

Botox: Widen Vista of Prosthodontics

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Abstract

Botulinum toxins have made their way into Dentistry specially in Prosthodontics for both dental esthetic and therapeutic uses. They are here to stay and with more intraoral uses of these materials, they are fast becoming an integral part of everyday dental practice. Botox is a neurotoxin derived from bacterium *Clostridium botulinum*. Botulinum toxin inhibits the release of ACH, a neurotransmitter responsible for the activation of muscle contraction and glandular secretion, and its administration results in reduction of tone in the injected muscle. They provide most significant, minimally invasive procedure at low cost with limited recovery time. Today Botox go for rejuvenative and cosmetic procedures. This review article explains the basics of botulinum toxin and its extensive and detailed uses in prosthodontics

Key words: Botox, Bruxism, Chemodenervation, Cosmetic, Prosthodontics, TMJ Disorders

Introduction:

In prosthodontics, Botulinum toxins are used for the treatment of trismus, parafunctional clenching, temporomandibular disorder, and in the associated headaches, it is a new option for symptom relief in patients in whom conventional treatments are not effective.^{1,2} Botulinum toxin which is available in the market is purified exotoxin of the anaerobic bacteria, *Clostridium botulinum*. This neurotoxin is the cause of serious paralytic illness, botulism. Seven types of botulinum toxins are found but only two, Types A and B, have been made commercially available.

Initially, only botulinum toxin A was available commercially on prescription but more recently, Type B also available in the market.³

Three forms of botulinum toxin type A (Botox, Dysport and Xeomin) and one form of botulinum toxin type B (MyoBloc) are available commercially for various cosmetic and medical procedures.⁴

Each vial of BOTOX contains:

1. 100 Units (U) of *Clostridium botulinum* type A neurotoxin complex,
2. 0.5 milligrams of Albumin Human,
3. 0.9 milligrams of sodium chloride in a sterile, vacuum-dried form without a preservative.

Mechanism of Action:

Injecting overactive muscles with minute quantities of botulinum toxin type-A results in decreased muscle activity. Botulinum toxin type-A inhibits the exocytosis of acetyl choline on cholinergic nerve endings of motor nerves,^{4,5} as it prevents the vesicle where the acetyl choline is stored from binding to the membrane where the neurotransmitter can be released. Botox achieves this effect by its endopeptidase activity against SNARE proteins, which are 25-kd synaptosomal associated proteins that are required for the docking of the ACH vesicle to the presynaptic membrane.⁶ Botulinum toxin type-A thus blocks the release of acetyl choline by the neuron. This effectively weakens the muscle for a period of three to four months.⁷

Preparation of Botox:⁸

Botox is prepared by laboratory fermentation of *C botulinum*, which lyses and liberates the toxin to the culture. The toxin is then harvested, purified, crystallized with ammonium sulfate, diluted with human serum albumin, lyophilized, bottled in vials, and sealed. Each vial contains 100 U of Botox. The human lethal doses are approximately 3,000U. Botox dosages used for cosmetic purposes are less than 100 U. Optimal pH of the solution is between 4.2

and 6.8, and vials should be stored at or below -5°C .

Preparations should be reconstituted with 1-5 ml of saline without preservatives just before use. Because Botox is easily denatured via bubbling or agitation, the diluents should be gently injected in to the inside wall of the vial. The constituted solution should be refrigerated at $2-8^{\circ}\text{C}$ and used within 4h.

Side Effects of Botox Therapy:^{9,10,11}

1. Temporary side effects like fever, palpitations, tingling sensations and nausea which usually subside within 1-2days.
2. Temporary partial weakness of the injected muscle.
3. Muscle soreness for few days after injection.
4. If Botox is injected for a longtime, it may cause atrophy of the muscle injected which can be reversible if the Botox therapy is discontinued.
5. Edema around the injection site.
6. Mild, localized and transient headache.
7. Ecchymosis lasting 3 – 10 days.
8. Numbness and paresthesia.
9. Mild malaise and myalgias.
10. Occasional vomiting.

Contraindications:^{10,12}

1. Psychologically unpredictable patients who are unstable and have unrealistic expectations.
2. Patients dependent on intact facial movements and expressions for their livelihood (Eg: actors, singers, musicians and media personalities).
3. Patients with neuromuscular disorder (Myasthenia gravis, Eaton-Lambertsyndrome).
4. Patients allergic to any components of Botox Type A or TypeB.
5. Medications like aminoglycosides, penicillamine, quinine and calcium blockers. that potentiate the effects of Botox by interfering with neuromuscular impulse transmission.
6. Pregnant or lactating mothers.

Prosthodontic Applications:

Gummy Smile: The visibility of excessive gingival tissue in the maxilla upon smiling, or“gummy smile, ”is both an oral hygiene and cosmetic issue with no simple alternative. Excessive gum exposure is frequently attributable to over-contraction of the upper lip muscles, particularly the levator labii Superioris alaeque nasi. 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. An injection point for botulinum toxin is basically 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 injectionsite.⁴

Facial Aesthetics: Botox injection along with dermal fillers are also used to enhance facial aesthetics by increasing the volume around the mouth such as the nasolabial folds, marionette lines, creating smile lines and lip-line.^{10,13}

Correction of lip deformity: Botox along with dermal fillers are also used to correct lip deformities where there is sagging of the lip on one side. This is the most challenging esthetic problem for the dentist.^{10,13}

Treatment of Black Triangles: Dermal fillers are injected into the interdental papilla between the teeth or dental implants to increase the tissue volume by puffing up the tissue and close the black triangles.¹³

Dental Implants: Overloading of the muscles of mastication can prevent or impede osseointegration of implants and/or fracture callus formation. The muscular relaxation achieved with botulinum toxin type A injections to the masticatory muscles can be therapeutically beneficial by allowing implants better unimpeded osseointegration

and fracture healing in a more stable environment.⁴

Removable Prosthodontics: Botox is also used in patients with a new denture specially in cases of long history of edentulousness and a decreased vertical dimension.¹⁰ 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 (e.g., fractured mandibular condyle).⁴

Bruxism: Botulinum neurotoxin has also shown promise in alleviating the symptomatology of bruxism. Van Zandijcke and Marchau, in their research, have described the successful treatment of a brain-injured patient with severe bruxism with 100U of a botulinum toxin type A injections to the temporalis and masseter muscles.¹⁴

TMJ Disorders: Temporomandibular disorder (TMD) is a term used to describe a number of diseases affecting masticatory function, which may include true pathology of the temporomandibular joint as well as masticatory muscle dysfunction. TMD manifests with facial pain, joint sounds, headache, peri-auricular pain, neck pain, and/or decreased jaw excursion. Most of the TMD cases include a myogenic component

and muscular spasticity secondary to bruxism, external stressors, psychomotor behaviours and temporomandibular dystonia are common aetiologic factors of temporo-mandibular disorders.

Temporo-mandibular disorders caused by excessive biting forces has conventionally been treated with intraoral appliances (occlusal splints), occlusal adjustments, dental restoration, and/or surgery. These techniques are invasive, irreversible, and expensive for the majority of patients.

Techniques currently available for aesthetic, conservative restorations may not withstand the parafunctional forces constantly applied by some patients.⁴ Thus, many of these treatment options are not ideal for all patients, and muscular relaxation with botulinum toxin A is a viable alternative. When a muscle relaxant is used with the muscles of mastication, this clenching reflex can be reduced or eliminated.¹⁵ Because a very small percentage of available force is required to masticate food, as light relaxation of muscle function reduces bruxing and is usually insufficient to affect chewing and swallowing.¹⁶

Conclusion

Botox has important clinical uses as an adjunct therapy in prosthodontics and for

patient with chronic TMJ and facial pain. Botox is also used to enhance aesthetic as a minimally invasive alternative to surgically treating high lip line cases for complete denture patients who have trouble adjusting to new prosthesis, gummy smiles, lip augmentation and also retraining of facial muscles. There are still many prosthodontic conditions which require FDA approval to be treated by botulinum toxin. Botulinum toxin has no doubt broadened the horizon of prosthodontics and is persuading dentists all over the world to bring it into their clinical practices.

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