Temporomandibular Bozukluklarda Fizyoterapi Uygulamaları

Physiotherapy Interventions in Temporomandibular Disorders

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ÖZ

Temporomandibular bozukluklar çiğneme kaslarını, temporomandibular eklemi ve ilişkili yapıları ifade eden, popülasyonun %10'undan fazlasını etkileyen karmaşık bozukluklardır. Semptomlar genellikle ağrı, eklem sesleri ve sınırlı hareket açıklığını içerir. Semptoma yönelik tedavi biçimleri konservatif tedaviden cerrahi tedaviye kadar uzanmaktadır. Elektrofiziksel ajanlar, manuel terapi ve egzersiz yaklaşımlarını içeren fizyoterapi uygulamaları, temporomandibular bozuklukların konservatif tedavisinde en sık kullanılan tekniklerdendir. Bu çalışmanın amacı, temporomandibular bozuklukların tedavisinde kullanılan fizyoterapi uygulamalarını ve etkinliklerini literatürü gözden geçirerek mevcut çalışmalar ışığında incelemektir.

Anahtar Kelimeler: Fizik tedavi modaliteleri, rehabilitasyon, temporomandibular eklem bozuklukları

ABSTRACT

Temporomandibular disorders are complex disorders affecting more than 10% of the population, expressing the masticatory muscles, temporomandibular joint and associated structures. Symptoms often include pain, joint sounds, and limited range of motion. Symptom-oriented treatment forms range from conservative treatment to surgical treatment. Physiotherapy interventions, including electrophysical agents, manual therapy and exercise, are one of the most commonly used techniques in the conservative treatment of temporomandibular disorders. The aim of this study is to examine the physiotherapy interventions and their effectiveness used in the treatment of temporomandibular disorders in the light of current studies by reviewing the literature.

Keywords: Physical therapy modalities, rehabilitation, temporomandibular joint disorders

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Introduction

Temporomandibular disorders (TMDs) have been defined by the American Academy of Orofacial Pain as an umbrella of clinical conditions affecting the masticatory muscles, the temporomandibular joint (TMJ) and associated structures (1). While studies report the prevalence of TMDs in the population as 10-15% for adults; It is known that this rate is 4-7% for adolescents. The prevalence of TMDs in childhood does not differ by gender. With adolescence, this balance deteriorates to the detriment of women. Similarly, studies in adults show that while the incidence of TMDs is two times higher in women than in men, it also reports that the incidence of TMDs symptoms is four times higher. In addition, it is known that the incidence of TMDs is most common in women during childbearing (20-40 years) (2). Although a definite etiology is not mentioned in the formation of TMD, one or more of the etiological factors are thought to play a role in the formation of TMD. These factors are grouped as trauma, pathophysiological systemic factors, pathophysiological local factors and psychosocial factors (3).

The main signs and symptoms involve TMJ pain, joint related sounds and limitation in movement. Pain may occur as headache, earache, preauricular or masticatory muscle tenderness, and dental pain. Sounds include popping or clicking and grinding sensations. Movement disorder includes occlusal interferences and asymmetric movements of the mandible on opening and closing (4). Conservative treatment approaches, which do not include surgical treatment for these symptoms and where physiotherapy is an important part, are the most commonly used treatment (5). The aim of this study is to summarize the prevalence, etiology and diagnostic criteria of TMDs and to review the physiotherapy practices that are recommended for clinical use and/or determined the level of evidence by scanning PubMed, Google Academic and ResearchGate databases with the words 'Temporomandibular Joint Disorders', 'Treatment' and 'Physiotherapy'.

Diagnosis of TMDs

In the past two decades, significant progress has been made in reviewing and verifying diagnostic criteria for TMDs. Originally known as Research Diagnostic Criteria for Temporomandibular Disorders, these criteria are now used as Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) in their validated and revised form. DC/TMD includes ‘Axis 1’ parts, which include diagnostic criteria used for the temporomandibular joint and associated structures, and ‘Axis 2’ parts that screen physical and psychosocial comorbidity (6). Based on all these diagnostic criteria scans, TMDs is examined in three subgroups as ‘Pain Disorders’ and ‘Joint Disorders’ (7). TMD-related pain may occur in the muscle or joint due to disorders in the nervous system, trauma, psychological disorders, functional conditions, sleep disorders, genetics, or comorbidities. Evidence levels for the etiology of pain in TMDs are shown in Table 1. After diagnosing muscle or joint pain, headache should also be investigated (8). Joint disorders may result from disc displacements with or without reduction, as well as from degenerative joint diseases such as osteoarthritis and osteoarthrosis, or from dislocations such as luxation and subluxation (7).

Physiotherapy Intervention of TMDs

TMDs treatment may vary from initial noninvasive therapeutic measures; such as occlusal splint therapy, pharmacologic intervention, behavioral and self-care therapies, acupuncture therapy, and physiotherapy interventions to more aggressive surgical treatments, such as arthrocentesis and arthroscopy (9). The ‘Minnesota Dental Association’ and the ‘American Academy of Craniomandibular Disorders’ have confirmed that physiotherapy is an important treatment for TMDs. The most commonly used physiotherapy interventions are electrophysical agents, manual therapy and exercise (10).

Electrophysical Agents

Electrophysical agents provide relaxation in muscles, reduce inflammation and increase blood flow by changing capillary permeability. However, scientific evidence regarding TMD is conflicting. Therefore, there is a need for more studies that integrate the application of electrophysical agents into a multidisciplinary treatment program (11).

Transcutaneous Electrical Nerve Stimulation (TENS) is mainly used in TMDs to manage long-lasting pain and to relax masticatory muscles (12). The beneficial effects of TENS on TMDs are generally explained by two theories. One of these is that it stimulates the motor nerves that cause rhythmic contraction of the masticatory muscles, increasing blood flow and oxygen, reducing edema and harmful toxin accumulation. Thus, it reduces the pain and fatigue on the chewing muscles. According to the second theory, tactile and pressure stimulation provides the inhibition of structures that provide sensory neuron stimulation by electrical means (gate control theory). Thus, TENS plays a role in the management of TMDs, with both central and peripheral impact mechanisms (13). In their study, Ferreira et al. applied TENS on the temporalis and masseter muscles for a total of 50 minutes, 25 minutes of low frequency (4Hz) and 25 minutes of high frequency (100 Hz). The study found that TENS's short-term therapeutic effects were superior to placebo in the recovery parameters of facial pain, deep pain sensitivity, and chewing muscle EMG activity (14). However, although the effect of TENS in managing chronic pain in TMDs is still controversial, there is no level of evidence in the literature (Table 2). Therefore, more randomized controlled studies are needed to determine the use of TENS in TMDs patients (13).

Ultrasound provides healing by increasing blood flow and membrane permeability in deep tissues and reducing spasm with the effect of heat. In the use of US in TMD, it is known that very little of the sound waves and energy reaches the TMJ and pterygoids. Therefore, the effect of US in the treatment of TMD has not yet been proven (Table 2) (15).

Biofeedback (BF) has long been used to facilitate recovery of normal movement patterns after injuries. Studies indicate that BF may be a beneficial treatment option for diseases involving different muscle groups (16). The researchers recommended the treatment method for the use of biofeedback in TMDs, where the electrodes were placed unilaterally or bilaterally on the massater muscle. Occasionally, the anterior temporal muscle may also be targeted, but the muscle does not usually reach the abdomen during electrode insertion. In a literature review conducted in 2014, it was found that biofeedback application was superior to placebo in 5 out of 6 controlled studies analyzed (17). In parallel with this, Criado et al. reported that 30 iterations of visual EMG-biofeedback training for four weeks reduced involuntary contraction and pain on the temporalis and masseter muscles (18). More importantly, the level of evidence for biofeedback in the treatment of myofascial TMD is Level 1a (Table 2) (11). Therefore, it is recommended to try biofeedback training in patients with TMDs who apply with altered muscle activity and are treated conservatively (17).

Low-level laser therapy (LLLT) is an electrotherapy method that enables red and infrared wavelength beams to be sent to a target area at a certain dose, single wavelength, high intensity and the same frequency, enabling the activation of the mechanisms that provide healing in tissues and cells (19). Chang et al. reported that LLLT with wavelengths of 780 and 830 nm on the masticatory muscles or joint capsule for TMD pain was moderately effective (20). Also, the level of evidence for LLLT in the treatment of myofascial TMD is Level 1a with positive and moderate clinical effects (Table 2) (11).

Manual Therapy

Manual therapy (MT) consisting of manipulation, joint mobilization and soft tissue mobilization is used in TMDs to increase normal range of motion, reduce local ischemia, stimulate proprioception, break fibrous adhesions, increase synovial fluid production, and reduce pain (21). Research and systematic reviews have reported the level of evidence for improving patient outcomes in myofascial TMDs as Level 1a for a mixed therapy that includes exercises as well as joint mobilization and soft tissue mobilizations (Table 2) (11). Parellel to this, Tuncer et al. reported improvement in pain and head posture in patients with TMDs who applied joint and soft tissue mobilizations to the jaw area for 30 minutes 3 times a week in addition to home exercises (21). Calixtre et al. reported improvement maximum mouth opening, pain and functionality in patiets with TMDs who applied muscle condition and streching exercises and cervical mobilization 35 minutes for 5 weeks (22). In similarly, Şahin et al.

reported that while 3 sessions of ischemic compression addition to exercise and exercise alone had similar effects on ROM, pain, PPT and functionality in TMDs at week 4, ischeamic compression addition to exercise more effective painless mouth opening and maximum assistive mouth opening at week 1 (23). Guidelines for MT techniques commonly used in the treatment of TMD are described below:

Temporomandibular Joint Anterior Glide Accessory Mobilization: The patient is in the supine position on the table with his mouth open. The therapist positions on the opposite side of the target joint for easy movement. The therapist places the cranial hand on the patient's forehead to stabilize the head. The thumb of the other hand that will perform the sliding movement is positioned on the first and second molars, and the second and third fingers are placed on the lower side of the ipsilateral and contralateral mandible, respectively. The inserted thumb provides an anterior-posterior sliding force, while the other fingers provide a force against the underside of the mandibular bodies. The technique is performed at a speed of 0.5-1 Hz. The therapist performs a total of 3 sets of 10 repetitions, with an interval of 30 seconds between sets on both sides (17,24).

Temporomandibular Joint Distraction Accessory Mobilization: The patient is in the supine position on the table with his mouth open. The therapist positions on the opposite side of the target joint for easy movement. The therapist places the cranial hand on the patient's forehead to stabilize the head. The thumb of the other hand is placed on the first and second molars, and the other fingers are placed on the lower part of the jaw body so that they are winged. Caudal force is applied against the molars to distract the joint. The grade (1,2 or 3) and duration of distraction varies according to the patient's restriction. The therapist performs a total of 3 sets of 10 repetitions, with an interval of 30 seconds between sets on both sides (17,24,25).

Accessory Mobilization with Active Mouth Opening: The patient is in the supine position on the table with his mouth open. The therapist positions on the opposite side of the target joint for easy movement. The therapist places the cranial hand on the patient's forehead to stabilize the head. The thumb of the other hand is placed on the first and second molars, while the other fingers are gently folded on the lower part of the jaw body. The application is started with caudal force and then a anterior gliding is applied. After these movements, the patient actively opens his mouth. The therapist performs a total of 3 sets of 10 repetitions, with an interval of 30 seconds between sets on both sides (24).

Upper Cervical Mobilization: The patient lies on his back on the table. The therapist is positioned at the head of the table. While the therapist stabilizes the occiput with one hand, he places the other hand on the patient's forehead. While the therapist makes slight distraction from the occipital bone with one hand, force is applied in the anterior-caudal direction from the patient's forehead with the other hand. The technique is performed at a speed of 0.5-1 Hz. The therapist performs a total of 3 sets of 10 repetitions, with an interval of 30 seconds between sets on both sides (24,26,27).

Dynamic Soft Tissue Mobilization of the Masseter Muscle: The patient is in the supine position. The therapist positions the patient sitting or standing behind the head. The therapist places the thenar part of both hands and the thumbs on the mandible, and the other fingers in the occiput. While the therapist massages the masseter muscle in a caudal direction; it also performs cranio-cervical traction. The technique takes about 90 s. applied throughout (24).

Dynamic Soft Tissue Mobilization of the Temporalis Muscle: The patient is in the supine position. The therapist positions the patient sitting or standing behind the head. The therapist places the thenar part of both hands and the thumbs on the mandible, and the other fingers in the occiput. The therapist massages the temporal muscle in the caudal direction; it also performs cranio-cervical traction. The technique takes about 90 s. applied throughout (24).

Massage: The following protocol is clinically applied in TMDs, as it is very easy to apply daily and leads to a significant reduction in myofascial pain (28):

a.Effleurage: Usually used at the beginning and end of each massage. It prepares the muscles for deep tissue work by applying soothing and stroking movements along the fibers of the massater and temporal muscles.

b.Kneading: The skin and subcutaneous tissues are moved in a circular and rotating movements. For the masseter muscle, the tips of the thumb, index finger and middle finger are used to press several points in the muscle tissue in circular motions. For the temporal muscle, the therapist grasps the head with the thumbs against the patient's forehead. At the same time, he places his index and middle fingers around the temples and the ring finger behind his ears. The therapist applies small circular movements with gentle pressure on the muscle.

c.Friction massage (for trigger points): Pressure is increased by gradually pressing the trigger point on the masticatory muscles, especially on the massater muscle, to the point where the patient will not feel it, with the tip of the index finger.
d.Streching: After trigger point therapy, the massater muscle must be stretched. The therapist can do this in two ways. The first is that the therapist uses his hands to stabilize the lower part of the patient's mandibula while sliding it with his thumbs from the upper insertion to the lower insertion of the massater muscle. The second is the cross stretching method. While a pressure is applied dorsally from the lower insertion of the muscle with the index and middle finger of one hand, pressure is applied from the upper insertion of the muscle to the abdominal area with the index and middle finger of the other hand. During the procedure, the muscle takes its 'S' shape.
The application is ended with the previously described effleurage and kneading methods.

Ischaemic compression: Ischemic compression is a thumb pressure application up to the maximum tolerable pain point. With this application, tactile signals inhibit pain sensation signals and reduce pain [49]. For the application of the technique, the patient was positioned supine in a neutral position and the physiotherapist located the trigger point on the surface of the temporalis and masseter muscle. After the trigger point was placed, gradually increasing pressure was applied until the pressure sensation became one of the pressure and pain. This pressure was applied for 90 seconds. If the participant noticed that approximately 50% of the discomfort or pain was relieved during the application, the pressure was increased until the discomfort or pain reappeared. The treatment was terminated with myofascial release (23).

Exercise

In TMDs, therapeutic exercise programs are used to relax the tense muscle system, increase range of motion, muscle coordination, muscle strength and proprioception. In the proposed jaw exercise program, streching and relaxation exercises, coordination exercises and strengthening exercises were included (11). In addition to jaw exercises, posture exercises are also used in exercise therapy, considering studies that reveal a strong relationship between TMDs and neck disorders (29). Studies have reported Level 1a as the level of evidence for combining exercise and mobilization techniques to improve outcomes in myofascial TMDs (Table 2) (11). Although the effect of therapeutic exercise has been proven, there is no proven consensus on parameters such as repetition, duration, intensity and frequency of programs. In addition to these, there are exercise programs specially prepared for TMDs to be used in the clinic (30). But, there is no level of evidence in the literature about special exercises (Table 2). Guidelines for exercise commonly used in the treatment of TMD are described below:

Stretching and Relaxation Exercises: This type of exercises are recommended in cases where the range of motion is limited and there is pain, to reduce the tension of the muscle fibers. The patient can actively perform the stretching exercise. Passive stretching is performed by the therapist (4). The patient opens his mouth to the maximum position he can open. The therapist performs stretching by placing the thumb on the upper molars of the patient and the index finger on the lower molars, increasing the mouth opening in a controlled manner. Maluf et al. applied passive stretching exercises with 3 repetitions for 30 seconds to the cervical spine, head, upper limbs and mandibular muscles of individuals with myogenic TMDs. They reported improvement in pain, pain threshold and EMG as a result of their treatment for 8 weeks (31).

Table 1. Evidence Levels for the Etiology of Pain in TMDs (8).

Factor	**Strong Evidence**	**Modarate Evidence**	**Low Evidence**
Trauma	Dental intervention Facial macro trauma	Cervical traumas	
Psychological	Catastrophizing	Depression Stress Childhood events	Personality disorders
Functional		Parafunction (daytime)	
Lifestyle		Nutrition Smoking	
Genetics		Genotypic	
Co-morbities	Fibromyalgia	Headache Lower back pain Irritable bowel syndrome Chronic widespread pain	Infection

Table 2. Evidence Levels of Treatments in Myofascial TMDs (11).

Treatment	**Level of evidence**
Electrophysical Agents	
Transcutaneous Electrical Nerve Stimulation	No evidence
Ultrasound	No evidence
Biofeedback	Level 1a
Low-level laser therapy	Level 1a
Manual Therapies & Exercises	
Joint mobilizations	Level 1a 'Manual therapy programs combined with exercises are recommended.'
Soft tissue techniques	
Exercises	

The contraction-relaxation technique, used to stretch muscle fibers, allows a strained muscle to stretch passively after contraction. The patient is asked to open his mouth to the maximum. After placing it in this position, it is asked to close its mouth and resistance is applied in a way that does not allow movement (32). Afterwards, the resistance is removed and the patient is asked to relax and open his mouth more. Another technique used to relax and stretch the elevator muscles is the pronunciation of the letter 'N'. The patient positions his tongue on the lingual surface of the maxillary incisors. The patient is then asked to open and close his mouth slowly, pronouncing the letter 'N' (4). Although the literature recommends doing this exercise many times a day (4), there is no frequency and intensity for both this exercise and the contraction-relaxation exercise that has been proven to be effective in previous studies or that has been determined specifically for TMDs.

Coordination Exercises: The coordination exercise aims to open and close the mouth slowly in front of the mirror and not to allow any deviation in the jaw during movement. The same movement is done by placing the hands on the joints and repeating them. Systematic reviews recommend doing the exercise 3 times a day, 20 repetitions (32).

Strengthening Exercises: During the depression, elevation and lateral movements of the jaw, a resistance is applied in the opposite direction of the movement. It is recommended to repeat the exercise several times during the day (32).

Posture Exercise: Posture exercises, which are generally used to reduce pain and tension in the neck and back, are used to reduce stiffness and fatigue in the orofacial area by improving the position of the head and mandible. Postural exercises are used as a variety of exercises involving correction of the head posture (33). Tuncer et al. reported that, in addition to the training he applied for 30 minutes a day, 3 times a week for 4 weeks, the posture exercises program had a positive effect on pain (34).

Special Exercises for Temporomandibular Disorders: Rocabado's 6x6 exercise program is a TMDs-specific exercise program that relaxes the chewing muscles and reduces pain by helping the synovial fluid move along the joint surfaces with repetitive movements, increase circulation, and remove the metabolites of the articular cartilage and nutrition of the joint (35). The exercise program consists of the following 6 exercises: rest position of the tongue, control of TMJ rotation, rhythmic stabilization technique, axial extension of the neck, shoulder posture and stabilized head flexion. Another special exercise program was designed by Kraus. Exercises are aimed at preventing excessive chewing muscle activity and targeting neuro-muscle control. The exercise program consists of the following these exercises: tongue position at rest, teeth apart, nasal-diaphragmatic breathing, tongue up and wiggle, strengthening, touch and bite, neuro-muscular control and isometric exercises (17).

Conclusion

Physiotherapy interventions have shown positive effects in the treatment of TMDs. Instead of using interventions alone, using a few interventions together, especially other physiotherapy techniques to be used in addition to regular exercise therapy, show positive results. The first of the disadvantages related to the use of physiotherapy interventions; these are treatment protocols that are not clearly specified and their advantages over each other are. Information on the intensities and frequencies of most of the interventions is not clearly stated in the literature. In addition, the second drawback is that the short-term and long-term effects of the interventions have not been compared. In conclusion, physiotherapy intervention are effective and safe methods that can be applied in patients with TMDs, despite all these uncertainties and more work is needed.

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