Management of Temporomandibular Joint Dysfunction Syndrome: An Overview

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Summary:

Temporomandibular joint dysfunction is a complex and multifactorial disorder of oro-facial region. It is one of the most common disorders in maxillofacial region. The usual complain of the patients with this syndrome are pain in the area of the jaw and associated muscles, eating problem, chewing and locking of the jaw. It is more common in female than male. It's etiology is not yet well established. However it's successful management depends on identification and controlling of the etiological factors.

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Introduction:

The American Dental Association (ADA) presidents' conference on temporomandibular disorder defined TMD as "A group of oro-facial disorder characterized by pain in the pre-auricular area, TMJ or muscles of mastication, limitations & deviation in mandibular range of motion, TMJ sounds during jaw function."[1] It is the most common and the third most chronic pain condition worldwide in maxillo-facial region after tension headache and back pain.[2,3] The causes of this condition are numerous and include trauma, systemic, iatrogenic, occlusal and mental health disorder.[4-9] Today mental health plays a dominating role in the pathogenesis of TMD.[10,11] Like other musculoskeletal disorders pain during function and/or at rest is the main reason patients seek treatment, and painreduction is the primary goal of treatment for these patients.[12,13]

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Epidemiology:

The signs and symptoms of temporomandibular disorders appear in about 60-70% of the general population but only a few people are actually aware of or report any symptoms.[14] Population based studies shows that TMD affects 10-15% of adults, but only 5% seek treatment.[15,16] Approximately 33% of the population has at least one TMD symptom and 3.6-7% of the population are aware and come to get treatment.[17] Severity of TMD problems are much more common in women and the ratio between women and men who seeks treatment for TMJ disorder is 8:1.[18] Temporomandibular dysfunction syndrome occurs usually within the reproductive age between the age of 20 and 40.[12, 13,19, 20] Although a few patients are seeking treatment, but the prevalence of TMD is high in developed societies.[21,22]

Etiology:

The etiology of TMJ disorders remains unclear, but it is mostly multifactorial. Capsule inflammation or damage and muscle pain or spasm may be caused by abnormal occlusion, para-functional habits (e.g., bruxism, teeth clenching, lip biting), stress, anxiety, or abnormalities of the intra-articular disk.[23,24] Parafunctional habits have been thought to cause TMJ microtrauma or masticatory muscle hyperactivity.[25] Associated factors include other pain conditions (e.g., chronic head-aches), fibromyalgia, autoimmune disor-ders, sleep apnea, and psychiatric illness.[26,27] The factors that causes TMD are classified as:

- Predisposing factors as structural, metabolic and/or psychologic conditions
- Initiating factors as trauma or repetitive adverse loading of the masticatory system

- Aggravating factors as parafunction, hormonal or psychosocial.[28-34]

Factors that interfere with healing or enhance the progression of temporomandibular disorder are called "Perpetuating factors."The following may be included in the perpetuating factors: [35]

a. Behavioral factors: grinding, clenching and abnormal head posture
b. Social factors: could effect perception and influence of learned response to pain
c. Emotional factors: depression and anxiety
d. Cognitive factors: negative thoughts and attitudes.

The following occlusal factors had a slight relation in patient with TMD symptoms: [35]

a. Open bite
b. Overjet greater than 6-7 mm
c. Retruded contact position/intercuspal position with sliding greater than 4 mm
d. Unilateral lingual cross-bite
e. Five or more missing posterior teeth
f. Faulty restorations and ill-fitting prosthesis.

Aplasia, hypoplasia, hyperplasia, dysplasia, neoplasia can lead to TMJ problems and trauma, anatomic, systemic, pathophysiological and emotional causes can make the disorder more severe. [26, 36, 37]

Classification:

Classification of TMD is very important for proper diagnosis of the disease because of similarities with numerous diseases and pain in the head and neck region. Following are the differential diagnosis of TMD: [36]

1. Deviation in form
2. Disc displacement with reduction
3. Disc displacement without reduction
4. Dislocation
5. Inflammatory conditions:
   a. Synovitis
   b. Capsulitis
6. Arthritides:
   a. Osteoarthrosis
   b. Osteoarthritides
   c. Polyarthritides
7. Ankylosis:
   a. Fibrosis
   b. Bony

The International Research Diag-nostic Criteria for Temporomandibular Dysfunction Consortium Network pub-lished an updated classification for TMD in 2013 and that is shown below. [38, 39]

Articular disorders (intra-articular):

A. Congenital or developmental disorders
   a. Condylar hyperplasia
   b. First and second branchial arch disorders
   c. Idiopathic condylar resorption
B. Degenerative joint disorders
   a. Inflammatory: capsulitis, synovitis, polyarthritides (rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, Reiter syndrome, gout)
   b. Noninflammatory: osteoarthritis
C. Disk derangement disorders
   a. Displacement with reduction
   b. Displacement without reduction (closed lock)
   c. Perforation
D. Infection
E. Neoplasia
F. Temporomandibular hypermobility
   a. Dislocation
   b. Joint laxity
   c. Subluxation
G. Temporomandibularhypomobility
   a. Ankylosis: true ankylosis (bony or fibrous) or pseudoankylosis
   b. Postradiation fibrosis
   c. Trismus
H. Trauma
   a. Contusion
   b. Fracture
   c. Intracapsular hemorrhage

Masticatory muscle disorders (extra-articular)

A. Local myalgia
B. Myofascial pain disorder
C. Myofibrotic contracture
D. Myositis
E. Myospasm
F. Neoplasia

Clinical Presentation:

TMD has many similarities to musculoskeletal disorders of other parts of the body and therapeutic approaches for other musculoskeletal disorders generally apply to

this disorder as well.[12, 13, 40] The typical signs and symptoms of TMD are-

pain in the joint (preauricular region), headaches behindand around the eyes, and pain radiating from the joint tothe temple, ears, side of neck and upper shoulder. Thepain is typically aggravated by wide opening, chewingor other joint activities, such as clenching and bruxism.There are clicking, popping or "locking" because of disc interference, which results in reflex masticatory muscle spasm.(41-44) Symptoms of TMD are also associated with jaw movement (e.g., opening and closing the mouth, chewing) and pain in the pre-auricular, masseter, or temple region. Another cause of oro-facial pain should be identified if pain is not associated with jaw movement.(45)Patients with TMD symptomsusually report that their pain is aggravated by stress, clenching, and eating, while it is relieved by relaxing, applying heat to the painful area, and taking analgesics.[12, 40, 46, 47]

Differential Diagnosis:

For proper diagnosis of TMD some another cause for oro-facial pain should carefully excluded as dental caries or abscess, oral lesions (e.g., herpes zoster, herpes sim-plex, oral ulcerations, lichen planus), conditions resulting from muscle overuse (e.g., clenching, bruxism, exces-sive chewing, spasm), trauma or dislocation, maxillary sinusitis, salivary gland disorders, Neuropathic pain (e.g., trigeminal neuralgia, postherpetic neuralgia, glossopharyngeal neuralgia, giant cell arteritis, primary headache syndrome, and pain associated with cancer) autoimmune diseases (e.g., systemic lupus erythematosus, Sjögren syndrome, and rheumatoid arthritis).(48,49)The differential diagno-sis and associated clinical findings are presented in Table-1[50]

Table-I

Conditions That May Mimic Temporomandibular Disorders

Condition	Location	Pain characteristics	Aggravating factors	Typical findings
Dental conditions				
Caries	Affected tooth	Intermittent to continuous dull pain	Hot or cold stimuli	Visible decay
Cracked tooth	Affected tooth	Intermittent dull or sharp pain	Biting, eating	Often difficult to visualize crack
Dry socket	Affected tooth	Continuous, deep, sharp pain	Hot or cold stimuli	Loss of clot, exposed bone
Giant Cell arteritis	Temporal region	Sudden onset of continuous dull pain	Visual disturbance, loss of vision	Scalp tenderness, absence of temporal artery pulse
Migraine headache	Temporal region, behind the eye, cutaneous allodynia	Acute throbbing, occasionally with aura	Activity, nausea, phonophobia, photophobia	Often normal, aversion during ophthalmoscopic examination, normal cranial nerve findings
Neuropathic conditions				
Glossopharyngeal neuralgia	Most often ear, occasionally neck or tongue	Paroxysmal attacks of electrical or sharp pain	Coughing, swallowing, touching the ear	Pain with light touch
Postherpetic neuralgia	Site of dermatomal nerve and its distribution	Continuous, burning, sharp pain	Eating, light touch	Hyperalgesia
Trigeminal neuralgia	Unilateral trigeminal nerve	Paroxysmal attacks of sharp pain	Cold or hot stimuli, eating, light touch, washing	Pain with light touch
Salivary stone	Submandibular or parotid region	Intermittent dull pain	Eating	Tenderness at gland, palpable stone, no salivary flow
Sinusitis	Maxillary sinus, intraoral upper quadrant	Continuous dull ache	Headache, nasal discharge, recent upper respiratory infection	Tenderness over maxillary sinus or upper posterior teeth

In differential diagnosis of TMJ disorders and pains, problems such as neoplasms, migraine,neuralgia and mental disorders should be considered. Practitioners must be alert for unusual pain locations, pain qualities, pain-aggravating and pain-relieving events, and other factors (e.g., unexplained fever) suggestive of disorders that may mimic TMD symptoms (e.g., infection, giant cell arteritis, meningitis, etc.).[13, 46]

Investigations:

Imaging plays an important role in the diagnosis of TMD when his-tory and physical examination findings are equivocal.[51]The usual radiographs are plain radiograph, panoramic view, and tomograms (frontaland lateral). Magnetic resonanceimaging (MRI) or arthrography canbe done for evaluation of the disc and associated soft tissuestructures. Other radiological studies mayalso be done if necessary.[52-56] The importance of different imaging study are given below:-

A. *Plain radiograph:*Evaluation of plain radiography (trans-cranial and trans-max-illary views) or panoramic radiography should be done first. Acute fractures, dislocations, and severe degenerative articular disease are often visible in these radiographs.

B. *Computed Tomography:* To assessbone abnormalities such as ankylosis, dysplasias,growth abnormalities, fractures, and osseous tumors.[57]

C. *Magnetic resonance imaging:*Is useful to analysis soft tissues, bone marrow changes, disc position, morphology, mobility, and jointeffusion.[53, 54, 58-60]

D. *Ultrasonography:*Ultrasonography is a noninvasive, dynamic, low-cost tech-nique to diagnose internal derangement of the TMJ when magnetic resonance imaging is not readily available.[61]

E. *Arthrography:* For primary imaging study of disc pathology, arthrography can be done as the replacement of MRI.[55,56]

F. *Isotope bone scan:* For detecting metabolic activity andinflammation.[62]

G. *Diagnostic Injections:*Injections of local anesthetic at trigger points involving the muscles of mastication can be a diagnostic adjunct to distinguish the source of jaw pain.[63]

Diagnostic injections include:-[36]

1. Nerve block (auriculotemporal nerve)
2. Trigger points injection
3. TMJ injections

Treatment:

Spontaneous resolution of symptoms occurs in 40% of the patients and only 5% to 10% of patients require treat-ment for TMD.A study shows that 50% to 90% of patients get relief from pain after con-servative therapy.[64, 65] Successful manage-ment of TMD can be done with multidisciplinary approach. Initial treatment goals should focus on resolving pain and dys-function.

Non-Pharmacological Management:

Selective treatmentsinclude:-[36]

1. Patient education and stress control
2. Mental therapy
3. Pharmacotherapy
4. Physiotherapy
5. Splint therapy
6. Occlusal correction
7. Surgery

A. *Patient education:*Patient education is the basic treatment for TMD.Associated measures include jaw rest, soft diet, moist warm compresses, and passive stretching exercises. TMJ immobilization is not beneficial and may worsen symptoms as a result of muscle contrac-tures, muscle fatigue, and reduced syno-vial fluid production.[2, 66, 67]Necessary instructions should include in patient education:-[36]

1. Muscle relaxant by voluntary limitation in mandibular function
2. Parafunctional habits modification
3. Physiotherapy at home

B. *Psychotherapy:* It prevent relapses that may occur with conventional therapy alone.[68]

C. *Physiotherapy:*"Active and passive oral exercises and exercises to improve posture are effective interventions to reduce symptoms associated with TMD".[69]Specialized physical therapy such as ultrasound, iontophoresis, electrother-apy, or low-level laser therapy have been used in the

management of TMD, despite the lack of evidence that support their use.[70]

D. *Splint Therapy:*Occlusal splints may be used to pre-vent degenerative forces placed on the TMJ, articular disk, and dentition.[71]The usual maxillo-mandibular appliances used are-

1. Flat plane stabilization appliance:The flat plane stabilization appliance (also known as the Michigan splint, muscle relaxation appliance, or gnathologic splint) is generally fabricated for the maxillary arch. This is the most commonly used type of intraoral appliance.[72]
2. Traditional anterior bite plane:It is a horseshoe shape appliance with an occlusal platform covering six or eight maxillary anterior teeth to prevent clenching (e.g., Hawley, Sved, Shore).
3. Mini anterior appliances:Itengage only a small number of maxillary anterior teeth (usually two-four incisors)
4. Anterior repositioning appliance:This is used to treat the patients with internal derangements (usually anterior disk displacements with reduction).[73]
5. Neuromuscular appliances:Jaw muscle stimulators and jaw-tracking machines are used to maintain the ideal vertical and horizontal position of the mandible relative to the cranium.[74]
6. Posterior bite plane appliances:It is fabricated for the mandibular arch to maintain vertical and horizontal maxillomandibular relationship
7. Pivot appliances:This is constructed with hard acrylic resin that covers either the maxillary or mandibular arch and is recommended for patients with internal derangements and/or osteoarthritis.
8. Hydrostatic appliance:It consists of bilateral water-filled plastic chambers attached to an acrylic palatal appliance to occlude patient's posterior teeth on the plastic chambers

E. *Occlusal Adjustment:*It is the selective removal of enamel from the occlusal contacts of teeth to maintain the maximum number of teeth in the intercuspal position.

F. *Acupuncture:*Acupuncture may be an adjunctive treatment, producing a short-term analgesic effect in patients with painful TMJ symptoms.[75]It's sessions typically last 15 to 30 minutes, and the mean number of sessions is six to eight.[76]

Pharmacological Management:

Drug management isonly used when other somatic symptoms, such as sleepdisorders, chronic pain, arthralgias, inflammatory diseases,myalgias or neuropathies are associated with TMD.[77]Varieties of medications are used to treat the pain associated with TMD. The most commonly used medicationsare muscle relaxants, non-steroidal anti-inflammatorydrugs (NSAIDs), analgesics, tricyclic antidepressants, benzodiazepines and corticosteroids.[77]NSAIDs are first-line management given for 10 to 14 days for initial treatment of acute pain.[78-80] Despite the multiple choices of NSAIDs available, only naproxen has proven benificial in reduction of pain.[79]Muscle relaxants can be prescribed with NSAIDs if there is evidence of a muscular cause of TMD.[80]Tricyclic antidepressants most commonly amitriptyline, desipramine, doxepin, and nortriptyline are used for the man-agement of chronic TMD pain[81]. Benzodiazepines are also used for two to four weeks in the initial phase of treatment.[78, 82]Ibuprofen is effective inskeletomuscular pains (dosage: 600 – 800 mg three times daily).[36]Opioids should be used cautiously because of the potential for dependence.[80] Injections of tender muscles, trigger areas, and/or

joint spaces with local anesthetic solution is used fordiagnosis and relief of symptoms. Corticosteroidinjection can be effective in reducing capsulitis.[83] It appears to be an effective method for treating severe bruxism and masseterichypertrophy whentraditional methods fail.[84-87] Muscle relaxants (baclofen, tizanidin, cyclobenzaprine),opiates (morphine), anticonvulsants (e.g., gabapentin),ketamine, and TCA (e.g., amitriptyline) are also used clinically for TMJ management, but there isno strong evidence for their efficacy.[88, 89]

Surgical Management:

Surgery is seldom needed for TMD patients. A study over 2,000 TMD patients from many practices found that only 2.5% needed TMJ surgery (1.4% arthrocentesis, 1.0% arthroscopy, and 0.1% open joint procedures).[90]The common TMJ surgeries are:-[36]

1. Arthrocentesis
2. Arthroscopy
3. Disc – repositioning surgery
4. Condylotomy
5. Arthroplasty
6. Total joint displacement
7. Prosthetic joint replacement: It may be indicated inpatients with severe joint degeneration,destruction, or ankylosis. But this should be used when their safety andefficacy has been recognized by the FDA.
8. Other Procedures: [91-97]
    a. Coronoidotomy/coronoidectomy
    b. Styloidectomy (Eagle's Syndrome)

Conclusion:

TMD should be treated with multidisciplinary approach as other musculoskeletal complaint.It is important to note that treating TMD onlyfrom the dental perspective may fail, as many of theseanomalies are caused by somatic diseases. If TMD is left untreated, symptoms can worsen and extend far beyond the jaw and mouth area. Conservative therapy is best as a first-line approach for treating the patient.Treatment goals in patients with TMD are pain relief and return of function. These goals willbe achieved only if diagnosed properly and the treatment plan is taken with consideration of mental and physicalproblems with predisposing factors.

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