Influence of the Temporomandibular Joint on Range of Motion of the Hip Joint in Patients With Complex Regional Pain Syndrome

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Abstract

Objective: This study evaluated if patients with complex regional pain syndrome (CRPS) would have an increase in range of motion (ROM) after myofascial release and a similar ROM decrease after jaw clenching, whereas in healthy subjects these effects would be minimal or nonexistent.

Methods: Documentation of patients with CRPS (n = 20) was established using the research diagnostic criteria for CRPS, questionnaires, average pain intensity for the past 4 weeks, and the temporomandibular index (TMI). Healthy subjects (n = 20, controls) also underwent the same testing. Hip ROM (α angle) was measured at 3 time points as follows: baseline (t1), after myofascial release of the temporomandibular joint (t2), and after jaw clenching for 90 seconds (t3). Comparison of the CRPS and control groups was made using *t* tests.

Results: Mean TMI total score and mean pain reported for the last 4 weeks were significantly different between the 2 groups ($P < .0005$). Hip ROM at t1 was always slightly higher compared to t3, but t2 was always lower in value compared to t1 or t3 for both groups. The differences of all hip ROM values between the groups were significant ($P < .0005$). Moreover, the difference between t1 or t3 and t2 was significantly different within the CRPS group (t1 = 48.7°; t2 = 35.8°; $P < .0005$).

Conclusions: The results suggest that temporomandibular joint dysfunction plays an important role in the restriction of hip motion experienced by patients with CRPS, which indicated a connectedness between these 2 regions of the body. (J Manipulative Physiol Ther 2009;32:364-371)

Key Indexing Terms: *Complex Regional Pain Syndromes; Temporomandibular Joint Disorders; Range of Motion, Articular; Hip*

Temporomandibular dysfunction (TMD) is a multifactor syndrome that can involve myofascial pain, disk displacements, and arthralgia or osteoarthritis of the temporomandibular joint (TMJ).[1] Although it is generally acknowledged that there is a degree of connectedness between various parts of the body and the TMJ, in particular neural and musculoskeletal involvement,[2,3] the nature and mechanisms of these connections are not all that clear because they have not been systematically studied. In addition, the contribution of malocclusion or TMD to the etiology of chronic pain syndromes due in part to myofascial dysfunction remains unclear, controversial, and needs research investigation. For example, postural disorders,[4,5] lumbosacral pain,[6] cervical spine disorders,[7] and general musculoskeletal symptoms[8] have all been linked to craniomandibular disorders or TMJ dysfunction, and better definition of the involvement might lead to improved treatments.

Ciancaglini et al[9] investigated the relationship between TMD and neck pain in a northern Italian population and concluded that it was significantly related. Wiesinger et al[10] also reported that there was a significant association between long-term back pain and musculoskeletal disorders involving the jaw and face. Although it is suspected that TMD can give rise to pain in different parts of the body, especially the trunk and the arms, for patients who have neuromuscular diseases, it appears there might be a common mechanism that is responsible for development of pain in specific body regions, which is connected with the masticatory system.[11] John et al[12] also reported that in women, widespread pain was a risk factor for the development of TMDs, which indicates that the reverse situation might be possible, that is, the common mechanism can work both ways through ascending

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and descending neural pathways. The work of Miyahara et al[13] may also support this concept, which showed that oral motor activity can exert a strong influence on the motor activity of other parts of the body. In addition, these investigators also demonstrated that voluntary teeth clenching can affect the soleus H reflex, modulated by descending influences from the cerebral cortex, as well as peripheral afferent impulses from the oral-facial region.

In a recent study, we noted a strong association of TMD with complex regional pain syndrome (CRPS), although different kinds of myopathies also seem to have a notable connection with TMD.[11] Complex regional pain syndrome is a common complication after trauma or operation with a prevalence of 0.03% in which subjects experience a severe neuropathic deep pain in the involved limb with distal accentuation and often hyperalgesia or allodynia (brush-evoked pain).[14] The current diagnostic guidelines distinguish between CRPS without or with obvious nerve lesions (CRPS type 1 and type 2, respectively).[15] Based on our clinical experience, reduced range of motion (ROM) (particularly hip joints) is a common occurrence in many painful musculoskeletal disorders and also appears to be another hallmark of CRPS type 1.[16-18] For example, Veldman et al[18] found that 88% of patients had a limited active range of movement of the affected extremity.

Currently there are no specific and validated tests that can diagnose the interference of the TMJ on ROM testing in chronic pain conditions. Moreover, attempts to use the leg-length inequality and internal foot rotation test in dental kinesiology to identify potential masticatory dysfunctions have been deemed unreliable.[19] Therefore, we sought to develop a procedure that would demonstrate the involvement of the TMJ in ROM measurements in patients with CRPS. Because 2 previous studies[20,21] and our clinical experience had suggested that patients with various painful musculoskeletal disorders had restricted ROM in the hip joint, standard examination techniques of the hip joint exist, and ROM is easy to measure, we chose ROM of the hip as the outcome measure. Our approach was to measure this parameter at baseline and then quantify the effect of applying traction to the TMJ so as to achieve myofascial release then create maximum stress on the TMJ structures for a short period to simulate dysfunction. Our hypothesis was that in patients with CRPS, we would observe an increase in ROM after myofascial release and a similar ROM decrease after jaw clenching, whereas in healthy subjects, these effects would be minimal or nonexistent.

Methods

Patients

Patients with CRPS (the CRPS group) were recruited using a university referral center of physical and rehabilitation medicine database and were assessed for disease-specific conditions, adjuvant therapy, sociodemographic variables, age, and sex. Patients were included into the study if the Research Diagnostic Criteria (RDC) for CRPS according to the IASP were fulfilled. The disease characteristics were based on the modified research criteria proposed by Bruehl et al,[22] in which a patient must have at least one symptom in each of the following categories: sensory (presence of hyperesthesia or allodynia), vasomotor (temperature asymmetry, skin color changes, or skin color asymmetry), sudomotor/edema (edema, sweating changes, or sweating asymmetry), and motor/trophic (decreased ROM; motor dysfunction; and trophic changes to the hair, nails, or skin), with at least one sign at the time of evaluation in 2 or more of the previously described categories and no other diagnosis that better explains the signs and symptoms. The questionnaire used was a standardized sign/symptom checklist of 3 categories with 22 items used at the clinic, which incorporated the modified research criteria proposed by Bruehl et al.[22] Healthy subjects were also recruited for a control group.

Inclusion and Exclusion Criteria

The minimum entry age was 18 years for both groups. For the patient group, the inclusion criteria were diagnosis of CRPS using the revised RDC for CRPS and pain duration greater than 3 months; for the control, group there were no additional criteria.

Subjects (both groups) were excluded if diagnosed with osteoarthritis, fibromyalgia, fever, and respiratory decompensation or if they were unable to speak, read, and write German or fill out the patient questionnaire. One of us (KR) collected completed questionnaires.

Patients gave written consent to participate in the study. The study was conducted at the Department of Neurology, Friedrich Baur Institute, Ludwig Maximilians University (Munich, Germany), in accordance with the ethical principles of the Declaration of Helsinki with the Edinburgh revision and according to current good clinical practice guidelines and was approved by the local ethics committee. The trial was registered with the Bavarian chamber of physicians (trial registration no. 5111).

Design

This was a single-center, prospective, experimental intervention study.

Examination

The examiner (MJF) was trained by an experienced dentist in the diagnosis of TMD and in the use of the temporomandibular index[23] (TMI). The examiner also underwent more than 50 hours of education, training, and calibration in the use of the TMI and was blinded to both the patient's diagnosis and reported pain measures. He