Change of Temporomandibular Joint Disk Configuration and Clinical Findings following Conservative Treatment

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Short title; Change of TMJ disk and clinical findings after treatment
Key words; temporomandibular joint, magnetic resonance imaging, conservative treatment, follow-up study

Abstract

The objective of this study was to evaluate the relationship between changes in the disk status (position and reduction) and changes in the clinical findings following conservative temporomandibular joint (TMJ) treatment.

The subjects consisted of 164 patients (328 joints) having TMJ disorders. Clinical examination and MR imaging were performed on all patients before and after conservative treatment. Clinical assessments included joint noise, pain and inter- incisal distance (IID). Disk position and reduction was classified as "improved", "worsened", or "unchanged" following treatment. Joint noise and pain were similarly classified as "improved", "worsened", or "unchanged" foll owing treatment.

In the 55 joints where disk position was improved, noise was improved in 37 (67.2%) and worsened in 6 (10.9%). In the 48 joints where disk reduction was improved, noise was improved in 34 (70.8%) and worsened in 4 (8.3%). There was a significant relationship between improvement in the disk status and improvement in the noise. In 55 joints where the disk position was improved, pain symptoms were disappeared in 22 (40.0%) and newly occurred in 4 (7.3%). In the 56 joints where the pain was disappeared, disk position was improved in 22 (39.3%) but became worse in 22 (39.3%) joints. In 56 joints where the pain was disappeared, disk reduction improved in 17 (30.4%) joints but became worse in 32 (57.1%). There was no significant relationship between improvement in the disk status and improvement in the pain. Treatment has no significant influence on IID.

We conclude that there was no relationship between improvement in the disk status and improvement in the joint pain and IID after conservative treatment, but there was close relationship between the disk status and the joint noise in their changes.

Introduction

Of patients receiving treatment for disorders of the temporomandibular joint (TMJ), increasing numbers are diagnosed with internal derangement (Murakami et al., 1993). Internal derangement has been defined as the displacement of the disk in relation to the condyle. When a significant symptomatic internal derangement exists, a conservative course of treatment is frequently indicated because the success rates of conservative treatments are usually high (Anderson et al., 1991). Conservative treatment typically consists of attempted disk recapture and mandibular repositioning by occlusal splints (Summer and Westesson, 1997).

With the increasing desire to see symptomatic joint structures, arthrography, magnetic resonance (MR) imaging and arthroscopy have become useful diagnostic modalities (Muller et al., 1996). MR imaging is the most popular method to diagnose the disk position and reduction because neither ionizing irradiation nor anesthesia is used and any oblique tomographic section can be obtained.

The relationship between disk status and clinical findings has been examined by multiple authors (Merill et al., 1990, Kurita et al., 1998, Schellhas, 1989). In most studies, a significant relationship between disk position and patient symptoms has been recognized. However, there is little understanding of the relationship between change of disk status and change of the

clinical signs following treatment. Accordingly, the aim of this outcome study was to investigate the influence of conservative treatment on the relationship between disk status (position and reduction) and clinical findings.

Subjects and Methods

Patients

The subjects in this study consisted of 164 patients (328 joints) selected from 1829 patients who underwent MR imaging for TMJ diagnosis. There were 119 females and 45 males. The average age of the patients was 35.0 (18-78 years old). The inclusion criteria for selecting patients in this retrospective study were:

1. Patients were clinically diagnosed as having TMJ disorder.
2. MR imaging and clinical examinations were available at the beginning and end of treatment.
3. The period between two MR examinations was more than one month.
4. Patient received conservative treatment. This consisted of attempted disk recapture and mandibular repositioning by occlusal splints.

Imaging

MR images were obtained with a MR scanner using bilateral 8-cm diameter surface coils. Images were obtained in closed- and open-mouth positions in the oblique sagittal plane perpendicular to the long axis of the condylar heads. Eight 3-mm images were obtained in the open- and closed-mouth position. Scanning parameters included a TR of 50 ms and gradient echo sequence.

Clinical findings

Clinical findings which were recorded at the clinical examinations included pain, noise and inter-incisal distance (IID) at maximal opening. Pain was recorded as either present or absent. Noises at TMJ on opening were classified into 3 groups: crepitation, clicking or silent by palpation and stethoscope. IID was measured in millimeters by a caliper between the upper and lower central incisors.

Pain after treatment was classified into 3 groups. If the patient had no pain after treatment, they were scored as "improved." Patients were grouped as "worsened" if they claimed any pain after treatment. We did not consider any type, degree, or duration of pain. Patients were classified as "unchanged" if they reported no change in their pain experience.

Noise after treatment was classified into 3 groups. If clicking or crepitation disappeared or crepitation changed into clicking after treatment, they were scored as "improved." Patients were grouped as "worsened" if they reported any new noise or their clicking changed into crepitation after treatment. We did not consider any frequency nor duration of noise. If there were no change in noise, we classified into "unchanged."

MRI findings

Disk positions at closed mouth position were classified into 3 groups, such as superior position, anterior-superior position and anterior position, according to the criteria reported previously (Murakami et al., 1993). In the cases which were diagnosed as anterior or antero-superior position at closed mouth position, those were also diagnosed whether disks were reduced or not at open-mouth position.

As for change of the disk position after treatment, we classified changes into 3 groups. If the displaced disks changed into normal position or anteriorly displaced disk changed into antero-superior position after treatment, we grouped into "improved". And we grouped into "worsened", if any displacement occurred or antero-superior disk more displaced anteriorly after treatment. If there were no change in position, we classified into "unchanged"

As for change of the disk reduction after treatment, joints were classified into 3 groups. If the displaced disks changed into normal position or non-reduced disk changed into reducing one after treatment, we grouped into "improved". And we grouped into "worsened", if any displacement occurred or reducing disk changed into non-reduced one after treatment. If there were no change in reduction, we classified into "unchanged."

Statistical analysis

The relationship between improvement in the disk status and improvement in the noise and pain after treatment was evaluated statistically with using Chi-square test for independence. The difference of IID between before and after treatment according to the change of disk status was investigated statistically with using Wilcoxon signed-rank test and Paired two group t-test. All statistical analyses were performed on StatView (ver. 4.0) software.

Results

There was noise in 227 joints (clicking: n = 144, crepitation: n = 83) and pain in 112 joints. Average IID was 42.0 mm.

MR imaging revealed that 107 joints had superior position disks, 41 joints had antero-superior position disks and 180 joints had anterior position disk. In opened mouth position there were 22 (53.7%) reduced disks in 41 antero-superior position disks and 54 (30.0%) reduced disks in 180 anteriorly displaced disks.

As for noise, crepitation disappeared in 16 (19.3%) out of 83 joints and clicking disappeared in 54 (47.4%) out of 144 joints. Crepitation changed into clicking in 9

(10.8%) out of 83 joints. Crepitation or clicking occurred in 37 (36.6%) out of 101 joints which had not had any noise at the initial examination. Clicking changed into crepitation in 15 (10.4%) out of 144 joints. While the pain disappeared in 56 (50.0%) out of 112 joints, the pain occurred in 14 (6.5%) out of 216 joints which had not had any pain at the initial examination. Average of IID after treatment was 42.7 mm.

After treatment disk position was not changed in 221 (67.4%) disks. There was improvement in 55 joints (16.8%) and worsening in 52 joints (15.9%).

After treatment disk reduction was not changed in 202 (61.6%) disks. There was improvement in 48 joints (14.6%) and worsening in 78 joints (23.8%).

As for the relationship between change of disk position and change of noise, noise was improved in 37 (67.3%) and worsened in 6 (10.9%) out of 55 joints where disk position was improved. In 79 joints where the noise was improved, 37 (46.8%) disk position was improved and 12 (15.2%) disk got worse on disk position. There was significant relation between improvement in the disk position and improvement in the noise statistically ($0.001 < p < 0.01$, Chi-square value: 10.5).

As for the relationship between change of disk reduction and change of noise, noise was improved in 34 (70.8%) and worsened in 4 (8.3%) out of 48 joints where disk reduction was improved. In 79 joints where the noise was improved, 34 (43.0%) disk reduction was improved and 13 (16.4%) disk got worse on disk reduction. There was significant relation between improvement in the disk reduction and improvement in the noise statistically ($p < 0.0001$, Chi-square value: 25.7).

As for the relationship between change of disk position and change of pain, pain was disappeared in 22 (40.0%) and newly occurred 4 (7.3%) out of 55 joints where disk position was improved. In 56 joints where the pain was improved, although 22 (39.3%) joints were improved, the same number of joints got worse on disk position. There was no significant relation between improvement in the disk position and improvement in the pain statistically ($p = 0.48$, Chi-square value: 0.5).

As for the relationship between change of disk reduction and change of pain, pain was disappeared in 17 (35.4%) and newly occurred in 3 (6.3%) out of 48 joints where disk reduction was improved. In 56 joints where the pain was improved, although 17 (30.4%) joints were improved, 32 (57.1%) joints got worse on disk position. There was no significant relation between improvement in the disk reduction and improvement in the pain statistically ($p = 0.60$, Chi-square value: 0.3).

As for change of IID, although average of IID was increased after treatment, there was no significant difference in each groups statistically.

Discussion

In this study, we found the statistical significant correlation between improvement in the noise and improvement in the disk status after treatment. It makes sense that noise was improved because the positional relationship between the disk and the mandibular condyle was improved after treatment. The TMJ noise decreased when joint space was increased, allowing smoother condylar translation beyond disk surface irregularity and positional abnormality (Kirk et al., 1991). In some of our cases, joint space would widen after treatment. However, out of 79 joints where the noise improved, disk position and reduction were worsened in 12 and 13 disks (15.2% and 16.4%). In these cases it was considered that clicking was disappeared because the disk was more anteriorly displaced and posterior attachment would be elongated by the treatment.

As for relationship between improvement in the pain and improvement in the disk status, there was no significant relationship statistically, although pain hardly occur newly in cases where the disk status was improved. In 56 cases where the pain disappeared, however, the disk position was worsened in 22 joints (39.3%) and the disk reduction was also worsened in 32 joints (57.1%). As reported previously, improvement of the pain might due to the restoration of the disk mobility (Kirk et al., 1991). And it was said that by improving the disk mobility, without improving the disk position, the articulation in joint space might benefit and thereby alleviate the pain (Montgomery et al., 1991). From our results, we can say the pain could occur not only by the abnormal disk status. As for the joint pain there must be various kinds of factors, so clinicians do not have to pay attention only to the disk status during treatments. It might take longer time to make the pain decreased after treatment. There is possibility of difference in time between improvement in the pain and improvement in the disk status.

Although average IID was increased after treatment, there was no significant difference between before and after treatments. Increasing the IID did not always correspond to the improvement of the disk status. For example, if the disk was more anteriorly displaced, condyle had no longer obstruction. In these cases, posterior attachment of the TMJ would be elongated or perforated. It was said that the keys to the improvement of IID appeared to be loss of elasticity of the posterior attachment and release of the adhesive force in the joint space (Choi et al., 1994). On consideration of IID, not only disk status but also posterior attachment and joint space should be diagnosed in the MRI or other modalities.

In this study a few faults could be indicated concerning with the classifications. On the classification of the disk position, we did not consider any degree of the displacement, although we classified the

displacement disks into two groups, such as "anterio rly" or "supero-anterioly". As for pain, we classified into "yes" or "no", according to patients complaints without considering kinds, duration nor frequency of the joint noise. On the TMJ noise, we did not pay attention to any duration and frequency. We did not collect data in detail because there were lots of variations in the clinical findings.

It was reported that there was no relationship between improvement in clinical findings and improvement in the disk position after treatment (Perrott et al., 1990). The study was conducted using arthroscopy, and although their findings were interesting, the use of anesthesia in both arthroscopic and arthrographic methods may affect a patient's reported pain symptoms.

If these data collection is performed in detail, the result would be changed a little. And in the future study, we should diagnose the disk status more precisely with using higher resolution MR scanner. Moreover the condition of the posterior attachment and joint effusion which are considered to be linked clinical findings should be evaluated.

In conclusion, there was no relationship between change of the disk status and change of the pain and IID. Although diagnosing on disk position and reduction by MR imaging has been popular, we had better investigate not only the disk status. We should know to improve the disk position and the disk reduction is not main purpose of the treatment for TMJ disorder patients.

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