

Accurate Evaluation of Balancing-side Contacts in Relation to Internal Derangements of the Temporomandibular Joint: Possible Roles of Balancing-side Protection

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ABSTRACT

Balancing-side contacts were precisely evaluated in relation to internal derangements of the temporomandibular joint. Balancing-side contacts were classified into the three following groups: 1) Severe balancing-side interference, 2) balancing-side interference and 3) balancing-side protective contacts. Balancing-side protective contacts were defined as balancing-side occlusal contacts on lower first and/or second molar in lateral excursive movements, which are observed only when clenching forces are exerted.

The prevalence of the balancing-side protection was revealed to be highly correlated with that of internal derangements of temporomandibular joint. These results strongly suggest that balancing-side protection might play an important role as a regulating mechanism in the etiology of internal derangements of temporomandibular joint.

Key words: *Balancing-side contact, Eccentric, Occlusion, Temporomandibular Joint*

Although occlusion has been thought to be an important factor in the etiology of the internal derangements of temporomandibular joint (TMJ), occlusion factor which directly regulates the prevalence of TMJ dysfunction has not been reported. Some investigators have reported significant correlations between malocclusions or occlusal interferences and TMJ dysfunction^{7,12,18,22)} while others have been unable to corroborate these results^{3,5,9,10,16,17)}. Balancing-side interference, interference between centric relation and centric occlusion and other occlusal interferences have been reported and discussed as etiologic factors of TMJ dysfunction. The occlusal components, however, have been accepted only as the causes of parafunction such as bruxism or clenching, and a direct relationship between the components and TMJ dysfunction has not yet been clarified.

The purpose of this study is to report a new aspect on the excursive occlusion as an important factor in the etiology of internal derangements of TMJ.

MATERIALS AND METHODS

Data were collected from 160 individuals, 25 to 30 years of age (mean age 26.6 years; 146 men and 14 women), working at Hiroshima University

School of Dentistry.

The anamnestic part of the study consisted of a questionnaire with six questions. The questions concerned actual symptoms such as TMJ sounds, difficulty and pain associated with different movements of the mandible, occurrence of grinding of the teeth and clenching, general joint and muscle pain as well as experience of orthodontic treatment and any accidents that had injured the jaws. The questionnaire also contained the side of TMJ sounds.

The clinical examination focused on 1) TMJ sounds as an early sign of internal derangements of TMJ and 2) occlusal contacts on balancing-side teeth in lateral excursive movement.

Clinical examination

The clinical examination involved the following items:

(1) Lateral Occlusion

Laterotrusive contacts were evaluated visually and by means of articulating paper. Cuspid guidance was defined as 'no multiple tooth contacts on working-side teeth in lateral excursions'¹¹⁾. Group function was defined as a lateral excursive movement in which more than one tooth, either anterior or posterior were responsible for the disclusion.

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(2) Balancing-side contact

Balancing-side contacts during mandibular excursive movements were evaluated with articulating paper and visually by one examiner. They were classified as follows:

a) Severe balancing-side interference and balancing-side interference

The examiner assisted the subjects with right and left lateral movements with the teeth slightly occluded. The most important point in this examination is that subjects were instructed not to clench at any time during these lateral excursive movements. Interferences that precluded any contact on the contra-lateral side during the lateral excursive movements were designated severe balancing-side interferences, and any other balancing-side contact observed during the lateral movements was recorded as balancing-side interference.

b) Balancing-side protection

Subjects were instructed to clench at the edge-to-edge position of canines. Balancing-side contact on lower first and/or second molar were recorded as balancing-side protective contact.

(3) TMJ sounds

The subjects were asked to open and close their mouths several times and to move their mandibles from side to side. The TMJs were palpated simultaneously during both vertical opening and lateral movement of the mandible. Structures were palpated from the lateral aspect, that is approximately 10 mm anterior to the middle of the tragus of the ear.

RESULTS

Subjects who showed any TMJ sounds in either anamnestic or clinical examination were classified as TMJ sounds positive. The prevalence of TMJ sounds in the total subject group was fifty-one percent (individual). Twenty-nine percent of total TMJs (side) showed TMJ sounds. Six of 160 subjects (3.8%) were revealed to have severe balancing-side interference and twenty-one subjects (13.1%) had balancing-side interference. The relation between balancing-side protection and TMJ sounds are shown in Table 1. Fifty of the 77 subjects (65%) with no balancing-side protection, showed TMJ sounds, whereas only 20 subjects (36%) showed TMJ sounds in the group with balancing-side protection. Fig. 1 shows the relationship between age of subject and TMJ sounds in groups with or without balancing-side protection. In the group with balancing-side protection, the prevalence of TMJ sounds seems to be independent of the age of the subject. Conversely, the prevalence of TMJ sounds in the group without balancing-side protection does seem to depend on age (correlation coefficient $r=0.922$, $p<.01$).

DISCUSSION

It is generally assumed that malocclusion plays

Table 1. Prevalence of TMJ sounds in groups with or without balancing-side protection

Subject	TMJ sounds		Total
	(+)	(-)	
balancing-side protection (-)	50	27	77
balancing-side protection (+)	20	35	55
Total	70	62	132

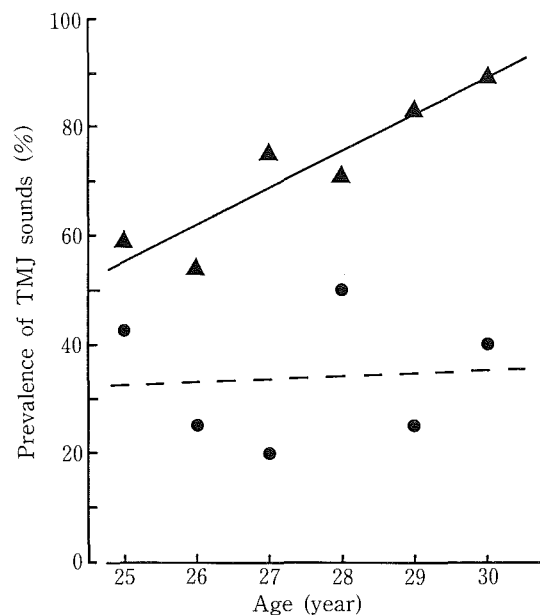


Fig. 1. Relationship between age of subject and TMJ sounds in groups with or without balancing-side protection. ▲: balancing-side protection (-) (correlation coefficient $r=0.922$; $p<.01$), ●: balancing-side protection (+) (no significant correlation).

an important role in the development of TMJ dysfunction. However, few of the occlusal components have been shown to be correlated with TMJ dysfunction, and the relationship between occlusion and TMJ dysfunction has not yet been fully clarified.

The prevalence of TMJ sounds observed in this study was 49%. These data being consistent with previous epidemiologic studies^{1,8,14}. In the present study, TMJ sounds were selected as an initial change of TMJ components commonly observed in internal derangements of TMJ.

Balancing and mediotrusive interferences have been shown to be related to TMJ disorders in some studies^{7,18,21} and shown to be unrelated in others^{3,5,9,10,16,17}. The evidence, therefore, is not entirely conclusive. Since balancing contacts are generally thought not to contribute to the function of the natural dentition but possibly relate to bruxism, they are commonly eliminated for patients with TMJ dysfunction^{4,13,20}. Ramfjord¹² also showed that the most common occlusal trigger for bruxism was interference or instability in the retru-

sive occlusal range and the second significant occlusal trigger was "heavy" balancing contact. Beyron²⁾ has stated that balancing-side contacts apparently are not functional parts of normal human dentitions, although such contacts are important for complete denture function.

Many studies on balancing-side contact have been conducted, as described above, as well as investigations analyzing jaw movements in patients with or without TMJ disorders^{18,19)}. However, few of them have referred to the intensity of balancing contacts^{12,14)} and none of them to the occlusal force in lateral excursive movements, under which balancing contacts are observed. Occlusal tooth contacts in the intercuspal position has been reported to depend on the occlusal pressure¹⁵⁾, and occlusal tooth contacts in lateral excursive movements in fact depend on the occlusal pressure as demonstrated in this study. Considering the occlusal forces that are assumed to be loaded on TMJ under bruxism or clenching, analysis of occlusion in lateral excursive movements with clenching force seems to be of great importance. Faulkner et al⁶⁾ reported that the reaction forces are in approximately a 2:1 ratio with the balancing-side condyle carrying the greater load. From our results, it was revealed that balancing-side protective contact, which are observed on balancing molars only when clenching force is exerted, is highly correlated with TMJ sounds and internal derangements of TMJ.

The increase of the prevalence of TMJ sounds, dependent upon age in the group without balancing-side protection (Fig. 1), suggests two things. One is the high participation of balancing-side protection in the etiology of internal derangements of TMJ. The other is that the prevalence of TMJ sounds or internal derangements of TMJ depends on the accumulated quantity of occlusal force loaded on TMJ during excursive movements.

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