Temporomandibular joint disorders (Review Article)

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Abstract

Temporomandibular joint (TMJ) is a sensitive and highly mobile joint. Temporomandibular disorders (TMDs) have been considered as a common orofacial pain condition. The term (TMDs) characterized by pain in the temporomandibular joint (TMJ) area, the periauricular area, or the muscles of mastication, TMJ sounds during mandibular movement and deviations, or restriction in mandibular movement.

Keywords: *Temporomandibular joint (TMJ), Internal derangement of TMJ, Myofascial pain syndrome (MPS), Temporomandibular joint (TMJ) disorder.*

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Introduction:

Temporomandibular disorders (TMDs) are a collective term for a number of clinical signs and symptoms involving masticatory muscles, temporomandibular joint (TMJ) and associated structures [(1)].

TMDs are characterized by pain in one of the masticatory muscles, the temporomandibular joint area and the associated hard and soft tissues, limitation in mouth opening and sounds in the TMJ [(2)].

The population-based epidemiological studies report that 10-15% of adults suffering from temporomandibular disorders (TMD) experience pain. In 40-75% occurs at least one of the symptoms of masticatory system dysfunction [(3-5)]. Several studies have pointed out that persistent and recurrent pain is a

potential etiological factor of psychological discomfort and physical disability, what can lead to limitations in quality of life [(6, 7)]. The clinical studies lead to developing of standards and guidelines for diagnosis and treatment, especially the first signs and symptoms of TMD. It is commonly agreed to separate the temporomandibular joint (TMJ) disorders from masticatory muscles disorders, although TMJ and muscles symptoms can occur simultaneously. The common disorders which affect TMJ are disc displacement (with and without reduction) and degenerative joint disease (arthrosis, arthritis) [(8)].

Temporomandibular disorders (TMJDs)

Temporomandibular disorder (TMD) is a generic term used for any problem concerning the jaw joint. Injury to the jaw, temporomandibular joint or muscles of the head and neck may cause TMD. Other causes include clenching of teeth, in which pressure on the TMJ induced; dislocation of the disc; the presence of osteoarthritis or rheumatoid arthritis in the TMJ; stress, aging. The most common TMJ disorders are pain dysfunction syndrome, internal derangement, arthritis, and traumas. TMD is seen most commonly in people between the ages of 20 and 40 years and occurs more often in women than in men [(9)]. The most frequent complaint is pain and a decrease in the maximal interincisal opening (MIO), which normal values are between 35 - 50 mm. The following symptoms as pain at rest, during maximum mouth opening and chewing, tenderness to palpation of the joint, sounds are clicking, crepitation, difficulty in opening the mouth, intermittent lock, closed lock, the stiffness of joint in the early morning are noticed [(10)].

Etiology

The etiology of TMJ disorders remains unclear, but it is likely multifactorial. Multifactorial etiology of TMD lead dentists to apply differential diagnosis and treatment [(11)]. In many cases, it is the just treatment of symptoms. Then, it is important to finding the underlying pathogenesis of TMD to develop treatment, to stop or even reverse the pathologic processes.

Epidemiological studies revealed that signs and symptoms of TMDs are common in adults of all

ages [12]. There is some evidence to suggest that anxiety, stress, and other emotional disturbances may exacerbate TMDs, especially clinically in patients who experience chronic pain [13]. Nevertheless, the cause of the signs and symptoms of TMDs is not clearly understood, and various opinions on their etiology have been offered (14). TMDs are among the most common orofacial pain conditions of non-dental origin, and often they are self-limited in the adult populations, and the prevalence of these disorders differ between studies, probably because of variations in methodology and definitions of TMDs.

The etiological factors of TMJ disorders as follows:

- Occlusal Factors: abnormal occlusion, class II, class II division II and loss of molar support
- Psychological factors: Laskin theory psychophysiology. (MPDS) Is primarily a result of emotional rather than occlusal and mechanical factors. Laskin theory states that stress can cause clenching and grinding which lead to muscle fatigue and spasm.
- Macrotruma: fracture, whiplash injuries, iatrogenic injuries during dental treatment.
- Microtruma: Parafunctional habits (e.g., bruxism [teeth grinding], teeth clenching, lip biting, nail, biting).

Internal derangement of TMJ

Internal derangement of the temporomandibular joint (TMJ) is defined as a disruption within the internal aspects of the TMJ in which there is a displacement of the disc from its normal functional relationship with the mandibular condyle and the articular portion of the temporal bone [15]. Internal derangement of the temporomandibular joint (TMJ) is characterized by displacement of the intra-articular disc, results in clicking or popping sounds. Those conditions may be painless or may be associated with pain, especially during the mouth opening. The most common causes are trauma, which results in a disc displacement, or chronic parafunction, which ends up in degenerative changes in the articular surfaces, increased friction, and gradual disc displacement [16].

Wilkes classification of internal derangement of TMJ (17)

Stage	Clinical	Radiographic
I-EARLY	Painless clicking; no limitation of opening	Mild disk displacement with early reduction; normal disk morphology
II-EARLY/INTERMEDIATE	Occasional painful clicking, intermittent locking	Mild to moderate disk displacement with late reduction, mild disk deformity
III-INTERMEDIATE	Joint tenderness, limited mouth opening, frequent pain	Displaced, non-reducing disk
IV-INTERMEDIATE /LATE	Chronic pain limited opening	Severe displacement without reduction, degenerative osseous change
V-LATE	Variable joint pain, joint crepitus	Non-reduction of the disk with perforation of disk attachment or disk degenerative osseous changes.

Myofascial pain syndrome (MPS)

The conventional definition of myofascial pain syndrome (MPS) is characterized by regional pain originating from hyperirritable spots located within taut bands of skeletal muscle, known as myofascial trigger points (MTrPs) [18]. Common etiologies of myofascial pain and dysfunction may be from direct or indirect trauma, exposure to cumulative and repetitive stress and anxiety, postural dysfunction, and physical deconditioning [19, 20]. Treating the underlying etiology is currently the most widely accepted strategy for MPS therapy. If the cause is not properly treated, MTrPs may reactivate, and MPS may persist [19]

Differentiation between temporomandibular joint pain dysfunction syndromes and myofascial pain dysfunction syndrome

A temporomandibular joint pain dysfunction syndrome is a term covering a verity of problems which include

the entire scope of temporomandibular joint disorders originating from intra and extra-articular.

Myofascial pain dysfunction syndrome is a psychophysiological disease that involves the muscle of mastication. The condition is characterized by dull, aching, radiating pain that may become acute during the use of the jaw, and mandibular dysfunction that involves limitation of opening.

TMD Research Diagnostic Criteria

The Research Diagnostic Criteria [8] (RDC) categories TMD criteria into three groups according to the common factors among conditions. Other TMJ disorders, which are uncommon, or have no reliable criteria or examination methods, are excluded.

TMD's RDC groups are:

GROUP I: Muscle disorders:
I (a) - Myofascial pain
I (b)-Myofascial pain with limited opening
GROUP II: Disc Displacements (DD):
II (a)- DD with reduction
II (b)- DD without reduction with limited II (c)-DD without reduction without limited opening
GROUP III: Other common Joint disorders:
III (a)- Arthralgia
III (b) -Osteoarthritis
III (c) -Osteoarthrosis

Differential diagnosis

1- Neural: Trigeminal neuralgia, multiple sclerosis, glossopharyngeal neuralgia.

2- Vascular: temporal arthritis, migraine, cluster headache & angina pectoris.

3- Musculoskeletal: TMJ disorders, elongated styloid process (Eagle's syndrome).

4- Oral / salivary disorders.

5- ENT-related disorders.

6- Psychogenic: atypical facial pain.

Evaluation and Diagnosis

1. History and Physical Examination Complete History taking from the patient, head and neck evaluation, general physical examination and clinical examination are essential.

2. Laboratory Studies: Laboratory studies are indicated for rheumatoid arthritis.

3. Imaging: Imaging of the temporomandibular joints and associated structures is necessary to establish the diagnosis and stage of disease to select the appropriate treatment, assist in prognosis, and to assess patient response to therapy. Imaging results will influence treatment strategy.

A. Radiographs this can provide the information include plain films, panoramic films, and tomograms (frontal and lateral) but disc displacement and associated soft tissue structures should also be imaged by Magnetic resonance imaging (MRI) [21, 22] or arthrography [23]. Other radiological studies may also be indicated.

B. Computed tomography (CT) it is very useful for diagnosis of any bony abnormalities like ankylosis, dysplasia, growth abnormalities, fractures, osseous tumors[24]. 3D CT is a valuable diagnostic advancement for complex cases needing major reconstructive surgery. A stereo lithography model of a patient's maxillofacial skeleton can be fabricated utilizing 3D CT technology [24, 25].

C. Magnetic Resonance Imaging MRI is used to determine any soft tissues, bone marrow changes, disc position, morphology, mobility, and joint effusion[26, 27]. D. Arthrography MRI has largely replaced by arthrography [24] as the primary imaging study for the pathology of the disc.

Management protocol

Many therapies have been used for treating TMD, and many health professionals have found that they can help patients improve TMD symptoms. The practitioner managing the patient's therapy should decide which therapies have the greatest potential to provide the patient with long-term symptom relief [1, 28].

1. Personality and emotional support.
2. Cold and hot application.
3. Soft diet & bilateral chewing.
4. Physical Therapy Physical therapy is used by TMD patients to keep the synovial joint lubricated, and to maintain the jaw motion. One of the exercises for the jaw is to open the mouth to a comfortable fully-open position and then apply a slight additional pressure to open the mouth fully. Another exercise includes stretching the jaw muscles by doing various facial expressions. Avoiding extreme jaw movements, taking medications, applying moist heat or cold packs, eating soft foods are other ways that may keep the disorder from worsening.

Research Diagnostic Criteria for the Temporomandibular Disorders RDC/TMD [8].

Group	Criteria
I Muscle Disorders	
I. a Myofascial pain: Key: Painful muscles	1. Reported pain in masticatory muscles. 2. Pain on palpation in at least three sites, one of them at least in the same side of the reported pain
I. b Myofascial pain with limited opening: Key: Painful muscles +limited movement	1. Myofascial pain 2. Pain-free unassisted opening< 40 mm and Passive stretch ≥ 5 mm
II Disk Displacements	
II. a Disc displacement with reduction: Key: Reproducible clicking	1. No pain in the joint. 2. Reproducible click on an excursion with either opening or closing click. 3. With click on opening and closing (unless excursive click confirmed): • Click on opening occurs at ≥ 5 mm interincisal distance than on closing • Clicks eliminated by protrusive opening
II .b Disc displacement without reduction with limited opening: Key: Limited opening with no clicking	1. History of locking or catching that interfered with eating. 2. The absence of TMJ clicking .3. Unassisted opening (even painful) ≤ 35mm and passive stretch ≤ 4mm 4. Contralateral excursion < 7mm Or Uncorrected ipsilateral deviation on opening.
II .c Disc displacement without reduction without limited opening: Key: History of previously limited opening-imaging needed to confirm DD	1. History of locking or catching that interfered with eating 2. The presence of TMJ sounds excluding DDR clicking 3. Unassisted opening (even painful) > 35mm and passive stretch > 4mm 4. Contralateral excursion ≥.7mm 5. Optional imaging (Arthrography or MRI) to confirm DD
III Other common joint diseases	
III. a Arthralgia: Key: Painful TMJ / no crepitus	1. Pain on TMJ palpation either laterally or intra-auricular 2. Self-reported joint pain with or without jaw movement 3. Absence of crepitus, and Possibility of clicking
III .b Osteoarthritis: Key: Painful TMJ + crepitus	1. Pain as for Arthralgia 2. Crepitus on any movement or radiographic evidence of joint changes
III .c Osteoarthritis: Key: Non painful TMJ + crepitus	1. Crepitus on any movement or radiographic evidence of joint changes 2. No reported joint pain nor pain on any movement

Pharmacotherapy:

Analgesic Drugs:

The pharmacologic agents who are commonly prescribed non-steroidal anti-inflammatory drugs (NSAIDs) to reduce inflammation. Muscle relaxants also are prescribed for the treatment of muscle pain and spasm. To increase their benefit, muscle relaxants combinations with NSAIDs are used[29].

Muscle Relaxants

Benzodiazepines depress the presynaptic release of serotonin and excite gamma-aminobutyric acid (GABA), which causes rapid inhibitory neurotransmission.

Antidepressants

Tricyclic antidepressants (TCAs) are a class of medications that have been indicated for treatment chronic pain, fibromyalgia, and neuropathic pain [30, 31].

5. Corrective dental treatment.
6. An occlusal splint as diagnostic &treatment device.

Occlusal orthotics are useful for masticatory muscle pain, TMJ pain, TMJ noises, restricted function, and TMJ dislocation [32]. If the appliance is worn at night, it has its most dramatic effect on the TMD.

Occlusal splint therapy may be defined as "the art and science of establishing neuromuscular balance in the masticatory system." The occlusal splint is a diagnostic, relaxing, repositioning, and reversible device. The occlusal splint is defined as any removable artificial device used for diagnosis or treatment that affecting the relationship of the mandible to the maxilla.

It may be used for occlusal stabilization, for the treatment of temporomandibular disorders, or to prevent wear of the dentition."

A common goal of occlusal splint treatment

1- Is to protect the TMJ discs from dysfunctional forces that may lead to perforations or permanent displacements.

2- Other goals of treatment are to improve jaw-muscle function and to relieve associated pain by creating a stable, balanced occlusion.

Type of splints:

- Stabilization splints: usually used to prevent clenching and bruxism, these are flat and cover all of the dentition. Can be made out of soft or hard materials.
- Repositioning splints: said to "realign the condyles," "capture the disc." These splints attempt to pull the mandible (lower jaw) forward. They are usually worn 24 hours a day.

Therapeutic uses:

1-painless clicking, acute pain with clicking and in patients with an anteriorly disc displacement without reduction treated with full covering appliance with non-steroidal anti- inflammatory drugs.

A. Chronic pain, or pain of increased intensity, treated with anterior repositioning appliance (protrusive splint) for 24hours a day for 4-8 weeks.
B. Removes the condylar function from the inflamed retro-discal tissue allowing for repair and adaption. It temporally repositions the mandible, so the condyle and disc are in a proper relationship. As the pain subsides the appliance is gradually altered to permit the mandible to return posteriorly.

7. Arthroscopic surgery of the superior joint space has shown successful in the treatment of disc displacement with and without reduction. Effective of lysis of adhesions and lavage shows enhancement in the function and decreased pain but the position of the disc not corrected. So need splints and physical therapy postoperatively[10].
8. Surgical open reconstructive arthroplasty with disc repositioning is indicated. Surgery is rarely needed for TMD patients. One study on 2,000 TMD patients from many practices found that only 2.5% .need TMJ surgery (1.4% arthrocentesis, 1.0% arthroscopy, and 0.1% open joint procedures)[33] Other than for the obvious reasons (e.g., infection, fracture, or neoplastic growth), there are three TMD disorders need surgical interference:

   1) TMJ inflammation

   2) acute TMJ disc displacement without reduction (closed lock)

   3) TMJ ankylosis (painless severe limited opening) [28]

9. Low-Level Laser Therapy Clinical studies of LLLT used on patients with disc derangement disorders using either AlGaAs 830 nm diode laser in continuous wave mode or He-Ne laser 632 nm combined with a diode laser 904 nm in pulsed mode have shown clinical advantages of reduction in pain and clicking. The application of laser beams reduced pain while simultaneously reducing muscle spasm. LLLT has a local effect by stimulating microcirculation and local cell tropism and a general effect by promoting pain relief for a variety of etiology, including irradiation of trigger points in myofascial pain, acting on tissue repair, reduction of edema and hyperemia. Similarly, Bertolucci & Grey in 1995 reported significant enhancement in articular noise, limitation of mouth opening and also in the masticatory function through reduction of muscle spasm and of intra-articular inflammation by LLLT [34]. The main effects of laser light used in LLLT on tissue include Analgesic, Bio stimulating, Anti-inflammatory. Advantages include aseptic, noninvasive, painless, no pharmaceutical and

reversible therapy, if used properly has no side effects. It has no postoperative discomfort. The disadvantage has been the high cost compared to the conventional therapies and the fast development in the field [34].

Conclusion:

Multifactorial etiology of TMD has lead dentists to apply a wide range of differential diagnoses and reversal, conservative treatment. TMD has many similarities to musculoskeletal disorders of other parts of the body, and similar treatment can generally be used. It is important for dentists to find out disorders that mimic TMD, to identify other disorders that may negatively impact the patient's TMD symptoms, and to offer the patient therapies that will provide the most cost-effective long-term symptom relief

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