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Comprehensive Overview of Temporomandibular Joint Disorders and Their Multidisciplinary Management

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Abstract:
TMDs encompass a group of musculoskeletal and neuromuscular conditions that involve the TMJs, the masticatory muscles, and all associated tissues, and they have been identified as a major cause of nondental pain in the orofacial region. Recent studies have demonstrated that the pathophysiology of common painful TMD is biopsychosocial and multifactorial, where no one factor is responsible for its development. Importantly, research has suggested different predisposing, initiating and perpetuating factors, including both peripheral and central mechanisms. This is an active field of investigation and future studies will not only seek to clarify specific causal pathways but translate this knowledge into mechanism-directed diagnosis and treatment.

Keywords: TMJ disorders, temporomandibular joint, musculoskeletal pain, disc displacement, conservative therapy, multidisciplinary management.

INTRODUCTION

The Temporomandibular disorders (TMD) are characterized by facial pain in the region of the TMJ and muscles of mastication, limitation or deviation in mandibular movements, hyperalgesia of the musculoskeletal structures, and TMJ sounds during jaw movement and function.[1] They usually affect the age group between 20 to 40 years predominating in the female population.[2] The causes of TMD are complex and multifactorial, which include occlusal abnormalities, orthodontic treatment, bruxism, orthopedic instability, macro trauma and microtrauma, factors like poor health and nutrition, joint laxity, and exogenous estrogen. Psychosocial factors like stress, tension, anxiety, and depression may also lead to TMD.

TMDs represent clusters of related disorders in the masticatory system with many common symptoms. The most frequent presenting symptom is pain, usually localized in the muscles of mastication or the preauricular area. Clinical signs comprises of painful clicking, popping, or grating in the jaw joint when opening or closing the mouth, pain in the muscles of mastication and/or joint, pain that spreads to the face or neck, jaw stiffness, limited movement or locking of the jaw, ringing in the ears, hearing loss, or dizziness, and also a change in occlusion.

TMJ DISORDERS

Joint pain

Joint pain is characterized by localized pain that is exacerbated by function and parafunction. On occasion, there may be a fluctuating swelling that decreases the ability to occlude on the ipsilateral posterior teeth. Arthralgia is the pain of joint origin affected by jaw movement, function, or parafunction and replication of this pain with provocation testing, either during mandibular movement or palpation of the TMJs. Arthritis is the pain of joint origin with clinical characteristics of inflammation or infection like edema,

erythema, and/or increased temperature. Associated symptoms can include occlusal changes such as ipsilateral posterior open bite if intra-articular swelling is present unilaterally.

Joint disorders

Articular disc displacement is the most common TMJ arthropathy and is characterized by several stages of clinical dysfunction that involve the condyle-disc relationship. It is characterized by an abnormal relation or misalignment of the articular disc relative to the condyle. Although posterior and mediolateral displacements of the articular disc have been described, the usual direction for displacement is in an anterior or anteromedial direction.[3]

Disc displacement with reduction: This is an intracapsular biomechanical disorder involving the condyle-disc complex: In the closed mouth position, the disc is in an anterior position relative to the condyle, and the disc reduces upon opening of the mouth.

Disc displacement with reduction with intermittent locking: This is an intracapsular biomechanical disorder involving the condyle-disc complex. In the closed mouth position, the disc is in an anterior position relative to the condyle, and the disc intermittently reduces with opening of the mouth. When the disc does not reduce with opening of the mouth, intermittent limited mandibular opening occurs.

Disc displacement without reduction with limited opening: This is an intracapsular biomechanical disorder involving the condyle-disc complex: In the closed mouth position, the disc is in an anterior position relative to the condyle and the disc does not reduce with opening of the mouth. This disorder is associated with limited mandibular opening that does not reduce with the clinician or patient performing a manipulative maneuver. This is also referred to as closed lock.

Disc displacement without reduction without limited opening: This is an intracapsular biomechanical disorder involving the condyle-disc complex: In the closed mouth position, the disc is anterior relative to the condyle, and the disc does not reduce with opening of the mouth. This disorder is not associated with limited mandibular opening.

Hypomobility disorders

Intra-articular fibrous adhesions and ankyloses are characterized by a restricted mandibular movement with deflection to the affected side on opening that may occur as a long-term sequela of trauma, including mandibular fracture. In case of bilateral involvement, asymmetries in mandibular movements during clinical examination will be less pronounced or absent.

Hypermobility disorders

Hypermobility disorders include two types of TMJ dislocations in which the disc-condyle complex is positioned anterior to the articular eminence and is unable to return to a closed position without a specific maneuver by the patient (ie, subluxation or partial dislocation) or by the clinician (ie, luxation or dislocation).

Joint diseases

Osteoarthritis (ie, osteoarthrosis or DJD) is defined as a degenerative condition of the joint characterized by deterioration and abrasion of articular tissue and concomitant remodeling of the underlying subchondral bone due to overload of the remodeling mechanism. The progressive loss of articular cartilage in the osteoarthritic TMJ results from an imbalance between predominantly chondrocyte-controlled reparative and degradative processes.[4] Different kinds of biochemical markers have been determined in the synovial fluid of TMJs with osteoarthritis. These include interleukin-6 (IL-6), tissue inhibitor metalloproteinase-1 (TIMP-1), matrix metalloproteinases, heat shock protein (HSP), transforming growth factor β 1 (TGF-β1), bone morphogenetic protein 2 (BMP-2), chondroitin-4-sulfate (C4S) and chondroitin-6-sulfate (C6S), keratan sulfate (KS), and human leucocyte antigen D related (HLA-DR).[5]

Condylysis/idiopathic condylar resorption is an idiopathic degenerative condition leading to the loss of condylar height and a progressive anterior open bite. The condition occurs spontaneously, is mainly bilateral, and occurs primarily in adolescent and young adult females.[6]

Rheumatoid arthritis is an joint inflammation resulting in pain or structural changes caused by a generalized systemic inflammatory disease, including rheumatoid arthritis, juvenile idiopathic arthritis,

spondyloarthropathies and crystal-induced disease (eg, gout, chondrocalcinosis). Other rheumatologically related diseases that may affect the TMJ include autoimmune disorders and other mixed connective tissue diseases (eg, scleroderma, Sjögren syndrome, lupus erythematosus).[7]

A neoplasm is new, often uncontrolled growth of abnormal tissue, in this case arising or involving the TMJ or supporting structures. Neoplasms in this area may be benign, malignant, or metastatic. Although neoplasia as an underlying cause of TMJ dysfunction is rare, it is well known in the literature. Approximately 3% of malignant neoplasia metastasizes to the jaws.[8] Neoplasia most frequently extending to the TMJ region causing pain and dysfunction are squamous cell carcinomas of the maxillofacial region and primary nasopharyngeal tumors.[9]

Synovial chondromatosis is a cartilaginous metaplasia of the mesenchymal remnants of the synovial tissue of the joint. Its main characteristic is the formation of cartilaginous nodules that may be pedunculated and/or detached from the synovial membrane, becoming loose bodies within the joint space.

Fractures

Direct traumatic force can injure all related bony components of the masticatory system (ie, temporal bone, maxilla, zygoma, sphenoid bone, and mandible). This trauma can be related to the following conditions: fracture, dislocation, contusion, or laceration of articular surfaces, ligaments, and disc, with or without intraarticular hemarthrosis. Sequelae could include adhesions, ankylosis, occlusal abnormalities, or joint degeneration.[10]

Congenital/developmental disorders

Aplasia is defined as a typically unilateral absence of the condyle and incomplete development of the articular fossa and eminence, resulting in facial asymmetries. Hypoplasia is defined as incomplete development or underdevelopment of the cranial bones or the mandible. Growth is proportionately reduced and less severe than in aplasia. Hyperplasia is an overdevelopment of the cranial bones or mandible. It is a non neoplastic increase in the number of normal cells. It can occur unilaterally or bilaterally as a localized enlargement such as condylar hyperplasia, or as an overdevelopment of the entire mandible or side of the face.

Masticatory muscle disorders

Overuse of a normally perfused muscle or ischemia of a normally working muscle may cause pain. Sympathetic and fusimotor reflexes can produce changes in the blood supply and muscle tone. Furthermore, different psychologic or emotional states can alter muscle tone. Neurons that mediate pain from skeletal muscles are subject to strong modulatory influences. Endogenous substances (eg, bradykinin, serotonin, prostaglandins, neuropeptides, and substance P) can sensitize the nociceptive endings very easily. Painful muscle conditions not only lead to increased sensitivity of peripheral nociceptors but also produce hyperexcitability in the central nervous system, resulting in central sensitization presenting with localized hyperalgesia and allodynia.[11]

Movement disorders

Orofacial dyskinesia involves involuntary, mainly choreatic (dancelike) movements that may involve the face, lips, tongue, and/or jaw. The disorder may result in traumatic injury to the oral mucosa or tongue. It is more common with advancing age and in patients with a history of using neuroleptic medications and/or associated with traumatic brain injury, psychiatric conditions, or other neurologic disorders (eg, Wilson disease).

Oromandibular dystonia involves excessive, involuntary, and sustained muscle contractions that may involve the face, lips, tongue, and/or jaw. They could be components of a number of central nervous systems disorders, including Parkinson disease and Meige syndrome, and could be an adverse event related to medication usage, notably neuroleptics.

Management of TMDs:

Management goals include decreased pain, decreased adverse loading, restoration of function, and resumption of normal daily activities. These are best achieved by a well-defined program designed to treat

the physical disorder(s) and to reduce or eliminate the effects of all contributing factors. Most patients with TMDs achieve good symptom relief with conservative therapy. Patients with pain-free clicking TMJs generally do not need treatment except for reassurance and explanation of the condition, whereas patients with nonreducing discs typically respond well to conservative treatment. Internal derangement of the TMJ often exhibits a natural progression of compensatory adaptation and remodeling. Even with progression or with osteoarthritic changes, the outcome is typically benign with adequate masticatory function. Myogenous disorders more frequently require recurrent treatment as compared with TMJ articular disorders. Relevant precipitating and perpetuating contributing factors should be identified through the history and clinical examination. Factors such as bruxism and other parafunctional habits, trauma, adverse anatomical relationships, and pathophysiologic and psychosocial conditions may all impact TMDs, but as the majority of these factors are highly prevalent in the general population, their presence in an individual case may be coincidental and not contribute to the TMDs. Therefore, in addition to the physical diagnosis, the goal of each evaluation should be the development of a prioritized problem list of the relevant contributing factors. In cases of chronic TMDs where pain is less frequent and patients engage in greater daily activity, the prognosis is better. When multiple contributing factors are present, and especially if the condition is chronic, a pain management program with a multidisciplinary team of clinicians may be needed. Treatment options include patient education and self-management, cognitive behavioral therapy (CBT), pharmacotherapy, physical therapy, orthopedic appliances, occlusal therapy, and possibly surgery.

Patient education and self-management:
The success of a self-management program depends on patient acceptance, motivation, cooperation, and compliance. The time spent on patient reassurance and education is a significant factor in developing a high level of rapport and treatment compliance. Modification of function (eg, avoidance of heavy mastication, gum chewing, wide yawning, singing, and playing certain musical instruments) and parafunctional habit reversal should be emphasized.

Biobehavioral therapy:
Behavioral modification for overuse or parafunctional behaviors remains a central part of the overall treatment program for individuals with TMDs. The success in reducing the frequency of parafunctional behaviors depends on several patient factors and clinical factors.

Pharmacologic management
Pharmacologic agents may promote patient comfort and rehabilitation when used as part of a comprehensive program. Long-term narcotic analgesic use in patients with chronic TMDs requires careful consideration. The most widely used pharmacologic agents for the management of TMDs include analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and low-dose antidepressants. Pharmacologic agents less often used include gabapentinoids, benzodiazepines, and muscle relaxants. The analgesics, corticosteroids, and benzodiazepines are indicated for acute TMD pain; NSAIDs and muscle relaxants may be used for both acute and chronic conditions; and the tricyclic antidepressants (TCAs) are primarily indicated for chronic orofacial pain management.

Physical therapy
Physical therapy helps to relieve musculoskeletal pain and to restore normal function by altering sensory input; increasing range of motion; reducing inflammation; decreasing, coordinating, and strengthening muscle activity; and promoting the repair and regeneration of tissues.

Posture training:
The goal of posture training involves the prevention of untoward muscle activity of the head, neck, and shoulder musculature, as well as the masticatory and tongue muscles. The aim should be to maintain

orthostatic posture to prevent increased cervical and shoulder muscle activity and possible protrusion of the mandible. The more anterior the head is relative to the spinal column, the greater is its effective weight.

Mobilization:

Mobilization techniques are indicated for improving decreased range of motion and pain due to muscle contracture, disc displacement without reduction, and fibrous adhesions in the joint. In some cases, repeated manipulation by the therapist can restore a more physiologic resting muscle length or improve joint function to allow a normal range of jaw motion. Muscle relaxation and pain reduction are often required to enhance the effect of mobilization.

Physical agents or modalities used for TMD management include electrotherapy, ultrasound, iontophoresis, anesthetic agents, dry needling (ie, botulinum toxin), acupuncture, and low-level laser therapy.

Orthopedic appliances, including interocclusal splints, orthotics, orthoses, bite guards, bite planes, night guards, or bruxism appliances, are routinely used in the treatment of TMDs. **Occlusal therapy**: The use of anterior positioning appliances in the treatment of TMJ disc displacement to establish a mandibular position with a corrected disc-condyle relationship has led to the concept of two-phase treatment

Surgery

TMJ surgery is an effective treatment for specific articular disorders. However, the complexity of available techniques, potential complications, prevalence of behavioral and psychosocial contributing factors, and the availability of nonsurgical approaches suggest that TMJ surgery should only be used in select cases. Preoperative and postoperative nonsurgical management must be integrated into the overall surgical treatment plan. This therapy is directed at decreasing the functional load placed on the joint, eliminating or modifying contributing factors such as oral parafunctional habits, and providing appropriate psychologic and medical support. Surgical management may include joint lavage (arthrocentesis), closed surgical procedures (arthroscopy), and open surgical procedures (arthrotomy or arthroplasty), as well as total joint replacement.

Conclusion

Practicing clinicians involved in the treatment of TMDs on a daily basis should be knowledgeable in clinical trial methodology and be able to critically appraise the literature upon which they base their treatments. urrent evidence supports the need for a biopsychosocial assessment including validated DC/TMD diagnostic instruments and primarily conservative multidisciplinary management strategies.

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