Use of botulinum toxin type a in temporomandibular disorder

ABSTRACT

Temporomandibular disorder (TMD) may be defined as a set of clinical scenarios involving the masticatory muscles, the temporomandibular joint (TMJ) and associated structures. Currently, 40 to 75% of the population has some sign of temporomandibular disorder, mainly pain located in the muscles of mastication in the pre-auricular region. The present clinical case was diagnosed as muscle temporomandibular disorder secondary to parafunction, as well as muscle hyperactivity due to surgical displacement of the left temporal muscle on two occasions, one for placement of aneurysm clips and the other for tumor excision from the supraorbital region on the left side. The patient sought medical and dental attention for 10 years due to constant headaches, tiredness and pain in the cheeks. The patient tried numerous bite-guards and pharmacological therapies to no avail. The American Academy of Orofacial Pain Questionnaire was applied combined with the Criteria for Research and Diagnostics (DRC) and a decision was made to use botulinum toxin type A in the masseter and temporalis muscles. An analog pain scale was applied over 90 days. Three days following the application of botulinum toxin type A, the patient reported a significant improvement with complete resolution of pain (level 0) after 90 days. At 12 weeks from starting treatment, facial muscle physiotherapy was introduced to strengthen the muscles of mastication and the patient remained pain-free, which allowed the preparation and adaptation of a snap-on prosthetic appliance. In conclusion, the use of botulinum toxin in patients with temporomandibular disorder should be considered as a viable therapeutic option.

without systemic or permanent side effects.

Thus, the purpose of this case report was to evaluate the effectiveness of botulinum toxin as an adjuvant treatment for temporomandibular dysfunction and facial muscle aches.

**CASE REPORT**

A 55-year-old female patient complained of strong headaches in the last 10 years, pressure in the eyes, pain and fatigue in the masseter muscle, ringing in the ears, difficulty opening her mouth, lack of restful sleep because of severe headaches, severe wear and fractures of the lower teeth due to bruxism, loss of occlusal vertical dimension (OVD), severe bruxism, excessive irritability, tiredness and depression because of strong and constant headaches.

Her medical history included two surgical procedures in one year for the excision of a supraorbital osteoma on left side (Figure 1A and B) and the other for the placement of an aneurysm clip (Figure 1C). Both procedures required the displacement of the temporal and frontal muscles for access, which probably caused muscle imbalance and, consequently, her headaches increased to an unbearable level. She reported having undergone many different treatment approaches by different health professionals, including bite-raising appliances, different anti-inflammatory drugs, muscle relaxants, painkillers, all of which unsuccessful.

In a study of patients with chronic pain resulting from hyperactivity of the muscles of mastication, parafunctional movements and hypermobility disorders, considerable improvement (91%) was shown with the use of BTX-A, corroborating the effectiveness of this method on tackling facial pain associated to chronic muscle hyperactivity in patients that do not respond to conventional treatment approaches. A study with patients diagnosed with bruxism and myofascial pain in the muscles of mastication reported a significant improvement in the range of mandibular movements as well as in pain levels, both at rest and during mastication after using BTX-A. Some evidence suggest the analgesic effect of the toxin is often more important than its effect on motor control, which may explain the pain relief reported in syndromes that are unrelated to muscle spasm.

Side effects of TBX-A, such as nausea, dysphagia, allergy or the feeling of having caught a cold are transient and tend to disappear within a few days of application. Treatment with botulinum toxin is, however, contraindicated in patients with myasthenia gravis as well as pregnant and lactating women, Lambert Eaton syndrome, acquired autoimmune disease, patients using aminoglycosides or those with a history of allergy to the toxin.

Supported by the pain syndrome theory and temporomandibular disorders and knowing that the use of botulinum toxin promotes muscle relaxation, reducing muscle hyperactivity and therefore a decrease in pain, the application of BTX-A has been indicated as an effective therapeutic approach for orofacial pain and TMD without systemic or permanent side effects.

The RDC/TMD axis I questionnaire was applied as part of the diagnosis process and the patient was also...
referred to a neurologist to rule out any post-surgical nerve-related complications that she might have developed as sequelae.

Treatment options were discussed with the patient and a joint decision was made to BTX-A applications. The patient signed an informed consent form prior to starting treatment. BTX-A (Dysport 500U) was reconstituted in 1 ml of sterile 0.9% NaCl solution and maintained at 2-8 degrees centigrade until injected in the temporal (25U) and masseter (50U) muscles bilaterally in the region of greatest muscle mass because of muscular hyperactivity. Following application, the patient was instructed regarding possible side effects and was encouraged to rest for the first 4 hours avoiding massaging the injection site.

In the second week after the BTX-A application, a hard clear acrylic bite-raising appliance was fitted and the patient was instructed to using hot compresses for 20 minutes at least three times a day, keeping to a liquid and/or soft diet taking care not to open her mouth too wide. After the fourth week of treatment, cervical stretching exercises were introduced, combined with mandibular movement coordination exercises and cognitive behavioral therapy. The patient was monitored with regards to pain using the visual analog scale (VAS) to measure pain intensity on days 0, 3, 5, 30, 60 and 90 following administration of BTX-A.

Based on data obtained from the RDC questionnaire, the patient was classified as having muscular and joint TMD secondary to parafunction (bruxism), with limited mouth opening and disc displacement with reduction. Based on the pain scale, the patient reported the highest pain intensity (10) and that after 5 days of BTX-A application, a slight improvement was reported (8). After 30 days, a significant improvement was observed with pain reported at level 4, however the greatest improvement was noted after 60 and 90 days when the patient reported no pain at all (0) (Figure 2).

The patient also reported improvement in quality of sleep and a return to her normal diet. She was, however advised to avoid opening her mouth too wide and to continue with all her daily exercises at least three times daily.

After 12 weeks of treatment, exercises were intensified aiming at strengthening her muscles of mastication, with the patient still free of pain, which permitted the preparation and fitting of a snap-on prosthetic appliance (Figure 3A and B) to recover her OVD, which had been lost to tooth wear. Her occlusal splint was adjusted and the patient instructed to wear it only to sleep every other day.

DISCUSSION

Many treatment modalities for pain secondary to hypertrophy of the muscles around the TMJ, such as muscle stretching exercises to improve mouth opening, physiotherapy, acupuncture and ultrasound have been used with varying degrees of success. Botulinum toxin has shown effectiveness in orofacial pain from musculoskeletal disorders\(^\text{35}\). The local effect of BTX-A injected into the muscle is blocking muscles innervation consequently inhibiting acetylcholine release. This will weaken the target muscle, reducing contractility and dystonic movements. This effect is permanent in the neural plate, however, with time (3 to 4 months), recovery of neuromuscular function may occur due to the sprouting of new nerve endings from the original nerve, which will bypass the blocked neuromuscular region\(^\text{36}\).

Analgesia is not the result of muscle paralysis alone, but also from chemical neurolysis and anti-inflammatory effects\(^\text{20}\). The feeling of decreased pain persists even
after the sensation of muscle relaxation has disappeared and in some patients the analgesic effect persists after the average period of action of the toxin. Improvement, therefore, comes from both relaxation and local action through breakage of the chronic pain cycle.

The specificity of BTX-A to cholinergic neurons in the presence of specific receptors causes it to also inhibit other neurotransmitters, like norepinephrine in motor nerves as well as adrenaline, noradrenaline, bringing additional benefits in terms of pain relief. BTX-A also suppresses the release of substance P, a neuropeptide involved in neurogenic inflammation and in the genesis of pain disorders, as well as the release of glutamate, another neurotransmitter involved in peripheral nociception, acting on the dorsal horn of the spinal cord.

Pain management was deemed successful in the patient reported, due to the initial application of BTX-A, which played an important role in encouraging the patient to adhere to the treatment plan proposed, since her past experience with numerous unsuccessful attempts to resolve her severe headaches and facial pain had rendered her reluctant to see long treatment approaches through. Irritability and depressive symptoms were the result of strong constant pain and sleepless nights. As a result of the proposed treatment, early improvement in mouth opening was achieved, which permitted impressions to be taken for an occlusal splint and also to restore the balance of her stomatognathic system much more quickly. Other studies have reported success with the use of BTX-A for pain relief.

It is paramount to definitively pinpoint specific causative factors in order to effectively manage patients with pain. In this case, myofascial pain was part of muscular TMD, which is a rather challenging condition to diagnose and treat. Initial therapeutic options should be minimally invasive, reversible and conservative (Machado et al., 2012). Botulinum toxin application is mildly invasive and reversible after 4-5 months, with few side effect, thus making it an excellent option in dentistry and, in particular, TMD patients.

CONCLUSION

BTX-A is herein presented as viable alternative approach for patients suffering from TMD pain syndrome, since it was shown to be effective in controlling chronic facial pain associated with muscle hyperactivity, due to its powerful muscle relaxation properties and consequent decreased muscle contracture.

Collaborators

MAU HUAMANI, NS ARAUJO and MH NAPIMOGA, conceptualization. MAU HUAMANI, NS ARAUJO, formal analysis. MAU HUAMANI, methodology. MAU HUAMANI, LA MOREIRA, NS ARAUJO, MH NAPIMOGA and ME MIRANDA, writing - review & editing.

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