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Review Article

Applications of Botulinum Toxin in Dentistry: Considerations about Indications and Contraindications

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Abstract:

The application of botulinum toxin type A began in Ophthalmology, indicated for the control of periorbital muscle spasms. However, in view of the aesthetic result achieved secondarily, it has been widely spread in aesthetic and cosmetic indications. Nevertheless, it should be emphasized that botulinum toxin is a drug and has several therapeutic indications, besides the aesthetic ones. The purpose of this article is to present the several indications in Medicine and Dentistry, as well as the contraindications and care in its use.

Keywords: Botulinum Toxins, Type A; Drug Repositioning; Off-Label Use; Therapeutic Uses; Dentistry; Medicine.

Introduction

Currently, botulinum toxin has been widely indicated for aesthetic and cosmetic purposes. However, it was initially indicated in Ophthalmology, in periorbital muscle alterations such as strabismus. Due to the secondary results presented in the attenuation of periorbital wrinkles, applications were started in the high regions of the face, in the frontal, glabellar and periorbicular areas[1].

Botulinum toxin is indicated in hyperfunctional facial lines, most commonly seen in the frontal, glabellar, periorbital (latero-cantal), nose, upper lip, cheeks, and platysma regions[2,4-6]. However, it is worth mentioning that botulinum toxin has several therapeutic indications[2-4]. Facing the possible interference of the applications in the physiological functions of the face, including facial mime, the dental surgeon must be extremely skilled and careful[2].

Another care to be highlighted is the particularization of each case. Factors such as the gender of the patients can influence the decision making about the regions and amount of toxin to be applied. Male patients have greater muscle mass than females, needing greater amounts of toxin[5]. Regardless of the indications - aesthetic or therapeutic - patients and dental surgeons should discuss the case extensively, in order to avoid dissatisfaction or disappointment with the result.

The purpose of this article is to present the several indications in Medicine and Dentistry, as well as the contraindications and care in its use.

Discussion

Historically, and based on the evolution of science, it is possible to observe that indications in Dentistry are derived from indications in Medicine[1]. Therefore, the indications in Medicine will be presented here separately from the stomatological indications. Additionally, several indications in Medicine can be transferred to the field of Dentistry in the future.

Indications in Medicine

Botulinum toxin type A has been indicated in movement disorders, in cases of focal dystonia, with involuntary, spasmodic muscle activity. Tics; tremor; strabismus; blepharospasm; nystagmus; limb, truncal, cervical, laryngeal dystonia; and hereditary muscle colic have been reported[1-4,7,8].

Stroke, cerebral palsy, traumatic brain injury, multiple sclerosis, spinal cord injury, and other conditions that present spasticities, botulinum toxin has shown benefits in reducing muscle tone[1,2,4,8].

In conditions of smooth muscle hyperactivity, such as achalasia *cardia*, detrusor muscle sphincter disorders, and chronic anal fissure, the toxin has also been advocated[2,8].

In cases of crocodile tears syndrome, in which hyperlacrimation is observed, the application of botulinum toxin has been indicated[3,8].

In the nasal mucosa, when injected or superficially applied through sponges, botulinum toxin presents an effect in reducing nasal secretion in patients with allergic rhinitis who present runny nose (rhinorrhea). However, due to the dryness of the mucosa, epistaxis or nasal crusts have been observed as common adverse events[3].

In Plastic Surgery, botulinum toxin has been recommended for the removal of keloids and hypertrophic and hyperpigmented scars, applying it before elective interventions. The purpose is to reduce the movement of the edges of the surgical wound by chemical immobilization by the toxin, providing better repair of the region[1-4,7-10].

In Gastroenterology, botulinum toxin was cited for the relief of biliary pain symptomatology after colescistectomy, when applied in the sphincter of Oddi. Additionally, body weight reduction has been reported through the application of botulinum toxin within the gastric antrum, delaying gastric emptying and food intake[8].

Indications in Dentistry

There are several indications on spasmodic stomatological conditions such as peripheral facial paralysis; oromandibular and orolingual dystonia; involuntary movements such as myokinesis or synkinesis after facial nerve reconstruction in craniomaxillary surgical procedures or in oncologic patients with parotid gland tumors; myoclonus; hemifacial spasm; and palate tremor[1-4,7-10]. Synkinesis is characterized by synchronized, involuntary movements of certain muscles of the mimic, including the platysma, and are often seen in cases of facial paralysis[3,4]. In the lingual floor region in patients with oromandibular dystonia, the application of botulinum toxin should be avoided due to the possibility of causing adverse events such as dysphagia and dysphonia, and hyposalivation, if applied inside the glandular parenchyma[3,4,8]. Repetitive dystonic contractions of the soft palate muscles (palatopharyngeus, palatoglossus, salpingopharyngeus, tensor and elevator muscles of the soft palate), cause rhythmic elevation of the soft palate. The palatal tremor may cause swallowing and phonation disorders, including tinnitus, due to velopharyngeal insufficiency. In these applications, guidance by electromyography is recommended for adequate detection of the target muscle[3,8].

In conditions associated with the Autonomic Nervous System, such as hypersalivation or sialorrhea, botulinum toxin can be applied. In some neurological diseases (amyotrophic lateral sclerosis, Parkinson's disease, cerebral palsy); salivary gland alterations (Frey's syndrome, sialoceles, parotitis) or carcinoma of the upper digestive tract, patients lose the ability to swallow saliva, or keep it in the oral cavity. This can lead to aspiration of saliva, causing aspiration pneumonia[1-4,8,10]. Except in Frey's syndrome, all applications are performed percutaneously, injected inside the glandular parenchyma. The result of botulinum toxin application is reduced salivary flow or xerostomia. This is also the first manifestation of botulism, a characteristic that gave rise to investigations into the use of botulinum toxin in sialorrhea[4]. Facial or scalp hyperhidrosis has the same principle as the treatment of gustatory sweating[3].

Botulinum toxin has shown various benefits in cases of chronic orofacial pain, trigeminal nerve neuralgia, symptomatic bruxism (Figure 1), headache secondary to parafunctional habits[1-4,6-8,10]. In patients with bruxism or clenching, unilateral masseter hypertrophy can be observed, causing facial asymmetry. In these cases, the amount of toxin applied should be doubled on the hypertrophied side to, in addition to causing the therapeutic effect, result in muscle hypotrophy and subsequently facial symmetry[1,3-6,10].

Figure 1: *Botulinum toxin application in patient with bruxism*

Regarding temporomandibular joint (TMJ) dysfunctions, symptomatic or asymptomatic, botulinum toxin has been indicated in cases with reduced ability to open the mouth; trismus; recurrent dislocation of the TMJ; and masticatory hyperactivity[1-4,6-8,10]. Additionally, toxin can be employed in arthrocentesis, referring less invasive procedures compared to surgery[4]. Temporomandibular dysfunctions (TMD) can be classified as arthrogynous (related to the joints) or myofascial (related to muscle action). The latter, with indication for treatment with botulinum toxin[4]. TMD is frequent in patients with epilepsy, oromandibular dystonia, truncocerebral syndromes, late or early neuroleptic induced dyskinesias[4]. The application of botulinum toxin has shown muscle relaxation, analgesic and anti-inflammatory effects as the main benefits[4,8]. Preferably, these applications should be performed with the aid of electromyography or ultrasound, in addition to palpation[1,3,4,8,10-13].

Botulinum toxin has been widely applied in cases of muscular gummy smile (Figure 2), promoting upper lip dehiscence[1,4,5,10,14]. The etiology of the gummy smile is multifactorial, and can be gingival, skeletal, or muscular, determining the type of treatment employed. In gingival etiology, resective gingival surgery (gingivoplasty) is required, and in skeletal etiology, orthognathic surgery is necessary. Sometimes an association between treatments is necessary[10,15-20].

Figure 2: *Patient presenting gummy smile (A)*
Esthetic result 10 days after botulinum toxin application (B)

In patients who have suffered facial palsy with facial asymmetry, the contralateral injection of botulinum toxin in reducing relative hyperkinesia, resulting in improved symmetrical facial function[4]. The toxin can also be applied intentionally to cause eyelid ptosis to prevent corneal dryness[1,4,9,10]. Facial palsy can also cause sinsynesis, which has been discussed previously.

In Implant Dentistry, botulinum toxin has been used to prophylactically reduce the contraction force of the masseter and temporalis muscles after immediate implant loading, favoring osseointegration[1,7,10].

Recently, the application of botulinum toxin in facial aesthetics promoted the remission of oral lichen planus in a patient with low self-esteem favoring and increasing quality of life[21].

Contraindications

Botulinum toxin is contraindicated in cases of patients who are hypersensitive to the formula's components. Among the components, there are albumin and lactose[1,6,22].

Due to lack of scientific information, botulinum toxin should not be performed in pregnant and lactating women, and it is therefore contraindicated[1,2,4-6,8,22]. There is also no scientific information on the safe use of the toxin in children under 2 years of age. Low weight and the possibility of comorbidities were also considered in this population[1]. In Dentistry, it is recommended that children under 12 should not receive botulinum toxin applications[2].

Neuromuscular diseases such as Eaton-Lambert syndrome, myasthenia gravis, and amyotrophic lateral sclerosis can be potentiated by botulinum toxin and result in excessive muscle weakness, and are contraindicated[1,2,4-6,22,23].

Care should be taken or avoid application to the oral floor muscles in patients with respiratory or swallowing disorders. Dysphagia, bronchoaspiration, pneumopathy, and anaphylaxis causing death in patients with significant asthenia have already been reported in the literature[1,6,24].

Patients in whom aminoglycoside antibiotics (gentamicin, streptomycin, amikacin, tobramycin, paramycin, netilmicin, spectinomycin) and other drugs that interfere with neuromuscular transmission (non-depolarizing blockers such as curare, quinidine, magnesium sulfate, succinylcholine) are administered should not receive botulinum toxin applications[1,4-6,22,28].

Botulinum toxin should not be applied in patients who have pre-existing local infection at the application site[1,22].

Considerations and Precautions for the Use of Botulinum Toxin

There are no documented cases in the medical literature of allergic reactions caused by botulinum toxin. Reported adverse effects include application site reactions and headache. The latter is usually transient and yields to the common analgesic[1].

The choice of the commercial brand of botulinum toxin should be considered, since some brands contain small amount of human serum albumin, aiming to increase the stability of the toxin-protein complex. In this perspective, there is the possibility of transmission of prion disease (Creutzfeuld-Jakob disease)[1,6,27].

There is no need for dose reduction in patients with renal or hepatic impairment[1].

Patients with alterations in platelet aggregation, coagulation disorders, or on treatment with anticoagulant or platelet antiaggregant drugs should be weighed by considering intramuscular transdermal injection[1].

The psychological profile of patients should be evaluated, particularly those with unrealistic expectations or unrealistic fear of the toxin should be avoided[1,22].

The professional who prescribes botulinum toxin must have extensive knowledge about the anatomy of the region to be applied, avoiding possible complications, since these are considered technician-dependent[1].

Conclusions

Botulinum toxin is a drug that has therapeutic effects, in addition to those already established in aesthetics. It is important that the dental surgeon knows the several indications in Medicine and Dentistry, as well as its contraindications and care inherent to the applications, avoiding possible complications and future ethical and legal problems.

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