

Temporomandibular Disorders: Current Concepts in Diagnosis and Management

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Abstract: Temporomandibular disorders (TMDs) are a heterogeneous group of musculoskeletal conditions affecting the temporomandibular joint, masticatory muscles, and associated structures. They are a leading cause of non-dental orofacial pain, with higher prevalence in women aged 20–40 years. Etiology is multifactorial, involving occlusal discrepancies, parafunctional habits, trauma, systemic conditions, and psychosocial factors. Clinical features include pain, joint sounds, restricted mandibular movement, and functional impairment. Diagnosis requires detailed history, examination, and imaging, with MRI regarded as the gold standard for evaluating internal derangements.

Management follows a stepwise approach, prioritizing conservative therapies such as education, behavioural counselling, physiotherapy, occlusal splints, and pharmacotherapy. Minimally invasive procedures—arthrocentesis, arthroscopy, and intra-articular injections (hyaluronic acid, corticosteroids, platelet-rich plasma, botulinum toxin)—are effective in refractory cases, while surgery is reserved for severe dysfunction. Recent advances include regenerative medicine, low-level laser therapy, digital occlusal analysis, and 3D imaging.

This review highlights current concepts, emphasizing evidence-based, interdisciplinary care and emerging innovations for enhanced clinical outcomes.

Keywords: Temporomandibular disorders, diagnosis, conservative therapy, minimally invasive management

Introduction: The temporomandibular joint (TMJ) is one of the most complex and highly functional joints in the human body, articulating the mandible with the cranium through a coordinated system of muscles, ligaments, and tendons. Its unique structural and functional characteristics, combined with its continuous involvement in mastication and speech, render it particularly susceptible to functional derangements and disorders.¹

Disorders affecting the temporomandibular joint are collectively termed temporomandibular disorders (TMDs) and contribute to approximately 10–15% of adult orofacial pain. However, studies indicate

that only around 5% of affected individuals actively seek professional care.^{2,3}

TMD is most commonly observed in patients aged 18 to 40 years, with a higher prevalence among women.⁴

The temporomandibular joint is a highly complex structure, and to aid in the diagnosis and management of TMDs, several clinical practice guidelines (CPGs) have been developed over time. Notable among these are the International Research Diagnostic Criteria for Temporomandibular Disorders (2013),^{5,6} the American Academy of Family Physicians’⁷ guideline on Diagnosis and Treatment of Temporomandibular

Disorders (2015), the American Academy of Pediatric Dentistry's Guideline on Acquired Temporomandibular Disorders in Infants, Children, and Adolescents (2015),⁸ and the American Society of Temporomandibular Joint Surgeons' Guidelines for Diagnosis and Management of Disorders Involving the Temporomandibular Joint and Related Musculoskeletal Structures (2015).⁹ These remain widely accepted and applied in clinical practice to date.

Etiology: The etiology of temporomandibular disorders is multifactorial and complex. The primary contributing factors to TMD include biomechanical, biopsychosocial, neuromuscular, and neurobiological components.^{1,10,11,12}

A. Predisposing Factors: Naturally occurring influences throughout an individual's lifetime that increase susceptibility to TMD. These include:

- Anatomic factors: Structural abnormalities, morphologic variations, and malocclusions.
- Pathophysiologic conditions: Joint pathologies and alterations in the masticatory muscles.
- Genetic factors
- Psychological and behavioral factors

B. Initiating (Precipitating) Factors: Elements that trigger the onset of TMD, such as microtrauma and macrotrauma.

C. Perpetuating Factors: Factors that hinder healing or promote disease progression, including behavioral, social, emotional and cognitive influences.

Signs and Symptoms of Temporomandibular Disorders: Temporomandibular disorders (TMDs) present with a wide range of signs and symptoms, including pain, restricted jaw function, malocclusion, mandibular deviation or deflection, limited range of motion, joint sounds, and episodes of locking. Associated manifestations such as

headache, tinnitus, visual disturbances, and other neurologic complaints may also be observed. Given the multifactorial etiology, the diagnosis and management of TMDs remain complex.

Classification: According to Schiffman, E., Ohrbach, R., Truelove, E., et al. (2014). Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications

The DC/TMD replaced the RDC/TMD and provides a dual-axis system:

Axis I (Physical diagnoses):

- Muscle disorders: myalgia, local myalgia, myofascial pain, myofascial pain with referral.
- Joint disorders: arthralgia, degenerative joint disease, subluxation.
- Disc displacements: with reduction, with reduction and intermittent locking, without reduction (with limited opening / without limited opening).

Axis II (Psychosocial assessment):

- Assesses pain intensity, pain-related disability, psychological distress (depression, anxiety, somatization), and jaw functional limitation.

Diagnosis:

A. Physical Examination: The assessment involves a neurologic screening, inspection of the ears, nose, and oropharynx, evaluation of the temporomandibular joint (TMJ), palpation of the masticatory and cervical muscles, examination of cervical spine posture and range of motion, and a comprehensive intraoral evaluation.^{1,2,13,14}

B. Radiographic Examination: Rationale: When indicated, diagnostic imaging plays a crucial role in the evaluation of TMD and orofacial pain. It aids in confirming suspected pathology, excluding alternative conditions, and providing additional information in cases where the clinical diagnosis remains uncertain.^{1,14}

Imaging modalities

1. Two-dimensional

- a. Conventional tomography.
- b. Transcranial, transmaxillary, projections.
- c. Submentovertex projection, transpharyngeal
- d. Posteroanterior and lateral cephalometric projections.
- e. Panoramic radiography: open and closed views.

2. Three-dimensional

- a. Multislice computed tomography (MSCT)
- b. Cone beam computed tomography (CBCT)
- c. Magnetic resonance imaging (MRI)

Diagnostic imaging of the TMJ is indicated in cases of trauma, occlusal changes, restricted mouth opening or closed lock, presence of reciprocal clicking or crepitus, systemic diseases, swelling or infection, and when conservative treatment fails.

Management: Approximately 5–10% of patients actively seek treatment, while nearly 40% experience spontaneous resolution of symptoms. Therefore, the primary goals of initial management should be directed toward alleviating pain and restoring function.⁷

Non-invasive treatment: The first line of TMD management involves supportive patient education (Table 1)¹³, complemented by home exercises and relaxation techniques. Guided jaw movements—such as controlled opening and closing within 15 mm, and lateral excursions of 5 mm to each side—have been shown to relieve clicking in approximately 82% of cases.

Counselling and Home Self-Care Guidelines for TMD Patients:

Category	Instruction	Details / Examples
Dietary Modifications	Eat soft foods	Soup, yogurt, mashed potatoes; avoid hard foods, prolonged chewing, and chewing gum

Limit Mouth Opening	Avoid excessive opening	Refrain from wide yawning, shouting, singing, or lengthy dental procedures
Thermal Therapy	Use hot compresses	Apply moist heat to painful area for 20 minutes, 2–4 times daily
Jaw Relaxation	Relax jaw muscles	Avoid clenching; place tongue on palate behind upper front teeth (“lips together, teeth apart”)
Posture Awareness	Maintain good posture	Keep proper alignment of head, neck, and back
Sleep Hygiene	Improve sleep position	Ensure restful sleep; avoid sleeping on the back or positions that strain jaw/neck
Aerobic Exercise	Stay active	Low-impact exercises such as walking and water aerobics help reduce pain and improve health

Photobiomodulation (PBM) OR low-level laser therapy (LLLT):

Low-level laser therapy (LLLT) has recently gained attention as a physical treatment modality for TMD due to its simplicity, short application time, and minimal contraindications.¹⁵ Using red or infrared light (wavelengths 810–830 nm), LLLT enhances cellular respiration, improves local circulation, promotes tissue healing, and provides analgesic and muscle-relaxant effects depending on tissue penetration depth.^{16,17} Clinically, it is commonly applied at 12 points: five over the TMJ, seven over the temporalis and masseter muscles, and at the insertion of the medial pterygoid.¹⁷

Occlusal splint and adjustments: Occlusal splints help prevent degenerative forces on the TMJ, dentition, and articular disc, and are especially effective in patients with severe bruxism or nocturnal clenching.⁷ Soft splints may reduce masticatory muscle pain within 4–11 weeks, while

combining splint therapy with short-term NSAIDs has shown enhanced pain relief in chronic cases.¹⁸ Evidence indicates splints can improve maximum mouth opening and decrease pain (VAS) in TMD patients, and may reduce pain intensity in those with TMJ clicking.¹⁹ Although occasionally used post-arthrocentesis to reduce joint overload, current studies remain inconclusive regarding their long-term efficacy.²⁰

Biofeedback: Compared with conventional care, biofeedback and cognitive behavioral therapy have shown superior short- and long-term benefits in managing pain in symptomatic TMD patients.⁷ Patients should also adopt behavioral modifications, including stress reduction, good sleep hygiene, avoidance of parafunctional habits (clenching, grinding, chewing objects), and limiting extreme mandibular movements.⁷

Botulinum toxin: Botulinum toxin (BTX) is a potent neurotoxin produced by *Clostridium botulinum*. It inhibits presynaptic acetylcholine release at the neuromuscular junction, thereby reducing muscle and gland activity. Commercially available in various formulations, BTX is supplied as a stable lyophilized crystalline substance combined with human albumin and reconstituted with saline before use.²¹

Acupuncture therapy: A PRISMA-compliant meta-analysis evaluated conventional acupuncture for TMD in adults against sham nonpenetrating acupuncture and sham laser therapy, demonstrating superior effectiveness of acupuncture in reducing pain episodes, particularly myofascial pain.²²

Analgesic gel phonophoresis and ultrasound: Phonophoresis, using ultrasound with an analgesic gel (e.g., aceclofenac), enhances topical drug delivery and has shown positive outcomes in TMD management. It is particularly beneficial for elderly patients or those intolerant to oral medications.²³

Short term transcutaneous electrical nerve stimulation (TENS) transcutaneous: Transcutaneous Electrical Nerve Stimulation (TENS) is used for pain control in TMD. While effective in reducing acute pain, its role in chronic pain remains controversial. Short-term TENS shows reliable benefit in masticatory myofascial pain, whereas long-term efficacy requires further research.²⁴

Pharmacological management: Pharmacologic management of TMD pain often begins with NSAIDs, typically for 10–14 days, with naproxen showing the most consistent benefit. Muscle relaxants may be added for muscular involvement, while tricyclic antidepressants are useful in chronic pain. Opioids are generally discouraged and reserved only for short-term use when non-opioid therapies fail, due to the risk of dependence.⁷

Invasive management: Arthroplasty: TMJ arthroplasty is an open surgical procedure that reshapes the joint surface to remove osteoarthritic changes and manage articular disk degeneration or displacement. Though complications are rare, they may include infection, facial nerve injury, occlusal changes, persistent pain, or vascular injury.²⁵

TMD surgical management includes disk repositioning or repair for minimally displaced or perforated disks, discectomy for severely damaged disks, and discectomy with grafts to prevent joint degeneration. Total joint replacement, using autogenous or alloplastic materials, restores form and function in end-stage disease, while tissue engineering approaches like intra-articular marrow-derived stem cells grafting are emerging as biological therapies, though clinical application remains limited.^{26,27,28,29}

Conclusion: Temporomandibular disorders remain a diagnostic and therapeutic challenge due to their multifactorial etiology, with no single factor responsible for disease onset. Accurate diagnosis,

guided by advanced imaging such as MRI, is essential to identify the underlying causes and plan effective treatment. While emerging therapies show promise, current evidence supports minimally

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