

REVIEW ARTICLE

“BOTOX: TALES BEYOND BEAUTY”

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ABSTRACT: BOTOX is a trade name for “botulinum toxin”, which comes in the form of a purified protein. There are seven distinct serotypes of botulinum toxin, viz., A, B, C, D, E, F, and G. Botulinum toxin A is the most commonly used form. The toxin inhibits the release of acetylcholine (ACH), resulting in temporary reduction of tone in the injected muscle. Apart from common cosmetic treatment for lines and wrinkles on the face, it has some therapeutic uses in diseases like temporomandibular disorders, bruxism, periodontal diseases, clenching, masseter hypertrophy. It is also being used to treat functional or esthetic dental conditions like high lip line, deep nasolabial folds, radial lip lines and black triangles between teeth. Botox therapy is a conservative, minimally invasive treatment that can expand the therapeutic options for benefit of the patients.

KEYWORDS: Botulinum toxin type A, Black triangles, Bruxism, Periodontal diseases, Temporomandibular Disorders.

INTRODUCTION: Many of us think of “Botox” primarily as a cosmetic treatment for wrinkles on the face, but “Botulinum toxin” that Botox is derived from has a long history of therapeutic uses. The very first clinically approved uses of Botox back in 1989 were not cosmetic at all. For nearly 13 years, until the introduction of botox cosmetic in 2002, the only FDA-approved uses of botox were for strabismus and blepharospasm.

Commercially available botulinum toxin is a purified exotoxin of the anaerobic bacteria “Clostridium botulinum”. Botulinum is a neurotoxin that can cause serious paralytic illness “Botulism”. Although it is a lethal, naturally occurring substance, it can still be used as an effective and powerful medication.¹

Forms of Botox: Seven types of botulinum toxins have been isolated but only two types A and B have been made commercially available. Three forms of Botulinum toxin A (Botox, Dysport and Xeomin) and one form of Botulinum toxin B (Myobloc) are available commercially from various cosmetic and medical procedures.²

Each Vial of Botox Contains:

- 100 units of clostridium botulinum type a neurotoxin complex.
- 0.5 mg of albumin human.
- 0.9 mg of sodium chloride in a sterile, vacuum dried form without a preservative.

Mode of Action: This toxin acts by preventing the release of acetyl choline from presynaptic vesicles at the neuromuscular junction resulting in an inhibition of muscular contraction.³ This blockade is temporary, 3-4 months after which sprouting of new axon terminals results in a return of neuromuscular function.⁴

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Therapeutic Applications: Type A is used for treatment of cervical dystonia, severe primary axillary hyperhidrosis, blepharospasm and temporary improvement in the appearance of moderate to severe glabellar lines.⁵⁻⁷ Type B has been approved for cervical dystonia treatment.

Clinical Technique: Botulinum toxin A is kept frozen (2–4°C) in a vial until it is ready to use. The prepared toxin is diluted with sterile saline, then administered to key muscle points via small injections. The material spreads no further than the size of a dime or nickel from the injection site. Once prepared it should be used within four hours. The preferred syringe is a calibrated 1.0-mL tuberculin syringe, and the needle selected for injection usually is between 26 and 30 gauge. Site preparation involves alcohol wipes and dry sterile gauze sponges. Aspiration before injection is recommended to avoid involuntary deposition of toxin into the facial arteries. Botulinum Toxin A achieves close to immediate results in one short appointment, but the results are not permanent and last for 6 months, with a range of 4-8 months.^{8,9}

After treatment, the patient should avoid lying down for the first 4 hours. Exercise and sun exposure must be avoided for an additional 24 hours. Any other activities that manipulate the skin or can cause skin flushing like massage, heat packs, alcohol consumption, and tanning should also all be avoided during that time.

Botulinum toxin needs to be administered 2-3 times a year depending upon the declination of its effect. The therapeutic effects of Botulinum toxin A, first appear in 1 to 3 days, peak in 1 to 4 weeks, and decline after 3 to 4 months.¹⁰ Therefore, Botulinum toxin injections are needed to be administered 2-3 times a year. Injections are spaced out for a minimum of three months to minimize the risk of antibody formation to the protein, which would prevent Botox from working the subsequent time.¹¹

APPLICATIONS IN DENTISTRY: From treatment point of view any restoration procedure that affects the support of lips, the amount of anterior tooth and gingival display, will impact the treatment outcome. But the question is what has botox got to do with dentistry and how can it possibly have any relationship to our patient's health?

Botox can be used to compliment esthetic dentistry, as a minimally invasive alternative to surgically treat high lip line cases, denture patients who have trouble adjusting to new dentures, lip augmentation, and in orthodontic cases where retraining of facial muscles is necessary. Botox also has a clinical use as an adjunct in temporomandibular joint and bruxism cases and patients with facial pain.

Gummy Smile: Gummy smile is both a cosmetic and an oral hygiene issue which could be difficult to treat. The most common treatment is surgical correction which includes gingivectomies and/or Le Fort I maxillary osteotomies with impaction for skeletal vertical maxillary excess.¹²

Botulinum toxin should be injected in small, carefully titrated doses to limit muscular over-contraction of upper lip, thus reducing exposure of the upper gums when smiling.¹² Hwang et al. proposed an injection point named as "Yonsei point" for botulinum injection.¹³ It is a point located at the centre of triangle formed by levator labii superioris, levator labii superioris alaeque nasi and zygomaticus minor. A dose of 3U is recommended at each injection site.

Dentofacial Aesthetics: Botox can also be used in a lip deformity where the lip raises more on one side than the other. It is also used in the treatment of "black triangles" which is a common and

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challenging aesthetic problem. Dermal fillers can be injected into the interdental papilla to plump it and close the interdental space. Treatment outcome usually last for eight months or longer after which the treatment needs to be repeated.

Dental Implant and Other Oral Surgery: Overloading of the muscles of mastication can prevent the osseointegration of implants and/or fracture callus formation.¹⁴ The muscular relaxation achieved with botulinum toxin type A injections to the masticatory muscles can be therapeutically beneficial and will allow better osseointegration and fracture healing in a more stable environment.

Botox and Periodontal Diseases: Recent studies indicate there is a strong relationship between stress, depression and periodontal disease. Stress and depression can reduce the immune system and facilitate chronic inflammation, mediated through the hypothalamic-pituitary adrenal axis. Furthermore, in April 2009, Dr. Michael Lewis an experimental psychologist at Cardiff university wales found the patients who have their from lines treated with Botox tend to be happier.

This result was not related solely to the satisfaction they gained from a perceived improvement in their appearance as patients who had other types of facial enhancement procedures performed did not have the same change in their “happiness rating” .It would appear that our emotions are reinforced, perhaps even derived by our corresponding facial expressions and that decreasing our ability to scowl or from results in a more positive mood. Though its influence on depression, Botox treatment may affect the health of the periodontium.

Bruxism: Treating severe bruxism with botulinum A helps limit the over-function of the muscles responsible for chewing. The treated muscles typically display a partial reduction in over-function within 2-3 days with maximal reduction 1-2 weeks after treatment.¹⁵ One of the earliest reports on use of botulinum toxin type A for bruxism was by Van Zandijcke and Marchau¹⁶ who described the successful treatment of a brain-injured patient with severe bruxism with 100 U of a botulinum toxin type A injections to the temporalis and masseter muscles.

Temporomandibular Disorders: Temporomandibular disorders are often intermingled with other chronic pain disorders including fibromyalgia, chronic fatigue syndrome or tension type headache. These symptoms can originate from the tissues of the joints themselves or the related musculature. Botulinum toxin can be a useful adjunct, especially in cases involving muscular hyperactivity. It also the treatment of dystonia, masticatory muscle hyperfunction, myofascial pain and to some extent, bruxism.¹⁷⁻¹⁹ Similarly it can act as an adjunct to appropriate physical therapy in some cases of whiplash injury.²⁰

Masseteric Hypertrophy: Patients who are chronic jaw clenchers frequently present with masseter hypertrophy.²¹ In several small but well-documented clinical trials, the injection of small aliquots (e.g., 30 U per side) of Botox into the masseter muscles resulted in a sustained reduction of masseter hyperactivity.²²⁻²⁴ Over time, in most patients, reduction in masseter hyperactivity has been found to yield a concomitant reduction in gross masseter size (maximum reduction 35.4%).²¹

Mandibular Muscle Spasm: Botulinum toxin treatment to the masticatory musculature diminishes the effects of hyperfunctional or spastic muscles.²⁵

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Oromandibular Dystonia: Oromandibular dystonia (OMD) is a movement disorder characterized by involuntary spasms and muscle contractions. Studies have reported improvement with botulinum toxin injections.²⁶ Botulinum toxin A was injected into the masseters and/or the submental is complex. Improvement in function for chewing and speaking was reported in 67.9% of the patients, and mean duration of clinical improvement was 16.4±7.1 weeks.

Pathologic Clenching: Botulinum toxin a limits the muscle contraction, and this reduction in clenching intensity will allow better reattachment of gum and bone after trauma. It can also limit clenching before and after periodontal surgery to improve healing. Further, in this application, the use of a splint is often contraindicated because the teeth should be functional during healing, so botulinum toxin acts as a pharmaceutical splint.

Orofacial Pain Disorders: Although research is still ongoing, there may be a place for it in the management of some forms of headache, migraine and tension type in particular where the more common therapeutic modalities have been unsuccessful.^{27,28}

OTHER USES:

- **Sialorrhea:** Botulinum toxin can block cholinergic parasympathetic secretomotor fibers of the salivary gland. Hence, botulinum toxin has been tested in some autonomic disease, such as achalasia, hyperhidrosis and gustatory sweating (Frey syndrome).²⁹
- **Trigeminal Neuralgia:** Botox 25–75 U injected into pericranial muscles relieves headache by relaxing the over active muscles and decreases pain associated with inflammation of the trigeminal nerve of the head and face can.³⁰
- **Complete Denture Patients:** Botox can be used in patients with a new denture especially if the patient has long edentulous history and has decreased vertical dimension.
- **Retraining Muscles during Orthodontic Treatment:** Botox can be used to prevent relapse of orthodontic treatment in patients with stronger muscle activity such as that of mentalis muscle. It can also reduce the intensity of the muscle after treatment and the muscle may be retrained to a more physiological movement.
- Higher doses of botulinum toxin type A may potentially be used as a pharmaceutical splint, limiting muscle contraction before resetting and during rehabilitation after fracture of a facial bone.
- Botulinum toxin type A can be used to verify whether the pain is muscular or pulpal (e.g., complex toothache) in origin in patients with chronic intermittent toothache. In this context, the use of botulinum toxin type A is both prophylactic as well as diagnostic.

ADVERSE EFFECT: "Only the Dose makes a Remedy Poisonous": Side effects are uncommon and relatively mild and transient more common at or near the site of injection. Mild stinging, burning or pain with injection, edema and erythema, dry mouth, dysphagia, dysphonia, transient muscle paralysis, headache, urticarial and nausea are some transient adverse effects. Bacterial or fungal infection can also be a risk if the injection sites are not kept clean and free of make-up, sweat, and dirt during the first 24 hours. Other botulinum like symptoms include muscle weakness, hoarseness or dysphonia, dysarthria, loss of bladder control, difficulty swallowing, double or blurred vision and drooping eyelids.¹¹ These can occur anywhere from day one to several weeks after treatment at unrelated sites.³¹ These complications are generally transient, and resolve within a couple of weeks.

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Contraindication: Patients that should not be treated or treated with extreme caution are:

- Psychologically unstable patients who have questionable motives and unrealistic expectations.
- Taking certain medications that can interfere with neuromuscular impulse transmission and potentiate the effects of Botulinum (e.g., aminoglycosides, penicillamine, quinine, and calcium blockers).
- Patients with a neuromuscular disorder.
- Allergic to any of the components.
- Pregnant or lactating (Botulinum toxins are classified as pregnancy category C drugs).

DISCUSSION: Botox injections have been widely acclaimed for their short-term, anti-ageing properties. The procedure has gained popularity as it is non-invasive, leaves no scars and the recovery period is low. Several medical disorders are also being treated with the help of Botox. It is also used to complement aesthetic dentistry cases, as a minimally invasive alternative to surgically treating high lip-line cases, for denture patients who have trouble adjusting to new dentures, periodontal cases, gummy smiles, lip augmentation, and also for orthodontic cases where retraining of the facial muscles is necessary.¹²

Hands-on training is essential in learning proper techniques of administration and intertwining them with dental treatment plans. With proper training, dentists are usually more proficient than any of other healthcare professionals in providing these treatments to patients, both for dental and cosmetic needs. The Indian Academy of Facial Aesthetics (IAOFE) in conjunction with the American Academy of Facial Aesthetics (AAFE) is also offering Botox and dermal fillers training course for dentists and physicians.

CONCLUSION: “Great Botox” application requires steady hands, the eye of an artist, and the innate ability to get it right. Although the drug is considered generally safe, there are a number of uncommon, relatively mild adverse reactions.

“You can teach an Old Dog New Tricks”: Training is absolutely necessary for dentists to administer injections, but learning curve is very short, because dentists can already achieve profound anesthesia in the orofacial region, thus making patient more comfortable and at ease. The practitioner must ensure that the treatment is within his or her scope of practice and that he or she has the appropriate training, not only to administer the drug but to deal with potential adverse effect.

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