

# CLINICAL VIEW OF THE TEMPOROMANDIBULAR JOINT DISORDER

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**SUMMARY** – Temporomandibular pain has a musculoskeletal origin because it occurs as a consequence of masticatory muscle function disorder and temporomandibular joint disorder. Most common diagnoses of disorders are disc displacement and osteoarthritis, but their comorbidity can also occur. Pain is the most common symptom, where chronic temporomandibular pain may contribute to the occurrence of psychological disorders in the patient population. Splint is the most widespread dental method of treatment but other, noninvasive methods of musculoskeletal pain treatment are also recommended. Electronic axiography is used for visualization of mandibular movements, in particular pathologic sounds in the joints. Mental health, although not so obvious in dental practice, can influence the need of a multidisciplinary approach to the patient with disorder of the temporomandibular joint.

**Key words:** *Chronic pain; Temporomandibular joint disorders – therapy; Osteoarthritis; Magnetic resonance imaging*

## Introduction

Musculoskeletal disorders of the stomatognathic system together comprise the term temporomandibular disorders (TMD). Within the diagnosis of TMD, myogenic and arthrogenic subgroups can be differentiated<sup>1</sup>. The etiopathogenesis of TMD is nonspecific, and there is no unified approach in identifying the potential etiologic factors, as well as the optimal way of treating them<sup>2,3</sup>. The etiopathogenetic correlation between anterior disc displacement and osteoarthritis of the temporomandibular joint (TMJ), as the main diagnoses of the arthrogenic forms of TMD, have not yet been fully explained<sup>4-7</sup>. This review is about

the clinical presentation of musculoskeletal disorders in the orofacial area. The article emphasizes medical-dental and radiological diagnostics of TMJ disorder.

## Methods for TMD Diagnosis

The Research Diagnostic Criteria (RDC)/TMD diagnostic system has become standard in scientific studies, wherein the clinical term TMD has been divided into separate diagnoses<sup>8</sup>. Thus, there is a distinction between a muscular disorder and TMJ disorder, i.e. osteoarthritis and anterior disc displacement. The importance of such a system is that it shows the possibility of defining certain diagnoses of TMD wherein the diagnosis of one subgroup does not exclude the diagnosis from the other subgroup in the same patient. Nevertheless, there are certain limitations because RDC/TMD does not include a supplementary magnetic resonance imaging (MRI) diagnostics. However, the generally accepted terminology does

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not explain all clinical aspects of temporomandibular pain as the most important clinical sign and symptom of the illness.

Apart from the use of nonspecific clinical procedures (palpation, auscultation, measuring of active and passive mandibular mobility), the importance of orthopedic tests is also growing (manual functional analysis by Bumann and Groot Landeweer). This implies a modern, biomedical approach to the illness but also an individual approach to the patient and treatment procedures<sup>9</sup>. Clinical evaluation is based on the main, diagnostically relevant clinical signs: pain in the TMJ region and/or masticatory muscles, limited mouth opening and noise (clicking, crepitations) in the TMJ.

### **Radiological methods**

Positive findings of arthrogenic disorder indicate further radiological diagnostics, i.e. magnetic resonance imaging (MRI) and computed tomography (CT). MRI serves as the gold standard in the diagnosis of disc displacement, but also for displaying TMJ hard tissue.

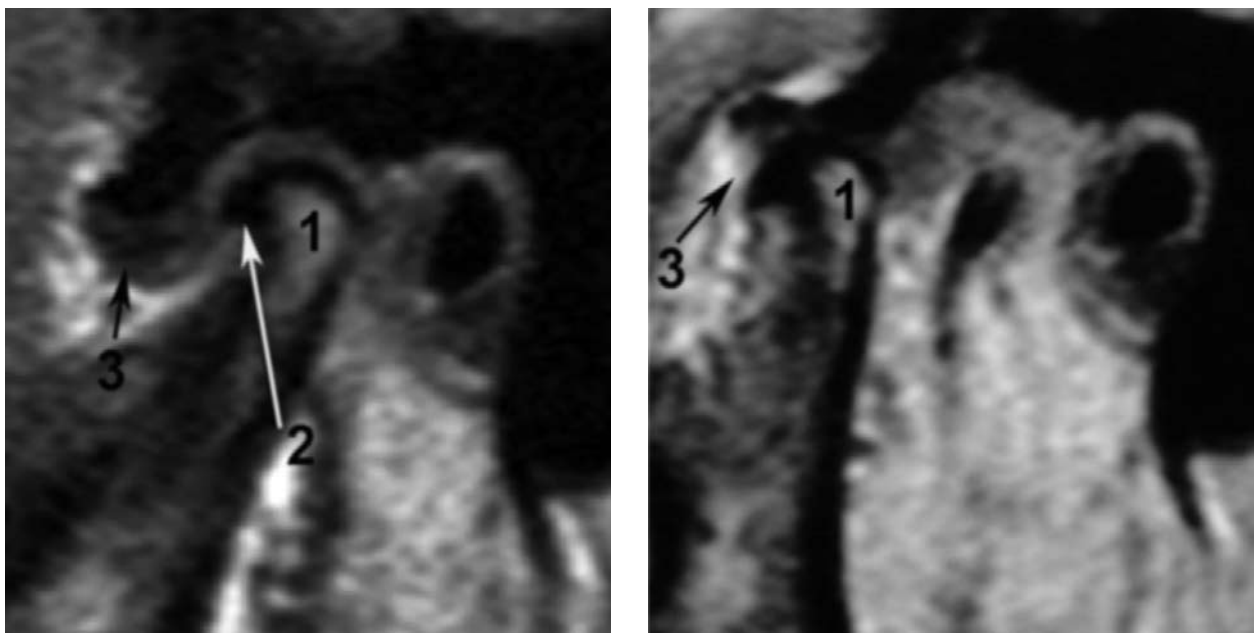
The gold standard for diagnosing a TMJ disorder as well as the use of radiological diagnostics of soft intra-articular tissue is MRI (Fig. 1). Apart from the nonspecific presentation of the TMJs on the panoram-

ic radiograph, with respect to the clinical diagnosis of osteoarthritis, radiological diagnostics includes highly specific methods for detection of hard tissue, i.e. CT (Fig. 2)<sup>10-13</sup>.

Successful clinical detection of degenerative TMJ changes was demonstrated in non-patient population and confirmed by MRI<sup>12</sup>. Radiological findings of osteoarthritis range from flattening of bone surfaces and degenerative changes of subchondral bone, especially the articular eminence, to the loss of continuity of cortical bone, development of subchondral pseudocysts and development of osteophytes as a consequence of unsuccessful remodeling<sup>13-15</sup>.

### **Axiography**

Within dental-medical diagnostics, there is also electronic axiography as a method of visualizing the amount and movement trajectories of the TMJ condyle and mandible (Fig. 3). Axiograph consists of upper and lower bows. Upper bow is, commonly, mounted similar as facebow. Lower bow is attached to the lower dental arch with the use of paraocclusal tray. During recordings of mandibular movements, sensors of the lower bow transmit impulses (optoelectronic, ultrasound, magnetic, mechanical, etc.), while receivers on the upper bow record them. The device



*Fig. 1. Magnetic resonance imaging of the anteriorly displaced disc with osteoarthritis of the temporomandibular joint in the sagittal plane (1 condyle; 2 osteophyte; 3 displaced disc without reduction; left: closed mouth, right: open mouth).*

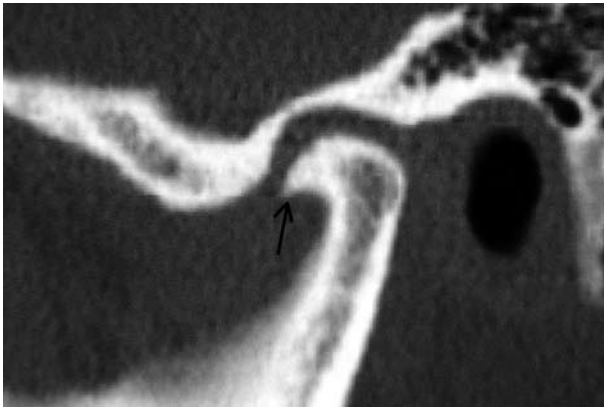


Fig. 2. Computerized tomography of the temporomandibular joint (arrow: osteophyte).

software calculates different values, depending on the device and movements performed (sagittal condylar inclination, Bennett angle, immediate side shift, etc.). Values and movement paths can be seen on the screen of the device, or on the computer. Electronic axiography is a diagnostic tool aimed for better description

of arthrogenic problems, which imply disorders and irregularities in the mandibular movements. Studies have shown the scientific and practical applicability of electronic axiography<sup>16-18</sup>.

#### View on TMD treatment

Treatment of TMD-pain complaints by occlusal splint is a generally accepted concept for symptomatic and noninvasive treatment. There is no definitive agreement regarding the prognosis of treatment of osteoarthritis either<sup>19</sup>. In addition, rheumatology/physical medicine uses a broad range of physical therapies, and nonsteroidal anti-inflammatory drugs and complementary treatment modalities as an additional treatment of pain<sup>20-24</sup>. On the other hand, in comparison with neuropathic pain, the success of pharmacological treatment amounts up to 50%<sup>25</sup>. Neuropathic pain in comorbidity with TMD (in 34.1% of cases with other, predominantly neuropathic, orofacial pain) can reduce standard TMD treatment modalities<sup>26</sup>.

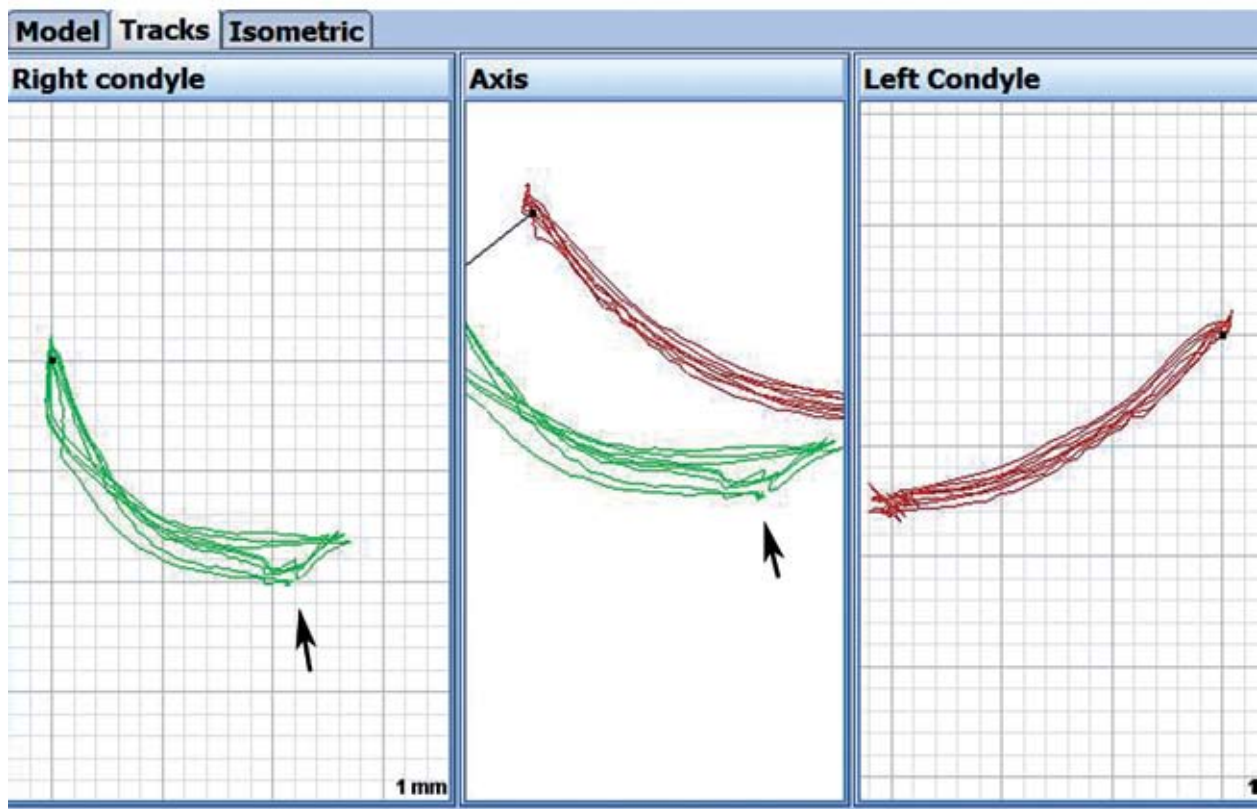


Fig. 3. Clicking (arrow) in the temporomandibular joint confirmed by the 'motion analysis' module (Arcus Digma II®, KaVo).



Fig. 4. Michigan splint on the upper dental arch.

Clinical practice has confirmed the usefulness of occlusal splint in TMD treatment, even in distinct degenerative changes in elderly patients<sup>27-29</sup>. The Michigan splint has a characteristic, almost flat occlusal surface, which besides programming of masticatory muscles, enables positioning of the condyles in relation to the anterior position of the disc and the entire glenoid fossa (Fig. 4). The relatively flat surfaces of the occlusal splint, which are in contact with working cusps of opposing (mandibular) teeth, enable smooth adjustment of the position of the mandible within 'freedom in centric'. Increasing the vertical dimension for the amount of the interocclusal free space also affects masticatory muscle relaxation<sup>27</sup>.

Since the conventional etiopathogenetic model of musculoskeletal disorder formation describes it as the result of multifactorial action, i.e. nonspecific etiopathogenesis for the individual patient, particular attention is paid to genetic factors and individual compensation mechanism of structural disorders of the TMJ, i.e. anterior disc displacement and/or degenerative osteoarthritic changes<sup>2,3,30,31</sup>. Osteoarthritis is mostly responsible for joint pain in general population, but experience tells us that TMJ is a dominant clinical sign and symptom that is often unrecognized as a separate entity because the criteria for clinical signs of TMJ are susceptible to validity checks compared to MRI findings<sup>14,15,32</sup>.

Although disc displacement in the TMJ can have a similarity with the pathology of the cervical spine and is often described as a unique biomechanical correlation of cervical spine and TMJ function, discopathy of TMJ by itself is not associated with degenerative

changes of bone structures, unlike osteoarthritis<sup>33</sup>. Interrelation of anterior disc displacement and osteoarthritic changes is not fully understood, especially since these two diagnoses, according to the accepted classification systems, can be clinically diagnosed independently of each other<sup>4,8,9</sup>.

The reason why degenerative and remodeling changes develop after disc displacement is the loss of cartilage structure (disc), which, together with the condylar head, forms a unique biomechanical body that moves during the movement of the mandible on the back slope of the articular eminence<sup>4</sup>. However, Campos *et al.*<sup>5</sup>, in their investigation using MRI, did not detect a statistically significant incidence of osteoarthritic changes in joints with disc displacement. It is not uncommon to see clinically manifested osteoarthritis of the TMJ, wherein the physiological disc position can be determined by MRI<sup>4,6,30</sup>.

There is no definitive agreement regarding the extent to which osteoarthritis of TMJ is linked to the general assumption of more frequent degenerative diseases in older age, although aging is not a significant factor for the development of osteoarthritis<sup>19,34</sup>. TMD are more common in working population, mainly women (the proportion of female patients can be 75% and more)<sup>30,35</sup>. Malocclusion and tooth loss are not critical for the development of osteoarthritic changes in the TMJ either, or for TMD in general<sup>34,36</sup>.

## Discussion

The application of the etiopathogenetic models of the origin of TMD (biopsychosocial concept, multifactorial concept) in certain patients with clinical signs and symptoms is not completely possible and therefore, the application of personalized/person-centered medicine concepts in chronic pain management is necessary<sup>37,38</sup>. The predominance of females among TMD patients is at least partially explained by the fact that greater severity of TMJ and other pain conditions are related to the decreased anti-inflammatory effect of estradiol during low serum estrogen level of the menstrual cycle<sup>39</sup>.

Dysfunctional conditions of the orofacial system need not only include pain and functional disorders related to TMD. The neurological aspects in the orofacial system can manifest in chronic diseases such as multiple sclerosis, wherein, for example, chronic

demyelinating disease with unpredictable course also involves the orofacial region as paresthesia of trigeminal nerve and palsy of facial musculature (including mimic muscles as well), or conversely, TMJ hypermobility<sup>40,41</sup>. Speech and mastication may be disturbed by acute palsy of the facial nerve (Bell's palsy or idiopathic peripheral facial weakness) with severe consequences in about 5% of patients. Vertigo as well as headache are often found as comorbidities in TMD. It has been shown that there is a relation between the occurrence of headaches and self-reported TMD pain in adolescent population<sup>42</sup>. In a study based on a questionnaire, vertigo was determined in 20.1%-44.8%, and headache in 25.7%-72.4% of subjects from the TMD symptom-positive subgroups of first-year healthy university students<sup>43</sup>.

It is very important for the neurologists and TMD specialists to collaborate in recognizing the conditions such as TMJ disorder and trigeminal neuralgia (TN) for managing non-dental orofacial pain. Comorbidity of TMJ disorder and TN, as well as only TN was found in 5% of all examined patients. Pains in the TMJ area and ear pain were statistically significant in patients with TMJ disorder, while there was no difference in noise in the TMJs and headache<sup>44</sup>.

### ***Pain medicine and TMD***

Orofacial pain (musculoskeletal, neuropathic, neurovascular) has a prevalence of up to 22%-26% in general population, out of which 7%-11% have chronic pain<sup>45,46</sup>. In clinical symptomatology, which involves sounds in the TMJ (clicking, crepitations) and reduced mouth opening, the symptom of arthralgia (joint pain) is the most common symptom that causes patients to seek diagnosis and treatment. Osteoarthritis is a common degenerative disease and a contemporary public health problem because of the painful ailments of bones and joints<sup>47,48</sup>.

The prevalence of pain in the TMJ and masticatory muscles is relatively low (2%-7%)<sup>49,50</sup>. Emergency cases in oral surgery are mostly consequences of odontogenic complications and soft tissue injuries (33.94% and 22.54%, respectively), whereas TMJ disorders and TN account for less than 2% (1.63% and 1.34%, respectively)<sup>51,52</sup>.

Chronic pain has a multidimensional character and it is not determined only by the duration (mostly

longer than 6 months). The complexity of chronic pain is affected by psychological factors, which play an important role in the complicated interaction of neurophysical, psychological and sociocultural factors<sup>53-55</sup>.

### ***Mental health in TMD patients***

Chronic pain is an essential criterion in the evaluation of patient psychological impairments. Schierz *et al.*<sup>56</sup> found the patients with persistent pain to exhibit dysfunctional, pain-related impairments about twice as frequently as patients with acute pain. Although the psychological factor is pronounced in the process of temporomandibular pain chronification, TMD are not psychological or social disorders<sup>57,58</sup>. Some other oral diseases, such as oral lichen planus (OLP) as one of many autoimmune diseases, are strongly related to psychological disturbances<sup>59</sup>. OLP is a T cell-mediated chronic inflammatory oral mucosal disease of unknown etiology, and there is ongoing concern that OLP may be premalignant<sup>60</sup>.

Rollman *et al.*<sup>61</sup> did not find any significance in the influence of depression, somatization and anxiety, or of some social factors (employment, household situation) on the improvement of TMD-pain complaints, and in the 6-month follow up study there was no controlled type of treatment and implementation of that treatment.

The psychological factors play an important role in the expression of pain during different stages of TMD, especially in perpetuation of TMD and in the response of such patients to treatment. A higher level of anxiety in TMD patients can be a risk for chronic pain development<sup>57,62</sup>. However, contrary to the relationship between chronic pain and anxiety, Giannakopoulos *et al.*<sup>63</sup> found importance of depression for women with chronic pain from muscular diagnosis according to Research Diagnostic Criteria (RDC)/TMD Axis I<sup>8,64</sup>. A higher degree of depression was found in patients with TMJ disorder and higher somatization in patients that were referred with pain<sup>65</sup>.

In general population (mean age, 42.1 years) with a depressive and/or anxiety disorder who were followed up for 2 years, Gerrits *et al.*<sup>66</sup> found that the most frequent pain location was headache (76.6%), and on the contrary, the least frequent was orofacial pain (18.1%). Joint pain was reported by 51.9% of the subjects, and it was only significant with the presence of depressive

and/or anxiety disorder. According to this study<sup>67</sup>, pain associated with a worse course of pain can be related to depressive and anxiety disorder.

Anxiety is the most common affective disorder and a great problem for psychiatry and general medicine. A certain degree of anxiety is normal and can serve as an alerting signal, warning of external or internal threat, and it has lifesaving qualities<sup>64</sup>. The negative effects of anxiety on the improvement of TMD pain complaints have not been completely explained<sup>61,67</sup>. In complex understanding of the influence of the psychological condition of the patient on the painful musculoskeletal symptoms, changes of nociceptive system at the central level can adversely affect chronification of pain and partial healing<sup>68,69</sup>.

Psychological help for patients with chronic TMD is primarily related to biopsychosocial consequences and chronification of musculoskeletal pain, wherein alternative and complementary medicine have a wide application in chronic patients, even up to 85%<sup>70,71</sup>.

## Conclusion

Clinical manifestations and treatment outcome of the TMD are not well understood, especially since there is no gold standard in the choice of treatment method. Within the field of radiological diagnostics, MRI is the gold standard for soft tissue diagnostics and it provides a high quality display of hard and soft tissues. There is no clear distinction between acute and chronic pain, and there is no clearly defined role of psychological factors in the course of treatment either. Mental health, although unnoticeable in dental practice, may affect the persistence of bruxism, and the occlusal splint has a common therapeutic and protective role in such patients.

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## Sažetak

## KLINIČKI POGLED NA POREMEĆAJ TEMPOROMANDIBULARNOG ZGLOBA

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Temporomandibularna bol je muskuloskeletnog podrijetla, jer nastaje kao posljedica poremećaja funkcije žvačnih mišića i temporomandibularnih zglobova. Najčešće dijagnoze temporomandibularnih poremećaja su pomak diska i osteoartritis, ali je moguć i njihov komorbiditet. Bol je najčešća tegoba, a kronična temporomandibularna bol može dovesti i do pojave psiholoških poremećaja u populaciji pacijenata. Udlaga je najrašireniji stomatološki način liječenja, ali se preporučuju i ostale, neinvazivne metode liječenja muskuloskeletnih bolova. U svrhu vizualizacije kretnji donje čeljusti, a osobito patoloških zvukova u temporomandibularnom zglobu, koristi se elektronička aksiografija. Mentalno zdravlje, iako neprimjetno u stomatološkoj praksi, može utjecati na potrebu multidisciplinarnog pristupa bolesniku s poremećajem temporomandibularnog zgloba.

Ključne riječi: *Kronična bol; Temporomandibularni zglob, poremećaji – terapija; Osteoartritis; Magnetska rezonancija*