

THE IMPACT OF MASSETER MUSCLE DYSFUNCTION ON ORAL REHABILITATION: CHALLENGES AND TREATMENT STRATEGIES

Gabi Topor¹, Ana Magdalena Bratu², Iulian Catalin Bratu^{3*}, Olimpia Dumitriu-Buzia^{1*}, Patru Radu Stanciu¹, Dragos Stanciu¹, Nicolae Sarbu¹, Mariana Ilie¹, Silvia Nica², Norina Consuela Forna⁴, Raluca Uleanu⁴, Iulia Alecsandra Salcianu²

1 Faculty of Medicine and Pharmacy, University "Dunarea de Jos" Galati, Romania.

2 Carol Davila University of Medicine and Pharmacy, Bucuresti, Romania.

3 Ovidius University of Constanta, Constanta, Romania

4 "Grigore T. Popa" University of Medicine and Pharmacy, Faculty of Dentistry, Iasi, Romania.

*Corresponding authors: dr_bratuilulian@yahoo.com, buzia_olimpia@yahoo.com

All authors have the same contribution.

Abstract

Dysfunctions of the masseter muscles represent a significant challenge in the field of oral rehabilitation, negatively influencing the success of prosthetic, orthodontic, and surgical treatments. This review explores the impact of these dysfunctions on various aspects of oral rehabilitation, identifying the main challenges and providing effective treatment strategies. Initially, the anatomy and function of masseter muscles are discussed, followed by an analysis of common types of dysfunction and their causes. The review then details the complications encountered in the oral rehabilitation process due to masseter dysfunctions, highlighting difficulties in diagnosis and planning. Various treatment strategies are presented, including conservative methods, drug interventions, and surgical options, emphasizing the importance of an interdisciplinary approach. By including case studies, the practical applications and outcomes of proposed treatments are illustrated. In conclusion, the article emphasizes the need for early diagnosis and adequate treatment to ensure the long-term success of oral rehabilitation in the presence of dysfunctions of the masseter muscles.

Keywords: masseter muscle dysfunction, bruxism, medication, surgical options, oral rehabilitation

Introduction

The masseter muscles play a crucial role in oral function, being responsible for mastication, jaw stability, and other essential movements of the oral cavity. Dysfunctions of these muscles can have a major impact on oral rehabilitation, affecting the effectiveness and success of dental, prosthetic, orthodontic, and surgical treatments. [1-3]

The masseter muscles are the main muscles involved in the mastication process and are found on each side of the face, covering the mandible. These are thick and strong muscles, forming from two parts: the superficial part and the deep part. The superficial part attaches to the zygomatic arch and extends to the angle of the mandible, while the deep part starts from the middle part of the zygomatic arch and attaches to the branch of the mandible. The masseter muscles are innervated by the mandibular branch of the trigeminal nerve (cranial nerve V) and are vascularized by branches of the maxillary artery. Their main function is to close the jaw, playing an essential role in the process of chewing and speaking. [1-5]

The masseter muscles play a crucial role in oral rehabilitation, being the main muscles

involved in mastication. Dysfunctions of these muscles can negatively affect the rehabilitation process, causing pain, tension, and limitations in opening the mouth. These problems can complicate dental treatments, such as implants, dentures, or orthodontic treatments, prolonging the duration and complexity of interventions. [1-3, 10-21]

In the context of modern dentistry, the complex approach to oral rehabilitation requires a deep understanding of all factors that can influence treatment outcomes. Dysfunctions of the masseter muscles, such as hypertonia, spasms, and contractures, can cause significant difficulties in the diagnosis and treatment process. These problems can lead to chronic pain, and discomfort and compromise the stability and functionality of braces. [1-3, 22-37]

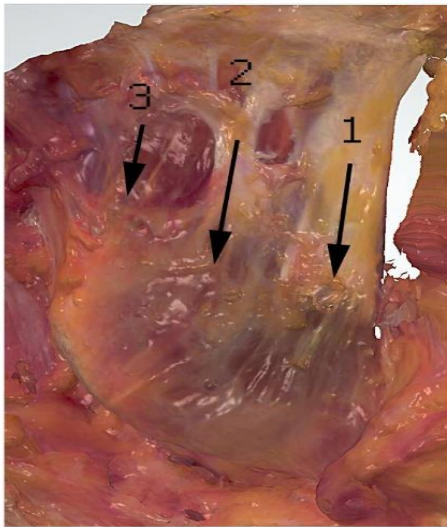


Image 1. Masseter muscle, section: superficial(1); intermediate(2); deep(3). [3]

This review aims to explore in detail the impact of masseter muscle dysfunction on oral rehabilitation, identifying the main challenges faced by practitioners. Various treatment strategies that can be implemented to manage these dysfunctions will also be discussed, with an emphasis on the importance of an interdisciplinary approach to ensure optimal outcomes for patients. [1,3, 38-46]

By reviewing the literature and relevant case studies, this article will provide comprehensive insight into how masseter muscle dysfunctions can be effectively addressed and treated, contributing to improved quality of life for

patients and the long-term success of oral rehabilitation. [1-3]

Masseter muscle dysfunctions and symptoms

The masseter muscles, essential for mastication and jaw stability, can suffer from various dysfunctions that negatively affect oral function and dental rehabilitation. Understanding the types, causes, and implications of these dysfunctions is crucial for proper diagnosis and effective treatment planning. [2-4]

Hypertonia of the masseter muscles refers to a state of increased and persistent tension in these muscles. This is manifested by a continuous and abnormal contraction, which is not related to the normal functional needs of mastication or speech. It can lead to significant discomfort, affecting the patient's quality of life and complicating various oral rehabilitation procedures. [3,5]

It is manifested by:

- persistent pain in the masseter muscles, which may radiate to the jaw, ear, and head;
- feeling of stiffness in the area of the mandible, difficulty in its free movement;
- difficulty opening the mouth to full capacity, which can affect mastication and speech;
- fatigue in the masseter muscles, especially after prolonged or intense mastication. [3-5]

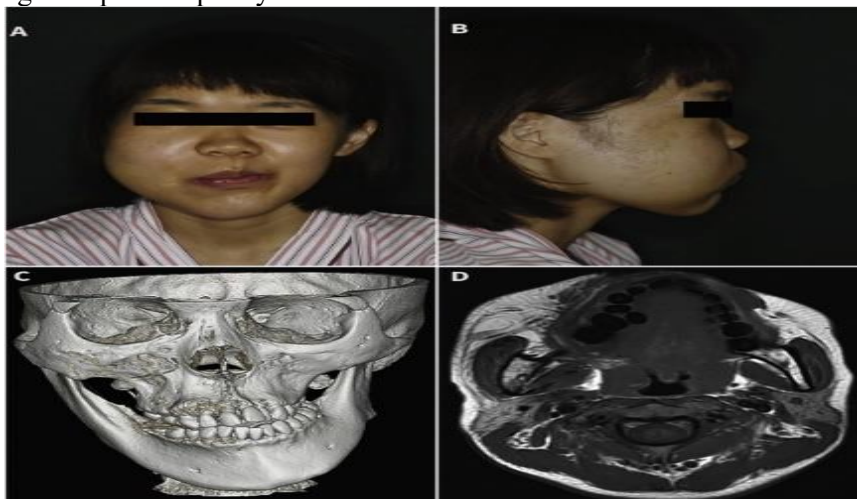


Image 2. Muscle hypertonia. A- front view, B- side view, C- front norm rendering, D- cross-section highlighting right masseter hypertrophy. [5]

Muscle spasms of the masseter muscles are involuntary, painful, and sudden contractions of

these muscles. These spasms may be short-lived or may persist, causing significant discomfort and

affecting the normal functionality of the jaw. They can occur spontaneously or be triggered by certain movements or activities, such as chewing or speaking. [4-6]

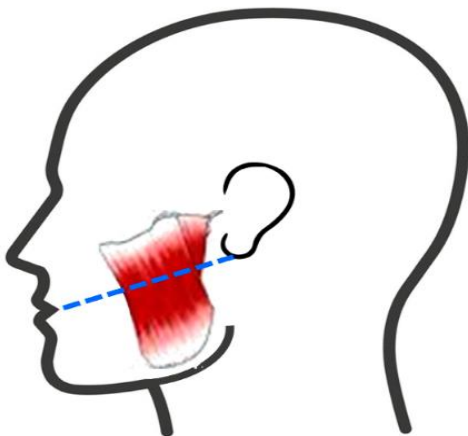
Symptoms of muscle spasms:

- intense and sudden pain in the area of the masseter muscles, which may radiate to the ear or head;
- muscle stiffness and tension in the area of the mandible;
- difficulty opening the mouth or performing normal movements of the mandible;
- pain when touching or applying pressure to the masseter muscles. [4-6]

Contractures of the masseter muscles refer to the thickening and shortening of these muscles, which leads to a permanent limitation of the mobility of the mandible. This type of dysfunction is often the result of prolonged muscle tension or repeated trauma, causing chronic stiffness and discomfort. [3-5]

Symptoms of contractures:

- limitation of mouth opening, which affects mastication and speech;
- chronic and persistent pain in the masseter muscles, which may radiate to the jaw and temporal region;
- masseter muscles feel stiff and tense on palpation;
- In severe cases, contractures can cause facial asymmetry due to uneven muscle traction. [4-6]



(a)



Image 3. Muscle contraction left masseter muscle[6]

Causes of dysfunction

Dysfunctions of the masseter muscles, including hypertonia, spasms, and contractures, can be caused by a variety of factors. Understanding these causes is essential for proper diagnosis and planning for appropriate treatment. [6-8]

Stress and anxiety can lead to increased muscle tension because the autonomic nervous system responds to stress by contracting muscles. Therefore, chronic tension can cause hypertonia, spasms, and, over time, muscle contractures. [6,8]

Bruxism by grinding and clenching teeth, often during sleep, causes constant overstrain of the masseter muscles. This repetitive behavior can lead to hypertonia, spasms, and the development of muscle contractures. [6-8]



(b)

Image 4. Scanning of masseter muscles. (a) The probe has been positioned along a line between the corner of the mouth and the lower ear insert, passing over the bulky part over the area of the drawn line. (b) The subject was seated in a supine position with his head slightly turned in the opposite direction. A water-based transmission gel was applied. The transducer was placed on the line and held perpendicularly. [8]

Direct physical trauma to the jaw, face, or head can cause inflammation and pain, leading to protective reflexes and muscle contractions. They can lead to acute muscle spasms and, in severe cases, the development of muscle contractures. [7,9]

Malocclusions through incorrect tooth alignment can create abnormal stress on the masseter muscles, forcing them to compensate to ensure an effective bite. This constant overuse can cause hypertonia and spasms, and in the long run, muscle contractures. [7-9]

Persistent chronic inflammation, such as temporomandibular arthritis, can affect the masseter muscles by increasing tension and pain. They can lead to the formation of scar tissue and muscle contractures. [7-9]

Poor or incorrect posture of the head and neck can affect balance and tension in the masseter muscles, forcing them to compensate. It can contribute to the development of hypertonia and muscle spasms. [7-9]

Genetic predisposition can influence the structure and functioning of muscles and joints, including masseters. Genetic factors can make certain people more susceptible to muscle dysfunction, such as hypertonia or contractures. [6,8]

Medical or dental interventions, such as tooth extractions or complex surgical procedures, can cause trauma or inflammation to the masseter muscles. These interventions can lead to postoperative muscle spasms and, in some cases, long-term contractures. [7,8, 47-58]

Overuse and activities that require heavy use of the masseter muscles, such as chewing gum or eating hard foods, can cause overuse can lead to hypertonia muscle spasms, and over time, contractures. [8,9]

Impact on Oral Rehabilitation

Dysfunctions of the masseter muscles have a significant impact on the oral rehabilitation process. These dysfunctions can complicate prosthetic, orthodontic, and surgical treatments, negatively affecting patient outcomes and comfort. [8-10]

Mobile or fixed dentures can become unstable due to uncontrolled muscle contractions, causing discomfort and reducing their functionality. Constant muscle tension and spasms can make it difficult to adapt dentures properly. Hypertoned masseter muscles can exert excessive pressure on dentures, causing them to not fit properly on the arch. [8-10]

Hypertonia and spasms can generate irregular forces on the orthodontic appliance, affecting tooth movement and prolonging the duration of treatment. Contractions and spasms can cause pain, reducing patients' tolerance to orthodontic appliances. Constant changes in muscle tension can interfere with proper tooth alignment. [8-10]

Dysfunction of the masseter muscles can be a complicating factor in oral surgery, potentially affecting surgical access, postoperative pain management, and patient recovery time. [9,10]

Constant discomfort and pain can increase patients' stress and anxiety levels, affecting their overall well-being. Difficulties in chewing, speaking, and opening the mouth can negatively affect patients' quality of life. Complications and frequent adjustments required can lead to frustration and a lack of confidence in treatment. [8-10]

Dysfunctions of the masseter muscles can aggravate xerostomia (dry mouth) and negatively influence dental inclusions in the oral rehabilitation process. Excessive muscle tension can impair salivary flow, contributing to oral dryness and discomfort. Also, stress on the masseter muscles can complicate the correct positioning of the included teeth, prolonging orthodontic treatment and affecting the final results of oral rehabilitation. A multidisciplinary approach, including the management of muscle dysfunction, is essential for successful treatment. [11-13]

Dysfunction of the masseter muscles can have a significant impact on oral rehabilitation, especially in patients using orthodontic braces. The masseter muscles, responsible for mastication, may become overworked or inflamed due to adjustments required during orthodontic treatment. This can lead to pain and discomfort, affecting the patient's ability to chew effectively. In addition,

excessive tension in these muscles can contribute to temporomandibular problems, aggravating existing dysfunctions and prolonging the duration of oral rehabilitation. It is essential for orthodontic specialists to closely monitor muscle function and provide appropriate treatments, such as muscle relaxation techniques or botulinum toxin therapy, to relieve discomfort and ensure effective rehabilitation. Proper management of these dysfunctions can improve treatment outcomes and patients' quality of life. [14-19]

Challenges in the diagnosis and treatment of masseter muscle dysfunctions

Evaluation of the patient's medical and dental history can identify risk factors and symptoms associated with masseter muscle dysfunction. Clinical examination and evaluation of the condition of the masseter muscles is done by palpation and observation of symptoms such as pain, stiffness, and limitation of mandibular mobility. [10,20-22]

X-rays, computed tomography (CT) scans or magnetic resonances (MRI) are used to detect structural damage or other abnormalities, which can contribute to muscle dysfunction. [20]

Functional assessment allows testing of mandibular function and temporomandibular joint (TMJ) mobility to assess the degree of impairment of daily activities such as chewing and speaking. [20-22]

Some cases may be resistant to conservative treatment, requiring more aggressive or combined therapeutic approaches. The use of

medications, such as muscle relaxants or painkillers, can be associated with side effects and unwanted side effects. Learning and applying relaxation techniques, such as deep breathing and meditation, to reduce muscle tension and stress. [20-22]

Treatment of masseter muscle dysfunctions with retard release transdermal systems loaded with essential oils can have a significant positive impact in oral rehabilitation. Essential oils, such as lavender or peppermint, are known for their anti-inflammatory and analgesic properties. The use of transdermal systems allows a controlled and constant release of these substances, thereby maintaining a stable therapeutic level. [23-26] It can reduce muscle tension and pain, relieving discomfort associated with masseter dysfunction. Treatment can also improve muscle flexibility and masticatory function, facilitating the oral rehabilitation process. Integrating these systems into the orthodontic treatment plan can help shorten recovery time and improve patients' quality of life, providing a complementary and natural approach to managing muscle dysfunction. [27-30]

Muscle dysfunctions can be complex and often require a multidisciplinary approach, which can complicate the management and coordination of treatment. Some treatments, such as physiotherapy exercises or Botox therapy, may require active and constant patient involvement, and lack of compliance can affect treatment outcomes. [22,31]



Image 5 a) botulinum toxin type A injection sites, divided into three points. (b) the position required for the design of the injector. [22]

Certain treatment options, such as Botox therapy or surgery, can be expensive and unaffordable for certain categories of patients. Even after the correct treatment, there is a risk of recurrence of muscle dysfunction, which requires long-term monitoring and subsequent adjustments to treatment. [31-34]

Myotomies allow cutting and releasing portions of the tense or contracted masseter muscles. Correction of structural damage or other abnormalities contributes to dysfunction of the masseter muscles through corrective surgery. [32-34]

Conclusions

Masseter muscle dysfunction poses a complex challenge in oral rehabilitation, requiring a multidisciplinary approach to manage symptoms and optimize treatment outcomes. Early recognition and prompt intervention are essential to minimize the impact of these dysfunctions on patients.

They have multiple causes, ranging from physical and behavioral factors to emotional and genetic ones. Proper diagnosis and early intervention are essential to prevent and treat these dysfunctions, thereby optimizing oral rehabilitation and patients' quality of life.

Careful evaluation, combined with appropriate interventions and effective

communication between healthcare professionals and patients, is essential to minimize the negative impact of these dysfunctions on oral rehabilitation and patients' quality of life.

The approach to treatment of masseter muscle dysfunctions should be individualized according to the severity of symptoms, the patient's general health, and underlying causes identified during diagnosis.

Treatment strategies for masseter muscle dysfunction must be individualized according to the severity of symptoms, underlying causes, and patient preferences, and a multidisciplinary approach may often be required to achieve the best results.

It is essential to provide patients with ongoing care and long-term monitoring to assess treatment progress and intervene promptly if symptoms recur. By properly addressing challenges in diagnosis, treatment, and care planning, optimal therapeutic results can be achieved and the quality of life of patients affected by masseter muscle dysfunction can be improved.

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