

**THE ROLE OF NEUROMUSCULAR DISORDERS IN THE PATHOGENESIS OF
TEMPOROMANDIBULAR JOINT DYSFUNCTION ASSOCIATED WITH MYOFASCIAL
PAIN SYNDROME.**

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ABSTRACT

Temporomandibular joint (TMJ) dysfunction is a multifactorial condition accompanied by pain, restricted mandibular movements, and impaired masticatory function. Neuromuscular disorders, including myofascial pain syndrome, muscle spasm, and imbalance of masticatory muscle tone, play a key role in its development. These changes are closely associated with disturbances of the central and autonomic nervous systems. The article provides a review of current literature data on the pathogenetic role of neuromuscular disorders in TMJ dysfunction and their importance for diagnosis and treatment.

Keywords:

Temporomandibular joint dysfunction; neuromuscular disorders; myofascial pain syndrome; muscle spasm; orofacial pain; multidisciplinary treatment; psycho-emotional factors; masticatory muscles; occlusal balance; physiotherapy.

INTRODUCTION

The temporomandibular joint (TMJ) is one of the most frequently used and functionally complex joints in the human body. Through this joint, hundreds of daily actions such as chewing, speaking, and crying are performed, while in infants it enables the process of sucking. Therefore, when TMJ dysfunction develops, the quality of human life decreases significantly.

According to the literature, signs of TMJ dysfunction are observed in approximately 20–40% of the population. Most patients complain of clicking or pain during mouth opening, while others present with nonspecific symptoms such as headache, tinnitus, or dizziness. These subtle signs often lead to delayed diagnosis.

In recent years, researchers have identified disturbances in the neuromuscular system as one of the leading causes of TMJ dysfunction. Muscle imbalance and myofascial trigger points negatively affect joint biomechanics, resulting in pain syndrome and neurological manifestations.

Neuromuscular Disorders and Their Role in TMJ Dysfunction

Neuromuscular abnormalities play a key role in the development and persistence of temporomandibular joint (TMJ) dysfunction. They aggravate the clinical picture, promote chronicity, and significantly reduce the patient's quality of life. Imbalance in the tone and coordination of the masticatory muscles leads to abnormal joint loading, disturbed biomechanics, and progressive articular changes.

A thorough understanding of neuromuscular pathogenesis is essential for accurate diagnosis and treatment. A comprehensive approach—including neuroimaging, myofascial assessment, and psycho-

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emotional evaluation—helps identify both peripheral muscular dysfunction and central sensitization processes that maintain chronic pain.

The best results are achieved when myorelaxation, psycho-emotional correction, and orthopedic interventions are applied together, addressing muscular and psychological components simultaneously to restore normal mandibular function.

Clinical Manifestations of TMJ Dysfunction

The most common clinical symptoms of temporomandibular joint (TMJ) dysfunction include:

- Mechanical clicking or popping during mouth opening or closing, often resulting from displacement or irregular movement of the articular disc;
- Pain during chewing or mandibular motion, caused by muscular hyperactivity or inflammation within the joint capsule;
- Restricted mandibular mobility, which may limit daily activities such as eating and speaking;
- Referred pain radiating to the head, temporal, or auricular regions due to shared trigeminal nerve pathways;
- Autonomic disturbances such as tinnitus, dizziness, and nausea, reflecting the close neurovascular relationship between the TMJ and adjacent cranial structures.

These symptoms may often mimic otolaryngologic or neurologic diseases, leading to diagnostic difficulties.

Changes in the Neuromuscular System

The main masticatory muscles include the masseter, temporalis, medial pterygoid, and lateral pterygoid muscles. These structures are responsible for the essential functional movements of the temporomandibular joint (TMJ), ensuring coordination during mastication, speech, and swallowing. Proper balance between these muscles maintains the physiological biomechanics of the joint. However, asymmetric alterations in muscle tone disturb this delicate equilibrium, causing irregular loading of the articular surfaces and subsequent joint dysfunction.

- Hypertonus — leads to pain, stiffness, and restricted mandibular motion due to increased tension and pressure within the joint.
- Hypotonus — increases abnormal joint movement and instability, predisposing to disc displacement.
- Spasm — is considered the primary source of myofascial pain syndrome, resulting from sustained involuntary contraction and local ischemia.

Persistent neuromuscular imbalance not only provokes pain but may also initiate degenerative changes in periarticular tissues.

Myofascial Pain Syndrome (MPS)

Myofascial pain syndrome is among the most common and clinically significant conditions associated with TMJ dysfunction. It is characterized by the formation of trigger points within the masticatory muscles, where localized areas of hyperirritability generate referred pain. Pressure on these points can reproduce discomfort radiating to the temporal, auricular, cervical, or even shoulder regions.

According to clinical data, 60–70% of patients with TMJ dysfunction exhibit signs of MPS. Prolonged muscle tension leads to reduced blood flow, accumulation of metabolic waste, and sensitization of peripheral nociceptors—all of which intensify pain perception. Without timely intervention, this process contributes to the chronicity of the disease.

Autonomic and Central Nervous System Reactions

The masticatory muscles and the TMJ are closely interconnected with the central nervous system (CNS) via the trigeminal nerve and its extensive afferent network. Persistent nociceptive input from

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the affected joint may cause functional reorganization within the brain's pain centers, leading to central sensitization.

As a result, patients may experience a variety of secondary symptoms:

- Insomnia due to continuous discomfort and hyperarousal;
- Tinnitus and dizziness, reflecting autonomic dysregulation;
- Palpitations and excessive sweating, caused by heightened sympathetic activity.

These systemic manifestations demonstrate that TMJ dysfunction extends beyond local pathology, influencing both autonomic and central neural circuits.

Psycho-Emotional Factors

TMJ dysfunction frequently develops within the context of psychological stress, anxiety, and emotional tension. Chronic pain leads to irritability, fatigue, and sleep disturbances, while psychological distress exacerbates muscular hyperactivity—creating a vicious cycle.

Scientific studies show that at least 50% of patients with TMJ disorders present psycho-emotional alterations, including depression and somatization. Addressing these components through psychotherapy and stress management is therefore crucial for long-term recovery.

Diagnosis

Accurate diagnosis of TMJ dysfunction requires a comprehensive multidisciplinary evaluation combining clinical and instrumental methods:

- Clinical examination — includes assessment of mandibular movement range, palpation of masticatory muscles, and detection of joint sounds;
- Radiography and computed tomography (CT) — visualize bony structures and degenerative changes;
- Magnetic resonance imaging (MRI) — provides detailed information about the condition of the articular disc and soft tissues
- Electromyography (EMG) — objectively measures muscle activity and identifies asymmetry or hyperfunction.

This integrative diagnostic approach enables precise differentiation between muscular, articular, and neurogenic mechanisms of dysfunction.

Therapeutic Approaches

1. Pharmacotherapy

- Muscle relaxants – reduce muscle tension and relieve spasms;
- Nonsteroidal anti-inflammatory drugs (NSAIDs) – alleviate inflammation and pain;
- Antidepressants – improve mood, modulate central pain pathways, and enhance sleep quality.

2. Physiotherapy

- Ultrasound and laser therapy – stimulate microcirculation and tissue repair;
- Electromyostimulation – restores muscle tone and balance;
- Therapeutic exercises – enhance coordination, flexibility, and joint stability.

3. Orthostomatologic Methods

- Splint therapy – promotes muscle relaxation, stabilizes occlusal contacts, and reduces joint strain.

4. Psychotherapy

- Stress-reduction techniques – such as cognitive-behavioral therapy and mindfulness;
- Relaxation and breathing exercises – to decrease muscle hyperactivity and anxiety levels.

Conclusion

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Temporomandibular joint dysfunction is a multifactorial condition primarily driven by neuromuscular imbalance. Spasms of the masticatory muscles and myofascial pain syndrome exacerbate pain and functional limitation, while central nervous system involvement contributes to chronicity.

Effective management therefore demands a comprehensive, multidisciplinary approach, integrating the expertise of dentists, neurologists, and psychotherapists. Such a collaborative model not only relieves pain and restores mandibular function but also reestablishes neuromuscular and psycho-emotional harmony, ultimately enhancing the patient's overall quality of life.

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