

## Department of Dentistry

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### General Summary

#### 1. Clinical studies of temporomandibular disorders

We continued our studies of screening questionnaires and the evaluation of quality of life in patients with temporomandibular disorders (TMDs). We also studied clinical questions for drafting guidelines for TMDs.

#### 2. Basic studies of obstructive sleep apnea-hypopnea syndrome

To clarify the effects of obesity on the properties and volume of lingual muscles, we analyzed the accumulation of triacylglycerol and the diameter of myofibers in the lingual muscles of obese rats fed a high-fat diet.

### Research Activities

#### *Clinical studies of TMDs*

##### 1. Reliability of a questionnaire of pain-related limitations of daily function in Japanese patients with TMDs

**Purpose:** We have used a new questionnaire to examine pain-related limitations of daily function due to TMD (LDF-TMDQ) in Japanese patients. The LDF-TMDQ consists of 10 items and can estimate 3 latent variables: "Limitation of mouth opening," "Limitation in executing a certain task," and "Limitation of sleeping." We have already verified the construct validity and cross validity of the LDF-TMDQ. The purpose of this study was to assess the within-day reliability of the LDF-TMDQ in Japanese patients with TMD.

**Methods:** All outpatients were asked to complete the LDF-TMDQ before they were examined at their first visit. Patients who were found to have painful TMD were requested to complete the LDF-TMDQ again on the same day after they had returned home. A total of 103 consecutive patients with TMD were recruited, and 77 of these patients (75%) completed the LDF-TMDQ and were eligible for analysis. Test-retest reliability was assessed with intraclass correlation coefficients and Spearman's correlation coefficients using the software program IBM SPSS Statistics version 12 (IBM Corp., Armonk, NY, USA). Internal consistency was assessed with Cronbach's  $\alpha$ .

**Results:** The intraclass correlation coefficients for test-retest reliability of "Limitation of mouth opening," "Limitation in executing a certain task," and "Limitation of sleeping" were 0.71, 0.71, and 0.83, respectively. Spearman's correlation coefficients were 0.69, 0.71, and 0.79 ( $p < 0.001$ ), respectively. Cronbach's  $\alpha$  values were 0.83, 0.83, and 0.91, respectively.

**Conclusion:** This study shows that LDF-TMDQ has excellent within-day reliability.

##### 2. Background of patients with false-positive and false-negative results on screening

test for TMDs

**Purpose:** To investigate the background of patients with false-positive (FP) and false-negative (FN) results on 1-item screening tests (binary scale) for TMDs.

**Methods and subjects:** We analyzed 1,225 dental patients (666 males and 559 females). Patients with FP results were those in whom TMD was diagnosed with a 1-item screening test but not with clinical evaluation, and patients with FN results were those in whom TMD was not diagnosed with a 1-item screening test but was diagnosed with clinical evaluation. We investigated the differences of these definite diagnosis constitutions between patients with FP results and those with true-negative (TN) results. According to a 4-item questionnaire for TMD (disturbance of mouth opening, pain on jaw opening or closing or both, deviation opening, and pain on chewing hard food) on a 5-point numeric rating scale, we compared the scores of 4 items between the FP and TN groups, the FN and true-positive (TP) groups, and the FP and FN groups.

**Results:** The percentages of subjects with inflammation and dental caries were similar in the FP group and the TN group. The FP group had significantly higher total scores for the 4 items than did the TN group. The FN group had significantly lower total scores for jaw opening pain or closing pain or both than did the TP group.

**Conclusion:** The rates of inflammation and dental caries in the FP group were as high as in the TN group. The FN group had weaker pain than the PT group.

### 3. Investigation of contributing factors associated with TMDs in the working population

**Purpose:** The purpose of this study was to extract contributing factors related to TMDs in the working population through a questionnaire survey.

**Methods:** We administered a questionnaire for TMD screening to determine contributing factors to 2,723 employees of company A and obtained valid responses from 2,203.

**Results:** Of the 2,203 employees, 362 were considered to have TMD (16.4%). This rate was higher than in the general population in Japan. The total scores for both psychosocial factors and habitual behaviors were significantly higher in persons with TMD than in persons without TMD. Multivariate logistic regression analysis showed the following to be significant factors contributing to TMD: increases in anxiety, fatigue, and tooth-contacting habit and symptoms upon waking in men, and an increase in fatigue and symptoms upon waking in women.

### 4. A randomized clinical trial of treatment for temporomandibular joint disc displacement

Of the various conservative treatments available for TMDs, we believe that therapeutic exercise leads to a good prognosis, especially for anterior disc displacement without reduction. Because its effectiveness has not been extensively evaluated, we performed a comparative study to verify the hypothesis that treatment efficacy does not differ between exercise and occlusal splints. Fifty-two patients with anterior disc displacement without reduction were randomly assigned to a splint treatment group or a joint mobilization self-exercise treatment group. Four outcome variables were evaluated: 1) maximum mouth opening range without pain and 2) with pain, 3) current maximum daily pain intensity, and 4) limitation of daily functions. All outcome variables showed significant improvements after 8 weeks of treatment in both groups. However, the mouth opening range increased more in the exercise group than in the splint group. This result demonstrates

that therapeutic exercise leads to earlier recovery of jaw function than does splint application.

#### 5. Interview of volunteer patients for collecting patient questions in the clinical guideline for TMDs

We performed personal interviews of volunteer patients who previously had symptoms of TMDs to collect Patient Questions for a course for establishing guidelines for the initial treatment of TMD. We recruited subjects (known hereafter as “informants”) by placing advertisements in 2 newspapers. After careful consideration, the study committee chose 10 persons from among 19 applicants as informants. The interviews were performed in a semistructured manner in an private room especially equipped for interviews. The answers from informants were tape-recorded and converted into oral sentences. From these sentences, important words and phrases were extracted and compiled by means of text mining. In regard to recognition of TMD, 4 informants answered “a disease in which the jaw is displaced,” and 4 informants answered “a disease that occurs if one’s occlusion is poor.” These were the most answers in all, respectively. However, only 1 informant had received an explanation about TMD from her dentist. Although 3 informants of the 10 had undergone mouthpiece therapy, they had not received explanations about the necessity of or the reason for this therapy. Six informants were satisfied with their treatments, whereas 2 informants were dissatisfied. The treatments for joint noise, mouth-opening restriction, and pain most often chosen by informants were, in descending order, mouth-opening exercises, massage, compress, jaw rest, chiropractic, and mouthpiece. This investigation showed us that all informants had only superficial knowledge of pathologic conditions and treatment methods. Our findings suggest that dentists do not provide enough information about pathologic conditions and treatments for TMD.

#### 6. Relations of sleep and headache in patients with TMDs

One-quarter to one-third of Japanese have headaches with unusual symptoms, and most have tension headaches. In 2005, we found that the prevalence of headache symptoms in 542 patients with painful TMDs was 49.1% and reported about the relation between headache and job type at the annual meeting of the Japanese Society for Temporomandibular Joint, but the relation of headache with sleep has not been investigated.

**Purpose:** We examined the relation between headache and sleep disturbance in patients with TMD.

**Methods:** After we obtained informed consent from 100 patients with painful TMD at their first examination, we asked them to complete evaluation questionnaire every 4 weeks. We continued to collect questionnaires from patients until they stopped their visits.

**Result:** The number of patient registered at the first examination was 100, and the percentage of patients with headache symptoms at the first examination was 43%. The male: female sex ratio was 43 : 57, and the average age was  $37 \pm 14.2$  years. We analyze an anxiety classification and a dejection classification of number of going to hospital, sleep disturbance, and the Hospital Anxiety and Depression Scale with Clause 2 logistic regression analysis to analyze the presence or absence of headache, the dejection degree (odds ratio, 2.083) in women and sleep disturbance (odds ratio 2.551) was of choice in men with sleep disturbance (odds ratio: 1.564). Patients with headache symptoms were

more likely to have sleep disturbance than were patients without headache symptoms (Mann-Whitney U test) with the presence or absence of headache because sleep disturbance was chosen by men and women.

Conclusion: In patients with painful TMD, we found a relation between headache and sleep disturbance.

#### 7. Changes in headache in patients with TMD

Purpose: To clarify how headache changes during treatment for TMD.

Methods: After we obtained informed consent from 100 patients with painful TMD at their first examination, we asked them to complete evaluation questionnaire every 4 weeks. We continued to collect questionnaires from patients until they stopped their visits.

Result: The number of patients registered at the first examination was 100, and the percentage of patients with headache symptoms at the first examination was 43%. The male: female sex ratio was 43 : 57, and the average age was  $37 \pm 14.2$  years. Women were observed more, as the relation between the presence of the headache and the sex differences of the headache. The prevalence of headache tended to decrease for 4 weeks after the first examination, but there were few subsequent changes. Headaches described as “extremely strong” were often absent during these 4 weeks, and the prevalence of “strong to moderate” headaches gradually decreased. As a result that we analyze an anxiety classification and a dejection classification of contents of operation work, sleep and Hospital Anxiety and Depression Scale using by Clause 2 logistic regression analysis to analyze for the presence or absence of headache, difficulty in falling asleep, input work, dejection degree were won characteristics, and anxiety degree was of choice in men.

Conclusion: Headaches may have been relieved by treatment for TMD by attention of the everyday life including operation work.

#### *Basic studies of obstructive sleep apnea-hypopnea syndrome*

##### 1. Changes in the lingual muscles of rats with obesity induced by a high-fat diet

Purpose: To clarify the effects of obesity on the properties and volume of lingual (genioglossus and geniohyoid) muscles in rats.

Methods: We analyzed the accumulation of triacylglycerol and the diameter of myofibers in the lingual muscles using histochemical studies and examined myosin heavy chain composition using real-time polymerase chain reaction in rats fed a high-fat diet for 10 weeks.

Results: In the genioglossus and geniohyoid muscles, the percentage of oil droplet areas in obese rats were 3.6 and 2.5 times greater than those in control rats, respectively ( $p < 0.025$ ). The diameters of slow myofibers in the genioglossus and geniohyoid muscles were approximately 20% greater in the obese rats than in control rats ( $p < 0.0001$ ), whereas the diameters of fast myofibers in the geniohyoid muscle were approximately 10% greater in obese rats than in control rats ( $p < 0.0001$ ). No significant difference was found between the obese rats and control rats in the expression of any of the myosin heavy chain isoforms studied in any of the muscles examined.

Conclusion: A high-fat diet induces fat deposition in myofibers and affects the structure

of the lingual (genioglossus and geniohyoid) muscles.

## Publications

**Haketa T<sup>1</sup>, Kino K<sup>1</sup>, Sugisaki M, Takaoka M<sup>1</sup>, Ohta T<sup>1</sup> (Tokyo Med Dent Univ).** Randomized clinical trial of treatment for TMJ disc displacement. *J Dent Res* 2010; **89**: 1259-63.

**Saito T, Yamane A<sup>1</sup>, Kaneko S<sup>1</sup>, Ogawa T<sup>1</sup>, Ikawa T<sup>1</sup>, Saito K<sup>1</sup>, Sugisaki M (Tsurumi Univ).** Changes in the lingual muscles of obese rats induced by high-fat diet feeding. *Arch Oral Biol* 2010; **55**: 803-8.

**Kuruma E, Sugisaki M, Kino K (Tokyo Med Dent Univ), Tamai K, Saito T, Hayashi K.** Reliability of questionnaire on the pain-related limitations of daily function in Japanese patients with

temporomandibular disorders (in Japanese). *Nihon Gakukansetsu Gakkai Zasshi* 2010; **22**: 176-80.

**Kino K<sup>1</sup>, Kakudo K<sup>2</sup>, Sugisaki M, Hoshi K<sup>3</sup>, Yuasa H<sup>4</sup>, Matsuka Y<sup>5</sup>, Saito T, Nishiyama A<sup>1</sup> (Tokyo Med Dent Univ, <sup>2</sup>Osaka Dental Univ, <sup>3</sup>Kitasato Univ, <sup>4</sup>Tokai Municipal Hosp, <sup>5</sup>Okayama Univ).** Interview of volunteer patients for collecting patient question in the clinical guideline for temporomandibular disorders (in Japanese). *Nihon Gakukansetsu Gakkai Zasshi* 2010; **22**: 151-7.