
“Botox and Dermal Fillers: A New Beginning in Dentistry”- Review Of Literature

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Abstract: “Botulism” is a life-threatening disease first described by Kerner. 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. However, botulinum toxin is a double-edged sword. Botulinum is the first toxin to be accepted for therapeutic uses. Botox is a safe, conservative, non surgical, reversible, minimally invasive treatment modality to achieve cosmetic results. Training is absolutely necessary for dentists to administer injections, but learning curve is very short, because dentists can already achieve profound anaesthesia in the orofacial region, thus making the patient more comfortable.

Keywords: Botox, Dermal Fillers, Facial wrinkles, Gummy smile, Cosmetics, Bruxism

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I. Introduction

The use of Botox is a minimally invasive technique of treatment and is used in management of strabismus, Temporo-mandibular joint disorders, bruxism, clenching, Facial pain, Migraines, Masseter hypertrophy, Gummy smile, Sialorrhea. Botox when used to improve esthetics, falls into the category of “Facial Rejuvenation”, along with other procedures such as “Dermabrasion” and “Dermal Fillers”. When properly administered, it relaxes overactive muscles that cause wrinkles, creating a smoothed, improved and more youthful appearance.

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.

BTA is marketed as follows:

- Botox[®] in the USA
- Dysport[®] in Europe
- Xeomin[®] in Germany
- Prosigne[®] in China.

BTB is marketed as follows:

- Myobloc[®] (Elan Pharmaceuticals, San Diego, CA) and
- Neurobloc[®] (Elan Pharmaceuticals, Shannon, County Clare, Ireland).

Each vial of BOTOX contains-

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

II. History Of Botulinum Toxin

The idea for a possible therapeutic use for botulinum toxin was first developed by the German physician Justinus Kerner (1786-1862). He deduced that the toxin acted by interrupting signal transmission within the peripheral sympathetic nervous system, leaving sensory transmission intact. He called the toxin a “sausage poison,” because it was observed that illness followed ingestion of spoiled sausage. In 1870, John Muller, another German physician, coined the name “botulism” (from the Latin root botulus, which means “sausage”). In 1949, Burgen was the first to discover that the toxin was able to block neuromuscular transmission. Scott *et al.* proved this fact by experimentally administering the Type A strain in monkeys. This strain was approved by the US Food and Drug Administration (FDA) in 1989 under the trade name Botox (Allergan, Inc, Irvine, Calif) for treating strabismus, blepharospasm, and hemifacial spasm in patients younger than 12-year-old. In the year 2000, Botox was approved for use in treating cervical dystonia (wry neck) and 2 years later for the temporary improvement of moderate to severe frown lines between the eyebrows (glabellar

lines). Serotype B has been FDA approved for treating cervical dystonia, and serotype F is under investigation in patients who are resistant to serotypes A and B.

III. Mechanism Of Action

BT produces a transient dose-dependent weakening of muscle activity. It is a neurotoxin and produces temporary chemical denervation of skeletal muscle by inhibiting the release of acetylcholine from nerve endings, which leads to flaccid paralysis. However, the neuromuscular transmission is re-established by sprouting of new axonal terminals and, therefore, the blockade is temporary. Thus, treatment with botulinum is actually a palliative approach rather than a curative option. The toxin has also been shown to prevent acetylcholine release at parasympathetic nerve terminals. 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.

IV. Preparation

Doses of BT used for the treatment of a particular condition depend on the particular brand/preparation as the unit of one product is not the same as the other. Instances of botulism have been reported in patients treated with intramuscular injections at therapeutic doses. However, BTA has been in clinical use since 1967 now, and its safety has been well established.

The two most commonly available types of BTA are Botox[®] and Dysport[®]. About 20–25 units of Botox[®] are equipotent to 80 units of Dysport[®]. Botox[®] is marketed as single-use, sterile 100 Units or 200 Units vacuum-dried powder for reconstitution only with sterile, preservative-free 0.9% sodium chloride injection USP prior to injection. It is recommended that the reconstitution should be gentle as froth arising out of vigorous shaking can lead to surface denaturation of the toxin.

BT is stored in a frozen vial (2–4°C) until it is ready to use. Adding 4 ml of 0.9% preservative-free normal saline solution makes injections, and the preparation should be used within 4 h. It is dispensed in small vials containing 100 U or 500 U. The preferred syringe is a calibrated 1.0 mL tuberculin syringe with a gauge preference of 26–30.

DERMAL FILLERS

Dermal fillers are materials that are injected beneath the skin to add volume, smoothing out peri-oral folds and area of reduced volume. The perfect dermal filler would be cheap, safe, painless to inject, hypoallergic, and long lasting. In addition, it should have reliable and dependable results, feel natural beneath the skin, require very little time to inject, be ready-to use and have a low risk of complications. As the people become more aware about cosmetic treatments their demand to achieve a more younger look is increasing day by day, the cosmetic market has responded by providing the esthetic surgeons and dentists with an numerous options to meet the demands of the these type of patient.

Types of Dermal fillers can be categorized as:

- A. Biodegradable (moderate and long duration)
- B. Non-biodegradable fillers.

Moderate duration biodegradable fillers

Example are collagen and the hyaluronic acid (HA) fillers, they are reabsorbed by the body quite quickly, so their cosmetic benefits are fairly short-lived.

HA

HA is the most prominent glycosaminoglycan in the skin. It potently binds to water and, when injected into the skin, softens, volumizes and hydrates the skin. It plays important role in cell growth, membrane receptor function, and adhesion.

HAs are linear polymeric dimers of N-acetyl glucosamine and glucuronic acid, their effect lasts up to 6-18 months depending on the source, extent of cross-linking, concentration and particle size of each product. To resist degradation by hyaluronidase, the crosslinking and the concentration of the HA is increased which in turn increase its viscosity and elasticity.

HA products are classified by the size of their microspheres.

1. Example of biphasic fillers are restylane, perlane, and macrolane contain different size of microsphere

2. Examples of monophasic HA products, such as juvederm, belotero, teosyal, prevelle silk, and varioderm, contain homogeneous microspheres and are more preferred fillers.

Collagen

Collagen is the major structural constituent of the skin. The first FDA-approved dermal filler was bovine collagen and was used until 2010, after which it was no longer produced. A bioengineered human collagen was FDA approved in the year 2003 for injection use. As this newer dermal filler had no bovine collagen, it did not require any pretreatment allergy testing. Lidocaine containing dermal fillers approved by FDA are both the bovine collagen (zyderm I, zyderm II, and zyplast) and bioengineered human collagen dermal fillers (cosmoderm I, cosmoderm II, and cosmoplast), they are least painful for the patient upon injection, and thus eliminate the use of topical anesthesia or nerve blocks.

Fillers with biodegradable particles

They stimulate the body to produce its own collagen and have longer duration of effect; example include calcium hydroxylapatite (CaHA; Radiesse; Merz Pharmaceuticals GmbH) and poly-L-lactic acid (PLLA; Sculptra; Valeant, West Laval, QC, Canada).

CaHA

They are synthetic CaHA microspheres suspended in a carrier gel, example is Radiesse, which was approved in 2006 by FDA for the treatment of facial wrinkles and folds and HIV-associated facial atrophy. In 2009 FDA approved it for cosmetic use in non HIV patients also. It is composed of 30% CaHA and 70% carrier gel. Injection provides immediate visual improvement with longterm deposition of new collagen surrounding the microspheres, contributing to an average duration of effect of about 15 months.

PLLA

PLLA is an artificial, biocompatible, biodegradable, immunologically inert peptide polymer that is believed to stimulate fibroblasts to produce more collagen, thus increasing facial volume. It provides soft tissue augmentation through stimulation of an inflammatory tissue response with subsequent collagen deposition. PLLA produces a gradual treatment effect and some degree of correction with each session of treatment. Three injection sessions are required but once final correction is achieved results last up to 2 years.

Non-biodegradable fillers

They provoke a foreign body reaction that stimulates a fibroblastic deposition of collagen around the non-absorbable microspheres. Examples are polymethylmethacrylate (PMMA; Artecoll, the polyacrylamide hydrogel aquamid, and silikon 1000, a medical-grade pure form of silicone.

PMMA

It consists of 80% bovine dermal collagen plus 20% PMMA microspheres. The microspheres encapsulated by a fine fibrous capsule are left after the collagen vehicle is degraded within 1-3 months. Aquamid is a hydrophilic polyacrylamide gel made up of 97.5% sterile water bound to 2.5% cross-linked acrylamide polymer. The polymer gets integrated with soft tissue, fluid exchange occurs constantly between the hydrogel and surrounding tissue. Silikon 1000 is injected in minute amounts using a microdroplet technique, the body deposits collagen around the silicone particles. As they are non-biodegradable, their complications are more and difficult to treat.

V. Applications Of Botox

BT is most commonly known for its cosmetic applications. Out of all the preparations available in the market, Botox[®] has received maximum approvals worldwide and is the most commonly used. While BTB has been accepted by US Food and Drug Administration (FDA) for cervical dystonia and hemifacial spasm (HFS), its use is generally limited to patients developing antibodies to BTA. BTA finds wider approved spectrum of use. The uses of Botox[®] as accepted by FDA are as follows:

- Temporary improvement in the appearance of glabellar lines (wrinkles)
- Overactive bladder
- Urinary incontinence associated with a neurologic condition
- Prophylaxis of headaches in adult patients with chronic migraine
- Upper limb spasticity in adult patients
- Cervical dystonia in adult patients (severe neck muscle spasm)
- Severe axillary hyperhidrosis (excessive axillary sweating)
- Blepharospasm (spasm of the eyelids)
- Strabismus (squint).

BT has found widespread applications even beyond the FDA accepted uses. The basic spectrum of applications is dependent on the mechanism of action of the neurotoxin. Extensive reviews of the clinical applications have outlined uses such as HFS, oromandibular dystonia (OMD), bruxism, rhinitis, sialorrhea, crocodile tears (lacrimation), pain (most commonly neuralgic origin), hyperhidrosis, foot dystonia, axial dystonia, Writer's cramp (WC) and other occupational cramps, Tardive dyskinesia, tremor, spasticity, protective

ptosis, spasmodic dysphonia, benign prostatic hyperplasia, as well as applications in parkinsonism. Of particular, interest to this review are applications of BT in dentistry and head and neck region.

USES OF BOTOX IN ORAL AND MAXILLOFACIAL REGION

The uses of Botox in maxillofacial region can be broadly divided into cosmetic and non-cosmetic applications. Continuous research has paved the way for innovative uses of BTA in dentistry. BTA or Botox® offers substantial benefits as an adjunct to cosmetic dental procedures as well as a minimally invasive alternative to conditions which are refractory to routine medical management or require extensive surgical intervention.

COSMETIC APPLICATIONS OF BOTOX AND DERMAL FILLERS

Facial wrinkles

- BTA has been most widely accepted for its use to temporarily treat hyperfunctional facial lines.
- Forehead rhytids are managed by injecting 10–20 U of BTA injected at least 1 cm above the orbital rim with a general rule of avoiding injecting frontalis without injecting glabella to reduce the chances of brow ptosis. The injection site and pattern of injections vary depending on the desired brow position. It is preferred to inject lower doses away from the brow so as to avoid the frozen look
- Glabellar lines (frown lines) are generally managed by 20–40 U of BTA divided over five injection sites. The five injection sites correspond to the area of the procerus (between the eyebrows above the nasal bridge), paired injection sites that correspond to the corrugator muscles (10 mm above the orbital rim on an imaginary vertical line running through the medial canthus) and a paired injection site for superior medial orbicularis (10 mm above the orbital rim approximately in the midpupillary line)
- Lateral canthal lines known as “crow's feet” (due to lateral orbicularis oculi) are generally managed by superficial injections of 8–16 U of BTA into the lateral orbicularis oculi about 10–15 mm away from the orbital rim so as to avoid diffusion into extraocular muscles
- Eyebrow lift by BTA injections can be managed by either injecting the glabella alone or injecting the vertical fibers of lateral orbicularis oculi in a dose of 20–40 U or 7–10 U respectively
- Perioral lines, wrinkles around the lips commonly called the “smokers wrinkles” are injected superficially at or above the vermilion border and sparing the corners of the mouth so as to avoid drooping of the corners. A side effect of these injections is difficult in pronouncing “b” and “p” and therefore, these injections are avoided in public speakers and singers. Doses are kept low so as to achieve esthetic results while maintaining function. Typical dose ranges in 5–6 U; however, doses as low as 1–2 U per injection point are advised.
- Wrinkles on neck (due to platysma muscle) can be managed by injecting 2–4 U into six injection points evenly distributed along the jawline.
- 5–6 U of BTA injected into mentalis muscle area can be used to manage cosmetic Mentalis dimpling.
- Botox and Dermal fillers can provide immediate volume to areas around the mouth, such as the nasolabial folds, marionette lines, and lips to create the proper lip lines, smile lines, and phonetics. Dermal fillers, such as Juvéderm® and Restylane®, are volumizers—or plumpers—that fill out lips and static folds in the face caused by loss of collagen and fat.

Temporalis and masseter muscle hypertrophy

The hypertrophy of temporalis and masseter muscles is generally associated with clenching or other parafunctional use of the jaws. The results of BT use in cases with masseter and temporalis muscle hypertrophy are very encouraging and appear to be safe and effective in treating chronic facial pain associated with masticatory hyperactivity. Injection sites identified by palpation during clenching receive 12 U of BTA percutaneously in the thickest part of the muscle.

Dentofacial esthetics and gummy smile

Recently, BT and dermal fillers have been used to provide immediate volume to black triangles formed due to loss or inadequate interpapillary tissue. Botox can also be used in a lip deformity where the lip rises more on one side than the other. It has to be injected at a specific site controlling where the lip goes and how much of it is raised and where and finally, the dreaded “black triangles” which is one of the most challenging aesthetic problems, for which there are very limited successful treatment options. Food particles accumulate in the space and create aesthetic issues. Dermal fillers can be injected into the interdental papilla to plump it and close the interdental space. Treatment outcome usually last for eight months or longer—at which point the treatment needs to be repeated. Dermal fillers along with BT act as volumizers injected into the interdental papilla to offer a minimally invasive treatment option as compared to the conventional therapies which include aggressive gingivectomy or orthognathic treatment approaches. Use of BT is particularly effective in managing cases of

excessive gingival display due to excessive contraction of upper lip muscles; primarily levator labii superioris alaeque nasi. A dose of 3 U is recommended at an injection point known as “Yonsei point” for injection of BT.

Asymmetrical smiles

Facial asymmetries may happen due to overactivity of one of the depressor labii inferioris. No treatment options were proved to successful until botox was used. Botox can be injected into the overactive muscle fibers of the depressor labii inferioris (the muscle responsible for the asymmetry of the lower lip) and then botox will cause a gentle relaxation of the muscle resulting in a symmetrical smile.

Drooping of corners of mouth

Hyperactivity of depressor anguli oris can lead to drooping of the corner of the mouth. Injection of BTA has shown to have positive results in such cases. The site of injection is on the trajectory of nasolabial fold to the jaw line. Bilateral injections in doses of about 2–5 U is the norm.

THERAPEUTIC APPLICATIONS

Temporomandibular disorders

Temporomandibular joint disorders (TMD) is a term suggested by Bell and signifies not only disorders of the temporomandibular joint (TMJ) but also includes a spectrum of disturbances associated with the function of masticatory system, which are poorly understood and often intermingled with other chronic pain disorders. These set of disturbances have been previously termed as TMJ dysfunction syndrome, functional TMJ disturbances, myofascial pain dysfunction syndrome, and temporomandibular pain dysfunction syndrome. TMDs may be myofascial (those related to muscles themselves) or arthrogenic (those related to TMJ), but majority of TMDs include a myogenic component and muscular spasticity in relation to bruxism, external stressors, OMD, and psychomotor behaviours. Conventional treatment approaches for TMDs include physiotherapy and exercise, anti-inflammatory and analgesic drugs, muscle relaxants, oral appliances (mostly stabilization splints), or a combination of these modalities. Surgery is sometimes indicated but is an expensive and invasive treatment option. BTA has been found to be effective in resolving pain and tenderness in TMDs. It has been proposed as an adjunct in managing TMDs, particularly in cases involving muscular hyperactivity. The diverse group of TMDs those are likely to be benefited by injection of BT includes the following:

- Bruxism and clenching
- OMDs
- Myofascial Pain
- Trismus
- Hypermobility
- Masseter and temporalis hypertrophy
- Headaches.

Although no definite protocol has been proposed, various case reports have recorded significantly decreased pain and improved function and mouth opening at doses ranging from 25 to 150 U of Botox[®] injected intramuscularly into temporalis and masseter muscles. Injection of BTA into lateral pterygoid muscle has been found effective in treatment of recurrent mandibular dislocation.

Oromandibular dystonia

Oromandibular dystonia (OMD) is a movement disorder characterized by involuntary spasms and muscle contractions. It manifests as distorted oral position and function resulting in difficulty in speaking, swallowing, and eating. Although it is a neurologic disorder, it is included as a subset of TMD because of its involvement of the masticatory apparatus. Most of the reported literature on OMD has been open-label studies, but all have reported improvement with botulinum toxin injections. The largest study to date was a prospective open-label conducted by Tan and Jankovic that treated 162 patients with OMD over a 10-year period. Botulinum toxin type A was injected into the masseters. Improvement in function for chewing and speaking was reported in 67.9% of the patients, and mean duration of clinical improvement was 16.4 ± 7.1 wk.

Bruxism

Severe clenching or grinding of teeth is called bruxism and is often associated with generalized attrition, TMJ symptoms, headache, and muscular pain. BTA has been successfully used in cases of bruxism. Injection of BTA bilaterally into masseter muscles (in a dose range of 25–100 MU per side) has been documented to significantly reduce the severity of symptoms for 6–78 weeks (mean 19 ± 17 weeks). In comparison with oral splint, BTs are equally effective on bruxism and injections at a dosage of <100 U are safe

for otherwise healthy patients. Use of BTA in sleep bruxism is also encouraging and a single injection has been shown to be effective for at least a month.

Sialorrhea and salivary secretory disorders

Sialorrhea (excessive salivation/drooling) is a common problem caused by poor oral and facial muscle control. Treatment options may range from a conservative medical line to a more aggressive surgical approach. Effects of BTA on salivary glands have been studied. The injection of BTA into the parotid and submandibular glands is effective in controlling drooling. Botox[®] is administered in a dose range of 30–70 U into parotid gland with a significant reduction in salivary flow observed in 4 weeks. However, the effects fade in about 3 months, and repeat injections are often necessary. BTA injections have also been shown to be effective in managing gustatory sweating (Frey's syndrome). Repeated treatment improves on the results of primary treatment.

Salivary fistula

Salivary fistula is a typical enlargement following the careful evacuation of parotid tumors. Most fistulae may close suddenly, persistent fistulae are difficult to be dealt with. An infusion of botox in the nearness of the parotid organs causes blockage of the parotid emission. This causes a decline in the salivary stream, trailed by glandular decay, enabling the salivary fistula to recuperate.

Facial nerve palsy

BTA injection treatment was effective in reducing facial synkinesis, thus improving facial expression symmetry both at rest and in voluntary movements. One of the complications of facial nerve palsy is hyperlacrimation (crocodile tears) associated with salivation due to the aberrant connection between secretomotor fibers of salivary gland to lacrimal gland. Injection of BT into lacrimal gland has been successful in managing this condition.

Facial pain and trigeminal neuralgia

BT has been found to be safe and effective in the management of pains in maxillofacial region, especially cervical dystonia and chronic facial pain associated with masticatory hyperactivity. BTA has been found to be effective in case of trigeminal neuralgia without major adverse effects. BT is fast becoming a minimally invasive method of choice in treating trigeminal neuralgia over other invasive therapies.

Implantology

- BT has been postulated to be therapeutically beneficial by allowing unimpeded osseointegration of implants. Stress due to any excessive functional force or any parafunctional habit may cause implant failure. Thus, injecting BTA relaxes the masticatory muscles, sparing the implant leading to unimpeded osseointegration.

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 Kayikçioğlu *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 digastric have been used successfully in the correction of posttraumatic anterior open bite. BTA has also been proposed in the management of ranula as a minimally invasive therapy.

Cancer and palliative care

The application of BTA can improve movement disorders like synkinesis following reconstructive surgery in patients with cancers of the parotid gland and as antispasticity agent in palliative care for severe pain. The application of BTA is a minimally invasive treatment option in various functional disorders, thus improving the quality of life in patients with head and neck cancers of different etiologies with minimal side effects.

Denture wearers

Jaw muscles are able to adapt themselves to the changing functional demands by altering their size, cross-sectional areas, and properties. BTA can be used in such patients struggling in getting used to a new set of dentures due to irregular and uncoordinated muscle activity, especially who have been edentulous for a long period of time by providing muscle relaxation.

Adjunct to orthodontic treatment and to prevent relapse

In some cases, relapse following an orthodontic correction may occur in patients with strong muscle activity such as that of mentalis muscle. BTA can be used during treatment to reduce the intensity of muscle contractions and muscles can be slowly and gradually trained post treatment to a more physiologic movement.

Pathologic clenching

Pathologic clenching is a disorder leading to chronic trauma to teeth, gingiva, and underlying tissues. Low doses of botulinum toxin Type A can potentially reduce this disorder. Because parafunctional clenching leads to periodontal trauma, limiting clenching before and after periodontal surgery can benefit healing.

Mandibular spasm

This type of muscular spasm results from spasm of all muscles of mastication and associated mandibular muscles. This disorder places limitations on completing the basic oral hygiene necessary to prevent oral disease. Other impairments can include: Restrictions on dental treatment, difficulty with eating and diminished oral utility. Botulinum toxin treatment to the masticatory musculature diminishes the effects of hyperfunctional or spastic muscles.

Diagnostic application

In patients with chronic intermittent toothache, BTA can be used to verify the origin of pain (muscular or pulpal), for example in cases with referred pain from anterior temporalis. Thus, BTA in such cases can be used prophylactic as well as diagnostic.

GENERAL GUIDELINES

- 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.

The treatment with BT is based on palliative rather than curative approach as the blockade is temporary. Blockade lasts for three to 4 months after which there is sprouting of new axon terminals resulting in return of neuromuscular function. The general latency for BTA is 1 week, and it is recommended that injection is done no more than once every 12 weeks to avoid development of antibodies against the toxin. Following application, the clinical effect occurs within approximately 3–7 days, followed by 1–2 weeks of maximum effect, which then levels off to a moderate plateau until full nerve recovery within 3–6 months. Depending on the target muscle, injection dose is 10–50 U of Botox[®] per site (total of 200 U in the masticatory system). Maximum of 400 U can be used if other sites in the head and neck are included in the protocol.

VI. Procedure

The aesthetic benefit for the patient with temporary fillers can be attributed to 90% technique and 10% substance, whereas it is usually 99% technique with permanent fillers.^[3]

Preparation and anaesthesia

The area of injection and also the surrounding skin should be cleaned properly with antiseptics. Anaesthesia is important for technical benefit and the patient's comfort. Anaesthesia can be ensured by:

- Application of ice
- Topical EMLA cream application
- Regional nerve blocks-infraorbital, mental, maxillary, submucosal-as applicable, depending on the area
- Distraction Techniques such as massage, application of vibration
- Talking in a soothing and comforting manner-Talkesthesia

Injection technique

The choice of the injection technique depends on the indication, its location, the filler substance, size of the needle, and the experience of the injector. The techniques include:

1. Linear threading technique
2. Serial puncture
3. Fanning
4. Cross-hatching
5. Depot

6. Fern
7. Cone

The first four techniques are used commonly, whereas the last three are only used in special situations. It is important to place the filler in the right place and the bevel orientation is not a significant issue at any site.

Postinjection management

Patients should be asked to avoid extreme cold or heat for 48 hours. Massaging of the treated area and strenuous physical activity should be avoided for six hours. Patients are asked to sleep with their heads elevated for one night; skin care routine may be followed after 24 hours.

Measures to achieve successful outcomes

A comprehensive treatment plan should be devised to suit the needs of each patient. Choosing the right filler for the right indication is vital. Where essential, combinations of fillers with botulinum toxin should be used to optimize the results.^[6] In such cases, it is advisable to inject the botulinum toxin first, wait for a week to see the improvement, and then, inject the filler to achieve best results.

VII. Adverse Effects

In general, adverse reactions are uncommon and localized. The results from a systematic review with meta-analysis have concluded that BTX-A has favorable safety across wide spectrum of therapeutic uses. Botox[®] is administered by injection and dosing depends on the condition that it is used for. Side effects of Botox[®] include allergic reactions, rash, itching, headache, neck or back pain, muscle stiffness, difficulty in swallowing, and shortness of breath. This can also be accompanied by nausea, diarrhea, stomach pain, loss of appetite, injection site reactions, sore throat, runny nose, ringing in ears, and increased sweating in areas other than the underarms. The two most common medication-related side effects from BT orofacial injections are alterations in salivary consistency and inadvertent weakness of the swallowing, speech, and facial muscles. These complications are injection site-specific (e.g., more common with lateral pterygoid injections and palatal and tongue muscle injections) and dose-dependent problems.

In some cases, BT effects may be observed at sites beyond the site of local application, known as the “Spread of toxin effect.” The symptoms of such a presentation are consistent with the actions of BT and include generalized muscle weakness manifesting as diplopia, dysphagia, dysphonia, ptosis, and urinary incontinence or even breathing difficulties. The probability of this spread of toxin effect is even more in the face as well as head and neck region due to facial planes and spaces.

BT is classified as category C for use in pregnancy, and its use is warranted only if the potential benefit outweighs the potential risk to the fetus. Similarly, use in nursing mothers is also not recommended routinely. Use of BT in pediatric age groups should also be restrained, and FDA guidelines for its use were followed.

The lethal dose of Botox[®] in humans is not known. Although it has been estimated to be about 3000 U. The maximum dose recommended for dental applications at an injection session is about 80–100 U. It means that 30 vials of Botox[®] injected would have a potentially lethal outcome.

- The muscles injected can be sore for a few days after the injections
- Botox can cause temporary partial weakening of the muscles injected
- When Botox is used for a long time, it may cause atrophy of the muscles injected. This atrophy is reversible if the therapy is discontinued
- There have been reports of temporary side effects such as flu-like symptoms, palpitations, tingling sensations, or nausea. These side effects are rare and usually go away within 1-2 days.

VIII. Contraindications

- In any known hypersensitive reaction to any of the botulinum preparations
- Allergy to any of the constituents of BTX-A or BTX-B.
- Dependent on intact facial movements and expressions for their livelihood (e.g. actors, singers, musicians and other media personalities).
- Presence of active infection at the proposed injection site.
- Pregnancy and lactation.
- Patients receiving treatment with aminoglycosides, anticholinergic drugs, penicillamine, quinine, calcium channel blockers or other agents interfering with neuromuscular transmission or muscle relaxants should be observed closely because the effect of Botox[®] may be potentiated
- Patients suffering from peripheral motor neuropathic diseases, sclerosis, or any neuromuscular junction disorders like myasthenia gravis, Eaton-Lambert syndrome are at increased risk for clinically significant adverse reactions and should be closely monitored

- Psychologically unstable patients.

IX. Conclusion

The journey of BT from a deadly poison to a remarkably resourceful therapeutic agent has broadened the horizon of dentistry. BT has certainly been demonstrated to have significant value in the management of cases where the patient is unresponsive to less invasive treatment modalities or in conjunction with them. It offers a minimally invasive approach to manage and treat selected suitable cases with minimum complications. However, the practicing dentist must ensure that the treatment is within his/her scope of practice and has appropriate training not just to administer but also to deal with its potential adverse effects.

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