvement but no further subjective improvement. The different effects of counseling and occlusal adjustment in the two studies is probably explained by both the different designs of the studies and the patient materials.

Reduction in frequency of headaches was reported by 36% and 24% of the patients in the T and C groups, respectively, at the end of the 6-month follow-up period, which indicates a therapeutic effect of information and counseling. In the double-blind clinical study by Forsell et al. (7) 69% of the patients in the occlusal adjustment group reported a lower frequency of headaches as compared with 49% of the patients in the mock equilibration group. The different results in the two studies might be explained by methodologic differences in study design.

With regard to facial pain there were statistically significant differences between groups at the end of the 6-month follow-up period. Very little improvement in facial pain was noted among the patients in the treatment group, but a considerable deterioration was noted among the controls. This finding indicates a negative development of the pain in the group in which no occlusal adjustment was performed.

Occlusal adjustment did not influence the clinical signs of CMD investigated in this study. A statistically significant difference between groups was noted, however, at the 3-month follow-up with regard to the Helkimo dysfunction index, in which more patients

improved in the T group than in the C group. One explanation for this might be that this variable was more sensitive than the others to changes induced by treatment. Clinical improvement after occlusal adjustment superior to that after counseling and mock equilibration has been demonstrated (8, 9), but contradictory results have also been presented, in which occlusal adjustment proved to have no effect on clinical signs of CMD when compared with other kinds of stomatognathic treatment (6). These opposing results might be attributed to methodologic aspects of study design and are indicative of one of the problems of clinical trials.

The initial VAS values were high in both groups (>50), but in spite of this no statistically significant changes in VAS were noted at follow-ups either within or between groups, although improvement of overall subjective symptoms was reported within the T group and between groups. One explanation of this might be that pain was not a major component in the patients' assessment of overall subjective improvement. In addition, the intensity of pain on the VAS was registered only once at every follow-up visit, and because of the fluctuations in symptoms the registered VAS values did not reflect the pain intensity over time.

In conclusion, the T group showed a better treatment effect than the C group for overall subjective improvement in the 3-month perspective. The results of this study thus show that occlusal adjustment is a treatment modality with a significant short-term effect on symptoms of CMD of muscular origin and superior to counseling.

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