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Role of Botox Therapy in Dentistry, Beauty with Fillers - A Review

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ABSTRACT

Introduction: In recent years the use of the minimally invasive technique of treatment is giving quite promising results not only in cosmetics but also in dentistry. Botulinum toxin is injected in the affected muscles which in turns inhibits the acetylcholine and results in the reduction of the tone of muscles. The commonly used name for Botulinum toxin is BOTOX. There are seven serotypes of botulinum toxin. Mainly two types are used. Patients who are contraindicated for conventional therapies can easily undergo BOTOX therapy as it is a preventive treatment at low cost.

Aim and Objective: This review article explains about the various applications of botulinum toxin for painful conditions in dentistry and also for aesthetics.

Key Words: Botulinum toxin, Aesthetics, Masticatorymuscles, Minimal invasive treatment

INTRODUCTION

In recent years, botulinum toxin has gained an attraction in Prosthodontics for therapeutic and esthetic uses. This toxin can be used in medical and dental procedures by working through chemo denervation method. The commonly used name for botulinum toxin is “Botox”. It is very essential to broaden the preventive treatment modalities for muscles triggered dental diseases. Many diseases affect the masticatory apparatus including the dysfunction and pathology of temporomandibular joint and muscles of mastications.¹ These damages can be treated either by intraoral appliances, occlusal adjustments, restorations and surgery, but not all the patients accept it. Though the use of analgesics, steroids, anti-inflammatory drugs can be accepted by the patients they are not ideal and does not provide long term effects. With the upcoming of the new addition is the use of Botulinum Toxin for the painful treatment in dentistry.^{1,2}

HISTORY

Botulinum toxin was first developed by German Physician JustinusKerner in the year (1786-1862) and coined the term

“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 and was 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.³

Botulinum Toxin

It is produced by anaerobic gram-positive bacteria Clostridium botulinum and is considered as a neurotoxin present in nature. Seven serotypes A-G of botulinum toxins are available but only two of the Type A and Type B has been available for commercial purposes.³

The signs and symptoms of botulism occur after the ingestion of contaminated food or from wound infection. When the toxins are ingested it spreads to the peripheral cholinergic nerve endings and blocks the release of acetylcholine which results in neuroparalytic illness. The toxin is heat labile and denatured by cooking. The incubation period is 18-36 hours after ingestion of the toxin.⁴

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MECHANISM OF ACTION

When Botulinum toxin-A is injected in overactive muscles, it results in decreased muscle activity. By the toxin at the neuromuscular junction, the release of acetylcholine is inhibited which results in reduced intensity or complete elimination of overall contraction of the muscle. The acetylcholine is stored in the vesicles and the botulinum toxin prevents its binding to the membrane where the neurotransmitter is released.

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.⁵ Large doses of botulinum toxin may result in complete paralysis of the muscles and partial activity can occur by therapeutic doses which also decreases the hyper-functional wrinkles.⁶

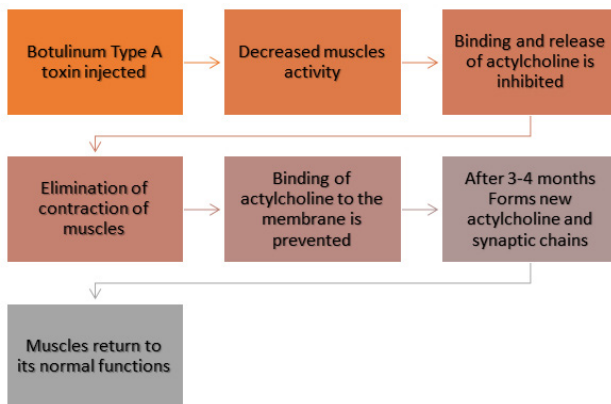


Figure 1: Mechanism of action of Botulinum Type A.

Preparation of Botox

Clostridium botulinum is fermented in the laboratory to form Botox, which lyses and liberates the toxin into the culture. Then the toxin is harvested, purified, crystallized with ammonium sulfate and is diluted with human serum albumin, lyophilized, bottled in vials & sealed. Each vial contains 100U of Botox, but the human lethal dose is approximately 3000U. Botox has a pH of 4.2-6.8 and it is stored at or below -5°C. When the toxin is injected intraperitoneally and being able to kill 50% group of 18 to 22g swiss webster mice becomes the one unit.⁷

Before use, it is recommended to add 1-5ml of saline to the preparation because Botox can easily denature via bubbling or agitation therefore diluents should be slowly injected into the inside wall of the vial. Myobloc is the trade name for Botulinum toxin B. This product does not require reconstitution and can be stored for 21 months in the refrigerator.^{7,8}

Applications of Botox

Temporomandibular disorders (TMD)

Temporomandibular joint disorder (TMD) is a collective term that holds several clinical conditions associated with masticatory muscles, temporomandibular joint and its apparatus. TMD exhibits with clicking sound of TMD, facial pain, headaches, periauricular neck pain, decreased point excursions. The key component of TMD is associated with periodontal and occlusal diseases having an etiology of dysfunction in muscles of mastications (Figure 2). Etiology factors for TMD are- Bruxism followed by muscle spasms, external stresses & psychomotor behaviours.¹

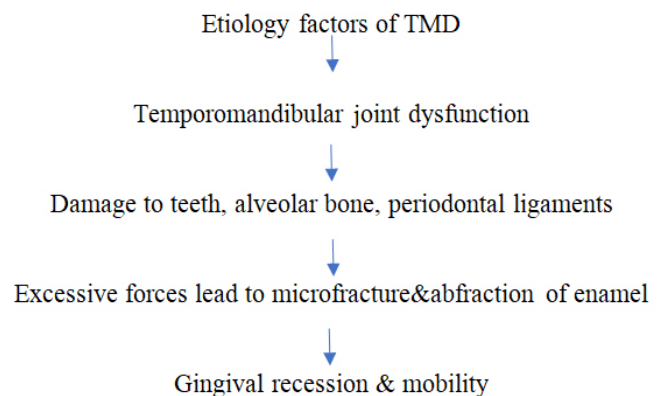


Figure 2: Flow Chart of Clinical Sequel of TMD.

The majority of the TMD patients undergo a multidisciplinary approach that includes patient education & self-care, cognitive behavioural intervention, pharmacotherapy, orthodontic therapy (interocclusal splints).⁹ Many of these techniques used are not ideal for all patients. Prophylactic treatments for TMD should reduce both conscious and unconscious parafunctional factors. Long term pharmacotherapy is unsatisfactory because of its side effects. Even physiotherapies, biofeedback provides short term relief. For the patient who failed with conventional treatment approach, the applications of BOTOX injections in painful muscles which is least invasive procedure is the best to cope with pain.¹⁰

Protocols for TMD

In temporalis pain treatment bilateral injections of 7.5 U is injected into the anterior vertical fibres of each temporalis muscles. 2.5 U in the middle and posterior third of the temporalis muscles is injected in severe cases. Masseter pain is treated with 5U into the belly of masseter below the imaginary line joining the ala tragus line and the corner of the mouth (Figure 3).¹¹

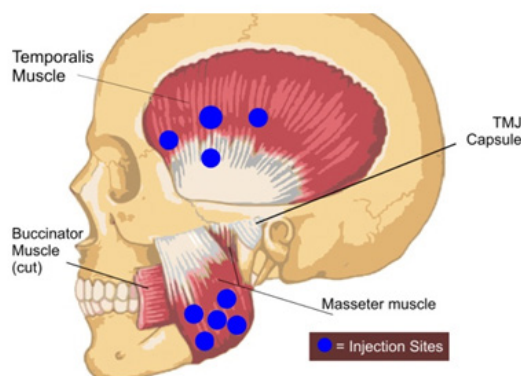


Figure 3: Sites for BOTOX injection on temporalis and masseter muscles for temporomandibular disorder.

Studies have been done, 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.¹² 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.¹⁰

Dental Implants and Surgical procedures

BOTOX can be beneficial for pre-surgical implant procedures. Osseointegration can be impeded when multiple or immediate implants are placed, by the excessive functional forces in patients with parafunctional habits. The muscles relaxation can be achieved by the BOTOX injection and it may further lead to better osseointegration. BOTOX can also limit the parafunctional clenching and allows the tissues to heal. During rehabilitation after facial bone fractures, high doses of toxin can be used as 'Pharmaceutical Splints'. The conventional splint is contraindicated because the teeth should be in function during healing. The bite force is not diminished with reduced alveolar bone support. Therefore, the BOTOX can be used as an alternative to conventional splint procedure.¹³

Kayikcioglu et al conducted a study on five patients of zygomatic fracture fixation surgery by using BOTOX to reduce the number of fixation sites and to prevent the dislocation. 100U of BOTOX preoperatively was injected into the masseter muscles of the fracture site. Patients were operated after 12-48 hours of injection and concluded that because of temporary paralysis of masseter muscle fewer mini plates were inserted and with none of the further complications.¹⁴ Some group has conducted a study for surgical reduction of mandibular condylar bone fracture by using BOTOX.

Salivary gland disorders

Disorders such as Sialorrhea, Sialocele and Freys syndrome BOTOX can be used. In hypersalivation disorders, BOTOX

acts on the cholinergic nerve endings causing proteolysis and loss of neuronal activity. Common dose injected is 10-100U and is injected intraglandularly.⁶

Masseteric Hypertrophy

Masseter muscles are essential for adequate mastication and are present laterally to the ramus of the mandible. It plays an important role in facial aesthetics. 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 tissue. Various authors did clinical trials by injecting small amounts of BOTOX into masseter muscles and found reduction of hyperactivity of masseter muscles (Figure 4).¹⁵⁻¹⁷

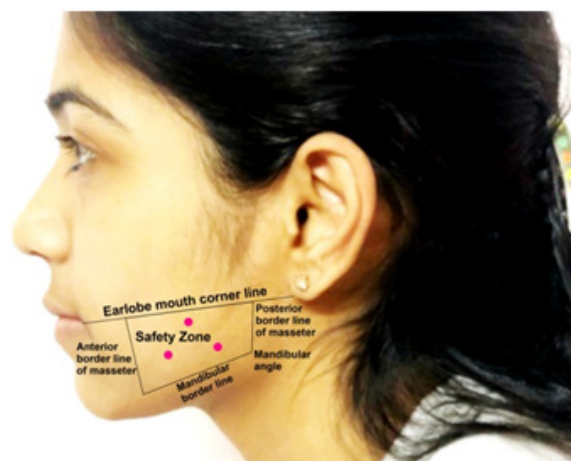


Figure 4: Injection site for masseter hypertrophy.

Mandibular Spasm/ Trismus

Microstomia is a term to describe the small oral aperture. Trismus occurs when the muscles of mandible remain in semi contraction or spasm, it can be because of various syndromes associated with mandibular muscles, infections. Such patients are unable to perform normal functions. The dental treatments for such patients are difficult due to limited access. BOTOX treatment to the mandibular musculatures or spastic muscles can decrease the pain and tenderness and further may improve the functions.¹⁸

The recommended dose of BOTOX is 25U into each masseter muscles and 10U into the temporalis muscles. Several studies have been done to describe the effectiveness of BOTOX in mandibular spasm patients by a few authors and concluded the positive results of BOTOX injections.¹⁹⁻²¹

Trigeminal Neuralgia, Headaches, Migraine

Pharmacotherapy may cause the number of side effects such as weight gain, nausea, diarrhoea. BOTOX treatment relatively has rare side effects. 25U-75U of BOTOX is

injected in pericranial muscles which block the nerve impulses by relaxing the over-reactive muscles and relieves the headache. In migraines, BOTOX acts by blocking the protein which plays a role of messenger to brain and relieves the pain as there are no muscles involved.^{2,22} Elcio et al observed that the pain associated with inflammation of the trigeminal nerve can be relieved by the BOTOX injections.²³ Lawrence et al suggest BOTOX as an anti-inflammatory substance and reduces the calcitonin related peptides.²⁴

Gummy Smile

It is defined as the excessive display of the gingiva by the hyper-functional muscles of the upper lip mainly upon smiling. Gummy smile hampers both oral hygiene and aesthetics. Various surgical techniques are quoted in literature but are not routinely used for gummy smile treatment.²⁵ BOTOX is the less invasive treatment which reduces the muscles over contraction by weakening them. Polo studied on five patients of the excessive gummy smile with BOTOX by injecting 2.5U injection per muscle bilaterally in Levatorlabii superioris, Superiorislabialis and Zygomatic minor muscles. All the patients observed with no side effects and effective upper lip length with a pleasing smile.²⁶

Facial Nerve Palsy

It is a neurological condition in which function of the facial nerve is partially or completely lost causing facial asymmetry. It is often idiopathic but, in some cases, it may be due to trauma, infections or metabolic disorders. Botulinum toxin 10-80U is injected intramuscularly in the contralateral lower facial muscles which weakens the muscles and restores the facial asymmetry.⁶

Facial aesthetics

The proverb "Face is an index of mind" holds good. One of the factors for ageing is wrinkles and laxity of skin. Recently BOTOX is used for the treatment of wrinkles and become more popular as an alternative to surgical procedures.²⁷ The cosmetic indications such as Crow's feet, frowns, nose wrinkles, bands on the neck, rhytids of the upper lip, pebbly chin, scar management (Figure 5).⁶

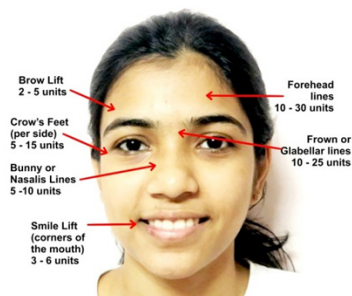


Figure 5: Various sites depicting for facial esthetics.

Patients selections

Poorly tolerated or contraindicated patients of preventive treatments and medications are mainly indicated for BOTOX therapy. Special patient populations, who prefer BOTOX treatment and are refractory to other treatment are also indicated (Table 1).¹⁰

Table 1: Dosage of BOTOX at Esthetic points

Esthetic points	Dosage
Eye brow lift	2-5U
Crow's feet (per side)	5-15U
Nasalis lines	5-10U
Dimple Chin	2-6U
Smile lift (Corners of the mouth)	3-6U
Frowns or Glabellar lines	10-25U
Forehead lines	10-30U

Contraindications of BOTOX

BOTOX is contraindicated in pregnancy, lactating females, neuromuscular diseases, concurrent usage of aminoglycosides and allergic and sensitive patients to BOTOX. Adverse effects of BOTOX oromandibular disorders include facial nerve paresis, redness and pain at the injection site, weakness of non-targeted muscles, hematoma. These are the transient complications and may resolve in a few weeks.⁶

CONCLUSION

BOTOX is used as an adjunct therapy to oral medications. It can be used in prosthodontics for various treatment of TMJ disorders and facial pain. As BOTOX is a minimally invasive procedure is used to complement aesthetics in complete dentures patients with high lip line or gummy smiles. BOTOX is scientifically approved and can be brought into clinical practices in dentistry.

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