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Review Article

Glimpse of Botox in Dentistry: A Review

[1]N Surya Vamshi, [2]C. Sreepradha, [3]Milind Rajan, [4]Umesh Shrivasatava, [5]N Priyadarshee, [6]Bratati Dey

[1]Postgraduate Student, Department of Oral Medicine and Radiology, Meghna Institute of Dental Sciences, Mallaram Village, Varni Road, Nizmabad, Telangana, India;
[2]Assistant Professor, Department Oral Medicine and Radiology, GDCRI, VIMS, Bellary, Karnataka, India;
[3]Postgraduate Student, Department of Pedodontics and Preventive Dentistry, Coorg Institute of Dental Sciences, Virajpet, Karnataka, India;
[4]Postgraduate student, Department of Oral & Maxillofacial Surgery, Hitkarini Dental College & Hospital, Jabalpur, Madhya Pradesh, India;
[5]MDS, Department of Oral Medicine and Radiology, Maitri College of Dentistry and Research Centre, Chhattisgarh, India;
[6]MDS, Department of Oral Medicine and Radiology, Maitri College of Dentistry and Research Centre, Chhattisgarh, India

ABSTRACT:
Many of us think of Botox primarily as a cosmetic treatment for lines and wrinkles on the face, but the botulinum toxin that Botox is derived from has a long history of medically therapeutic uses such as in cervical dystonia, hyperhidrosis, strabismus and blepharospasm. A growing number of dental surgeons have now been using this toxin as a part of their armamentarium for the management of various muscle related dental disorders like bruxism, massetric hypertrophy, myofacial pain, trismus, TMJ disorders and for retraining muscles during orthodontic treatment. The aim of this review literature is to elaborate the role of botox in dentistry
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Corresponding author: N Surya Vamshi, Postgraduate Student, Department of Oral Medicine and Radiology, Meghna Institute of Dental Sciences, Mallaram Village, Varni Road, Nizmabad, Telangana, India

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INTRODUCTION

Botox (botulinum toxin-BTX or botulinum neuro toxin) is a protease exotoxin released by Clostridium botulinum, which is a gram-positive, rod-shaped, anaerobic, spore-forming, motile bacterium.[1]

"Botulism" is a life-threatening disease first described by Kerner.[2] It is caused by botulinum toxin (BT) also known as botulinum neurotoxin produced under anaerobic conditions by Clostridium Botulinum. Botulinum is one of the most lethal toxins known and has found applications in bioterrorism as well.[3] However, botulinum toxin is a double edged sword. Botulinum is the first toxin to be accepted for therapeutic uses. Since the first therapeutic use by Scott for strabismus till today, the spectrum of therapeutic applications of BTs has widened. BTs can be differentiated into seven types from A to G. However, commercially available variants are purified exotoxin and only BT type A (BTA) and BT type B (BTB) are marketed by various brand names.[4,5]

Today botox is the name which is hottest in the field of cosmetic and esthetic industry. There is no question that botox and dermal fillers are well known for their esthetic results in terms of smooth skin and replacing lost volume in face, especially the oral and perioral areas.[6]

Botox is emerging as one such popular treatment to improve various facial anomalies. The aim of this review literature is to elaborate the role of botox in dentistry.

Table no 1: History of Botox[7,8,9]	
Year	**Landmarks**
1817–1822	Observations and seminal writings of Justinus Kerner on symptoms of botulism outbreaks in Germany
1897	Emile Van Ermengem finds the responsible agent for botulism and calls it bacillus botulinum
1924	The name clostridium botulinum was introduced by Ida Bengton
1949	Burgen, discovered that the toxin can block the neuromuscular transmission and was experimented on monkeys.
1989	US Food and Drug Administration (FDA) approved under the trade name – Botox (Allergan, Inc, Irvine, Calif) which was used for treating hemi facial spasm, strabismus and blepharospasm in young adults
2000	Botox was approved to treat cervical dystonia (wry neck)
2002	It obtained a green signal to treat severe frown lines between the eyebrows (glabellar lines). Type B by FDA is approved to treat cervical dystonia

COMMERCIALLY AVAILABLE BOTOX

Each vial of Botox® contains 100 Units (U) of Clostridium botulinum type A/B neurotoxin complex, 0.5 milligrams of Albumin (Human), and 0.9 milligrams of sodium chloride in a sterile, vacuum-dried form without a preservative.[5,10]

BTA IS MARKETED AS FOLLOWS

Botox® (Allergan, Irvine, CA) in the USA
Dysport® (Speywood Pharmaceuticals, Maidenhead, UK) in Europe
Xeomin® (Merz Pharmaceuticals, Germany) in Germany
Prosigne® (Lanzhou Biological Products Institute, China) in China

BTB IS MARKETED AS FOLLOWS

Myobloc® (Elan Pharmaceuticals, San Diego, CA)
Neurobloc® (Elan Pharmaceuticals, Shannon, County Clare, Ireland

MECHANISM OF ACTION

Acetylcholine is a neurotransmitter, released by neurons responsible for muscular contraction. Injecting overactive muscles with minute quantities of botulinum toxin type-A results in decreased muscle activity. Botulinum toxin type-A inhibits the exocytosis of acetylcholine on cholinergic nerve endings of motor nerves, as it prevents the vesicle where the acetylcholine is stored from binding to the membrane where the neurotransmitter can be released. Botulinum toxin 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. Botulinum toxin type-A thus blocks the release of acetylcholine by the neuron. This effectively weakens the muscle for a period of three to four months.[11,12]

THERAPEUTIC APPLICATION OF BOTOX IN DENTISTRY

TEMPOROMANDIBULAR JOINT DISORDER

TMD is an umbrella 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, periauricular pain, neck pain, and/or decreased joint excursions. Patients who have failed with conventional treatment approaches, the least invasive method is the application of BOTOX injections into the painful masticatory muscles which can provide relief of intractable symptoms.[13]

Emara et al. assessed the effects of BOTOX for the treatment of TMJ clicking in 6 patients. Botulinum toxin was injected in lateral pterygoid muscle and it was observed that the toxin eliminated the clicking sound during the first week and one joint after a week.[14] Freund et al. conducted a trial on 46 patients suffering from TMD and conclude that after injecting 150 U of BOTOX in temporalis and masseter muscles decreased the pain and improved functions.[15]

FACIAL WRINKLES

A study in 1994 reported the effectiveness of Botox A for reducing the appearance of facial wrinkles; since then, it has been used as a cosmetic treatment. Wrinkles are formed by dermal atrophy and repetitive contraction of underlying facial musculature. Botulinum toxin has been most widely accepted for its use to temporarily treat hyper functional facial lines. Dynamic wrinkles, seen during muscle contraction, yield more dramatic results than static wrinkles, which are visible at rest.[16]

Botox is used for reducing glabellar frown lines, crow's feet at the side of the eyes, horizontal forehead creases, wrinkles around the mouth, nasolabial folds and smoothing out neck and chest/cleavage wrinkles.[17] The clinical effects of Botox are seen on the first to the fourth days after injection, followed by 1–4 weeks of maximum effect, which will resolve after 3–4 months. In order to prolong the effects of Botox from six months to one year, the treatment

should be repeated for one year or more. The duration of Botox effect varies among individuals due to differences in muscle arrangements, meaning that different individuals may require different doses of Botox. The effect will last up to 120 days.[16,18]

GUMMY SMILE

Smile plays a pivotal role in conveying the emotion of a person. In Orthodontics, smile aesthetics is considered to be an important part of any treatment objective. Gummy smile is a term used to describe excessive display of gingival tissue in the maxilla upon smiling. This can cause undue psychological hindrance as the individual with excessive gingival display will be self-conscious and at unease regarding the same and thus seek treatment.[19]

For the patient whose gummy smile was mainly caused due to hyperactive lip muscles, treatment with Botox was considered as an alternative treatment approach. 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. Hwang et al., at Yonsei University College of dentistry, Seoul, Korea have proposed a injection point for botulinum toxin and named it as Yonsei point. It 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 injection site.[20]

ORTHODONTIC TREATMENT

Botulinum toxin can be used to prevent relapse of orthodontic treatment in case of patients with stronger muscle activity such as that of mentalis muscle. When used during treatment it reduces the intensity of muscle contractions and muscles can be trained post-treatment to a more physiologic movement over time.[21]

BRUXISM

Nocturnal bruxism (NB) is defined as abnormal maxillomandibular activity during sleep, characterized by grinding and clenching of the teeth. NB can lead to wear on the teeth, dental prostheses/implant failure, tooth sensitivity, pain in the teeth, jaw, masticatory muscle, and temporomandibular joint (TMJ), neck pains and headache, periodontal disease, oral or facial pain, and potentially tooth loss.[22]

Botox injections are directly applied into the masseter and temporalis muscles to relax these muscles. The clinical effects are typically seen on the first to third days after the injection, followed by one to two weeks of maximum effect, and the typical duration of the effect is three to four months. In a study by Lee et al., it was reported that BTXA injection reduced the number of bruxism events during sleep and it was therefore suggested that BTXA injection could be used as an effective treatment for nocturnal bruxism.[23]

DENTURE WEARERS

Completely edentulous patients, who have been without dentures for a long time have reduced vertical dimensions. This can be treated with Botulinum toxin which helps the muscular component adapt more to physiologic vertical dimensions, which are formed with complete denture. By altering their size, cross-sectional areas, and properties jaw muscles adapt themselves to the changing functional demands.[24]

IMPLANTOLOGY

Botulinum toxin allows unimpeded osseointegration of implants and reduces stress due to any excessive functional force or any para-functional habit that may cause implant failure. It relaxes the masticatory muscles, sparing the implant leading to unimpeded osseointegration.[25]

ORAL AND MAXILLOFACIAL TRAUMA

The use of BT in treating injuries affecting the bones in the maxillofacial region including maxilla, mandible, zygoma, nasal bone, and orbital bone has shown astonishing results. In a study done by Kayikçioglu et al., temporary paralysis of masseter muscles allowed for fewer mini plates/microplates in the treatment of zygomatic fractures. Use of BTA in the management of condylar fracture has been strongly recommended in various reports. Higher doses of BTA may potentially be used as a pharmaceutical splint during management of fractured facial bone. BTA injections in anterior belly digastrics have been used successfully in the correction of post traumatic anterior open bite. BTA has also been proposed in the management of ranula as a minimally invasive therapy.[26]

TRIGEMINAL NEURALGIA

Trigeminal neuralgia (TN) is one of the most painful disorders, which presents as recurrent, unilateral, brief but severe, electric-shock-like pains of rapid onset and short duration (up to 2 minutes) in the distribution of the trigeminal nerve. Botox 25-75U injected into the pericranial muscles blocks the nerve impulses that trigger contractions and relax the overactive muscles further relieving the pain. Elcio et al. (2005) observed that the excruciating pain associated with inflammation of the trigeminal nerve of head and face was relieved by Botox injections.[27,28]

GENERAL GUIDELINE[5]

- Preparation has to be used within 4 h
- The area of the injection has to be covered with a topical anesthetic cream or can be anesthetized using ice
- Start with a lower dose
- Muscles should not be paralyzed completely
- Males generally require higher dose due to larger muscle masses.

DRUG INTERACTION

The following drugs are seen to change the effect of Botulinum toxin: Muscle relaxants, Aminoquinolenes, Linosamide, Magnesium Sulphate, Quinidine, D-Penicillamine, Cyclosporin, Aminoglycosides.[29]

SIDE EFFECTS OF BOTOX

The side effects of Botulinum toxins are mild and transit, usually seen at the site of injection. These include nausea, headache, urticaria, dry mouth, dysphagia, dysphoria, transient muscle paralysis. As a safety measure the commercially available botulinum toxin A should have a "Boxed warning" on its product including the adverse reaction as prescribed by both health Canada and FDA. The effect of the symptoms can range from one day to several weeks.[30]

CONTRAINDICATION OF BOTOX[9]

- Pregnant or lactating mothers
- In any known hypersensitive reaction to any of the botulinum preparations
- Allergy to any of the constituents of BTX-A or BTX-B
- Psychologically unstable patients
- Patients receiving treatment with aminoglycosides, anticholinergic drugs or other agents interfering with neuromuscular transmission or muscle relaxants should be observed closely because the effect of Botox may be potentiated.

CONCLUSION

There are many medical and dental conditions which do not have complete treatment modalities in conventional ways. The botulinum toxin can be used as an alternative treatment modality working through chemo denervation method in many medical and dental conditions. Botox is a successful treatment for many facial and oral musculature dysfunctions because it provides an overall conservative, quick and painless approach. Botox can be a valuable addition to the dentistry.

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