

Case Study

Efficacy of therapeutic exercise for temporomandibular disorders as assessed by magnetic resonance imaging: a case report

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Abstract. [Purpose] The efficacy of exercise therapy in temporomandibular disorders has been recognized. Here, we present our experience with exercise therapy. [Participant and Methods] A 25-year-old female with a sudden onset of mouth opening limitation in October 2018 was admitted to our hospital in November 2018. Based on our initial findings, the patient was diagnosed with left disc derangement of the temporomandibular joint without reduction. A definitive diagnosis was established following magnetic resonance imaging in December 2018. Subsequently, range-of-motion exercises for the temporomandibular joint as passive movements and self-traction therapy as active movements were conducted. Magnetic resonance imaging was repeated 4 months after the first treatment. [Results] The temporomandibular joint disc remained in anterior dislocation during mouth opening and closing. The mouth opening joint motion was significantly improved compared to the pre-therapy range. The pain-related visual analog scale score also significantly improved. [Conclusion] The range of motion of the temporomandibular joint was improved by range-of-motion exercises for the temporomandibular joint, and was maintained and managed using self-traction therapy. Improvement of the range of motion was confirmed by magnetic resonance imaging.

Key words: Temporomandibular disorders (TMDs), Exercise therapy, MRI

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INTRODUCTION

Several temporomandibular disorders are caused by contractures in the joint capsule following fibrosis in the joint capsule and anterior dislocation of the joint disc¹⁾. A wide variety of treatments are available for temporomandibular disorders, such as lifestyle modifications, pharmacotherapy, physical therapy (including therapeutic exercises), appliance therapy, occlusal treatment, cognitive behavioral therapy, psychosomatic medical treatment, and surgical treatment. In recent years, reversible conservative treatment has been recommended as the initial treatment for temporomandibular disorders by Kurita et al.²⁾ and Sato et al.³⁾ Studies have reported improvements observed in the natural history of the disorders, and from the basic statement from International Association for Dental Research in 2010⁴⁾. Therefore, the effects of reversible conservative treatments have been investigated⁵⁾. The effectiveness of exercise therapy is being recognized due to the recent accumulation of evidence^{6–8)}. However, most reports to date have examined the effects of exercise therapy using active movements, and

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there is insufficient evidence regarding passive movements^{9,10}. For that reason, it is necessary to accumulate more evidence.

Additionally, Diagnostic Criteria of for Temporomandibular Disorders (DC/TMD)¹¹ published in 2014 are recognized worldwide for the diagnosis of temporomandibular disorders. We believe that clarifying the patient's clinical condition based on this diagnostic criteria and, then, prescribing treatment will further contribute to accumulation of evidence.

Disc derangement of the temporomandibular joint without reduction (DDwoR)—one of the pathophysiological classifications of temporomandibular disorders—has been reported to significantly deteriorate the quality of daily life of patients¹². The aim of this article was to report the therapy performed in a patient with DDwoR, which resulted in significant improvements in the symptoms and range of motion with evaluation of the range of motion of the temporomandibular joint using magnetic resonance imaging (MRI) before and after the treatment.

PARTICIPANT AND METHODS

A 25-year-old female (height: 162.0 cm; weight 50.0 kg) noticed acute limitations in mouth opening in October 2018. In November 2018, she was admitted to the Aichi Gakuin University School of Dentistry. The initial symptoms included painless maximum mouth opening of 30 mm and painful maximum opening of 34 mm based on the upper and lower right central incisors, including the vertical lid, deviation of the mouth to the left on opening, and pain in the left temporomandibular joint on opening. Based on the diagnostic criteria of DC/TMD¹³, a clinical diagnosis of DDwoR was established, and a definitive diagnosis was established using MRI (Fig. 1).

After explaining the disorder to the patient in December 2018, the patient was treated with range-of-motion exercise for the temporomandibular joint (TMJROME) by the dentist using passive movements and self-traction therapy (STT) as part of the active movements for maintenance and stability. We considered TMJROME and STT as one exercise program. The parameters evaluated included painless maximum opening distance, jaw opening pain, meal pain, and the degree of disability in daily life. The evaluation was performed each time since the first visit and subsequent follow-up examinations. Regarding the painless maximum opening, the distance between the right upper and lower mandibular central incisors, including the vertical lid was measured using an aperture measurement instrument (Keisei Scale: Keisei Medical Industry Co., Ltd. Tokyo, Japan). For other evaluation items, we used the visual analog scale (VAS). In March 2019, each item was re-assessed and MRI was repeated to estimate the range of the temporomandibular joint.

TMJROME was performed according to the method described by Farrar and McCarty¹⁴. The head is firmly fixed with the palm of the left hand, and the affected temporomandibular joint is palpated with the third finger simultaneously. The first finger of the right hand is placed on the molar, the bone is held with the remaining fingers, and force is applied to rotate the mandible. After relaxing the patient, perform this maneuver with enough force to get a sense of “stretching” in the direction of stretching at the temporomandibular joint in forward and downward directions. Additionally, the pulling time is approximately 10–15 seconds for each time this maneuver is performed, and it is repeated 5–6 times (Fig. 2).

On the other hand, STT requires a slightly forward posture in the sitting position. The second and third fingers are placed on the front teeth of the mandible and the first finger grips the mental part. The mandible is pulled forward and downward,

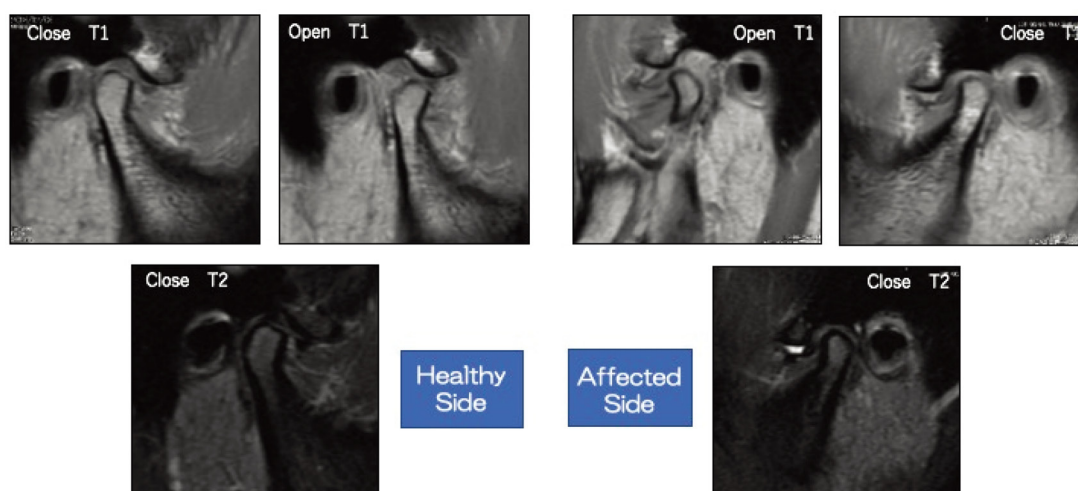


Fig. 1. MRI at first visit.

Upper raw: T1-weighted image; Lower raw: T2-weighted image.

In affected side, the position of the mandibular condyle did not reach beyond the joint ridge during mouth opening before the treatment (T1-weighted image). The cross section of the MRI was the cross section where the joint disc was most depicted.

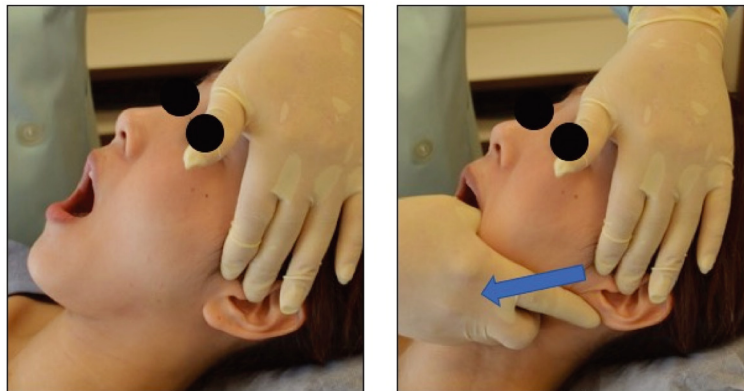


Fig. 2. Passive movement (Range-of-motion for temporomandibular joint). Range-of-motion exercise for the temporomandibular joint (TMJROME). The therapist firmly holds the head in the left palm and palpates the impaired mandibular joint by using the middle finger. The therapist presses the thumb of the right on the left side of the occlusal surface of the molar, holds the diaphysis with the other fingers, and then applies force to rotate the mandible in the anterior-lower direction.



Fig. 3. Active movement (Self-traction therapy). Self-traction therapy (STT). The patient sits upright while leaning slightly forward. The patient holds the anterior teeth of the mandible with the thumbs. The patient slowly performs bouts of mandibular traction such that the mandible rotates in the anterior-lower direction.

and the force required is enough to obtain a sense of “stretching” in the direction of stretching at the temporomandibular joint and in the masticatory muscles. STT of two daily sets with 10 episodes of traction for approximately 10 seconds per set was prescribed. It is important to stretch the lower jaw in the direction of the muscles, and the strength applied should be enough to open the front teeth 4–5 mm more than their maximum opening (Fig. 3).

The ethics committee of the Aichi Gakuin University School of Dentistry approved this article (Approval number: 381), and written informed consent was obtained from the patient.

RESULTS

The opening distance and VAS score also improved as illustrated in Figs. 4–6.

Four months after the treatment, MRI of painless maximum opening and closing were obtained and compared with those from before the treatment. The joint disc demonstrated forward dislocation, both, during the opening and closing before and after the treatment (Fig. 7).

Compared Fig. 1 with Fig. 7, the position of the mandibular condyle did not reach beyond the joint ridge before the

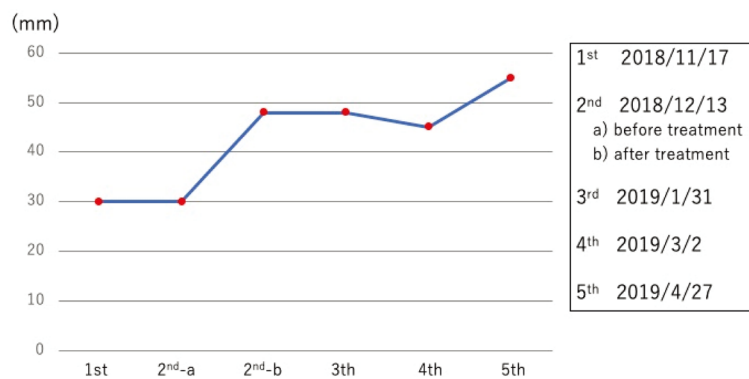


Fig. 4. Mouth opening range.

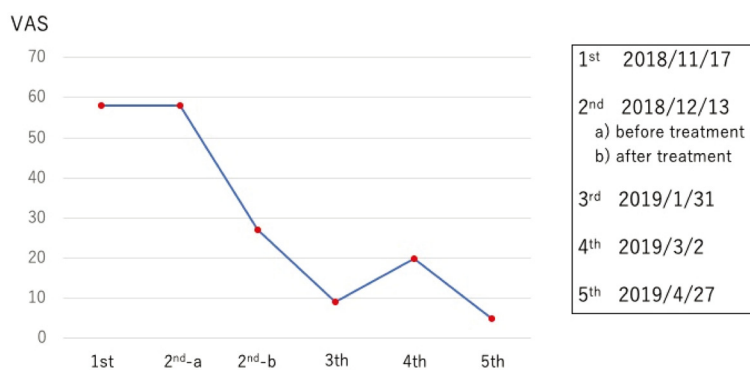


Fig. 5. Jaw opening pain.

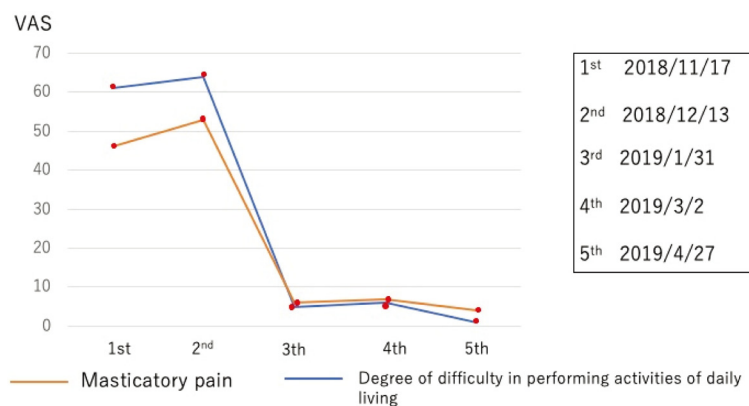


Fig. 6. Masticatory pain/degree of difficulty in performing activities of daily living.

treatment; however, it moved anteriorly and downwardly beyond the joint ridge during mouth opening four months after the therapy. Improvement in the range of motion was confirmed (Fig. 8).

DISCUSSION

It has been previously reported that the symptoms of temporomandibular disorders can improve as part of their natural history^{2, 3)}. However, as has been reported with the knee joints, prolonged periods of immobilization can result in muscle contractures and joint capsule contractures¹⁵⁾. These contractures can occur immediately after immobilization.

In the case of the temporomandibular joint, as in the case of the knee joint, the possibility that the adjacent tissues related

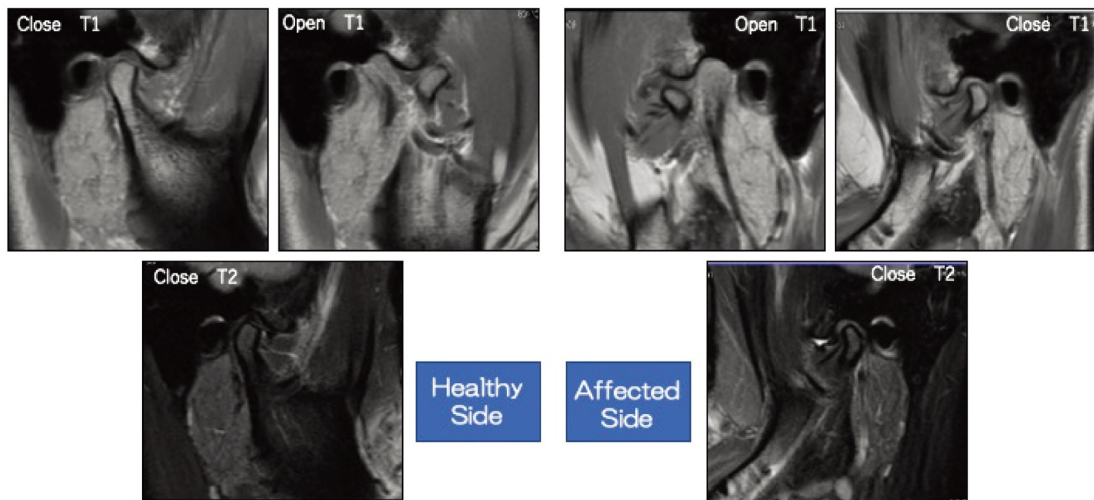


Fig. 7. MRI at 4 months later. Upper row: T1-weighted image; Lower row: T2-weighted image. In affected side, the position of the mandibular condyle moved anteriorly and downwardly beyond the joint ridge during mouth opening four months after the therapy (T1-weighted image). The cross section of the MRI was the cross section where the joint disc was most depicted.

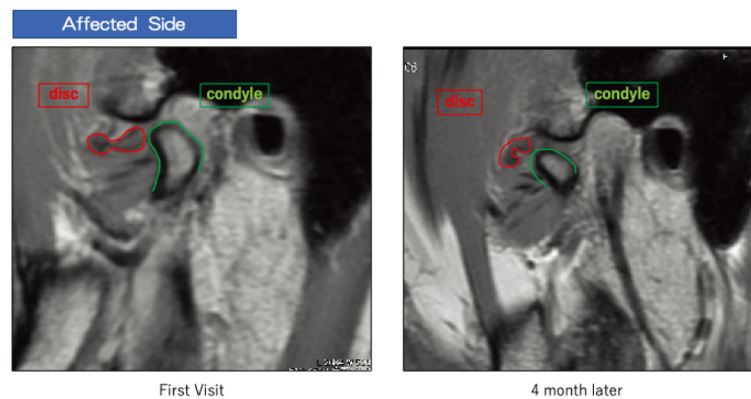


Fig. 8. Comparison first visit with 4 months later (Open T1-weighted image). When comparing Fig. 1 and Fig. 7, the position of the mandibular condyle did not reach beyond the joint ridge before the treatment; however, it moved anteriorly and downwardly beyond the joint ridge during mouth opening four months after the therapy. Improvement in the range of motion was confirmed. The joint disc is pushed forward compared to the first visit. The cross section of the MRI was the cross section where the joint disc was most depicted.

to the temporomandibular joint will develop contractures with immobilization cannot be ruled out. Therefore, improving the range of motion as early as possible appears to play an important role in preventing contractures.

We believe that DDwoR can be better divided into acute and chronic cases, and better results can be obtained with therapy. In the acute cases, we aim to reposition the disc since an early stage if there is no severe functional pain. In acute cases in which repositioning cannot be performed as well as in chronic cases, the goal should be to improve the quality of life by increasing the range of motion to increase the amount of opening and reduce pain as much as possible. Although the criteria for distinguishing between acute and chronic cases have not been established, considering cases with onset within 3 months as acute cases appear to be reasonable based on the report by Nakagawa et al.¹⁶⁾ In the current case, we were able to perform TMJROME, which includes passive movements as early as possible, in those older than 25 years of age within 2 months of the onset. The MRI at first visit confirmed that the mandibular condyle, which could not exceed the joint ridge at the time of maximal opening (Fig. 1), was able to move beyond the joint ridge in the MRI at 4 month later (Fig. 7). Comparing the first

visit and the 4 months later, it is confirmed that the range of motion has been greatly improved (Fig. 8). Although significant improvements in multiple symptoms were achieved, we were not able to reposition the temporomandibular joint disc. We believe that the treatment outcomes were maintained and managed by the active movements of STT, which further improved the outcomes.

If there is no acute pain, in both acute or chronic cases, it is desirable to obtain informed consent and start exercise therapy as early as possible, after explaining to the patient the possibility that some pain may be exacerbated if there is mild-to-moderate functional pain. With regards to the pain management in that time, pharmacotherapy may be added as appropriate. In the current case, the pain at presentation was mild and the patient did not wish to take concomitant medications.

One of the benefits of passive movements is that the patients can realize significant improvements in symptoms from the early stages. Providing patients with early substantial improvements in symptoms will improve their motivation for active movements, which will also facilitate better rapport with patients.

The effectiveness of exercise therapy in temporomandibular disorders is being recognized; however, specific methods are still being investigated in various forms^{6-10, 16}. With the accumulation of clinical evidence as in this case, it may be possible to greatly contribute to early symptomatic improvements with exercise therapy programs following a clinical diagnosis, even when MRI may not be feasible. In order to do so, it is necessary to objectively investigate and publish the number of exercises and the strength of the force required in the future.

Funding and Conflict of interest

None.

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