



## How to Get Better Outcomes in the Management of Symptomatic Bruxism: Association between Occlusal Splint and Botulinum Toxin

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### Abstract

The application of botulinum toxin has been widely used in dentistry in various stomatological indications, such as gummy smile and lip asymmetry, temporomandibular disorders (trismus, temporomandibular joint dislocation), dystonia oromandibular, sialorrhea, facial palsy, orofacial pain, parafunctional habits (bruxism and clenching) and its consequences, as masseteric hypertrophy. The purpose of this study is to report the case of a patient with bruxism who presented orofacial pain and headache secondary to parafunctional habit, dysphagia and insomnia. The patient received botulinum toxin injections, even having already been user of occlusal splint, reducing hypermyotonia of masseter and temporal muscles and secondary complaints. The application of botulinum toxin is a useful therapeutic option, being effective to improve the quality of life of patients with bruxism and clenching in the highest degree, uncooperative or resistant to medical and dental treatment.

**Keywords:** Bruxism; Headache; Muscle Hypertonia; Occlusal Splint; Type A Botulinum Toxins

### Introduction

Bruxism is defined by diurnal or nocturnal parafunctional activity characterized by involuntary and spasmodic rhythmic movements which include creaking and grinding of teeth [1-5]. It features variable incidence depending on various methodologies of population studies, from 5 to 96% of adults and from 7 to 88% of children [1-7]. However, only 5 - 20% of patients with bruxism are aware of parafunctional habit [1,5,8].

Several etiologic factors have been proposed, although the pathogenetic mechanism is still unclear. Factors such as emotional stress (disorder of attention deficit and hyperactivity disorder, fear and anxiety); occlusal disorders; neurological disorders (Rett syndrome, anoxic encephalopathy, cerebral palsy, dystonia cranium-cervical, comatose patients, cerebellar damage and bleeding, Huntington's disease, Whipple's disease); sleep disorders; and

the administration of certain drugs (inhibitors selective serotonin reuptake such as venlafaxine or antidepressants) may be related to the appearance of bruxism, which in some cases seems to have a multifactorial etiology [1,3-7].

The diagnosis is based on patient history, medical history and clinical signs of abnormal tooth wear [1,3]. Secondly, other disorders can be presented, such as dentinal hypersensitivity and crown height reduction, which causes occlusal changes and subsequently reduction of occlusal vertical dimension. Other associated manifestations can occur, such as fracture of restorations, prostheses and dental implants; occlusal audible sounds of creaking, hypertrophy of the masticatory muscles, headache, painful symptoms and discomfort in the temporomandibular joint. Radiographically, suggestive signs can be observed: increased pericementary space and thickening of the hard blade in periapical radiographs [1,5,8].

Several treatment modalities have been reported for the treatment of bruxism. However, there is still no consensus on the best therapeutical option [1,5,8]. Mouth protectors and muscle relaxants plates, stainless steel crowns, spasmolytic medications and relaxation therapy can be used in order to prevent tooth wear. However, such interventions present limited results in most cases due to the inability of patients to cooperate as a result of the severity of bruxism [1,6]. In cases in which the signs and symptoms of bruxism are significant, the application of botulinum toxin is recommended [1,2,7].

### Purpose of the Study

The purpose of this study is to report the case of a patient with bruxism who presented orofacial pain and headache secondary to parafunctional habit, dysphagia and insomnia. The patient received botulinum toxin injections, even having already been user of occlusal splint, reducing the hypermytonia of masseter and temporal muscles and secondary complaints.

### Case Presentation

Leucodermic male patient, 45 years old, had painful symptoms and headache secondary to bruxism, dysphagia and insomnia for 30 days.

Clinically, the patient has excessive wear and attrition of the upper and lower teeth (Figure 1), even using the night occlusal splint (Figure 2).



**Figure 1:** Patient with excessive wear and attrition of the upper and lower teeth.

Radiography (panoramic radiography and Updegrave transcranial technique, with open and closed mouth movements) revealed normal contours and preserved portions of the heads of the mandible and mandibular fossa of the temporal bones. Functional

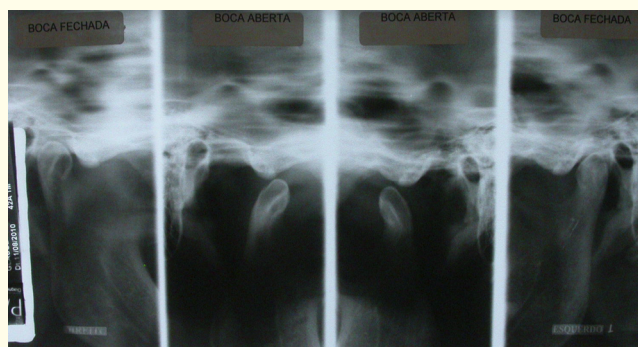


**Figure 2:** Use of nocturnal occlusal splint

studies showed centralization of the mandibular heads in their respective fossa (closed mouth and at rest); and intra-articular spaces preserved. At maximum opening, the heads of the mandible positioned themselves beyond their previous joint limits. However, the change in dynamics was completed, with bilateral hyperexcursion, what can translate subluxation (Figure 3 and 4).



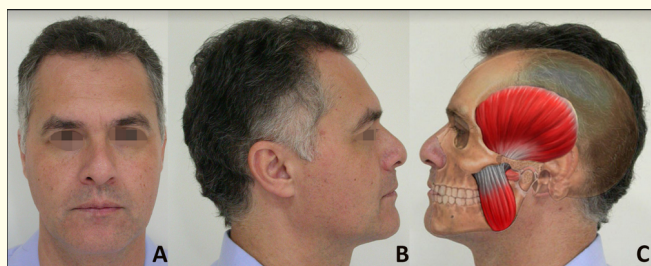
**Figure 3:** Initial radiographic features.



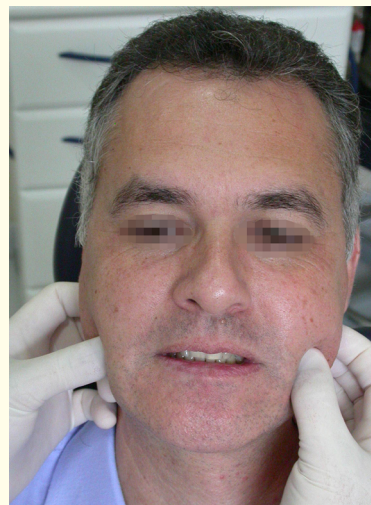
**Figure 4:** Updegrave transcranial technique with mouth movements closed and open.

The application of botulinum toxin has been suggested, in order to prevent excessive contraction of the muscles of mastication, associated with the use of the occlusal splint. The patient agreed to the proposed treatment and signed a consent form of botulinum toxin application.

The history of the patient, the visual clinical examination (Figure 5) and bilateral bidigital palpation (Figure 6) showed the need for bilateral implementation in the temporal and masseter muscles. In the masseter muscles, the trapezium was considered as a safety area the application of botulinum toxin, determined by the upper lines (imaginary line between earlobe and labial commissure), lower (lower border of the mandible), rear (posterior edge of the mandible branch) and anterior (anterior bundle of the masseter muscle) (Figure 7). The skin was previously cleaned with 70% ethyl alcohol, in order to prevent local infection and remove oils from the same. Three points of application were determined in each masseter muscle, forming a lower base triangle, with the subsequent application of dermatological topical anesthetic (Emla™ cream, Astra-Zeneca Brazil, Cotia, São Paulo, Brazil), staying for 15 minutes (Figure 8). In the temporal muscles, the points were determined according to the painful symptomatology - trigger points - also receiving dermatological topical anesthetic for 15 minutes. Botulinum toxin type A (Botox™ 200 units, Allergan Pharmaceuticals, Westport, Ireland) was diluted in 2 ml saline, according to manufacturer standards, and 10 units were injected in each particular site (Figure 9), totaling 100 units. After application, the patient was instructed not to lay down his head for four hours and not engage in physical activity during the first 24 hours after the procedure.



**Figure 5:** Front visual clinical examination (A), lateral (B) and schematic drawing of the masseter and temporal (C).



**Figure 6:** Bidigital bilateral palpation of the masseter.

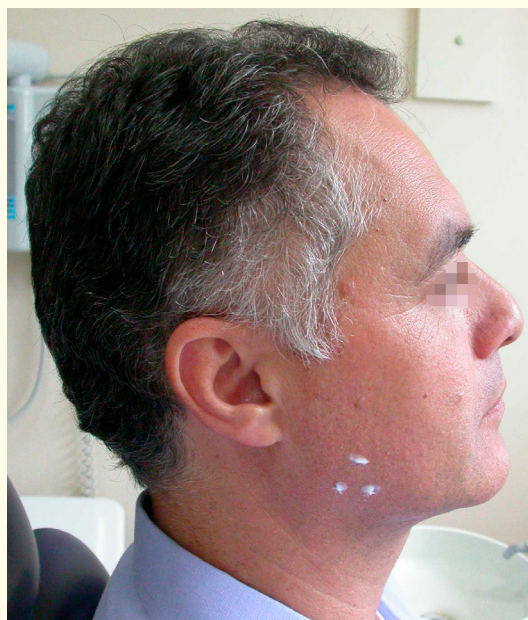


**Figure 7:** Security area for demarcation of the trapezoid for application of botulinum toxin.

After 14 days of application, the patient reported absence of pain symptoms and improvement of associated symptoms (dysphagia and insomnia). Repeated applications are recommended every six months, according to the perception of the patient's complaint.

### Discussion

Botulinum toxin in the muscle acts by blocking nerve transmission to the motor plate, ranging from 3 to 6 months according to



**Figure 8:** Determination of the three application points, forming the lower base of the triangle, followed by application of dermatologic topical anesthetic.



**Figure 9:** Application of botulinum toxin.

the volume of the dose until the neurological muscle regeneration [1,4,7]. The application of botulinum toxin has a positive effect in reducing muscle contraction and subsequently on the occlusal force, preserving the teeth and prostheses [1,8]. However, the use

of occlusal splint is advised to mitigate the deleterious effects of bruxism and clenching, such as the protection of present teeth and prostheses already installed [1,7].

Injections should be bilateral and performed in major muscles responsible for mastication, particularly the masseter and temporal [1,4,9], since they are the major muscles involved in movements of creaking and tightening in bruxism and clenching, respectively [1,10]. Some authors advocate a single injection of botulinum toxin into the masseter muscle sufficient to inhibit muscle contraction caused by the spread of the toxin in addition to ease of application [4,10,11]. In this report, for the symptoms presented, bilateral investments were made in the masseter and temporal muscles.

Various application protocols have been suggested in the literature. A priori, the muscle to be applied to should be identified clinically (Figure 5) according to the patient's complaint and subsequently, by palpation (Figure 6). The masseter muscle must be found by careful palpation at the site of its insertion (angle and body of the mandible) [1,4,10,11].

The security realm to the application of the toxin should be considered, determined the trapeze, which is limited by an upper imaginary line between earlobe and labial commissure; the lower edge represents the inferior edge of the mandible; the anterior edge can be felt on palpation when the muscle is contracted (asking the patient clenching); and the posterior edge corresponds to the posterior margin of the mandible branch (Figure 7). Three applications are carried out by projecting a triangle with lower base parallel the base of the mandible, with a distance of 15 mm between each vertex [1,8]. Anesthetic dermatological topic should be used before the application, and should be kept at the site for 10 to 15 minutes (Figure 8). It was recommended that the patient should be placed in the supine position [1,4,10,11]. However we suggest that he is sitting for the best definition of the points (forming a triangle).

The recommended dose is varied because it depends on the size and strength of muscle contraction [1,4]. Usually, the amount ranges from 25 to 100 units, including the masseter and temporal muscles [5,8-10]. Each application point may receive from 5 to 15 units, starting with the lowest amount and being adjusted according to the obtained results [1,10,11].

Insulin syringes with needles up to 100 units and from 8 to 12.7 mm long and 0.3 mm in size (29 or 30G) can be used. Bilateral injections are performed in parallel line 1 cm above the bottom edge

of the mandible, introducing the needle perpendicular to the muscle (Figure 9). For patient comfort, it may be necessary to administer analgesics in the post-application<sup>1</sup>. In the present report, there were no post-application complaints reported.

The beginning of action of the toxin occurs between 2 and 5 days and the duration of the effect of botulinum toxin lasts from 4 to 6 months [1,4,6,10], being required the application when symptoms presented by the patient [1,10,11].

The injection of botulinum toxin can cause some temporary complications such as pain, bruising, edema, headache, muscle atrophy (resulting from multiple injections), paresthesia or paralysis in areas adjacent to the injection site and muscle weakness [1,4,6,7,10,12]. Side effects are rare [1,9]. Some factors such as the dose, the size and identity of muscles involved and the severity of bruxism can affect the clinical response after injection of botulinum toxin [6,10]. Due to long-term repeated application, botulinum toxin injections can lead to changes in the size of muscle fibers [4].

As an adjunct treatment to bruxism, the occlusal splint can be made, preferably before application of botulinum toxin, in order to reduce the symptoms and promote the protection of pre-existing teeth and prostheses (Figure 2). The thickness should be as small as possible, offering resistance, without, however, changing the vertical dimension and functional space, being mounted in centric relation and be smooth to allow the sliding of antagonist teeth and promote patient comfort. The time of usage varies according to the complexity of the case, being recommended the nocturnal use for 45 days with periodic maintenance. After this period, the discontinuous use is indicated with semi-annual review, in order to evaluate the signs and symptoms [5,8].

Additionally, patients with bruxism or clenching, who present great loss of tooth structure demand extensive rehabilitation, requiring correct diagnosis and proper planning for the reestablishment of the vertical dimension of occlusion [5,8].

It is noteworthy that for multifactorial etiology, bruxism or clenching require multidisciplinary care involving dental treatment, physiotherapy and medical, pharmacological and psychological therapy [1,5,8].

Botulinum toxin has even been used in the prevention of injuries caused by self-mutilation in patients with Lesch-Nyhan syn-

drome, familial disorder of uric acid metabolism and of the central nervous system function, which present a delay in motor and cognitive development, having biting as the main cause of self-injury in fingers, lips and tongue. The application in the masseter muscles of these patients, with the purpose of reduction of masticatory forces, minimizes risks arising from lesions of self-mutilation by biting. It is noteworthy that the application of botulinum toxin should be used along with the use of mouthguards. In this indication, the application of botulinum toxin also showed advantages avoiding the need for multiple extractions, making the patient full edentulous and subsequently avoiding injuries by biting [1,14,15].

## Conclusion

The application of botulinum toxin is a useful therapeutic option and less invasive in functional disorders such as bruxism and clenching, being effective to improve the quality of life of these patients. Care must be taken with regard to anatomy and pharmacology, and botulinum toxin administration should be performed by trained and qualified professionals. The experience and expertise in injection techniques minimize the risk of complications. However, the application of botulinum toxin is a costly treatment and should be considered as a therapeutic option only for patients who present bruxism or clenching on a higher level or uncooperative and resistant to medical and dental treatment.

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