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*You will be met with an exceptional program covering different topics, from basic research areas to areas within daily practice of Restorative Dentistry, Endodontics, Prosthodontics, Oral Surgery and Implantology, Periodontology, Pediatric and Preventive Dentistry.*

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# CONSERVATIVE TREATMENT OF THE MASSETER MUSCLE HYPERTROPHY ASSOCIATED WITH TEMPOROMANDIBULAR JOINT DISORDER

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**Abstract:** *Masseter muscle hypertrophy occurs bilaterally with the squared lower third of the face. Etiology is unknown, related to gum chewing, bruxism, malocclusion, psychological disorders, and temporomandibular joint disorders. Patients complain of facial asymmetry; symptoms are pain, trismus, or bruxism. Several treatment options are presented: pharmacotherapy, occlusal splints, neuromodulator botulinum toxin, and surgical reduction. Patients were treated with a conservative approach the occlusal equilibration by splints and injecting botulinum toxin locally into the hypertrophied muscle. A significant reduction in muscle thickness and facial reduction was observed on a 6-month follow-up. Botulinum toxin injection is a safe, effective treatment for masseter hypertrophy.*

**Key words:** *masseter muscle, hypertrophy, TMJ, TMD*

## Introduction

Masticatory muscle hypertrophy (MMH) is a functional, reactive hypertrophy affecting mainly the masseter muscles [1]. Hypertrophy occurs bilaterally/unilaterally, and patients have typically squared lower faces [2]. Etiology is multifactorial, due to modern life stress and anxiety many patients adopt bad habits like clenching and grinding teeth, biting nails, chewing pencils, and toothpicks. These triggers are not very strong, but over long periods can lead to overworking the chewing muscles, accompanied by pain, trismus, and hypertrophy [3]. Malocclusion and facial morphology are often considered an important etiological factor [4], [5]. MMH has no gender and ethnic predominance with a high incidence of occurrence in 20-40 years. Patients have type I when the enlargement is due to muscle hypertrophy or type II when the swelling presents a prominence of mandible angle and not much hypertrophy of masseter muscles [6]. Clinical examination involves extra, intraoral observation, palpation, radiography, ultrasonography, morphometric analysis, and electromyography measurement [7], [8]. Differential diagnoses include muscle, vascular, parotid, mandible tumors, and salivary gland diseases [9]. Treatment options range from pharmacotherapy, occlusal splints, relaxation techniques, and botulinum toxin to more invasive surgical bone reduction [10]. The paper aims to present conservative treatment of the masseter muscle hypertrophy associated with temporomandibular joint disorder as one of the possible therapeutic modalities with effective reduction in muscle volume and activity.

## Material and methods

Patients with bruxism were treated with muscle relaxants, occlusal equilibration by splint, and local injection of botulinum toxin-A into the hypertrophied masseter muscle. Standardized photography and clinical parameters were used to assess facial contour and muscle thickness at the beginning of the therapy and successive follow-ups. Both patients had type I hypertrophy.

A 30-year-old female patient was treated for bruxism with a soft occlusal splint. Anamnestic data were positive for grinding and clenching teeth during sleeping, and pain in the peri-auricular and temporomandibular joints. Clinical examination showed bilateral hypertrophy of the masseter muscles on both sides, upper frontal teeth incisal chipping, occlusal abrasion, tongue indentations, and linea Alba - Figure 1. We did not detect local inflammation in the masseteric area, the consistency was normal, homogeneous, and painless. The TMD Disability Index Questionnaire showed 45% disability.



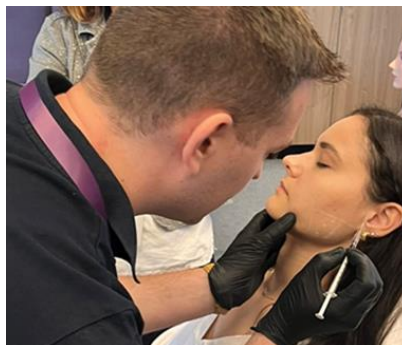
**Fig. 1. Extraoral photographs of bruxism patient: a. squared lower face b. tongue indentations**

The patient was advised to avoid chewing hard food and to perform jaw and tongue exercises for 15 minutes/day to strengthen the muscles that control the movements and improve flexibility. The stabilization occlusal splint was made of hard acrylic material in a neutral jaw position, and the patient was advised to wear it while sleeping and for several hours during the day – Figure 3. There was no significant reduction in muscle activities in 60 days, but occlusal equilibration decreased symptoms.



**Fig. 3. Occlusal stabilisation splint**

Botox was injected into the masseter muscles to prevent nerve signals that cause overuse and relieve discomfort by clenching and grinding. Dysport 500 IU was diluted with 2.5 mL normal saline, and 30 IU was injected into 3 equidistant bulging points on the masseters on both sides. Although the dosage of the toxin is not standardized, it is very important to inject it correctly - Figure 4. The patient clenched and held the teeth, the safe area was marked from the anterior to the posterior border of the muscle, under the line from the tragus to the corner of the mouth. Avoiding certain anatomical positions like the parotid gland and risorius muscle to prevent unwanted complications is very important.



**Fig. 4. Marking the “safe area” for toxin application**

The female patient 43 years old reported bulging in the region of the right mandible angle, massive teeth erosions in both jaws, no pain and discomfort, but significant problems in chewing and esthetic appearance. The changes progressed slowly within several years. She was diagnosed with bruxism, teeth wear, and improper occlusion. There was a complete change in the position of the mandible, with a cross-bite on the right side- Figure 5.



**Fig. 5. Patient with severe bruxism: Intraoral view**

The protocol started with a change in diet, endodontic treatment of upper incisors, and a repositioning occlusal splint in the lower jaw. We used Durasoft 3, 0 mm (sandwich foil 2,1mm hard/0,9mm soft) which is an abrasion-resistant, transparent material with a hard and soft side used for combined hard/soft splints in patients with bruxism.



**Fig. 6. a. Durasoft splint b. PMMA provisional bridges**

The patient received the first provisional bridges manufactured with the digital method from PMMA and Botox injections. Three months later, the final provisionals were cemented in new, rebalanced muscles and lower jaw position in TMJ. By injecting small doses of botulinum toxin directly into the right masseter, the muscle was weakened enough to stop involuntary grinding of the teeth and clenching of the jaw. This significantly relaxed the muscles and reduced further wear of the teeth.

### **Results**

A significant reduction in the distance from the angle of the mandible to the most prominent point of the chin was observed between pre-treatment and 6-month follow-up. The thickness of the muscle on palpation was significantly reduced and extraoral photography confirmed the change in facial contour and reduction in prominence at the angle of the mandible - Figure 8. At the end of the treatment, we performed conservative restoration of the teeth with composite material.



**Fig. 8. Extraoral view after treatment**

Our second patient received a complete prosthodontic restoration one year after the first appointment with multilayered zirconia bridges. The protocol reprogrammed the muscles and TMJ, reduced hypertrophy,

bruxism grinding and clenching, and all accompanying symptoms. The new prosthodontic restoration was manufactured with increased vertical dimension in central occlusion - Figure 8.

## Discussion

The biting force, chewing, diet, or para-functional habits like bruxism determine the volume of the masseter muscle. The masticatory forces generated during bruxism may be increased by six times the maximal biting force generated in normal chewing cycles [11], [12]. The treatment of the condition may be conservative, surgical, or a combination depending on the severity of the symptoms [13]. Botulinum toxin was presented as a less aggressive treatment option for lower face hypertrophy by Smith et al. Tan's study suggested that botox is a safe and effective treatment for people with severe bruxism, but should be considered for patients not responding to conventional therapy [14]. Botulinum toxin inhibits muscular contraction by blocking the release of acetylcholine from motor nerves. The toxin decreases motor activities which lead to muscle atrophy and symptom relief [15], [16].

Occlusal splints are removable, artificial occlusal surfaces used for diagnosis or therapy affecting the relationship between the mandible and maxillae [17]. They can provide a balanced and stable jaw relationship improving muscle activity and thus preventing dentition wear [18], [19]. The hard acrylic splints 3-6mm thick should be worn for at least 3-6 months regularly day/night to achieve significant pain decrease and symptom improvement for myofascial pain [20]. Hard stabilization occlusal splints with posterior contacts also are involved in relaxing the masticatory muscles bringing equilibration between temporal and masseter muscles [21]. Therefore, the splints are often a part of the conservative treatment of the TMD, especially in cases with increased muscle activities and bruxism. A combination of these conservative treatments should bring an effective reduction in muscle volume and activity, and be accompanied by relief of symptoms with a smooth, symmetrical, and balanced contouring of the lower face without inconvenient side effects [22].

## Conclusion

Botulinum toxin injection is a non-invasive, safe, and effective treatment for MMH. The injection technique was found to be effective, and patient satisfactory, with a good outcome over the follow-up period and we recommend its use. The clinical method for evaluating muscle bulk is an economical alternative to radiographic techniques and is easy to use in our clinical practice.

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