

Botulinum Toxin: An Asset in Aesthetic Dentistry- A Review

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Abstract:- In this article, we have tried to summarize the basics of botulinum toxin and its application in various branches in dentistry. Botulinum Toxin is derived from “Clostridium Botulinum” which is the anaerobic gram-negative organism and after fermentation of a toxin; it is harvested from a culture medium. Despite the fact that botulinum toxin type A (BTX-A) has been used in the medical field for the treatment of various conditions since 1970s, there are many conditions in medical and dental field which requires proper treatment modalities in conventional ways. The Botox is a minimally invasive and efficient technique and may prove out to be an attractive alternative to surgery in many cases.

Keywords:- Botulinum Toxin, Botox, Cosmetic Dentistry, Aesthetic, Gummy Smile.

I. INTRODUCTION

Botox possess an elaborate and interesting history in the field of medicine. It has been used as a therapeutic in various conditions like cervical dystonia, hyperhidrosis, strabismus, blepharospasm and also for cosmetic purposes. [1].

Botulinum Toxin is a naturally occurring, lethal substance, which can be used as an effective and powerful medication when administered in approved dosage (FDA)[2].

The use of Botox has been increasing over the past few years in the field of dentistry as it promises therapeutic effects in treatment of various disorders like Masseteric hypertrophy, Mandibular spasm etc. It can also be used in unaesthetic clinical situations like gummy smiles, black triangles and deep nasolabial folds [3].

Botulinum toxin has 7 subtypes from A to G, which diverge in their strength, period of action, and target sites[4,5].

FDA has approved BTX-A, which is marketed worldwide by the name Botox® and in Europe as Dysport®, and also FDA has approved BTX-B, for various treatments

will be marketed under the name Myobloc® in the US and Neurobloc® in Europe [6,7,8,9].

II. HISTORY

The idea for a possible therapeutic use for Botulinum Toxin was developed in the year 1786- 1862 by a German Physician Justinus Kerner.[3] The term “botulism” was coined by another German Physician, John Muller in the year 1870. Burgen in 1949 concluded that this toxin was able to obstruct the neuromuscular transmission which was experimentally proved by Scott et al administering the Type a strain in monkeys. In the year 1989, FDA approved this strain under the trade name Botox, for removing facial lines temporarily [10,11].

What is Botox?

Botulinum toxin type A is produced after it is fermented and cultured from an anaerobic bacterium clostridium & is marketed in the name BOTOX, which is a stable, sterile, vacuum-dried powder which is diluted with saline solution without preservatives for it to be injected[12].

III. MECHANISM

The botulinum toxin prevents the release of acetylcholine at the neuromuscular junction and causes muscle paralysis. Toxin gets internalized into the nerve after binding to the nerve and is cleaved by internal proteolytic enzymes, and the degradation by products interferes with the normal process of vesicle fusion to the plasma membrane. Inhibition of the exocytosis of acetylcholine, leads to neuromuscular blocking effect. Large doses can result in complete paralysis, therapeutic doses allow partial activity, thereby decreasing the visual of hyper functional wrinkles [13].

IV. PREPARATION

The toxin is produced by the gram-negative anaerobic bacterium, Clostridium botulinum. It is harvested from a culture medium after fermentation of C.botulinum, which is then taken and precipitated, purified, and finally crystallized

with ammonium sulphate and botulinum toxin-A should be stored in cold temperature but should not be frozen. Botulinum toxin -A should be diluted with preservative-free saline and the preparation used within 4 hours of reconstitution. The toxin should be stabilized in solution with a pH 4.2-6.8 and temperature <20°C. The large molecule can be fragile and gets inactivated, if shaken [14].

V. INDICATIONS IN DENTISTRY

It can be used for correction of low, average or high gummy smile. Also can be used for various temporomandibular disorders. It is admixture for treatment of Masseteric hypertrophy. To relieve the patients suffering from Hemi facial spasm & myofascial pain. Used to treat patients suffering from Bruxism and also Trismus. Used for treating Sialorrhea. In the course of fixed orthodontic therapy for Retraining muscles. It can be used for training the patient, to be able to use new dentures, to control strong muscle activity.

For Jaw line contouring [12].

A. Contraindications

- As BTXs are classified as pregnancy category C drugs, it should be avoided in such cases.
- Persistent Presence of infection at the site of administration.
- Patients who are allergic to botox.
- Patients with any known neurological disorders or systemic disorders or certain drugs which can interfere with botox [14].

B. Advantages

- Patients are benefitted aesthetically and psychologically, moreover it is minimally invasive, which is highly accepted by them.

C. Disadvantages

- No long term benefits
- Anaesthetically appearance of smile, occasionally due to improper administration.
- Technique sensitive.
- Expensive.

D. Adverse reactions

- Nausea and vomiting.
- It can also cause localized pain to the patient, also Inflammation & infection.
- Bleeding/bruising.

E. Discussion

Administration of BOTOX into certain sites in a measured doses, will give a long lasting benefit for masticatory muscle relaxation which is highly reliable, quick and easy method. Excessive muscle function can be limited by targeting specific muscles around the mouth with application of Botox, which contributes to the condition, where an upper lip can no longer over-retract, the corners of the mouth can turn up instead of down, and the chin muscle is relaxed instead of puckered.

CLINICAL APPLICATIONS OF BOTOX AND ITS MODE OF TREATMENT [3].	
TMJ Disorders	Mild-severe cases: Bilateral application of injections into temporalis muscle.
Masseteric Hypertrophy	Botox injected into the masseter muscle beneath Ala- tragus line.
Headache, Migraine & Trigeminal Neuralgia	25-75 U injected into per -cranial muscles
Sialorrhea	It prevents the release of acetylcholine and thus, it can block cholinergic parasympathetic secretomotor fibers of the salivary gland.
Mandibular Spasm	35 units for each lateral pterygoid muscle & 30 units for the sub-mentalis complex
Pathologic Clenching	five or six injections into various muscles of mastication
Dental Implants	application BOTOX into the masticatory muscles for relaxation-better implant osseointegration
Oral Surgery	Low doses of BOTOX: promotes healing of tissues which were traumatized
	When High dosage is applied botox limits the muscle contraction during rehabilitation after fracture of the facial bone.
Gummy Smile	0.25 U per muscle bilaterally into the levator labii superioris, levator labii Superior is alaeque nasi, and at the overlap areas of the levator labii superior is and zygomaticus minor muscles.
Diagnostic Applications	Injection of BOTOX into the muscles aids in differentiation of muscular or pulpal origin of the toothache
Myofascial and Neck Pain	Injection of muscles with BOTOX for treatment myofascial pain

Polo [16] conducted a study on 30 patients receiving BTX-A injections for the treatment of gummy smile correction. Patients were followed at regular intervals up to 24 weeks post injection, and changes post treatment were documented by photographs and videos. The result stated

that BTX-A injections were effective and statistically significant, although the effect was temporary.

Sandler et al [17] treated a female patient of age 35 with a gummy smile, and the result showed that the BTX-A injections used for correction of gummy smiles were effective

and minimally invasive and had a temporary treatment outcome.

Patel et al.[18] conducted a study on 60 subjects aged 18 to 23 years with excessive gingival display due to hyperfunctional upper lip elevator muscles. They were treated with BTX-A injections, and the patients were evaluated clinically till 6 months at regular intervals & concluded that the treatment modality was effective, which gave aesthetically pleasing smiles and the changes lasted 3-6 months.

Amin et al.[19] reported a case in which the patient with excessive gingival display was treated with BTX-A injection, and concluded that the use of Botox is a conservative treatment in a patient with short upper lip and gummy smile. The effect is temporary and must be repeated every 6 months to 1 year.

Botulinum neurotoxin has shown promising results in decreasing the symptoms of bruxism[20]. Ivanhoe et al.[21] reported success of botulinum toxin Type A application in a separate brain injury case with a history of severe bruxism, when administered into the masseter muscle of these patients upto 19 weeks.

Tan and Jankovic also conducted a long-term study which included 18 patients who had a problem of bruxism. Administration of BOTOX into the muscles of mastication till 19 weeks gave promising results and were effective to the patients [22].

Lee in his research evaluated the effect of BOTOX on patients who had minimum mouth opening due to TMJ disorder and as a result there was reduction in pain without any side effects during the post operative reevaluation period upto 12 months[23].

VI. CONCLUSION

Botox can be an effective treatment in the field of cosmetic dentistry. Evolution of Botox has definitely improved the management of many dental conditions like myofascial pain particularly myogenous temporomandibular disorders etc. Currently Botox and Derma Fillers have made their way into dentistry, in the oral and maxillofacial areas. They are now becoming an integral part of everyday dental practice including restorative, aesthetic, periodontal, orthodontic and prosthodontics implications. With its precise, predictable, minimally invasive, aesthetic and therapeutic outcomes it is patient friendly. But the need to explore it more still remains.

REFERENCES

[1]. Nayyar P, Kumar P, Nayyar PV, Singh A. Botox: broadening the horizon of dentistry. *J Clin Diagn Res*. 2014;8(12):25-29.
 [2]. Barbano R. Risks of erasing wrinkles: Buyer beware!. *Neurology*. 2006;67(10):17-18.

[3]. Kala S. B, Nagunuri D, Prakash S. Botox: Its Illuminating Frontiers of Dentistry. *Int. J. Pharm Sci Rev Res*. 2016 37(1),155-162.
 [4]. Dolly O. Synaptic transmission: inhibition of neurotransmitter release by botulinum toxins. *Headache: J Head Face Pain*. 2003;43:16-24.
 [5]. Welch MJ, Purkiss JR, Foster KA. Sensitivity of embryonic rat dorsal root ganglia neurons to Clostridium botulinum neurotoxins. *Toxicon* 2000;38(2):245-58.
 [6]. Jankovic J, Brin MF. Therapeutic uses of botulinum toxin. *N Engl J Med* 1991; 324(17):1186-94.
 [7]. Brashear A, Gordon MF, Elovic E, Kassicieh VD, Marciniak C, Do M, et al. Intramuscular injection of botulinum toxin for the treatment of wrist and finger spasticity after a stroke. *N Engl J Med* 2002; 347(6):395-400.
 [8]. Binder WJ, Brin MF, Blitzer A, Schoenrock LD, Pogoda JM. Botulinum toxin type A (BOTOX) for treatment of migraine headaches: An open label study. *Otolaryngol Head Neck Surg* 2000;123:669-76.
 [9]. Brashear A. The botulinum toxins in the treatment of cervical dystonia. *Semin Neurol* 2001;21:85-90.
 [10]. Dastoor SF, Misch CE, Wang HL. Botulinum toxin (Botox) to enhance facial macro esthetics: A literature review. *J Oral Implantol* 2007;33(3):164-71.
 [11]. Azam A et al. Botox in dentistry : a review. *J Int Oral Health* 2015; 7(2):103-105.
 [12]. Sahoo KC, Raghunath N, Shivalinga BM. Botox In Gummy Smile-A Review. *Indian J Dent Sci*. 2012;4(1).
 [13]. Sinha A, Hurakadli M, Yadav P. Botox and derma fillers: The twin face of cosmetic dentistry. *Int J Contemp Dent Med Rev* ;2015.
 [14]. Patil HA, Kerudi VV, Bonde PV, Tekale PD. Botox: In orthodontics. *J Dent Allied Sci*. 2016;5(1):21.
 [15]. Moriarty KC. Botulinum Toxin in Facial Rejuvenation; Revised; 2006.
 [16]. Polo M. Botulinum toxin type A in the treatment of excessive gingival display. *Am J Orthod Dentofacial Orthop* 2005;127(2):214-218.
 [17]. Sandler PJ, Alsayer F, Davies SJ. Botox: A possible new treatment for gummy smile. *Virtual J Orthod* 2007;7:30-4.
 [18]. Patel DP, Mehta F, Thakkar SA, Suthar JR, Verma S. Botulinum toxin type A (Botox) for the neuromuscular correction of excessive gingival display on smiling (gummy smile). *Indian J Basic Appl Med Res* 2014;3:237-44.
 [19]. Amin V, Amin V, Swathi, Jabir A, Shetty P. Enhancing the smile with Botox — Case report. *Glob J Med Res* 2013;13:14-8.
 [20]. Van Zandijcke M, Marchau MM. Treatment of bruxism with botulinum toxin injections. *J Neurol Neurosurg Psychiatry* 1990;53(6):530.
 [21]. Ivanhoe CB, Lai JM, Francisco GE. Bruxism after brain injury: Successful treatment with botulinum toxin-A. *Arch Phys Med Rehabil* 1997;78(11):1272-3.
 [22]. Tan EK, Jankovic J. Treating severe bruxism with botulinum toxin. *J Am Dent Assoc* 2000;131(2):211-6.

- [23]. Lee KM, Chow J, Hui E, Li W. Botulinum toxin type A injection for the management of myofascial temporomandibular pain disorder. *Asian J Oral Maxillofac Surg* 2005; 17(2) 100-3.