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REVIEW

Saadet Sağlam Atsü · Figen Ayhan-Ardic

Temporomandibular disorders seen in rheumatology practices: a review

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Abstract Temporomandibular disorders are recognized as the most common nontooth-related chronic orofacial pain conditions. This article reviews the recent temporomandibular disorders literature and summarizes the temporomandibular disorders seen in rheumatology practices. Arthritis is a common condition affecting the temporomandibular joint. Although degenerative and rheumatoid arthritis are the most frequently encountered infectious arthritis, metabolic arthritis, spondyloarthropathies and the traumatic arthritis have also been reported. Distinguishing between different temporomandibular disorders is as important as the clinical course, long-term prognosis, and therapy. Diagnostic criteria are generally based on signs and symptoms of the patient. The American Academy of Orofacial Pain established the first well-defined diagnostic classification. In addition, Research Diagnostic Criteria for Temporomandibular Disorders have been developed using similar classification. In the treatment of temporomandibular disorders, conservative and noninvasive treatments are endorsed for the initial care of nearly all TMD patients because the majority of patients with TMD achieve good relief of symptoms with conservative treatment.

Keywords Temporomandibular disorders · Degenerative arthritis · Rheumatoid arthritis · Diagnostic classification · Treatment

S. S. Atsü
Department of Prosthodontics, Faculty of Dentistry, University of Kırıkkale, Kırıkkale, Turkey

F. Ayhan-Ardic
Division of Rheumatology, Department of Physical Medicine & Rehabilitation I, Ankara Education and Research Hospital, Ankara, Turkey

S. S. Atsü (✉)
444. Sokak, No:21/18, Orkide Apt. , Çukurambar Mahhallesi, Balgat, Çankaya, 06420 Ankara, Turkey
E-mail: saadetats@yahoo.com
Tel.: +90-0318-2244927
Fax: +90-0318-2246907

Definition of temporomandibular disorders

Temporomandibular disorders (TMD) is a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular joint, or both. It has been identified as a major cause of nondental pain in the orofacial region and is considered to be a subclassification of musculoskeletal disorders [1–3]. The most presenting symptom is pain, usually localized in the muscles of mastication, the preauricular area, and/or the temporomandibular joint (TMJ). Common patient complaints include jaw ache, earache, headache, and facial pain. In addition to pain, patients with these disorders frequently have limited or asymmetric jaw moment and joint sounds [1–3].

Prevalence

Temporomandibular disorders (TMD) is a common condition. Cross-sectional epidemiologic studies in specific populations show that about 75% have at least one sign of TMD and about 33% have at least one symptom [3–5]. Signs and symptoms of TMD generally increase in frequency and severity from the second through the fourth decade of life. Studies report a ratio of approximately 4:1 of females to males seeking care for TMD. Although the large populations have signs or symptoms, individuals with mild transient signs and symptoms may not require treatment and it is estimated that only 5–6% are in treatment [1, 3, 6, 7].

Etiology and contributing factors of TMD

The etiology of temporomandibular disorders has been accepted to be multifactorial in nature [1–3, 8]. These factors are classified as predisposing, initiating, and perpetuating to emphasize their roles in the progression of TMD [1, 3]. Predisposing factors include patho-

physiologic, structural, and/or psychological conditions that adversely affect the masticatory system to increase the risk of developing TMD. Pathophysiologic factors include neurologic, vascular, rheumatologic, metabolic, hormonal, degenerative, neoplastic, and infectious disorders. Structural factors such as skeletal malformations, past injuries, and inappropriate dental treatment may be predisposing factor. Occlusion is a known predisposing factor for TMD, but it is controversial. However, studies show that discrepancy between the retruded contact positions and the intercuspal position than 2 mm, extreme anterior open bite, overjet greater that 6–7 mm, five or more missing posterior teeth [9, 10]. Psychologic predisposing factors include emotional, personality, and attitude characteristics. The authors reported that patients with masticatory muscle pain had more stress and depression [11–13]. Initiating factors lead to the start of symptoms, and are primarily related to trauma or adverse loading of the masticatory system. Trauma to head, neck, or jaw can result from an impact injury or injury while eating, yawning, and opening during long dental treatment or general anesthesia. Trauma can also be caused by sustained and repetitious adverse loading of the masticatory system as a result of parafunction. Parafunctional habits are common and can cause damage to dentition, masticatory system, and/or joints when they pass over the individual's physiological tolerance and the structural tolerance of the masticatory system [1, 3]. Many studies observed associations between oral parafunctions and tenderness in masticatory muscles and TMJ [3, 8, 12]. Perpetuating factors, such as parafunction, hormonal factors, or psychosocial factors may be associated with any predisposing and initiating factor and can complicate TMD management [1, 3].

Biomechanics of TMJ

Understanding of biomechanism in TMJ function is essential to the understanding of joint dysfunction and treatment of the TMD. The TMJ is a compound and not a weight-bearing joint. Its structure and function can be divided into two distinct systems: the inferior joint cavity between the condyle and articular disk responsible for rotational movement in TMJ and the superior joint cavity between the superior surface of the articular disk and mandibular fossa responsible for translation [3, 14]. The retrodiscal tissue attaches to the posterior border of the articular disk. When the teeth are together, and the condyle is in the closed joint position, elastic traction on the disc is minimal. However, during mandibular opening, superior retrodiscal lamina composed of elastic connective tissue becomes increasingly stretched, creating increased forces to retract the disk. Superior lateral pterygoid attach to the anterior border of disk and when this muscle activates, the disk is pulled anteriorly and medially. It is activated only in conjunction with the activity of the elevator muscles during mandibular closure or a power stroke. In addition, anterior capsular ligaments attach the disk to the anterior margin of the articular surface of the condyle and inferior retrodiscal lamina attaches the posterior edge of the disk. Both ligaments are composed of collagenous fibers and will not stretch but only passively restrict extreme movements. As soon as the condyle is moved forward, the force of superior retrodiscal lamina becomes greater than the muscle tonus of superior lateral pterygoid and disc is rotated posteriorly. When the condyle is returned to the resting closed joint position, once again the tonus of the superior lateral pterygoid becomes predominant and the disk is repositioned forward as far as the disk space will permit [3, 14].

Assessment

Screening for TMD is recommended as an essential part of the routine dental and rheumatologic examination [1, 3, 15]. The screening consists of a questionnaire, brief history and examination (Table. 1, 2) [1–3]. If the findings are significant, a comprehensive history and examination should be conducted. Comprehensive history must include chief complaint, history of present illness, medical history, dental history, and personal history. Radiography of TMJ is essential when the clinical examination leads to consider joint pathology [16]. Corrected cephalometric tomography is the most accurate method for radiographically examining patients with suspected TM joint degenerative disease [17]. Magnetic resonance imaging (MRI) is used to examine patients of suspected TMJ soft tissue disorders, such as disk displacement, effusion, or tumors [18]. However, it is rarely indicated for nonsurgical treatment because the diagnosis is usually accomplished with clinical examination. Computed tomography (CT) is useful for imaging bone abnormalities, such as trauma, neoplastic conditions and developmental anomalies of TMJ [19].

Evaluation of TMD patients should include oral habits and psychosocial evaluation such as stressful life events, depression,and anxiety. In some cases, stress-related muscle hyperactivity might be the primary contributing factor [3, 12]. Additional clinical tests such as laboratory test, diagnostic anesthetic injections and dental cast evaluation may be necessary. Laboratory test may include analysis of blood and urine to identify hematologic, rheumatologic, metabolic, or other abnormalities suggestive of systemic disease [1, 3].

Diagnostic classification of temporomandibular disorders

The American Academy of Orofacial Pain (AAOP) established the first well-defined diagnostic classification, which was revised in 1996. The following sub-classification of temporomandibular joint (articular) and masticatory muscle (nonarticular) disorders are mentioned [1].

Joint disorders

It can be subdivided into articular disorders such as congenital or developmental disorders, disk derangement disorders, dislocation, inflammatory disorders, osteoarthritic disorders, ankylosis, and condylar fracture.

Congenital or developmental disorders It can be subdivided into aplasia, hypoplasia, condylolysis, hyperplasia, and neoplasm.

Disk derangement disorders It represents a disk–condyle misalignment and is subdivided into disk displacement with reduction or disk displacement without reduction. Acute episode is usually painful.

Disk displacement with reduction It is characterized by the misaligned disk and reciprocal clicking. Range of motion is usually normal.

Disk displacement without reduction It is also called closed-lock. Disk–condyle structural relationship is altered that is maintained during translation. It is characterized by lack of joint noise and limited jaw motion [1, 3].

Joint dislocation It is known as open-lock, and is characterized by condyle positioned anterior to the articular eminence and unable to return to a closed position [1, 3].

Inflammatory conditions Inflammatory conditions can occur as a localized synovitis or capsulitis often secondary to trauma or as a generalized synovitis associated with systemic joint disease. It can be subdivided into synovitis/capsulitis and polyarthritides [1, 3].

Arthritis of temporomandibular joint It is the most common condition affecting the TMJ as in other joints. Although degenerative and rheumatoid arthritis are most frequently encountered infectious arthritis, metabolic arthritis, spondyloarthropathies and the traumatic arthritis have also been reported [1, 3, 15].

Rheumatoid arthritis The ratio of TMJ involvement in rheumatoid arthritis (RA) has changed from 4.7 to 84% in different studies depending on the use of different criteria for clinical and radiological evaluation [20–24]. Although the TMJ may be affected early in the course of disease, other joints in the body are usually involved first. In severe cases the osseous tissues can be resorbed, with significant loss of condylar support. It may also occur in the TMJ, and is almost bilateral. Both children and adults are affected. In the child, destruction of mandibular condyle by the disease process result in growth retardation and facial deformity characterized by a severely retruded chin. Fibrous or bony ankylosis is a possible sequel at all ages. It is well known that many RA patients may present muscular pathology in addition to the joint pathology, also in the orofacial area and the myofascial pain of temporomandibular system is an important cause of pain in RA [15, 20, 21]. Patients with RA of the TMJ have bilateral pain, tenderness, and swelling in the preauricular region as well as limitation of mandibular movement. These symptoms are characterized by periods of exacerbation and remission. While temporomandibular joint involvement pattern was symmetrical in patients with RA, patients with MPD tended to have asymmetric involvement. In severe cases, when condylar support has been lost, an acute malocclusion (anterior open bite) results. In addition to the comprehensive clinical examination, radiological evaluations are generally needed in RA patients. Mild bony changes, not demonstrated by radiographs, are clearly seen by high-resolution computed tomography [2, 21, 23, 24] and RA patients having higher CRP levels had advanced CT changes [24, 25]. Condylar head erosion, joint space narrowing and degeneration were statistically more prominent features in patients with rheumatoid arthritis compared with controls. About 50–80% patients show bilateral evidence of demineralization, condylar flattening, and bone erosion [15]. The pain score on active palpation on TMJ may be correlated with the number of the mandibular subchondral cysts on high-resolution computed tomography.

Spondyloarthropathies Psoriatic arthritis and ankylosing spondylitis can also involve the TMJ [26].

Psoriatic arthritis It occurs in a small percentage of patients who have long-standing cutaneous psoriasis. Often only one TMJ is involved. TMJ pain, restricted jaw movement, crepitus, and similar symptoms with RA are seen [26]. They usually involve erosive changes in the

Table 1 Questionnaires for TMD

1. Do you have difficulty or pain, when opening your mouth?
2. Does your jaw get stuck, locked, or go out?
3. Do you have difficulty or pain, when chewing, talking, or using your jaws?
4. Are you aware of noises in the jaw joint?
5. Do you have pain in or about ears, temples, or cheeks?
6. Does your bite feel uncomfortable or unusual?
7. Do you have frequent headaches?
8. Have you had a recent injury to your head, neck, or jaw?
9. Have you previously been treated for a jaw joint problem? If so, when?

Table 2 Clinical examination procedures for TMD

1. Measure range of motion of the mandible on opening and right and left laterotrusion
2. Palpate for preauricular TMJ tenderness
3. Palpate for TMJ crepitus
4. Palpate for TMJ clicking
5. Palpate for tenderness in the masseter and temporalis muscles
6. Note excessive occlusal wear, excessive tooth mobility, or migration, in the absence of periodontal disease, and soft tissue alterations, for example, buccal mucosal ridging, lateral tongue scalloping
7. Inspect symmetry and alignment of the face, jaws, and dental arches

condyle and glenoid fossa and associated with extreme narrowing of the joint space that is nonspecific and cannot be distinguished easily from other arthritis.

Ankylosing spondylitis About one-third of the patients with ankylosing spondylitis develop TMJ involvement several years after the onset of the disease. Pain and limitation of jaw movement are the most common symptoms and ankylosis can develop in advanced cases. Erosive changes in the condyle and fossa and narrowing of the joint space are seen in 30% of the patients [27].

Traumatic arthritis It is characterized by TMJ pain and limited jaw movement. Inflammation and occasional hemarthrosis resulting from the acute trauma can also lead to loss of tooth contact on the affected side. No radiographic changes, widening of the joint space due to intra-articular oedema or hemorrhage and/or intracapsular fracture may be seen on radiographic examination [15].

Infectious arthritis It rarely involves the TMJ. It can affect the TMJ as part of systemic disease such as gonorrhea, syphilis, tuberculosis, and Lyme disease, and direct extension of an adjacent infection of dental, parotid gland, or otic origin [28]. Symptoms of infectious arthritis are unilateral pain, tenderness, swelling, redness of TMJ region, and systemic findings of the infection such as fever and chills. There is often inability to occlude the teeth. No radiographic changes in the early stages, widening of the joint space due to accumulation of inflammatory exudates, and bony destruction may be seen on the radiographic examination. In the later stages, fibrous or bony ankylosis may occur. In the child, infectious arthritis can affect the growth of the condyle and result in facial asymmetry [15].

Metabolic arthritis It is rare in TMJ and can accompany with gout or pseudogout [29].

Gout Gouty arthritis of TMJ occurs most frequently in men older than 40 years. When the attack occurs, swelling and pain in TMJ are seen. No radiographic changes may occur for a long period if the attacks are infrequent [15, 29].

Pseudogout Calcium pyrophosphate dihydrate arthropathy (pseudogout) in the TMJ is clinically similar to gout. Mandibular condyle may show degenerative and erosive changes. It can occur both in older patients (primary form) and in younger patients (secondary form). There is intra-articular calcification, and diffuse calcification also occurs in the intra-articular disk [15, 29].

Degenerative arthritis (osteoarthritis) It is the most common type of arthritis involving TMJ. Clinical symptoms of the disease have been reported in up to 16% of the general population however radiographic evidence has been found in up to 44% of asymptomatic persons [15, 30]. Parafunctions such as clenching and grinding of the teeth are sufficient to contribute to similar degenerative changes in some patients [31]. Osteoarthritis of TMJ is divided into primary and secondary noninflammatory osteoarthritic conditions. A primary osteoarthritic condition is characterized by structural changes of the joint surface and remodeling mechanism which is usually seen in older people. It generally produces only mild discomfort, and patients rarely complain about the condition [15, 32]. Secondary arthritis occurs similar to articular breakdown and remodeling, but it is usually seen in younger patients (20–40 years age group) and tends to be painful. Osteoarthritis is characterized by minimal or no pain in TMJ that is increased by function (when painful it is secondary inflammation), clicking and popping sounds in the TMJ and probable crepitus in the late stages, and moderate limited range of motion. The earliest radiographic evidence of structural bony changes is subchondral sclerosis in the mandibular condyle [15]. In the later stages flattening of condyle, erosion of the cortical plate, and osteophyte of the mandibular condyle are seen. Bone cysts resulting from breakdown of the subcortical bone may occasionally be seen. Narrowing of joint space also occurs in the late stages, and may lead to degenerative changes in the intra-articular disk [15].

Ankylosis It is not associated with pain. Fibrous adhesions are thought to occur mainly in the superior compartment of the TMJ and it commonly follows hemarthrosis due to trauma. Osseous ankylosis is commonly associated with a previous infection [1].

Fracture Extrinsic trauma can injure all related bony components of the masticatory system [1].

Masticatory muscle disorders

Masticatory muscle disorders include myofascial pain, myositis, myospasm, local myalgia, myofibrotic contracture, and neoplasm.

Myofascial pain and dysfunction Myofascial pain is a regional or localized dull aching pain associated with localized tenderness in firm bands of muscle (trigger points), tendons, or fascia that reproduces pain on palpation [1, 3]. Pain of unilateral origin is the most common symptom of myofascial pain and dysfunction (MPD). In contrast to pain in joint disease, which is well localized, pain of muscle origin is more diffuse and the patient is generally unable to identify the specific site involved. Characteristic pattern of localized tenderness and regional referred pain on palpation is associated with myofascial pain and differs from the more generalized tenderness in many sites of the body associated with fibromyalgia [1, 3, 15, 33]. Inactivation of the trigger point area with local anesthesia, spray and stretch, or ice usually relieves pain. The masseter is the most frequent muscle involved and the patient usually refers to the pain as a jaw ache. The temporalis is the next commonly involved muscle, and it produces pain on the head. Involvement of the lateral pterygoid muscle produces earache or a deep pain behind the eye and medial pterygoid involvement causes discomfort on swallowing and the feeling of a painful, swollen gland beneath the angle of mandible. The pain is usually constant in MDP, which aggravates during eating, talking or parafunction. Muscle tenderness and limitation of mandibular motion are also cardinal symptoms of MDP [1, 3, 15].

Myositis It is an acute, painful, and inflammatory condition within the muscle tissue. Myositis is usually a result of local causes such as infection or trauma. Range of mandibular motion is limited because of pain and swelling [1, 3].

Myospasm It is a sudden, involuntary contraction of a muscle. Generally acute pain, limited range of motion, and increased electromyographic activity even at rest accompanied with myospasm [1, 3].

Local myalgia—unclassified This sub-classification includes muscle pain secondary to ischemia, bruxism, fatigue, muscle soreness, and protective splinting that cannot be distinguished from other muscle classifications [1, 3].

Myofibrotic contracture It is chronic resistance of a muscle to passive stretch as a result of fibrosis. Generally it is not painful and caused by trauma but can result from infection or any disorder resulting in hypomobility [1, 3].

Neoplasia Masticatory muscle neoplasia can be malignant or benign [1, 3].

In addition to AAOP diagnostic classification, Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) have been developed using similar classification [34]. The RDC/TMD uses clinical examination and history-gathering methods. It is based on a dual axis system that allows physical diagnosis based on pathophysiology to be placed on one axis (axis I). This axis includes the physical diagnosis of myofascial pain, disk displacement, and arthritis. Second axis (axis II) includes assessment of pain-related disabilities and psychological status [34].

Management of TMD

Management goals for patients with TMD are similar to patients with other rheumatologic disorders [1, 3, 15]. The aim is decreased pain, decreased adverse loading, restored function and normal daily activities. Management of TMD patients involves patient education and self-care, cognitive behavioral intervention, pharmacotherapy, physical medicine, orthopedic appliance therapy, occlusal therapy, and surgery. Conservative treatments are endorsed for the initial care of nearly all TMD patients because the majority of patients with TMD achieve good relief of symptoms with conservative treatment [1, 3, 15].

Patient education A successful home care program may allow healing and prevent further injury to the masticatory system. Home care program should include the following: rest of the masticatory system through voluntary limitation of mandibular function, awareness of oral parafunctions if it is present and modification, and a home physiotherapeutic program of moist heat and/or ice to the affected areas, massage of the affected muscles, and gentle range of motion exercises [1, 3, 15].

Behavior modification The changing maladaptive habits and behavior is an important part of the overall treatment program for TMD patients. Behavior modifications such as a habit-reversal program, life-style counseling, progressive relaxation, and biofeedback may be considered. Use of dental therapies such as stabilization or repositioning appliance appears to enhance the effect of behavioral treatment [1, 3, 15].

Pharmacotherapy Pharmacologic agents used in the treatment of TMD include analgesics, anti-inflammatory agents, muscle relaxants, corticosteroids, anti-anxiety agents, and low-dose antidepressants [1, 3, 15].

Physical medicine Physical therapy helps to relieve musculoskeletal pain and restore normal function [35]. In most cases, physical therapy is used as an additional treatment to other treatments. Physical agents include electrotherapy and ultrasound devices, vapocoolants, and anesthetic injections. Exercise may be recommended to stretch and relax muscles, increase joint range of motion, increase muscle strength, develop normal coordination, and stabilize the TMJ [1, 3, 35].

Occlusal splints Occlusal appliance (occlusal splints) is routinely used in the treatment of TMD and have reported 70–90% rate of clinical success [36, 37]. Removable acrylic resin appliances that cover the teeth have been used to alter occlusal relationship and redistribute occlusal forces, to prevent wear and mobility of the teeth, to decrease bruxism and parafunction, to treat masticatory muscle pain and dysfunction, and to alter structural relationships and forces in the TMJ [1, 3, 36, 38]. Two major types of splints are commonly used for TMD, namely, stabilization appliances and anterior positioning appliances.

Stabilization appliances are also termed 'muscle relaxation' or 'flat plane'. Stabilization appliances are designed to provide stabilization of the joint, redistribution of forces at the tooth and joint level, relaxation of the elevator muscles, and protection of the teeth from the bruxism. The occlusal surface of the appliances should be adjusted to provide a stable mandibular posture by creating posterior occlusal contacts which mandible stabilizes in its most physiological position [1, 3, 38].

Anterior positioning appliances are used to decrease joint pain, joint noise, and associated with secondary muscle symptoms in disc displacement with reduction disorders. These appliances reduce or change the localization of stress in the joint by altering the structural relationships [1, 3, 39]. The mandibular anterior positioning should be no more than 1–2 mm to prevent irreversible changes in the occlusion. After joint pain is reduced, the appliance should be adjusted to allow positioning of mandibula as close as possible to the original intercuspal position [1, 3, 39].

Occlusal adjustment It should be considered after appliance therapy if the patient's occlusion is unstable and uncomfortable to the patient on closure. It is also indicated especially after repositioning therapy or orthodontic treatment [1–3].

Restorative therapy Restorative therapy may be indicated when the effects of repetitive adverse loading can be decreased or the forces can be redistributed by altering structural relationships. Fixed, partial, or complete removable dentures may be used in treatment [1–3].

Orthodontic therapy It is the treatment of choice for the more complex malocclusion because orthodontic therapy can alter large dental and skeletal discrepancies [1–3].

Surgery TMJ surgery is the indicated treatment for a very small percentage of TMD patients with TMD articular disorders because of the complexity of the available techniques, potential for complications, and success of nonsurgical treatment approach. Surgical treatments include closed surgical procedure (arthrocentesis and arthroscopy) or open surgical procedures (arthrotomy and condylotomy) [1, 40].

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