



# Temporomandibular disorders treatment: comparison of home exercise and manual therapy

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## Research Article

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**Purpose:** The aim of this study was to compare the effectiveness of home exercises therapy (HT) and manual therapy (MT) in patients with temporomandibular disorders (TMD) after 4-weeks of intervention period. **Methods:** Forty patients with TMD with myofascial pain and/or anterior disc displacement with reduction were randomly divided into two groups: HT (N=20) and MT (N=20) groups. The HT group received education and postural exercises. The MT group received education, postural exercises, and temporomandibular joint and soft tissue mobilization. Pain intensity and head posture were measured before and after the treatment. **Results:** Compared with the baseline, both interventions were found to be significantly improved visual analog scale (VAS) and head posture after the treatment ( $p<0.05$ ). The VAS decreased and head posture improved. Between the groups, the MT group showed significant changes in both parameters ( $p<0.05$ ). **Conclusions:** The MT with HT was more effective for patients with TMD.

**Keywords:** Temporomandibular joint dysfunction, Manual therapy, Exercise therapy.

## Temporomandibular disfonksiyon tedavisi: ev egzersizi ve manual tedavinin karşılaştırılması

**Amaç:** Çalışmanın amacı, temporomandibular eklem disfonksiyonu (TMD) olan hastalarda ev egzersiz tedavisi (ET) ile manuel tedavinin (MT) etkisini dört haftalık tedavi sonrası karşılaştırmaktır. **Yöntem:** Bu çalışma TMD miyofasiyal ağrılı ve/veya temporomandibular eklem redüksiyonlu disk problemi olan 40 hasta ile gerçekleştirildi. Hastalar rastgele yöntemle ET grubu (N=20) ile MT grubu (N=20) olmak üzere ikiye ayrıldı. ET grubuna, eğitim ile postür egzersizleri verildi. MT grubuna; eğitim, postür egzersizleri ve temporomandibular eklem ve yumuşak doku mobilizasyonu uygulandı. Her iki grupta tedavi öncesi ve tedavi sonrası ağrı ve baş postürü açısından değerlendirildi. **Sonuçlar:** Her iki grubun tedavi öncesi ve sonrası değerleri karşılaştırıldığında vizüel ağrı skalası (VAS) ve baş postüründe istatistiksel olarak anlamlı gelişme saptandı ( $p<0.05$ ). VAS değerinde azalma ve baş postüründe düzelme kaydedildi. Gruplar arası karşılaştırma yapıldığında her iki parametrede de iyileşme açısından farkın MT grubu lehine istatistiksel olarak anlamlı olduğu belirlendi ( $p<0.05$ ). **Tartışma:** TMD hastalarında ET ve MT programlarının birlikte uygulanmasının daha etkili olduğu görüldü.

**Anahtar kelimeler:** Temporomandibular eklem disfonksiyonu, Manuel tedavi, Egzersiz tedavisi.

Temporomandibular disorder (TMD) is a general term which encompasses a variety of clinical dysfunctions, disorders, and problems that primarily involve the masticatory musculature and/or the temporomandibular joint itself as well as its associated structures.<sup>1</sup> The most frequent presenting symptom and reason for seeking TMD treatment is orofacial pain.<sup>2</sup>

Several authors have suggested that posture relates to the status of health, and that poor posture can lead to pain and dysfunction.<sup>3-6</sup> One frequently noted abnormal posture is an excessive forward head posture (FHP),<sup>3</sup> which Kendall<sup>6</sup> defined with shortening of the posterior cervical extensor muscles and tightening of the anterior cervical muscles. In addition, it is characterized by a dorsal flexion of the head together with the upper cervical spine (C1-C3), and accompanied by a flexion of the lower cervical spine (C4-C7).<sup>3,5</sup> With this posture the head's centre of gravity is forward to the spine's weight bearing axis. Authors have been demonstrated an association between FHP to neck pain<sup>4</sup> and chronic tension type headache.<sup>5</sup> The FHP is an often suggested factor in etiology of TMD.<sup>7,8</sup>

The relationship between head posture and the stomatognathic system is of immense importance in the fields of physical therapy and dentistry. Changes in the head posture can alter the position of the mandible,<sup>9</sup> and the activity of the masticatory muscles.<sup>10</sup> La Touche et al,<sup>10</sup> demonstrated in their experimental study that different cranial-cervical postures influences the maximal mouth opening and pain of the TMD patients. Forward head posture increases the tension in masticatory muscles that pull the mandible upwards, cervical hyperlordosis, or compression of the cervical apophyseal joints.<sup>8,11,12</sup> It is well known that cervical spine tissues can refer pain to the head and orofacial region.<sup>13</sup>

In the literature, a wide range of treatments for TMD has been described as medication, physical therapy, manual therapy, occlusal splint, occlusal adjustment, surgical approach, and bio-behavioral treatment.<sup>1,14,15</sup>

There is a growing consensus that treatment strategies should be reversible since the majority

of TMD patients may achieve sufficient relief of symptoms with reversible therapy.<sup>16</sup> Home exercise therapy (HT) including self-care treatment, patient education, habit awareness and modification may be advised for TMD management. The HT primarily involves active joint distraction, jaw movements, correction of body and head posture, and behavioral education.<sup>14-17</sup> Hanten et. al.<sup>18</sup> showed the effectiveness of home exercise therapy in reducing pain and sensitivity for treatment of patients with myofascial pain.

Manual therapy (MT) within the field of physical therapy primarily involves the application of pressure by hand and is intended to move joints and surrounding tissues an effort to improve function and relieve symptoms, such as pain<sup>19</sup>. Moreover, MT is the most commonly approach in management of spinal conditions,<sup>20</sup> and useful method to TMD management.<sup>21</sup> The MT treatment includes soft tissue techniques such as myofascial release, joint techniques such as traction and gliding, exercises including jaw muscle exercises, stretching exercises, and mouth movements against resistance or reflexive relaxation for TMD management. These exercises are intended to reduce muscle spasm, alter the jaw closure pattern, and improve coordination of the muscles of mastication.<sup>19-25</sup>

Medlicott et al,<sup>15</sup> concluded that patients with TMD symptoms had benefit of active, passive, and postural exercises combination in manual therapy. However, there has been no study in the literature comparing MT combined with HT to HT alone on patients with TMD. Most studies compared MT to splint treatment,<sup>24-25</sup> or combination of different types of physical therapy programs.<sup>26,27</sup>

Therefore, the purposes of this study were to compare the effectiveness of MT with HT to HT alone to evaluate pain intensity and head posture and determine a change of head posture affecting pain intensity in patients with TMD.

## METHODS

**Subjects:** Subjects with chief complaints of

similar pain level in the Temporomandibular region participated at this study. A stomatognathic examination was performed to diagnose TMD according to the Research Diagnostic Criteria.<sup>28</sup> This study was approved by the Ethics Committee of Hacettepe University, Faculty of Medicine, Ankara, Turkey. An explanation of study was given to subjects and consent forms were obtained.

Inclusion criteria for the study were (a) myofascial temporomandibular pain, (b) anterior disc displacement with reduction, (c) pain in the masticatory muscle/temporomandibular region persisting more than one month, (d) symptoms lasting at least three months, (e) evidence of postural dysfunction, (f) similar initial pain level and (g) informed consent and the ability to attend the clinics for treatment and assessment,

Exclusion criteria were (a) anterior disc displacement without reduction, (b) arthrogenic pain, (c) other temporomandibular disorders treatments within the last 3 months, (d) neurologic or psychiatric disorders, (e) temporomandibular joint and/or cervical spine surgery, and (f) history of pain medication abuse or current medication abuse.

Forty patients who met the inclusion criteria qualified as the subjects of the study and were randomly assigned into two treatment groups. The MT group consisted of 20 patients (16 women and 4 men) and received a combination of MT and HT. The HT group consisted also of 20 patients (15 women and 5 men) and received only HT.

#### **Assessment of subjects**

Pain intensity at rest and with stress was measured with a visual analogue scale (VAS) as outcome variables. The VAS was labeled from 0 = "no pain at all" to 10 = "worst possible pain." The subject marked a certain length of this line that was equivalent to the intensity of pain experienced. The distance of this mark, from "no pain" to the end of the scale, was measured. The VAS has been shown to be a reliable and valid instrument for measuring pain intensity.<sup>29</sup>

Pain with stress was measured during clenching in the intercuspal position for 60 seconds.<sup>17</sup> Pain at rest was measured at mandibular

rest position which was considered no contacts between teeth on maxilla and mandible as well as no stress on mandibular muscles. Pain at rest was measured prior to stress condition.

Forward head posture was measured in degrees as the angle between the horizontal plane and the line of the seventh cervical vertebra and ear.<sup>30</sup> The subjects stood in a comfortable position with the head in its natural balance and the arms relaxed at the side. None of the patients was informed that the study would involve posture to eliminate bias. By manual palpation, the seventh cervical vertebra (C7) was located. One of the goniometric lines connected to the ear (external auditory meatus) while the other line was kept parallel to the horizontal plane. The angle between C7, ear, and the horizontal plane was measured in degrees.<sup>5,30</sup> Raine and Twomey<sup>31</sup> have reported the reliability of this of this procedure as high.

#### **Treatment of subjects**

Home exercises therapy (HT): This program included patient education, self-massage and stretching for masticatory and neck muscles, active jaw movement exercises and coordination exercises for TMJ, head and general posture correction training and strengthening exercises.<sup>16-18</sup> Each HT session was 30 minutes, and three treatments per week were administered by themselves.

Manual therapy (MT): This program included HT, deep friction massage and myofascial release techniques for masticator and neck muscles, guided opening and closing movements for temporomandibular joint (TMJ), joint distraction, anterior and/or lateral glide to stretch the TMJ capsule for disk-condyle accommodation, stabilization and coordination exercises for TMJ, gentle isometric tension exercises against resistance, and mobilization of cervical spines.<sup>19-22</sup> Thirty-minute treatment sessions were scheduled three times per week.

All the patients completed the treatment program.

#### **Statistical analysis:**

Data analyses were performed using SPSS software (SPSS 15.0, Chicago, USA). Each measurement time was measured with mean

values, and 95% confidence intervals of the data were presented for each measurement. The baseline characteristics (age, height, and weight) between the groups were evaluated by the independent samples t-test. The Mann Whitney U test was used to compare the complain duration. The Chi-square test was used to compare categorical variables, gender, diagnosis, and effected side. The VAS and FHP were compared within and between groups with paired t-test and independent samples t-test. Level of significance was set at  $p < 0.05$ .

## RESULTS

Baseline characteristics of the patients are presented at Table 1. A total of 40 subjects, 31 females and nine males, participated in this study. Thirty-one (77.5%) of the subjects had disc displacement with reduction, and nine (22.5%) had myofascial pain. The HT group (Group 1) had five males and 15 females, and their ages ranged from 20-63 years (the mean age was  $34.8 \pm 12.4$ ). The MT group (Group 2) included four males and 16 females subjects and their ages ranged from 18-72 years (the mean age was  $37.0 \pm 14.6$ ). There were no statistically significant differences between the groups at baseline for their age, height, weight, complaint duration, diagnosis, and affected side values (Table 1). After completion of treatment, modalities at the end four weeks of treatment period, no adverse effects were reported. All subjects completed the four weeks of intervention period. No adverse effects were observed during the treatment. No drug therapy was initiated during the treatment period.

We observed no statistically significant difference between the groups at baseline ( $p > 0.05$ ). After the treatment period, VAS scores at rest and with stress showed a statistically significant decrease within the groups (HT group,  $p < 0.05$ ; MT group,  $p < 0.05$ ). However, when we compared the groups after treatment, only VAS with stress scores in the MT group were significant reduced as compared to the HT group ( $p < 0.05$ , Table 2).

The forward head position angle mean scores

ranged from  $32.60 \pm 4.26$  degrees to  $35.5 \pm 3.95$  degrees in the HT group and  $33.7 \pm 7.19$  degrees to  $41.05 \pm 4.16$  degrees in the MT group. There were no significant differences between the groups at the beginning ( $p > 0.05$ ). After the treatment period, both group values of the forward head posture were improved compared to baseline ( $p < 0.05$ ). When we compared the groups after treatment, the forward head position angle mean scores in the MT group were statistically higher than that of the HT group ( $p < 0.05$ , Table 2).

## DISCUSSION

The results of this study support that forward head posture is associated with TMD and manual therapy combined with home exercises can be effective in reducing symptoms and improving the functional status of patients suffering from TMD. 31 females and nine males fulfilled the criteria of inclusion. This difference in numbers between the genders can be explained by the higher prevalence of TMD in women.<sup>32</sup>

There is convincing evidence in the literature that head posture is related to masticatory muscle activity, the postural rest position of the mandible, the habitual pathway of jaw closure, and initial occlusal contact.<sup>7-12</sup> Several authors have suggested that a forward head posture is closely associated with certain TMD symptoms.<sup>4,8,10</sup> Lee and his colleagues<sup>33</sup> reported that the angle of the ear-seventh cervical vertebra-horizontal plane was smaller in TMD patients than that of the control subjects. We found similar result presenting that the angle of the ear-seventh cervical vertebra-horizontal plane was smaller before treatment. During the treatment, subjects in both groups had to perform postural exercises, which were to stretch structures that tended to be shorten, and to strengthen structures that tended to be weaken. In addition, we wanted to create an awareness of the desirable posture by educating subjects. After the treatment, the angle of head posture increased, which was a correction of forward head posture and showed a statistical significance in both groups. Comparing the two groups, correction of forward head posture was statistically significant

**Table 1. Baseline characteristics of the study population.**

	Home exercise therapy (N=20) X±SD	Manual therapy (N=20) X±SD	p
<b>Age</b> (years)	34.8±12.4	37.0±14.6	>0.05
<b>Height</b> (cm)	166.4±7.5	163.8±7.9	>0.05
<b>Weight</b> (kg)	62.6±9.9	64.1±8.6	>0.05
<b>Complaint duration</b> (months)	14.1±9.7	13.0±11.8	>0.05
	n	n	
<b>Gender</b> (female/male)	15/5	16/4	>0.05
<b>Diagnosis</b> (ADDwR/MP)	14/6	17/3	>0.05
<b>Effected side</b> (left/right/both)	5/10/5	9/8/3	>0.05

ADDwR:anterior disc displacement with reduction, MP: myofascial pain.

**Table 2. Results of pain (Visual Analog Scale, mm) at rest and with stress, and forward head posture of study groups.**

	Home exercise therapy (N=20) X±SD	Manual therapy (N=20) X±SD	p
<b>Pain at rest</b> (VAS, mm)			
Before treatment	17.5±21.5	23.0±23.6	>0.05
After treatment	4.5±10.0	0.5±2.2	>0.05
	p<0.05 <sup>a</sup>	p<0.001 <sup>a</sup>	
<b>Pain with stress</b> (VAS, mm)			
Before treatment	66.5±20.6	62.5±20.5	>0.05
After treatment	43.5±20.8	7.0±12.6	<0.001
	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	
<b>Forward head posture</b> (degrees)			
Before treatment	32.6±4.2	33.7±7.1	>0.05
After treatment	35.5±3.9	41.0±4.1	<0.05
	<0.05 <sup>a</sup>	<0.05 <sup>a</sup>	

a: Comparison between before and after treatment in groups.

in the MT group than that of the HT group. The correction of the head posture is associated with the relief of the pain related to the muscular imbalance in the stomatognathic system. The fact that TMD is often the cause of a variety of symptoms throughout the head and neck is widely recognized.<sup>8</sup> Studies showed cervical posture influences pain,<sup>22,33</sup> mandible movement,<sup>11</sup> and the rest position of the mandible.<sup>7,9</sup> Wright et al,<sup>34</sup> reported that posture correction and self-management instructions for TMD patients have a positive effect in myofascial pain and maximum pain-free mouth opening. The authors found

significance between improvement in TMD symptoms and improvements in neck symptoms. In addition, other studies showed the efficacy of exercise and postural correction in patient with TMD.<sup>35,36</sup> Our results were in an agreement with those reported by La Touche et al,<sup>10</sup> and by von Piekartz et al,<sup>22</sup> who also showed that FHP could affect TMD.

Treatment approaches for TMD vary largely from the difference of opinion regarding its main etiology. A review by List and Axelsson<sup>37</sup> evaluated the literature on the management of TMD from systematic reviews, and had found that

the surgery, occlusal adjustment, and electro-physical modalities seem to have no effect in alleviating TMD pain. Management goals of TMD are best achieved by using multidisciplinary approaches to decrease pain, increase muscular coordination and muscular strength.<sup>14,15,38</sup> A systematic review by Medicott and Harris<sup>15</sup> evaluated the literature on the efficacy of physical therapy interventions for TMD patients. They stated the value of combined approach of active exercises and MT to be effective for people with TMDs. This review favored the use of multifaceted TMD treatments.

It is generally believed that MT treatments are effective in reducing symptoms associated with TMD.<sup>20,39</sup> Various reports have suggested manual therapy as a viable and useful approach in the management of myofascial and/or anterior disc displacement with reduction TMDs.<sup>21-25</sup> Our findings are in agreement with these studies with similar results, which also indicate effectiveness of MT. A study by Carmeli et al,<sup>24</sup> reported that MT with active exercise was more effective than soft repositioning splint in reducing pain in patients with anterior displaced temporomandibular disc syndroms. Nicolakis and his colleges,<sup>36</sup> also showed that MT with exercises and education improved mouth opening and reduction pain level in patients with anterior disc displacement with reduction. In addition, Furto et al,<sup>40</sup> provided manual physical therapy and exercise program patients with TMD. They investigated 15 subjects with TMD who were treated with manual physical therapy and exercise. After two weeks of follow up, subjects demonstrated clinical improvement in function.

In a systematic review, Gross et al,<sup>20</sup> concluded that MT should be done with exercise for improving pain and patient satisfaction. This supports the hypothesis that patient education and home physical therapy in combination with MT can be effective on treatment of TMD patients. We found significant improvement including decrease of pain level, and correction of forward head posture in the MT group after treatment. We believed that postural and cervical muscle training as well as MT has been shown to improve TMD

signs and symptoms.

There are factors in this study that supports the patients' improvement in the MT group. In the present study, the MT group could meet with the physiotherapist three times a week. This had two positive effects on patients. First, like Chan and Can<sup>41</sup> suggested, a positive relationship between the patient and the clinician helped patients to manage the symptoms of pain. Second, the MT group received more treatment than HPT group. Groups who received more treatment modalities seemed to do better than who received fewer modalities.<sup>38</sup> The MT may influence both pain modulation through neurophysiologic effects and mobility thought neuromuscular mechanism.<sup>39</sup> We believed that all these factors support patients' improvement in the MT group in our study.

We limited our evaluation with four weeks. This was a limitation of this study. Future research is necessary to investigate the long term effects of MT and HT treatments in homogeneous TMD populations.

In conclusion, the results of this study suggest that MT in combined with HT for treatment of TMD is more effective than the HT alone in the short-term, particularly, in reducing pain and correcting forward head position. Further study is needed to establish scientific evidence to support the use of MT and HT in a homogeneous TMD population.

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