Three-year longitudinal study of mandibular dysfunction in young adults with intact and restored dentitions

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Thirteen adolescents with intact dentitions and 16 with restored dentitions were re-examined after 3 years for signs and symptoms of mandibular dysfunction. In accordance with the results of the first examination, a lower prevalence and degree of clinically recorded dysfunction was found at the follow-up study in subjects with intact teeth than in those with dental restorations. This difference was especially explained by more muscle tenderness recorded in the individuals with restored dentitions than in those with intact teeth. However, the reported symptoms were as a rule mild and relatively evenly distributed in the two groups. □ *Clinical study; temporomandibular joint*

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Epidemiologic studies have disclosed high prevalences of signs and symptoms of functional disturbances of the masticatory system (1, 2). It is apparent from these studies that the dysfunction is judged to be milder and less frequent in children and young individuals than in older persons (3). Epidemiology has not offered any predominant etiologic explanation, which has generally been taken as support for a multifactorial etiology. However, the controversy about the relative importance of different etiologic factors, including occlusal ones, still exists (4, 5). Kampe et al. (6–8) recently found more signs and symptoms of mandibular dysfunction in subjects with restored dentitions than in those with intact teeth. They suggested, as an explanation for their findings, that dental fillings might induce neuromuscular changes in the masticatory system.

One way to explore this hypothesis further is to study longitudinally the development of the function of the masticatory system in individuals with and without dental fillings.

The aim of this study was therefore to re-examine young adults with intact and restored dentitions after 3 years and compare the findings with regard to signs and symptoms of mandibular dysfunction and occlusal factors with those found at the first examination.

Materials and methods

The subjects of this study were selected from a series examined in 1982 by Kampe et al. (6). Sixteen subjects with intact and 16 with restored dentitions were called for a follow-up examination in 1985. Two subjects with intact dentitions could not participate, and a third had had some dental treatment since the first occasion and was excluded. All subjects with restored dentitions came to the examination. The subjects studied thus consisted of 13 adolescents with intact, non-repaired dentitions (group I) and 16 with restored dentitions (group C). The subjects in group I were born in 1967, 1968, and 1969 and those in group C in 1968. All subjects were enrolled in the organized dental care for children and adolescents and attended the same dental clinic.

The subjects in this study were on an average 14 years old when first examined in 1982. The findings from the comparative anamnestic and clinical investigation of man-

Table 1. Prevalence of various reported symptoms in a group of 13 subjects with intact dentitions (group I) and 16 subjects with restored dentitions (group C) in 1982 (1) and 1985 (2). Figures denote number of subjects

Question	Group I		Group C	
	1	2	1	2
1. TMJ sounds (clicking)	2	2	2	5
2. Stiffness in the jaws in the morning	0	1	0	0
3. Fatigue in the jaws during chewing	1	2	3	5
4. Difficulties in mouth opening	0	0	1	0
5. Feeling of locking or luxation of the mandible	0	2	2	3
6. Aching neck, back, throat, or shoulders	3	2	5	4
7. Aching muscles or joints other than the TMJ	1	3	4	2
8. Feeling of unevenness of occlusion	1	1	4	5
9. Locking of bite	0	1	0	0

dibular dysfunction have been presented previously (6–8). The methods used now were the same as in the earlier studies, with a questionnaire and a clinical examination especially designed for studying symptoms and signs of mandibular dysfunction and details of occlusion. From the case history of each subject an anamnestic dysfunction index (Ai) was derived, and from the clinical examination a clinical dysfunction index (Di) and score (Dip) were calculated in accordance with Helkimo (9). The following clinical variables were recorded: interference (unilateral contact) in the retruded contact position (RCP), lateral deviation ($\geq$0.5 mm) between RCP and the intercuspal position (IP), mediotrusion interference and contact (interference denoting no contact on the working/laterotrusion side), dentin facets in the lower medial incisors and the first lower molars, and attrition distally on the second lower molars, according to Kampe (7).

Statistical methods

Non-parametric methods, including Pitman's permutation test and Spearman's rank correlation test, were used.

Results

Questionnaire

One or more orofacial parafunctions were reported by about half of the subjects in both group I and group C at both examinations. More than two parafunctions were reported by one subject in group C both at the first and at the follow-up examination. Nail biting was the most frequently reported parafunction. No subject reported frequent accidental biting of the tongue or the cheek. There were no significant differences between the groups with regard to parafunctions.

The prevalence of reported symptoms of mandibular dysfunction is shown in Table 1. In line with the findings at the first examination, the symptoms at the follow-up study were as a rule mild and relatively evenly distributed among the individuals in both groups (no significant differences). Pain on movement of the mandible and pain in the face or the jaws were not reported by any of the subjects. Only one subject in group C and none in group I had headache twice a week or more frequently.

The distribution of the individuals in the two groups with regard to the anamnestic dysfunction index (Ai) is shown in Table 2. The values in group C were not significantly higher than those in group I. Two subjects in group I reported locking of the jaw at the follow-up examination, which explains the increase of Ai from 0 to II in this group. Otherwise, there were only a few changes between the two examinations in group I and slightly more in group C. There was a statistically significant correlation between the indices calculated at the two exam-

Table 2. Cross-tabulation of anamnestic dysfunction index (Ai) on two occasions, in 1982 and 1985, in 13 subjects with intact dentitions (group I) and 16 with restored dentitions (group C). Figures denote number of subjects

	Ai 1982							
	Group I				Group C			
Ai 1985	0	I	II	Total	0	I	II	Total
0	9	1	0	10	7	1	0	8
I	0	1	0	1	3	1	1	5
II	0	2	0	2	1	0	2	3
Total	9	4	0	13	11	2	3	16

inations ($r_s = 0.82$; $p < 0.001$ for group I; and $r_s = 0.51$; $p < 0.05$ for group C).

Clinical examination

The distribution of the subjects with regard to different clinically registered variables is shown in Table 3. Muscles tender to palpation were commoner among subjects with restored dentitions than in those with intact teeth in 1985 (statistical tendency, $p = 0.04$ in a two-tailed test). The individuals in group I had a mean of 1.2 muscle sites tender to palpation in 1985, compared with 0.5 in 1982. In group C, the corresponding values were 3.5 at both examinations.

The subjects of group C had a mean of 5.6 fillings in the teeth at the follow-up study, compared with 5.3 in 1982.

Unilateral contact in RCP was found in 69% of the subjects in group I and 56% in group C. In 1982 the corresponding values were 54% and 69%, respectively. Lateral deviation between RCP and IP ($\geq$0.5 mm) was found in one subject in group I (8%) and five subjects in group C (31%). The corresponding values 3 years earlier were one (8%) and four (25%) subjects, respectively. In 1985 the RP contacts were located in the molar or premolar/molar regions in 3 subjects in group I, compared with 11 subjects in group C (statistical tendency, $p = 0.05$ in a two-tailed test). Two subjects in group I and nine in group C showed an altered location for the RP contacts in 1985 compared with 1982.

Dentin facets in the lower medial incisors were found in 9 subjects in group I and 12 subjects in group C. For the first lower molars the corresponding values were three and seven subjects, respectively.

The distribution of the subjects with regard to the clinical dysfunction index (Di) is shown in Table 4. Changes indicating both improvement and impairment occurred in

Table 3. Prevalence of various clinical signs in 13 subjects with intact dentitions (group I) and 16 subjects with restored dentitions (group C) in 1982 (1) and 1985 (2). Figures denote number of subjects

	Group I		Group C	
	1	2	1	2
TMJ				
Tenderness to palpation laterally	3	5	8	7
Tenderness to palpation posteriorly	0	0	3	2
Clicking	2	1	2	2
Chewing muscles				
No muscle tenderness	9	7	4	4
Muscle tenderness, 1–3 muscles	4	4	6	4
Muscle tenderness, $\geq$4 muscles	0	2	6	8
Pain during extreme movements				
No pain during movements	12	13	13	14
Pain during one movement	1	0	1	2
Pain during more than one movement	0	0	2	0

Table 4. Cross-tabulation of the clinical dysfunction index (Di), in 1982 and 1985, in 13 subjects with intact dentitions (group I) and 16 with restored dentitions (group C). Figures denote number of subjects

	Di 1982									
	Group I					Group C				
Di 1985	0	I	II	III	Total	0	I	II	III	Total
0	4	2	0	0	6	1	1	0	0	2
I	2	4	0	0	6	1	2	2	1	6
II	0	1	0	0	1	0	3	2	0	5
III	0	0	0	0	0	0	1	1	1	3
Total	6	7	0	0	13	2	7	5	2	16

both groups, and there was no significant correlation between the indices at the two examinations. In 1985 the index values were higher in group C than in group I ($p < 0.05$).

Attrition distally on the second molars was found in three subjects in group C in 1985, compared with none in 1982, whereas no subject in group I showed such attrition on any occasion.

Correlations

The variables TMJ clicking, Ai, and Di were tested for correlations to signs and symptoms and other variables recorded at the follow-up study in 1985. Only a few statistically significant correlations were found. There was a tendency to a significant correlation between Ai and Di in group I ($r_s = 0.56$; $p < 0.10$) but not in group C or the groups combined. Di was correlated to unilateral contact in RCP ($r_s = 0.66$; $p < 0.05$) in group I but not in group C or in the groups combined. No other occlusal variables were significantly correlated to the dysfunction indices or to TMJ clicking in the combined groups. In the intact group, however, TMJ clicking was correlated to lateral slide between RCP and IP ($r_s = 0.61$; $p = 0.05$).

Discussion

The number of subjects in this study was rather small, and conclusions must therefore be drawn with caution. Nevertheless, the investigation is of interest since there are few longitudinal studies of mandibular dysfunction in young adults and none concerning subjects with intact and restored dentitions (10).

In accordance with previous studies of adolescents with and without dental fillings (6–8), the subjects in group C had a higher prevalence and degree of mandibular dysfunction than those in group I. The difference between the groups was almost the same as at the examination 3 years earlier. It should be emphasized, however, that the signs and symptoms were generally mild in both groups, although they tended to increase slightly during the observation period. The average results are in this respect similar to those reported in a longitudinal study in children (10). As in the earlier studies (6–8), the difference between the groups was greatest concerning muscles tender to palpation. This is interesting in light of the finding in a psychologic study of the original group (11) that dental restorations were commoner in subjects with autonomic and motor disturbances related to anxiety proneness. However, for the moment it is impossible to tell whether the difference in muscles tender to palpation is due to psychological differences between the subjects in the two groups, the fillings *per se*, or combinations of different factors, in line with the frequent opinion in current literature of a multifactorial etiology of mandibular dysfunction (1, 3–5). More longitudinal follow-up studies of larger materials are necessary to solve these problems.

The influence of observer variability on the reliability of the results of clinical investigations has been discussed and studied (12, 13). To minimize the errors, all palpations were made by one observer (H. Hannerz), who also performed that part of the clinical examination 3 years ago. The previously reported finding (11) that individuals with higher clinical dysfunction indices (Di II–III) had higher scores on the Muscular Tension Scale is of interest in this context, since it corroborates the reliability of the muscle palpation in this study.

Two subjects in group I reported that they sometimes had a feeling of locking or lux-

ation of the mandible, and they ascribed this sympton to heavy trauma to the jaw some years ago. Macrotrauma has been proposed as a frequent etiologic factor in the internal derangement of the TMJ (14). However, none of the three subjects in group C with the same symptoms could recall trauma to the jaw, which may indicate a multifactorial cause of this symptom, too.

In accordance with the earlier study in 1982 (8), lateral deviation between RCP and IP was commoner in group C. In this study, the difference between the groups was not statistically significant, perhaps because of the small material, but the finding may indicate an altered muscular tone in subjects with restored dentitions, which has been discussed previously (6, 8). This may also explain why the RCP contacts were more often located in the molar or premolar/molar regions than in the premolar region in the subjects in group C, as also found in a similar study (T. Kampe, H. Hannerz, P. Ström. Kontaktförhållandena mellon tandraderna vid passiv registrering av den retruderade mandibelpositionen hos individer med och utan restaurationer i bettet. Unpublished manuscript.) and why the location of the RCP contacts was more often changed in group C than in group I when compared with the location recorded in 1982. However, the relationship between occlusal conditions and mandibular dysfunction is notoriously difficult to interpret (4, 5).

Attrition distally on the second lower molars was registered in three individuals in group C and none in group I. Together with the finding of a higher prevalence of attrition on the lower incisors and first molars, this indicates more muscular hyperactivity in the subjects with restored dentitions than in those with intact teeth. This was verified in the previous psychological study (11), in which group C had higher scores on the Muscular Tension Scale than group I.

The results of this study seem to verify the previous finding that adolescents with intact dentitions had fewer signs and symptoms of mandibular dysfunction than those with dental fillings. The mainly small changes observed during a 3-year follow-up period in both groups did not clarify the role played by the dental fillings *per se*. However, the subjects with restored dentitions showed signs of more muscular hyperactivity, which could possibly partly explain the higher prevalence and degree of mandibular dysfunction in this group. A hypothesis that the dental fillings were at least partly responsible for the difference between the groups has been discussed elsewhere (6–8, 15). To test its relevance further, one would need larger groups both with intact and with more restored dentitions. Such studies have hardly been possible earlier but might be practicable in the near future, when more people will retain their dentitions intact without fillings.

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