



# BOTOX: Advancing the Realm of Prosthodontics

<sup>1</sup>Dr. Nelanuthala Keerthi Meghana, <sup>2</sup>Dr. Yeshwante Babita, <sup>3</sup>Dr. Chiniwar Shubha,  
<sup>4</sup>Dr. Kuche Ashwini, <sup>5</sup>Dr. Katwate Pooja

<sup>1</sup>PG Student, <sup>2</sup>Professor and HOD, <sup>3</sup>PG Student, <sup>4</sup>PG Student, <sup>5</sup>PG Student

<sup>1</sup>C.S.M.S.S. Dental College and Hospital, MUHS Nashik

<sup>2</sup>C.S.M.S.S. Dental College and Hospital, MUHS Nashik

<sup>3</sup>C.S.M.S.S. Dental College and Hospital, MUHS Nashik

<sup>4</sup>C.S.M.S.S. Dental College and Hospital, MUHS Nashik

<sup>5</sup>C.S.M.S.S. Dental College and Hospital, MUHS Nashik

## ABSTRACT:

Botulinum toxins have made their way into dentistry specially in Prosthodontics for both dental esthetic and therapeutic uses. Botox is a neurotoxin derived from bacterium clostridium botulinum. Botulinum toxin inhibits the release of Acetylcholine, 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. This review article explains the basics of botulinum toxin and its extensive and detailed uses in prosthodontics.

**Key Words:** Botulinum Toxin, Botox, Prosthodontics

## INTRODUCTION:

Botulinum toxin has grown in popularity in prosthodontics recently owing to its therapeutic and cosmetic benefits. Botulinum toxins are a new option for symptom relief in patients for whom traditional treatments are ineffective. In prosthodontics, they are used to treat trismus, parafunctional clenching, temporomandibular dysfunction, and the associated headaches.<sup>1,2</sup> Botulinum toxin is a protease exotoxin released by Clostridium botulinum.<sup>3</sup> The commonly used name for botulinum toxin is "Botox". This neurotoxin is the cause of serious paralytic illness, botulism. This toxin can be used in medical and dental procedures by working through chemo denervation method.<sup>4,5</sup> Seven types of botulinum toxins have been isolated but only two, Types A and B, have been made commercially available as purified exotoxins.<sup>2,6,7</sup>

## HISTORY:

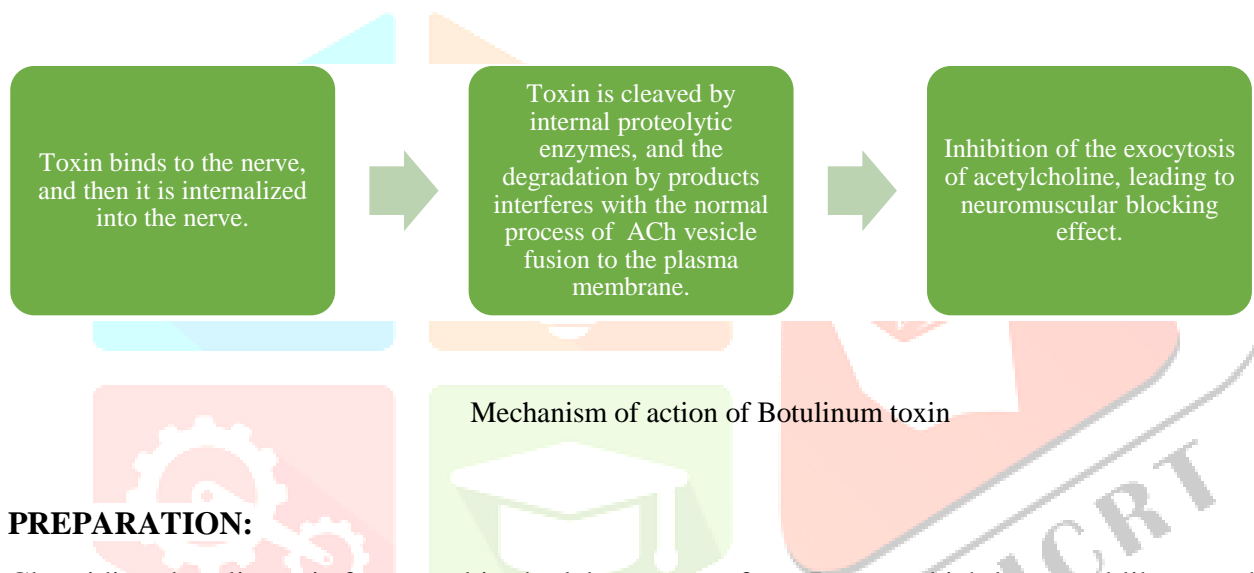
Botulinum toxin was first described by German Physician Justinus Kerner between the year 1817- 1822 termed as "Sausage poison". John Muller another German physician coined the term "botulism" in 1870. In 1949 Burgen, discovered that the toxin can block the neuromuscular transmission as experimented on monkeys. Botox was approved for the treatment of cervical dystonia in the year 2000 and 2 years later for the improvement of frown lines between the eyebrows.<sup>3</sup>

## BOTULINUM TOXIN:

Botulinum toxin is a deadly poison produced by a Gram-positive bacterium called clostridium botulinum, gram-positive, rod-shaped, anaerobic, spore-forming, motile bacterium.<sup>3,8</sup> The bacteria produce 7 antigenically distinct exotoxins that are labelled from A to G. The signs and symptoms of botulism occur after the ingestion of contaminated food or from wound infection. When the toxin is ingested, the toxin spreads to peripheral cholinergic nerve endings and blocks acetylcholine release. This results in a bilaterally symmetric descending neuroparalytic illness. The incubation period after ingestion is 18-36 h. In human beings, botulism is mainly caused by Types A, B, E, and rarely F, whereas in animals, it is caused by Types C and D. The toxin is heat labile and denatured by cooking.<sup>3,5</sup>

### MECHANISM OF ACTION

The botulinum toxin causes muscle paralysis by inhibiting acetylcholine release at the neuromuscular junction, which results in reduced intensity or complete elimination of overall contraction of the muscle, shown in Figure 1 and Figure 2. The effect of toxin weakens the muscle for around three to four months, the muscle initiates new acetylcholine receptors and forms the new synaptic chain from the growth of branches from the neurons. With time the muscles return to its function with none of its side effects. Although large doses can result in complete paralysis, therapeutic doses allow partial activity, thereby decreasing the visibility of hyper functional wrinkles.<sup>2,5,9</sup>



### PREPARATION:

Clostridium botulinum is fermented in the laboratory to form Botox, which lyses and liberates the toxin into the culture. The toxin is then harvested, purified, crystallized with ammonium sulfate, diluted with human serum albumin, lyophilized, bottled in vials, and sealed. Botulinum toxin A is marketed under trade names Botox, Dysport, Xeomin and Jeuveau. Each vial contains 100 U of Botox. The human lethal dose is estimated to be approximately 3,000 U. For cosmetic purposes typically less than 100 U of Botox is used. Vials should be stored at or below  $-5^{\circ}\text{C}$ . Optimal pH of the solution is between 4.2 and 6.8. Just before use it is advised to reconstitute the preparation with 1-5 ml of saline without preservatives. As Botox is easily denatured via bubbling or agitation, the diluents should be gently dispensed into the inside wall of the vial. The reconstituted solution should be refrigerated at  $2-8^{\circ}\text{C}$  and used within 4 hours. Botulinum toxin B is marketed under the trade name Myobloc. Its relative potency to Botox is 50-125 U of Myobloc to 1 U of Botox. This product does not require reconstitution and is stable for up to 21 months in a refrigerator.<sup>2,3,10</sup>

### PROSTHODONTIC APPLICATIONS:

#### Temporomandibular disorders (TMDs):

Temporomandibular disorders manifest with facial pain, joint sounds, headache, peri-auricular pain, neck pain, and/or decreased jaw movements. TMDs caused by excessive biting forces has conventionally been treated with intraoral appliances like occlusal splints, occlusal adjustments, dental restorations or surgery. Many of these treatment options are not ideal for all patients and botulinum toxin A of 25 to 150 U dose can be alternative for muscular relaxation.<sup>11</sup>

### 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. The dentures we make for the patients may fit perfectly but with strong irregular muscle contractions, the patients will have a hard time getting used to their dentures and keeping in their mouths, thus botox reduces the muscular contractions and increases the stability of the dentures.<sup>7</sup>

### Salivary gland disorders:

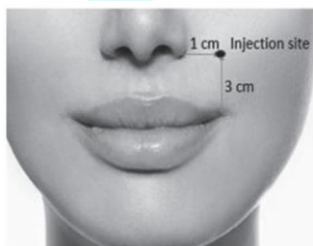
Botox can be used disorders such as Sialorrhea, Sialocele and Freys syndrome. In hypersalivation disorders, Botox acts on the cholinergic nerve endings which results in proteolysis and loss of neuronal activity. Usually, dose of 10-100 U is injected intraglandularly.<sup>12</sup>

### Dental Implants:

Due to the excessive functional forces in patients with parafunctional habits, osseointegration can be impeded when multiple or immediate implants are placed. The muscular relaxation can be achieved by the Botox injection (25-75 U) which is therapeutically beneficial by allowing implants better unimpeded osseointegration. Botox can also limit the parafunctional clenching and allows the tissues to heal.<sup>13</sup>

### Gummy Smile:

Gummy smile is when a significant portion of the gums is visible when a person smiles, it is both a cosmetic and an oral hygiene issue which is challenging to treat. Typically treatment is surgical correction which includes gingivectomies and/or Le Fort I maxillary osteotomies with impaction for skeletal vertical maxillary excess.<sup>14</sup> 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. proposed an injection point named as “Yonsei point” for botulinum injection.<sup>15</sup> It is a point located at the centre of triangle formed by levator labii superioris, alaeque nasi and zygomaticus minor. A dose of 3U is sufficient.<sup>8,14</sup>



Yonsei Point



### 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.<sup>16</sup>

### Asymmetrical smiles:

Botox along with dermal fillers is used to correct lip deformities where there is sagging of the lip on one side.<sup>17</sup> Over activity of one of the depressor labii inferioris may result in asymmetrical smiles. No other treatment options were proved successful until Botox was used. Botox can be injected into the overactive muscle fibers of the depressor labii inferioris and then Botox will cause a gentle relaxation of the muscle resulting in a symmetrical smile.<sup>8</sup>

### Facial Esthetics:

Ageing is characterized by wrinkles and laxity of skin. The use of fillers in the lower face and the use of Botox for the upper face is advised. The cosmetic indications such as Crow's feet, frowns, nose wrinkles, bands on the neck, rhytids of the upper lip, pebbly chin, wrinkles of forehead and scar management are well treated using botox.<sup>12</sup>

### How much Botox will I need?



### Bruxism:

Grinding or clenching of the teeth is called as bruxism. It is generally because of mental stress and can occur both nocturnally and diurnally. Bruxism might lead to tooth wear, periodontal disease, headaches and Temporomandibular Joint disorders. The injection of the Botox (25- 100 U) into both masseter as well as temporalis muscles bilaterally is effective in treating Bruxism.<sup>8</sup>

### Masseteric hypertrophy:

Masseter muscles are present laterally to the ramus of the mandible, play a pivotal role in facial esthetics. Masseteric hypertrophy is a clinical condition in which swelling is present on the angular mandibular region of the face. Surgical resection is the most common treatment which may result in contracture of the tissue. Clinical trials proved that injecting small amounts of BOTOX into masseters caused reduction of hyperactivity of these muscles.<sup>18</sup>

### Trigeminal Neuralgia:

It is a unilateral neurological disorder affecting orofacial muscles leading to attacks of pain triggered by touching the face, chewing, speaking or brushing the teeth. Botox (25-100 U) can be used as an adjunctive treatment modality in these patients which acts on nerve endings, thereby reducing the severity of the pain.<sup>17</sup>

### Facial Nerve Palsy:

Neurological condition in which function of the facial nerve is partially or completely lost causing facial asymmetry. It is usually idiopathic but, in some cases, it may be due to trauma, infections or metabolic disorders. Botulinum toxin 10-80 U is injected intramuscularly in the contralateral lower facial muscles which weakens the muscles and restores the facial asymmetry.<sup>12</sup>

### SHOULD DENTISTS ADMINISTER BOTOX THERAPY?

It is certainly time to recognize that dentists can be just more efficient Botox injections than any of the other healthcare providers as dentists have much greater expertise in the oral and maxillofacial areas and are also trained to be experts in the muscles of mastication and the muscles of facial expression, which routinely receive these treatments.

### CONCLUSION:

Botox therapy is a conservative, minimally invasive treatment that can expand our therapeutic options for the benefit of patients. 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 aesthetics 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. 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.

### CONFLICTS OF INTEREST:

The authors have no conflicts of interest, financial or otherwise, to declare.

**REFERENCES:**

1. Makmacher L. Botulinum Toxin Frontline TMJ syndrome and Dental Therapeutic Treatment. Chicago USA.: Academy of General Dentistry. 2013.
- 2.. Azam A, Manchanda S, Thotapalli S, Kotha SB. Botox therapy in dentistry: A Review. Journal of international oral health: JIOH. 2015;7 (Suppl 2):103.
3. Dastoor SF, Misch CE, Wang HL. Botulinum toxin (BOTOX) to enhance facial micro esthetics: A literature review. J Oral Implantol 2007;33:164-71.
4. Rao LB, Sangur R, Pradeep S. Application of Botulinum toxin Type A: An arsenal in dentistry. Indian Journal of Dental Research. 2011 May 1;22(3):440.
5. Chandak AV, Dubey SG, Sathe S, Balwani TR. Role of Botox Therapy in Dentistry, Beauty with Fillers-A Review. Int J Cur Res Rev, Vol. 2020 Dec;12(24):7.
6. David Mock. Botulinum Toxin and Dentistry. Ensuring Continued Trust, Royal College of Dental Surgeons of Ontario: Ensuring Continued Trust: Dispatch. 2009. p. 1-4.
7. Modi P, Sarapur S, Adeshra K, Parmar U, Makwana T, Oza Z. Botox: Widen Vista of Prosthodontics.
8. Bansode PV, Pathak SD, Wavdhane MB, Priyadarshini L. Botox: A Beautiful Smile, Not Just Beautiful Teeth.
9. Meunier FA, Schiavo G, Molgo J. Botulinum neurotoxins: from paralysis to the recovery of functional neuromuscular transmission. J Physiol (Paris) 2002;96(1-2):105-13.
10. Banbano R. Risks of erasing wrinkles: Buyer beware! Neurology 2006;67(10): S17-18.
11. Freund B, Schwartz M, Symington JM. The use of botulinum toxin for the treatment of temporomandibular disorders: Preliminary findings. J Oral Maxillofac Surg 1999; 57(8):916-21.
12. Govil H, Srivastav S, Singh A, Trivedi T. Botox in Prosthodontics: A Review. University J Dent Sci 2018;4(1):13-18.
13. Nishimura K, Itoh T, Takaki K, Hosokawa K, Naito T, Yakota M. Periodontal parameters of Osseo integrated dental implants: A 4-year controlled follow-up study. Clin Oral Implants Res 1997;8:272-8.
14. Polo M. Botulinum toxin type A (Botox) for the neuromuscular correction of excessive gingival display on smiling (gummy smile). American Journal of Orthodontics and Dentofacial Orthopedics. 2008;133(2):195-203.
15. Hwang W-S, Hur M-S, Hu K-S, Song W-C, Koh K-S, Baik H-S, et al. Surface anatomy of the lip elevator muscles for the treatment of gummy smile using botulinum toxin. 2009.
16. Freund B, Finkelstein I and Ko G. "Review of the applications of Botulinum Toxin and Tissue Fillers in Dental Practice". 2015;3:1-16.
17. Sinha A, Hurakadli M, Yadav P. Botox and derma fillers: The twin face of cosmetic dentistry. Int J Contemp Dent Med Rev 2015; 2015: Article ID: 131214.
18. Al-Ahmad HT, Al-Qudah MA. The treatment of masseter hypertrophy with botulinum toxin type A. Saudi Med J 2006;27:397- 400.