"Botox"– Enhancing Orofacial Esthetics

Dr Seema Grover [1], Dr Somesh Grover[2], Dr M. S. Sidhu[3], Dr Namrata Dogra[4] , Dr Ashish Dabas[5], Dr Vikas Malik[6]

[1]Professor,[2] Private Practitioner, [3] Professor and HOD, [4] Senior Lecturer,[5] Professor, [6]Reader

[1,2,3,4,5,6,7]Department of Orthodontics and Dentofacial Orthopedics ,SGT Dental College , Gurgaon, 123505, Haryana, India.

Abstract

There are some clinical situations which demands surgical and invasive procedures for achieving the esthetic and therapeutic goals. Conservative noninvasive treatment modality that is quick, easy, relatively inexpensive, long acting and effective by the healthcare providers is always welcomed. Botulinum toxin, a natural protein, is one of the most potent biological substances known which decreases the contractility of the muscles. It can be a useful in treating several conditions for the associated with excessive muscle contraction or pain. A sound knowledge of the chemistry, mechanism of action, dose, method of administration, indications, contraindications and precautions is requisite for achieving the optimal outcome. A growing number of dentists are now providing botulinum toxin, treatment for their patients for both oral and maxillofacial cosmetic and therapeutic use. The objective of this review is to discuss the emerging role of botulinum toxin in the treatment of various pathological conditions of dentofacial region.

Keywords: Botox, Botulinum, Gummy smile, Esthetics

Introduction

Botulinum toxin is a neurotoxic protein produced by fermentation of anaerobic bacteria *Clostridium botulinum*. Botulinum toxin is synthesized as a large single-chain peptide. Activation of BTX requires a two-step modification in the tertiary structure of protein. This process converts single chain neurotoxin to a di-chain neurotoxin comprising a 100,000-Da heavy chain (HC) linked by a disulfide bond to a 50,000-Da light chain (LC). BTX acts at neuromuscular junction where it exerts its effect by inhibiting the release of ACH from the presynaptic nerve terminal.

Botulinum toxin occurs in seven known serotypes labeled A-G produced by different strains of *Clostridium botulinum*.[1]. Clinically important biologic activity, particularly in the cosmetic arena, is limited primarily to the type A serotype, although a type B formulation is approved in several countries for treating cervical dystonia. Although botulinum toxin type B has been extensively researched for cosmetic use, it generally elicits more pain upon injection and has been found to have a faster onset but shorter duration of action than the type A serotype.[2]

Over the last two decades, Botox (trade name of botulinum toxin) has been approved by the Food and Drug Administration (FDA) for therapeutic treatments of eye muscle problems (in 1989), neck problems (in 2000), and excessive sweating (in 2004). In 2002, the FDA approved Allergan's Botox application in cosmetics for erasing temporarily facial lines.\

Mechanism of Action\

Botox decreases muscle activity by blocking overactive nerve impulses that triggers excessive muscle contractions or glandular activity. Botox A weakens skeletal muscles by cleaving the synaptosome associated protein SNAP-25, thus blocking the release of acetylcholine from the motor neuron and enabling the repolarization of the postsynaptic terminal. As a result, the muscular contraction is blocked. The production of acetylcholine is not affected by this blockade of the neuromuscular transmission.

Method of Formulation and Storage

Serotype A is the only commercially available form of botulinum toxin for clinical use, although experience is emerging with development of other serotypes; B, C, and F preparations.[3] Two preparations of botulinum toxin A exist: Dysport and Botox. Recently, it has been shown that a unit of Botox is three times as potent as a unit of Dysport.[4] Botox is stored in freezer at or below - 5°C.

There are two sizes of vials available in India, 100 and 50 units.[5] The package recommends reconstitution using sterile saline without preservative; 0.9% sodium chloride is the preferred diluent. Botox is denatured easily by bubbling or agitation; gently inject the diluent onto the inside wall of the vial and discard the vial if a vacuum does not pull the diluent in. Theoretically, more concentrated solutions reduce reliability in delivering a specific unit dose, and more dilute solutions lead to greater diffusion of the toxin.[6] Once reconstituted, Botox is kept refrigerated at 2-8°C. The reconstituted Botox should be used within 4 hours.

Method of administering botulinum toxin

Botulinum toxin is injected into affected muscles or glands using a 30 gauge 1 inch needle. Doses are tailored according to mode of use and individual patients, and the dose depends on the mass of muscle being injected. The larger the muscle mass, higher the dose required. However, lower doses may be required in patients with pre existing weakness and in females.

Applications of Botulinum toxin Injections in Dentistry

Botulinum toxin has various indications which includes; Tempromandibular disorders (TMD's), extracapsular myogenic pain caused by masticatory muscle hypertonicity, secondary dental pain, trismus, adaptation to rapid change in vertical dimension associated with oral prostheses, elimination of bruxism, sialorrhea, hemifacial spasm, masseter hypertrophy, gummy smiles (injecting levatoranguliorisalaequenasi), sialorrhoea associated with stroke or parkinson's disease, speech & voice disorders.[7,8]

Esthetic Correction

The best orthodontically treated subjects may not be satisfied the treatment, if soft tissue problem is not corrected. When an excess of gingiva superior to the maxillary anterior teeth is displayed upon full smile, it is termed a gummy smile. Etiological factors involved in the formation of a gummy smile can be, Skeletal (vertical maxillary excess), Gingival (passive eruption) or Muscular (hyperfunctional upper lip) and treatment options range from Le fort I osteotomy, crown lengthening, intrusion, myectomy to muscle resection.[9]

Botox is indicated when the gummy smile is due to a hyperfunctional upper lip elevator muscles (muscular capacity to raise the upper lip is higher than average).

Procedure for injection:

For correction of a gummy smile, Botox is injected into the hyperactive elevator muscles of the lip blocking excessive contractions and, thus, preventing the lip from being pulled too far up while smiling. It will be important for the patient to avoid taking aspirin or related products, such as ibuprofen or naproxen if possible after the procedure to keep bruising to minimum. Prior to injection, reconstitute vacuum dried botox with sterile normal saline without a preservative; 0.9% Sodium Chloride Injection is the only recommended diluent.

Draw up the proper amount of diluent in the appropriate size syringe, and slowly inject the diluent into the vial. Botox should be administered within four hours after reconstitution. During this time period, reconstituted Botox should be stored in a refrigerator (2° to 8°C). Reconstituted Botox should be clear, colorless and free of particulate matter.

Mario Polo[9] has advocated injection of Botox at levator labii superioris (LLS), levator labii superioris alaeque nasi (LLSAN), LLS/ zygomaticus minor (ZM) overlap and in severe cases at depressor nasii and orbicularis oris (OO) also. The ideal dosage might be 2.5 U per side at the LLS & LLSAN, 2.5 U per side at the LLS/ZM sites, and 1.25 U per side at the orbicularis oris (OO) sites.

Recently Hwang et al[10]; Yonsei University College of Dentistry, Seoul, Korea [11] have

proposed an injection point for botulinum toxin A, and named it as YONSEI POINT and they recommend a dose of 3U at each Yonsei point. Yonsei point is located at the centre of the triangle formed by levator labii superioris [LLS], levator labii superioris alaeque nasi [LLSAN], and zygomaticus minor [ZMi].

Treating masticatory muscle hypertonicity

Certain conditions can cause an increase in sympathetic muscle tone. These conditions include stress, hormones, diet, drugs, trauma, and certain neuromuscular diseases. The increased tone affects the trigeminal center in the brain, which stimulates the masticatory closing muscles causing masticatory muscle dystonia recognized as masticatory muscle hypertonicity and parafunction[11].

Traditionally, dentistry has attempted to treat and prevent this transient disease with methods that are expensive, risky, irreversible, and not evidence-based. These include analgesics, splints, moist heat, exercises transcutaneous electrical nerve stimulation, muscle relaxants, low-dose tricyclic antidepressants, local anaesthetics, alpha adrenergic receptor antagonists, occlusal adjustments, full mouth rehabilitation, orthodontics, orthognathic surgery, or a combination of these treatments.

Botox B has been approved by the FDA for the treatment of cervical dystonia, and is marketed under the name Myobloc in the United States and Neurobloc in Europe (Solstice Neurosciences Inc, South San Francisco, CA, USA). The current treatment protocol ranges from one injection of 7.5 U bilaterally into the anterior vertical fibres of each temporalis muscle. In more severe cases, additional injections of 2.5 U are given into the middle and posterior third of the temporalis muscles. Treatment begins with lower doses because it is always possible to titrate up to a higher dose if necessary.

The massetric component of pain is treated with 5 U injected into the belly of the masseter below an imaginary line joining the tragus of the ear and the corner of the mouth. Pain relief from the tendon of temporalis is achieved with multiple injections of 2.5 U equidistantly spaced in the temple area outside the orbital rim of the eyes.

Treatment of masseter hypertrophy

Masseter hypertrophy is a benign condition with variable causative factors, such as bruxism, temporomandibular disorders, malocclusion and others, but has an unclear etiology in the majority of cases. Surgical masseteric resection was the conventional method of treatment for asymmetric swellings over ramus and angle of mandible on one or both sides, in addition to the generally unsuccessful treatments of occlusal adjustment, splint therapy, tranquilizers or others

The use of botulinum toxin type A in masseter muscle hypertrophy therapy was shown to be a successful and safe treatment method.[11]This procedure to control parafunctional activities involving the masticatory muscles of patients appears to be useful. The possible complications of this procedure are external scar and damage to the mandibular branch of the facial nerve, change in bite force, speech disturbance, muscle pain, facial asymmetry, and prominent zygoma

Bruxism

Bruxism is the general term that refers to both clenching and grinding of the teeth. There is no question that bruxism leads to the destruction of otherwise healthy dentition, exacerbates periodontal disease, causes TMD and is the cause of headaches and facial pain. Traditionally, intraoral appliances have been the treatment of choice for bruxism with good success as to relieving some or all of the symptoms.[12]

Botox A products can be used routinely in patients with bruxism and TMD patients. Bilateral injections of botox A are given into the masseter and temporalis muscles. Using the right amount of botox A will reduce the intensity of contractions of these muscles of mastication as well as give your patient full competence for chewing, eating properly and speaking. The relief afforded to patients by botox A neurotoxins can help eliminate facial pain, grossly reduce their TMD symptoms and can significantly help the other associated treatments of periodontal disease by removing the bruxism element.[13]

Orthodontic Therapy

Many times it seems that dental practitioners forget about the muscles once the teeth are set after orthodontic therapy has taken place. Relapse has been a continual problem for many general and orthodontic dental practitioners and there are a number of theories as to why this happens. There are so many patients who have a hyperactive mentalis muscle that might be disrupting the alignment of the teeth. Botox A neurotoxins can reduce muscle contraction intensity, and over time, muscles can be trained to work normally. This idea could revolutionize how we deal with orthodontic relapse as dental practitioners become more familiar with the use of botox -A neurotoxins.

For treatment of Speech & voice disorders

Speech and voice disorders especially spasmodic dysphonia are benefitted from botox A therapy. Spasmodic dysphonia is a focal dystonia of the *larynx* with characteristic interruptions in voice and visible true and false vocal fold spasms when the larynx is visualized during running speech.

Many treatments have been advocated, including voice therapy, recurrent laryngeal nerve section, laryngeal framework surgery, and selective denervation. Over the past decade, the treatment of choice for most patients has been botulinum toxin injections into the muscles of the larynx. This temporarily weakens or paralyzes these muscles, which reduces or eliminates the spasms. The procedure is simple and easily accomplished in the office setting, and has had predictably good results.

Need for additional injections

Effect of botox is seen within 5-10 days and lasts about 6 months, with a range of 4 to 8 months, at which time the patient can return to repeat the process. It is important not to give injections prematurely (before the effects of the treatment have worn off), as this can result in a build up of antibodies to botox that would dilute the effect of further treatments.

Contraindications include; During pregnancy or while breast feeding, Presence of inflammation or infection at the site of proposed injection, hypersensitivity or allergies to human albumin, botox or saline solution, motor neuropathy, neuromuscular disorders such as amyotrophic lateral sclerosis, myasthenia gravis, Lambert-Eaton Syndrome, muscular dystrophy, multiple sclerosis etc., Aminoglycoside antibiotics because aminoglycosides may interfere with neuromuscular transmission and potentiate the effect of botox therapy and patients with calcium channel blockers.

Side effects include nausea, localized pain, infection, inflammation, tenderness, swelling redness, and/or bleeding/bruising. **The main advantages of botox are;** Psychological benefit to the patient, minimally invasive. **Disadvantages include** Short term effect, asymmetrical/unnatural appearance of smile sometimes due to improper injection technique, and cost factor.

Conclusion

Botox therapy is a conservative, minimally invasive treatment that can expand our therapeutic options for the benefit of our patients and is a natural progression. Awan KH reported that there has been evidence supporting the efficacy of Botox in the treatment of laryngeal dystonia, headache, cervical dystonia, masticatory myalgia, sialorrhoea, temporomandibular joint disorders, bruxism, blepharospasm, hemifacial spasm and rhinitis.[14]General dentists and specialists can easily accomplish these procedures with proper training.

References

1. Aoki KR, Guyer B. Botulinum toxin type A and other botulinum toxin serotypes: A comparative review of biochemical and pharmacological actions. Eur J Neurol 2001;8(Suppl 5):21-29.
2. Flynn TC, Clark RE. Botulinum toxin type B (Myobloc) versus botulinum toxin type A (Botox) frontalis study: Rate of onset andradius of diffusion. Dermatol Surg 2003;29(5):519-522.
3. Jankovic J, Brin MF. Botulinum toxin: Historical perspective and potential new indications. Muscle Nerve Suppl. 1997;20:129–145.
4. Odergren T, Hjaltason H, Kaakkola S, Solders G, Hanko J, Fehling C, et al. A double blind, randomised, parallel group study to investigate the dose equivalence of Dysport® and Botox® in the treatment of cervical dystonia. J Neurol Neurosurg Psychiatry. 1998;64:6–12.
5. Hurkadle JK, Jatania A, Shanthraj R, Lakshmi B, Subbiah P, Linga S. Botox: Buy Me Beauty!. J Orofac Res 2012;2(3):160-164.
6. Ranoux D, Gury C, Fondarai J, Mas JL, Zuber M. Therapy with Botulinum Toxin. J Neurol Neurosurg Psychiatry. 2002;72: 459–462.
7. Hoque A., Mc Andrew M. Use of botulinum toxin in dentistry. N Y State Dent J 2009;75(6): 52-55.
8. Azam A., Manchanda S., Thotapalli S., Kotha SB. Botox therapy in Dentistry: A Review. J Int Oral Health 2015;7:103-105.
9. Polo M. Botulinum toxin type A in the treatment of excessive gingival display. Am J Orthod Dentofacial Orthop 2005;127:214-218.
10. Huang WS et al. Surface anatomy of the lip elevator muscles for the treatment of gummy smile using botulinum toxin. Angle Orthod.2009 Jan;79(1):70-77.
11. Katz H. Botulinum toxins in dentistry--the new paradigm for masticatory muscle hypertonicity. Singapore Dent J. 2005 Dec;27(1):7-12.
12. Benedetto AV. Asymmetrical smiles Corrected by botulinum toxin Serotype A. American Society for Dermatologic Surgery 2007;33:S32-S36.
13. Song PC et al. The emerging role of botulinum toxin in the treatment of temporomandibular disorders. Oral Diseases 2007 13, 253–260.
14. Awan KH. The therapeutic usage of botulinum toxin (Botox) in non-cosmetic head and neck condition- An evidence based review. Saudi Pharm J 2017;25(1):18-24.