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Analysis of thermal pain sensitivity and psychological profiles in different subgroups of TMD patients

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Abstract. This study evaluated differences in pain sensitivities and psychological profiles among different temporomandibular disorder (TMD) pain subtypes. Evaluation was done on 36 normal subjects and 39 TMD patients with high Graded Chronic Pain scale scores. TMD patients were placed in three pain subgroups (myogenous, arthrogenous, mixed) using the Research Diagnostic Criteria for TMD (RDC/TMD) axis I guidelines. RDC/TMD axis II profiles including depression and somatization were analysed. Cold pain threshold (CPT), heat pain threshold (HPT), and heat pain tolerance threshold (HPTT) were measured on three facial regions (anterior temporalis, masseter, TMJ) and a leg region (anterior tibialis). The arthrogenous pain subgroup showed significantly higher CPT and lower HPT and HPTT in the facial region, and lower HPTT in the anterior tibialis region compared with normal and myogenous pain subgroups. The myogenous pain subgroup had significantly higher somatization scores than normal and arthrogenous pain subgroups, and higher depression scores than normal subjects. The results suggest that peripheral and/or central sensitization are present in chronic arthrogenous pain more so than in myogenous pain, and this phenomenon appears to take place regardless of the patient's psychological profiles. These results may explain the underlying mechanism that aggravates TMD pain.

Keywords: Research Diagnostic Criteria for temporomandibular disorders; RDC/TMD; muscle; temporomandibular joint; thermal pain threshold; psychological profile.

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Some patients with temporomandibular disorder (TMD) develop pain of a persistent and recurring nature in addition to their limitations or alterations of mandibular movement. The presence of chronic pain has the potential to induce long lasting neuroplastic changes of the peripheral and central nervous system. There have been many studies and reports of altered pain perception in patients suffering from generalized chronic pain. For example, patients with fibromyalgia demonstrate clinical evidence of a centrally mediated allodynia and general nociceptive facilitation, which yields higher visual analogue scale (VAS) scores to painful pressure stimuli and lower thermal pain thresholds[2,11].

With a more focal pain disorder such as TMD, there is conflicting experimental evidence about whether these patients exhibit enhanced sensory (non-pain) and pain signal facilitation compared with pain-free individuals. One study examined pressure pain thresholds (PPT) and heat pain thresholds on localized myofascial TMD patients before and after giving

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standardized infusions of pain-inducing hypertonic saline[23]. It reported that while PPT was lower for the pain group no significant group differences were found for heat pain thresholds. Another study showed that pain-free women and women suffering from TMD did not differ in sensitivity to ischemic pain and heat pain tolerance[4]. A study that examined and compared the detection thresholds of two TMD subgroups (temporomandibular joint arthralgia and masticatory myalgia) by examining the heat and electrical detection thresholds of patients suffering from TMD[7] reported that arthralgia patients had a significantly lower electrical detection threshold in the auriculotemporal nerve territory, however pain thresholds and pain tolerance thresholds were not examined nor were other (non-trigeminal) body sites.

Even if there may be a general facilitation of nociceptive signal transduction for fibromyalgia, it cannot be assumed that this is also true for patients with local myofascial pain. While the various quantitative sensory testing studies on TMD described above show inconsistent results and investigational approaches, these data could be explained logically if severe chronic localized inflammatory pain in the temporomandibular joint (TMJ) differed in its effect on pain signal facilitation from localized myofascial pain, which is generally considered as a non-inflammatory disease process. An additional confounder is that pain is a complex sensory experience and chronic TMD pain is frequently accompanied by psychological distress, notably depression and somatization. Psychological factors may be involved in the pain perception process and conversely pain may dramatically affect the personality of patients[8]. Several types of psychophysiological procedures have been developed to measure pain sensitivity in patients showing orofacial pain symptoms. Studies based on quantitative sensory testing in chronic orofacial pain have not consistently included a psychological assessment of their subjects. This study examines whether there is a difference in pain sensitivity between TMD patients and an age- and sex-matched group of normal subjects, and among the well-defined TMD subgroups of myogenous, arthrogenous, and mixed pain. The authors tried to elucidate the relationship between the psychosocial profiles and thermal pain thresholds obtained by quantitative sensory testing.

Materials and methods

39 consecutive patients with primary symptoms of TMD (7 men, 32 women, mean age $\pm$ SD = 30.8 $\pm$ 11.7 years) were studied. Inclusion criteria were: patients diagnosed with TMD according to the Research Diagnostic Criteria for TMD (RDC/TMD)[5]; and patients who reported high Graded Chronic Pain (GCP) scale (described later in this report) scores (Grade III or IV). Exclusion criteria were: patients with migraine, neuralgia, other musculoskeletal diseases, recent trauma or general medical diseases that might cause alterations of sensory thresholds; patients with pain in the orofacial region not originating from the TMJ and related structures; and patients younger than 18 years.

The control group consisted of 36 age- and sex-matched (7 men, 29 women, mean age $\pm$ SD = 29.0 $\pm$ 7.0 years), pain-free, healthy individuals with no history of any TMD diagnosis and situations pertinent to the exclusion criteria of the patient group. The study was approved by an Institutional Review Board and informed consent was obtained from each subject.

The RDC/TMD axis I guidelines were applied to examining and separating the TMD patients into three pain subgroups. Group 1 included patients with only myogenous pain, who feel pain mainly in the orofacial and/or head musculature during muscle palpation and jaw functioning or resting. Group 2 included patients with only arthrogenous pain, who feel pain mainly in the TMJ area during joint palpation and jaw functioning or resting regardless of the presence of disc displacement and/or degenerative change of the mandibular condyle. Group 3 included patients with both myogenous pain and arthrogenous pain (mixed pain), who feel pain in both the orofacial and/or head musculature and joint area during muscle, joint palpation and jaw functioning or resting. The diagnostic criteria for the three TMD pain subgroups are shown in Table 1.

RDC/TMD axis II profiles

The Korean version of the RDC/TMD axis II history questionnaire was administered to each subject. The original English version of the RDC/TMD axis II history questionnaire was first translated into Korean. This translation was evaluated and revised by several faculty members in the Department of Oral medicine and Oral Diagnosis, Seoul National University. A native English speaker who was fluent in Korean then translated the draft Korean version back into English. The backward translated English version was compared with the original English version to confirm that the questions had been properly translated. The 1-week interval test–retest reliability of the questionnaire used in this survey was assessed in 154 TMD patients prior to this study, and the result reported good reliability[21].

Parameters of psychological profiles from the RDC/TMD axis II history questionnaire including depression and somatization were analysed[5]. The method of assessing depression and somatization was derived from the Symptom Checklist-90-Revision (SCL-90-R). Participants responded to a total of 20 items (13 items of depression parameter and 7 items of an additional parameter) from SCL-90-R, and the resultant raw mean score was regarded as the depression scale. The somatization scale was obtained by calculating the raw mean

Table 1. Selection criteria for each TMD pain subgroup.

TMD pain subgroup	Diagnosis criteria
Myogenous pain (n = 12)	Pain at facial, TMJ, temporal, preauricular and inner ear areas at rest or during function. Pain during palpation at more than 3 sites among the 20 muscle sites (1 of 3 sites must be on the pain side) Does not satisfy the criteria of the arthrogenous pain subgroup.
Arthrogenous pain (n = 12)	Pain during palpation of joint area. Spontaneous pain in TMJ or pain during maximum mouth opening, assisted maximum mouth opening, or lateral movement. Does not satisfy the criteria of the myogenous pain subgroup.
Mixed pain (n = 15)	Satisfies all the criteria of both the subgroups.