CHAPTER 28

Physical Therapy Interventions for the Orofacial Region

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CHAPTER OUTLINE

Temporomandibular disorders (TMD) is a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular joint (TMJ), and associated structures (Okeson, 1996). Most patients with TMD typically show signs of pain or discomfort in the muscles of mastication or the neck; limitations of jaw movement, especially mouth opening; pain and TMJ sounds; or a combination of these.

The American Academy of Orofacial Pain (AAOP) and the European Academy of Craniomandibular Disorders (EACD) cite physical therapy as one relevant treatment. Physiotherapy in this chapter is defined according to the World Confederation for Physical Therapy ([WCPT], 1995), namely, as "a health profession concerned with the assessment, diagnosis and treatment of disease and disability through physical means. It is based on principles of medical sciences, and is generally held to be within the sphere of conventional medicine and [to] be evidence based." Evidence-based practice (EBP) is part of the decision-making process described by Sackett et al. (1998) as "the integration of the best research evidence with clinical expertise and patient values." Physiotherapy applications for TMD include a wide variety of techniques and treatment modalities that have been commonly used to inform and advise the patient and to alleviate pain, reverse the dysfunction, and restore optimal muscle and joint function, including oral activities such as mouth opening, chewing, laughing, and talking. Exercises normally include education, joint mobilization, biofeedback, relaxation, postural correction for the basic activities of daily life and ergonomic instructions, and, when necessary, strengthening and mobilization or stretching exercises to make a postural correction possible.

THEORETICAL MODELS: GENERAL CONSIDERATIONS

The physiotherapeutic approach is tailored to the individual patient, based on the principles of a self-supportive strategy and the knowledge that most

nonspecific TMD problems are benign and that a conservative (reversible) therapy is the intervention of first choice. In complex cases, there is a special need for cooperation between the dental profession or medical specialist(s) and an orofacial physical therapist. As discussed in Chapter 17, we adopt the clinical guidelines of the AAOP (Okeson, 1996) for the clinical examination of the orofacial region. This means that the physiotherapeutic approach is based on a biopsychosocial model and that both diagnostic and therapeutic procedures cover biomedical and psychosocial issues. To analyze the patient's problems, the physiotherapist can use the rehabilitation problem-solving form, which allows the clinician to focus on specific targets and to relate the symptoms to disabilities and modifiable variables. The RPS Form is based on the International Classification of Functioning, Disability and Health (ICF) (Steiner et al., 2002).

In daily practice, it is possible to implement diagnostic and therapeutic strategies related to different theoretical constructs or rationales. Diagnosis and therapy should always proceed from a theoretical construct. This construct dictates the choice of how to diagnose or what kinds of interventions will be followed, but can also dictate the choice of outcome measurement for research evaluation.

In the beginning of the treatment process, at the end of the consultation phase, it is necessary to change patients' unrealistic beliefs and counsel them that their problem is a benign and self-limited condition. Patients are informed that chronic pain may follow if they stop normal activities, stop work, fail to enter into an active exercise program, develop poor posture, allow stress, pay too much attention to their condition and worry, or rely on medications rather than activity.

The traditional biomedical paradigm has its roots in the Cartesian division between mind and body and considers disease primarily as a failure within the soma, resulting from injury, infection, inheritance, and the like. This model has been extraordinarily productive for medicine but prevents accounting for all relevant medical aspects of health and illness. Therapies that are appropriate for acute disease are not often useful in the care of those with chronic conditions. Therefore, treatment as care focuses on pathophysiology, whereas management seeks to reduce the impact of the condition without necessarily curing it. In an acute condition, treatments are usually discrete and simple, with short-term goals. Chronic conditions generally involve a mixture of therapies to manage the condition.

Hansson et al. (1980) introduced the theoretical model or construct of James Cyriax (1975) in dentistry. He introduced the functional examination of the masticatory system based on the Cyriax approach in order to make a more precise diagnosis. The clinician working in this biomedical model examines the locomotor system with functional tests in order to find the body structure that causes the pain. The intervention that follows then focuses on that specific structure (e.g., muscle, ligament, capsule, or other joint structure). It is a disease-centered approach for the locomotor system.

In recent years, the so-called biopsychosocial model has found broad acceptance in some academic and institutional domains. It is now generally accepted that, in contrast to the disease model, illness and health are the result of an interaction between biological, psychological, and sociocultural factors. Engel proposed this model in 1977. This model presumes that it is important to handle the two (biological and psychosocial) aspects together because they are interlinked. Therefore, clinicians who are working with this model should collect data on both axes. This has consequences for outcome studies in research as well. The biopsychosocial model in physiotherapy and rehabilitation is implemented in the disablement process and was acknowledged in 1994. This model proposes a pathway that links pathology with impairments, functional limitation, and perceived disability. There is a bidirectional relation between all these entities. Extraindividual and intraindividual factors, and comorbidity as a special case of an intraindividual factor, may act upon this pathway and modify the course of the disease and the extent to which an individual is affected. Many studies have attempted to determine the relative contributions of diseases to the total perceived disability of patients. Di Fabio (1998) showed that clinical change can occur in these areas in patients with TMD.

In rehabilitation and allied health care such as physiotherapy, there is a need to describe the functioning of the patient in daily lift—in other words, the consequences of disease for the patient. This is in addition to the medical diagnosis. The ICF, the current framework, was approved by the World Health Organization. It is in use in more than 200 countries and fits the ideas of the disablement process and the biopsychosocial model. Steiner et al. (2002) discussed the concept that one disease can have different consequences for patients and that they can be explained using the ICF model. Swinkels (2005) showed that the outcome measurements in most research studies on physiotherapy in

patients with rheumatoid arthritis are limited to one of the categories, namely, body functions and structures. He emphasizes the need to put effort into designing instruments that will cover the other areas of the ICF in research settings.

PHYSICAL THERAPY INTERVENTIONS FOR THE OROFACIAL REGION

Scientific Evidence for Physical Therapy in Temporomandibular Disorders

Based on information from several databases, meta-analyses, and Cochrane reviews, the overall conclusion regarding physical therapy is that effectiveness is especially well proven for exercise therapy in all domains, that is, musculoskeletal, neurologic, and cardiopulmonary. The results for physical therapy modalities and massage therapy are still inconclusive at this moment because of a lack of high-quality studies. For manual therapy, clinically relevant results exist for spinal disorders and for shoulder and hip disorders.

A frequently cited article in the scientific literature focused on physiotherapy and TMD is that written by Feine and Lund (1997). They published a review article on physical therapy and modalities for the control of chronic musculoskeletal pain as a follow-up to their report for the National Institutes of Health (NIH) Technology Assessment Conference on Management of Temporomandibular Disorders in 1996. The general conclusion was that although some forms of therapy appeared promising, no definite conclusions could be drawn because of the overall low quality of the trial designs. The studies included were from the period 1980 to 1995. Using the methodologic standard of that period, they showed that treatment was almost always better than no intervention (15 of 16 clinical studies). Systematic reviews and discussions regarding clinical relevance have improved during the last two decades. Early single-center studies did little to clarify the clinical relevance of physiotherapy, due to fragmentary description of the therapy involved, vague criteria for the patients included and the symptom relief obtained, and insufficient controls and blinding procedures. In an editorial, Furlan (2007) supports the latest techniques in meta-analysis to assess the robustness of conclusions by conducting sensitivity analysis and meta-regression techniques to determine why studies included in an analysis reach different conclusions. These modern techniques make it possible to show the consequences of underpowered studies, in this case showing electrical nerve stimulation for chronic musculoskeletal pain to be effective, in contrast with earlier systematic reviews. Because of the methodologic shortcomings of earlier studies, the results should be interpreted with caution. The fact that there is no external support in the databases yet does not mean that the intervention does not work. We do know that therapy in most musculoskeletal cases is better than no treatment at all, with the same results for totally different interventions frequently shown in databases. We therefore would like to know whether a specific physiotherapy intervention works better (and on which outcome measures) than no intervention, placebo, or another intervention. The therapist's clinical experiences and the patient's values and preferences are also important factors in the clinical reasoning process and need to be evaluated.

In a systematic review conducted by McNeely et al. (2006) on the effectiveness of physical therapy for TMD, the same methodologic shortcomings were found as earlier. In their search, McNeely et al. (2006) included 36 potentially relevant articles of the 1,138 first selected; in the end 14 articles, representing 12 studies, were analyzed. There was considerable heterogeneity among the studies in the type of TMD, the treatment modality, comparison groups, and the frequency or duration of the interventions. They used the Jadad scale and a critical appraisal especially relevant for daily practice (e.g., clinically relevant variables; Vet de et al., 1997). Their review gives a good overview of the available studies, but no extra analyses (pooled data, sensitivity analyses) were conducted. Significant improvements in active mouth opening were found in the studies using muscular awareness relaxation therapy, biofeedback training, and low-level laser therapy.

McNeely et al. (2006) also analyzed exercise therapy as part of the physiotherapy program. They included single-center studies by Komiyama et al. (1999) and Wright et al. (2000). Both trials investigated the effect of posture training as additional therapy for myogenous TMD and found a significant improvement in pain and active mouth opening. Within the patient group for which posture correction was added to the cognitive behavioral program, the opening value increased markedly within 1 month, from 35.0 to 43.1 mm, and there were significant and clinical decreases in pain intensity (Komiyama et al., 1999). Other studies in this review also discussed aspects of posture training. For example, Carmeli et al. (2001) and Schiffman et al. (2007) added posture training to TMD self-management

instructions for patients with arthrogenous TMD (anterior displaced disc). They found clinically relevant effects in the combination group and an improvement in symptom severity in patients with neck pain and TMD. In conclusion, McNeely et al. (2006) supported the use of active and passive oral movement exercises and of exercises to improve posture as effective interventions to reduce symptoms associated with TMD.

Medlicott and Harris (2006) analyzed studies examining the following physical therapy interventions: manual therapy, electrotherapy, relaxation training, and biofeedback. Their recommendations should also be viewed cautiously because of the methodologic problems they encountered. None of the studies they reviewed could be judged as studies with strong scientific rigor. In the 30 studies reviewed, more than 75 different outcome measures, using different tools or methods, were utilized. After studying the 30 articles that met the inclusion criteria, they recommended both active and passive exercises, postural training in combination with other interventions, relaxation techniques, and biofeedback as forms of reversible physiotherapy interventions.

Physical Modalities

Electrical Nerve Stimulation

A meta-analysis by Johnson and Martinson (2007) regarding the efficacy of electrical nerve stimulation (ENS) for chronic musculoskeletal pain in any anatomic location showed a significant decrease in pain at rest with ENS therapy as compared with placebo. The working mechanism is based on the gate control theory of Melzack and Wall (1965) and stimulation-induced release of endogenous endorphins (Sjolund & Eriksson, 1976). ENS is generally believed to be an effective, safe, and relatively noninvasive intervention that can be used to alleviate many different sorts of pain. In their analyses, these authors concluded that the mixed results of the majority of the existing studies were a result of low statistical power. The standard deviations were typically large relative to the scale on which pain was measured, which necessitates large sample sizes. In their review, the pain relief provided by ENS was, on average, three times greater than the pain relief provided by placebo. Further, from the 38 studies included in the analysis, 35 favored ENS therapy with respect to placebo, with 24 studies showing a significant benefit of ENS therapy versus placebo. This review showed that answers regarding the efficacy of the various frequencies, modalities, and durations of ENS therapy can only be obtained by studies with sufficient power. Other benefits of ENS therapy were a decreased use of other therapies, including medication, and less pain interference at home and work (Fisbain et al., 1996).

Low-Level Laser Therapy

Low-level laser therapy (LLLT) reduces inflammation through reduction of prostaglandin E2 levels and inhibition of cyclooxygenase-2 in cell cultures. We currently lack data on what biological effects lasers cause in the human body. In a review, Bjordal et al. (2003) included 11 trials with 565 patients with an average Physiotherapy Evidence Database (PEDro) score of 6.9 of 10 points. The results showed a mean weighted difference in change of pain on the Visual Analogue Scale (VAS) of 29.8 mm (95% CI: 18.9–40.7) in favor of the active LLLT groups. Global health status improved for more patients in the active groups (relative risk, 0.52; 95% CI: 0.36–0.76). In this review, two studies were related to TMD (Gray et al., 1994; Conti, 1997). Conti (1997) used a dose outside the suggested range that Bjordal et al. (2003) assumed as therapeutic (doses of 0.4–19 J and power density of 5–21 mW/cm^2). Bjordal et al. (2003) could not find a significant effect compared with placebo treatment, whereas Gray (1997) found a significant pain reduction. Finally, Kulekcioglu et al. (2003) investigated the effectiveness of LLLT in a placebo-controlled study in both myogenous and arthrogenous subgroups of TMD patients. They found significant improvement in the active treatment group in both subjective parameters (e.g., pain and number of tender points) as well as in objective functional parameters (e.g., mouth opening or lateral motions).

Exercise Therapy

Two pragmatic randomized controlled trials (Van der Glas et al., 2000; Michelotti et al., 2004), which included the myogenous type of TMD patients, compared the effectiveness of physiotherapy and dental treatments such as an appliance and education and found clinically relevant effects. Van der Glas et al. (2000) included 71 myogenous TMD patients without occlusal interference and contrasted physiotherapy and splint therapy. Splint therapy aims to effect pain reduction and restore function by a change in TMJ position, muscle length, and occlusal relationship with changes in oral behavior (e.g.,

Figure 28.1 Exercise Therapy for Temporomandibular Joint

clenching, grinding, or nail biting). Physiotherapy in this study was a self-supportive program based on the principles of the biopsychosocial model, with emphasis on patient education, oral instruction including the rest position of the tongue, postural (head and neck) alignment, relaxation techniques, automassage techniques, habit reversal procedures, and muscle strength exercises (**Figure 28.1**). Regardless of the treatment choice, a single intervention was successful in the short term for two thirds of the patients, with a similar reduction of pain for facial as well as nonfacial areas. In the long term, the chance of treatment success varied between 50% and 66%. The authors argue that physiotherapy might be preferred as a starting option with respect to splint therapy because of the lower costs, similar efficacy, and shorter treatment duration. Other factors may modify the choice as well (such as tooth grinding or attrition).

In this study by Michelotti et al. (2004), the summed VAS score (24 areas in the upper quarter of the body; 0–10 cm) was used (Grootel et al., 2005). The successful treatment group had an outcome at the start of the study of 332.4 of 2,400 mm (SEM 36.8; $n = 63$); the nonsuccessful treatment group scored 494.5 of 2,400 mm (SEM 62.2; $n = 44$). Predicting factors for success of treatment were pain severity and the duration of preceding TMD symptoms. Next to a pain reduction (>55%) in facial areas (87%), the authors found a reduction in pain in the nonfacial areas, such as neck and shoulders (84%), as well. This study found an average pain reduction of 27% after the first consultation, which only provided a diagnosis and no treatment. Myogenous pain in TMD patients could be characterized in two daily pain patterns: 79% had maximal pain after lunchtime or late in the day (PM group) and 21% had pain early in the day (AM group). The PM subgroup (pain intensity, 29.1 mm; frequency, 69% of the scoring times; duration, 5.5 hours a day) frequently had a more widespread pain condition that had consequences for the therapy. The incidence of pain-free days was 12%. The mean VAS score averaged across AM and PM group patients was 29 mm (SD 18.8). During the day there was a continuous increase in mean VAS scores for the PM group and a decrease for the AM group. Forty-four percent of all patients did not use pain medication.

Türp et al. (2004) conducted a systematic review on the efficacy of stabilization splints for the management of patients with masticatory muscle pain. These authors identified 13 publications, including 9 controlled clinical trials. Their conclusion was that a stabilization splint does not appear to yield a better clinical outcome than a soft splint or physical therapy. Schiffman et al. (2007) did a pragmatic follow-up study comparing four treatment strategies (medical management, rehabilitation, arthroscopy with postoperative rehabilitation, and arthroplasty with postoperative rehabilitation) for chronic and nonchronic TMJ closed lock. Their rehabilitation program included the participation of a dentist, physical therapist, and health psychologist. Physical therapy involved joint mobilization modalities and a home exercise program. They were unable to detect any net benefit associated with surgery over that of medical management or rehabilitation at any follow-up period (3–60 months). Their study showed that the short-term improvement with regard to pain and function, as measured at 3 months, was similar for all four treatment strategies. This result did not change during a 5-year follow-up period. In their view the primary treatment for patients with a closed lock consists of medical management (education, a 6-day regimen of oral methylprednisolone followed by NSAIDs for 3 to 6 weeks, and a self-help program) or rehabilitation (medical management, splinting, physical therapy, and cognitive behavioral therapy).

Regarding behavioral therapy in general, there is agreement that behavioral and educational programs are useful and effective in the management of many chronic pain conditions. Spending extra time in physiotherapy programs to educate patients seems to be effective, because adequate information in simple terms assists in making choices and overcoming unhelpful beliefs. Further, when it is necessary, it helps patients to modify their behavior. In addition, management of myogenous TMD may also benefit from behavioral interventions. Behavioral programs have focused on information about the disorder and skills training in self-control strategies to modify pain perception, such as relaxation training or cognitive restructuring techniques by psychologists to alter dysfunctional belief systems. The label *biobehavioral treatment* encompasses a large collection of modalities, the most commonly studied of which are biofeedback, relaxation, education, and cognitive-behavioral methods. The common aims of these methods are self-management and the acquisition of self-control over pain symptoms as well as the cognitive attributions or meanings given to those symptoms.

In more complex patients, a multidisciplinary approach is usually recommended. Dentists, physiotherapists, and psychologists work together to improve function and decrease the need for active treatment in order to let the patient be self-supportive as much as possible. Conclusions related to research data in the field of orofacial pain for such a multidisciplinary approach are scarce.

IMPLEMENTATION OF PHYSICAL THERAPY IN THE MYOGENOUS OR ARTHROGENOUS TYPE OF TEMPOROMANDIBULAR DISORDER

Physiotherapy is frequently chosen for the treatment of TMD and is especially focused on the main target regarding the patient's demand. The physiotherapist normally explains the natural course of the pain condition and discusses the relation between load and tolerance and the relation between the complaints and the correlated variables (ICF, problem-solving form: impairments, level of activity, and participation and psychosocial context). Next to general information, more specific information about the diagnosed condition is provided. It is important to have visual information to explain what is going on, and therefore there is a need for proper instruction material. The main goals of the treatment depend on whether the disorder can be categorized as caused by movement disorders, biomechanical patterns, segmental disturbances, or personal or psychosocial factors. Promoting an adequate way of coping seems to be as useful as relieving the muscle tone with massage techniques.

The physical therapy program is usually part of a self-management approach and demands the active participation of the patient. Normally the home exercise program will include several procedures, such as counseling, patient education that includes habit reversal techniques, (auto) massage, and proper use of the jaw (Laat de et al., 2003; Michelotti et al., 2005). Exercise therapy normally is the cornerstone of the therapy, and there is strong evidence that it is effective for a wide spectrum of musculoskeletal disorders, including TMD. The most useful techniques for muscle rehabilitation include muscle stretching, mobilization of the joint (**Figure 28.2**), proprioception, posture training, breathing exercises or other relaxation training, and exercises to improve relevant functions such as muscle tone, mobility, strength, and stability (kinetic and ergonomic parameters). When indicated (VAS score above 6/10, impact of the pain on the patient's functioning and activities high, or an abnormal course), medication such as the pain medication cyclobenzaprine (Flexeril) or tricyclic antidepressants (amitriptyline) can be effective. Occlusal splints can be the dental treatment of choice. The number needed to treat (NNT) calculated from the study conducted by Ekberg et al. (1998) was 2.3 (95% CI: 1.7–4.5), indicating that almost two in three patients with myogenous TMD pain will have to be treated before one of them experiences at least 50% pain reduction.

The role of occlusal factors has changed during the last decade. The consequence is that irreversible (occlusal adjustment) and extensive occlusal therapy take a minor position in the treatment of the majority of patients. A surgical approach could be indicated if conservative interventions fail and the condition negatively affects daily activities such as speech, chewing, singing, and yawning.

Therefore, in most simple, nonspecific conditions, the physiotherapist can play a role in treatment of these painful conditions; in more chronic or complex conditions, the physical therapist is part of the management team that includes a dental specialist and psychologist. Sometimes a consultant medical specialist (e.g., anesthesiologist) is also needed within the treatment team.

Figure 28.2 **Manual Joint Mobilization of the Temporomandibular Joint.**

CONCLUSION

The quality of the randomized controlled trials conducted should be improved. Concealed allocation, blinding of the assessor, increasing the sample size and follow-up time, intention-to-treat analyses, and standardization of the outcome measurements will help improve studies and stimulate discussion on the clinical relevance of their results. The outcome assessment must be placed in a broader perspective and related to the ICF domains. It will also be of interest to avoid chronicity in acute and subacute conditions; therefore, studies must start in this time frame as well. Instead of pragmatic studies, we need to do more placebo-controlled studies.

The clinical expertise and the information in the literature give the impression that physiotherapy, especially exercise therapy, is an adequate treatment option for TMD. Physical therapy modalities (e.g., ultrasound, shortwave diathermy, iontophoreses) can be discouraged until the moment that we have better studies with clinically relevant results. ENS and laser treatment in different settings and populations call for special mention. Thermotherapy and massage therapy and other soft-tissue techniques, in spite of the lack of external evidence, are frequently used in treatment protocols of patients with orofacial pain or TMD. The outcome for patients and therapists are positive, whereby the results of the massage treatment are believed to be a stimulation of parasympathetic activity, engaging a relaxation response, and a reduction of stress and anxiety. These techniques alleviate musculoskeletal pain conditions involving muscle trigger points, pain points, hypertonus, and stiffness.

The approach for the acute TMD condition with a normal course should be counseling, including general information, and, when indicated, a tailored exercise program depending on the type of the disorder (AAOP or RDC-TMD criteria) and other conditions, such as those related to the ICF domains or to local factors such as attrition.

When there is a deviating course in an acute or subacute condition, it is essential to avoid chronicity; effort must be placed into influencing the risk factors, including pain intensity, depression, anxiety, and self-esteem (Steenks et al., 2007; Dworkin et al., 2002; Brister et al., 2006). In chronic pain and more complex conditions, an exercise program that uses behavior-oriented principles in relation to functioning, activity-related goal setting, and pacing of activity can play a key role in rehabilitation. The approach can be time contingent, that is, a step-by-step advancement of activities on the basis of a previously determined period of time, rather than on the basis of pain, which is meant to focus the attention of the patient on activities rather than on pain.

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