ABSTRACT
Botulinum toxin type A, also known as Botox, has been widely used in various clinical applications due to its neurotoxic properties. It inhibits the release of acetylcholine (ACH), a neurotransmitter, by blocking the docking of the ACH vesicle to the presynaptic membrane. This mechanism effectively reduces muscle activity by blocking the release of acetylcholine at the neuromuscular junction.

INTRODUCTION
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. Botox has been increasingly used in dentistry as well due to its therapeutic uses in the treatment of certain oral conditions.

MECHANISM OF ACTION
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, effectively weakening the muscle for a period of three to four months.

TEMPOROMANDIBULAR JOINT DISORDERS
Temporomandibular disorder (TMD) is a 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, peri-auricular pain, neck pain, and/or decreased jaw excursion. The majority of TMD cases include a myogenic component and muscular spasticity secondary to bruxism, external stressors, oromandibular dystonia, and psychomotor behaviors that are common aetiological factors of TMD. TMD is caused by excessive biting forces that have conventionally been treated with intraoral appliances, occlusal adjustments, dental restoration, and/or surgery. These techniques are invasive, irreversible, and expensive for the majority of patients. Techniques currently employed for aesthetic, conservative restorations may not withstand the parafunctional forces continually applied by some patients. Thus, many of these treatment options may not be ideal for all patients, and muscular relaxation with botulinum toxin A is a viable alternative. When a muscle relaxant is used with the muscles of mastication, this clenching reflex can be reduced or eliminated. Because a very small percentage of available force is required to masticate food, a slight relaxation of muscle function reduces bruxing and is usually insufficient to affect chewing and swallowing.
Botulinum 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 Juvederm® and Restylane®, are volumizers—or plumpers—that fill out lips and static folds in the face caused by loss of collagen and fat. 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.

**BRUXISM**

Botulinum neurotoxin has also shown promise in alleviating the symptomatology of bruxism. One of the earliest reports on use of botulinum toxin type A for bruxism was by Van Zandijcke and Marchau [15], who described the successful treatment of a brain-injured patient with severe bruxism with 100 U of a botulinum toxin type A injections to the temporals and masseter muscles.

**DENTAL IMPLANTS AND SURGERY**

Overloading of the muscles of mastication can prevent or impede osseointegration of implants and/or fracture callus formation [16,17]. The muscular relaxation achieved with botulinum toxin type A injections to the masticatory muscles can be therapeutically beneficial by allowing implants better unimpeded osseointegration and fracture healing in a more stable environment.

Kayikcioglu and colleagues [17] conducted a small open-label study to prospectively examine the use of botulinum toxin type A as an adjunct to zygomatic fracture fixation surgery, in an attempt to reduce the number of fixation sites and to prevent dislocation of the zygomatic bone. Five male patients with zygomatic bone fractures were injected with 100 U of botulinum toxin type A into the masseter muscle of the fractured side. Patients were then operated on 12 to 48 h after the injection and EMG confirmation of muscle denervation. The temporary paralysis of the masseter muscles allowed for fewer miniplane and/or microplate insertions in all patients, and resulted in no complications related to either the botulinum toxin injections or surgical procedures [17]. Kayikcioglu’s group also found similar benefits of adjunct botulinum toxin treatment for surgical reduction of mandibular and condylar bone fractures [17].

**GUMMY SMILE**

The display of excessive gingival tissue in the maxilla upon smiling, or “gummy smile,” is both an oral hygiene and cosmetic issue with no simple remedy. Excessive gum exposure is frequently attributable to over-contraction of the upper lip muscles, particularly the levator labii Superioris alaeque nasi. Although several surgical techniques have been reported in the literature for correction of hyperfunctional upper lip elevator muscles, such as the Rubinstein and Kostianovsky [18], Miskinyar [19], and Rees and LaTrenta [20] techniques, they are not routinely used to treat gummy smile [21]. In general, the most common surgical corrections currently used are the LeFort I maxillary osteotomies with impaction for skeletal vertical maxillary excess, and gingivectomies for delayed passive dental eruption with excessive gingival display [21,22].

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 [23]. 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.

In a small open-label trial, five patients with excessive gingival display resulting from hyperfunctional upper-lip elevator muscles were treated with Botox injections under electromyographic guidance [25]. Patients received one 0.25 U per muscle bilaterally into the levator labii superioris, levator labii Superioris alaeque nasi, and at the overlap areas of the levator labii superioris and zygomaticus minor muscles. All of the patients were pleased with the results and the effective increase in upper-lip length upon smiling averaged 124.2% [25]. The duration of effect ranged from 3 to 6 months, and no adverse effects were reported or observed. However, the improvement is temporary and must be repeated every six months to one year.

**MASSETERIC HYPERTROPHY**

Patients who are chronic jaw clenchers frequently present with masseter hypertrophy [26,27]. The increased size of these muscles is evident in the patient’s facial appearance which is often substantially altered. The jaw appears swollen and misshapen. The common treatment before botulinum toxin was surgical resection [28], which results in substantial contracture. In several small but well-documented clinical trials, the injection of small aliquots (e.g., 30 U per side) of Botox into the masseter muscles resulted in a sustained reduction of masseter hyperactivity [26,27,29,30] [Table/ Fig-4a,b] [31]. Over time, in most patients, reduction in masseter hyperactivity has been found to yield a concomitant reduction in gross masseter size (maximum reduction 35.4%) [27]. If the underlying pathology responsible for the hyperactivity is resolved,
MANDIBULAR SPASM

When the mandibular closing musculature remains semicontracted or in spasm, mouth opening becomes limited. This type of muscular spasm places limitations on completing the basic oral hygiene necessary to prevent oral disease [32]. Other impairments can include: restrictions on dental treatment, difficulty with eating and diminished oral utility (a broad spectrum of oral functions are impaired by restricted opening and the contraction of bite radius). Botulinum toxin treatment to the masticatory musculature diminishes the effects of hyperfunctional or spastic muscles [33].

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 [34]. Most of the reported literature on OMD has been open-label studies, but all have reported improvement with botulinum toxin injections [35-39]. 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 [39]. Botulinum toxin type A was injected into the masseters and/or the submental muscle pain from the anterior temporalis is often referred to the teeth. This should be treated before any major irreversible dental treatments are undertaken. In this context, the use of botulinum toxin type A is both prophylactic as well as diagnostic.

PATHOLOGIC CLenching

Excessive forces created by parafunctional clenching impede healing and reattachment of gum and bone in the mouth after trauma [40]. Botulinum toxin type A limits the muscle contraction, and this reduction in clenching intensity will allow traumatized tissue to heal. Because parafunctional clenching contributes to periodontal trauma, botulinum toxin type A can limit clenching before and after periodontal surgery to improve healing. Further, in this application, the use of a splint is often contraindicated because the teeth should be functional during healing, so Botulinum toxin acts as a pharmaceutical splint.

Orthodontic treatments on patients who are clenchers or have a deep or crossed bite are prolonged if the vertical component of muscular force is greater than the force of the fixed or removable appliance. These cases often require the use of removable functional retainers in combination with regular fixed braces in an attempt to control the component of vertical force [41]. With the use of botulinum toxin, orthodontic treatment time can be reduced, and patients would be far more comfortable and functional (eating, speaking, swallowing).

OTHER USES

1. Sialorrhea: This toxin also blocks the release of acetylcholine at the cholinergic synapses of the autonomic nervous system; thus, this toxin can block cholinergic parasympathetic secretomotor fibers of the salivary gland. Hence, botulinum toxin has been tested in some autonomic disease, such as achalasias, hyperhidrosis and gustatory sweating (Frey syndrome) [42]. Lim and Choi [43] have reported that injection of botulinum toxin type A is a highly effective and relatively safe primary method of treatment for an acute postparotidectomy salivary fistula that, if treated with conventional pressure dressings, takes long to subside.

2. Trigeminal Neuralgia: BOTOX 25–75 U injected into pericranial muscles relieves headache by relaxing the over active muscles by blocking nerve impulses that trigger contractions. According to Elcio, excruciating pain associated with inflammation of the trigeminal nerve of the head and face can be substantially relieved by injections of BOTOX [44].

3. Retraining Muscles During Orthodontic Treatment: Botox can be used to prevent relapse of orthodontic treatment in case of patients with stronger muscle activity such as that of mentalis muscle. Botox can be used to reduce the intensity of the muscle post treatment and over time, the muscle may be retrained to a more physiological movement.

4. Botox can be used in patients with a new denture especially if the patient has long history of edentulousness and has decreased vertical dimension.

5. Higher doses of botulinum toxin type A may potentially be used as a pharmaceutical splint, limiting muscle contraction before resetting and during rehabilitation after fracture of a facial bone (e.g., fractured mandibular condyle).

6. Botulinum toxin type A can be used to verify whether the pain is muscular or pulpal (e.g., complex toothache) in origin in patients with chronic intermittent toothache [45]. For example, muscle pain from the anterior temporals is often referred to the teeth. This should be treated before any major irreversible dental treatments are undertaken. In this context, the use of botulinum toxin type A is both prophylactic as well as diagnostic.

CONTRAINDICATIONS

Patients should not be treated or treated with extreme caution who are [46]:

- Psychologically unstable or who have questionable motives and unrealistic expectations.
- Dependent on intact facial movements and expressions for their livelihood (e.g., actors, singers, musicians and other media personalities).
- Afflicted with a neuromuscular disorder (e.g., myasthenia gravis, Eaton-Lambert syndrome).
- Allergic to any of the components of BTX-A or BTX-B (i.e. BTX, human albumin, saline, lactose and sodium succinate).
- Taking certain medications that can interfere with neuromuscular impulse transmission and potentiate the effects of BTX (e.g., aminoglycosides, penicillamine, quinine, and calcium blockers).
- Pregnant or lactating (BTXs are classified as pregnancy category C drugs)

DISCUSSION

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 patient more comfortable and at ease. Botulinum toxin A is kept frozen (2–4°C) in a vial until it is ready to use. The drug is put into solution, following manufacturer’s guidelines, by adding normal saline (preservative-free 0.9% saline solution). Once prepared it should be used within four hours. The preferred syringe is a calibrated 1.0-ml tuberculin syringe, and the needle selected for injection usually
is between 26 and 30 gauge. Skin preparation involves alcohol wipes and dry sterile gauze sponges. Aspiration before injection is recommended to avoid involuntary deposition of toxin into the facial arteries. Botulinum Toxin A achieves close to immediate results in working the subsequent time [45]. Mild stinging, burning or pain at the injection site, flu-like symptoms, non-targeted muscle weakness, dysphagia, and hematoma. These complications are generally transient, and resolve within a couple of weeks. Hands-on training is essential in learning proper techniques of administration and interwining them with dental treatment plans. With proper training, dentists are usually more proficient than any other healthcare professionals in providing these treatments to patients, both for dental and cosmetic needs. The American Academy of Facial Aesthetics is conducting more than 50 local courses a year, has trained more than 6,000 dental professionals from 48 states and 28 countries through comprehensive hands-on live patient two-day facial aesthetic training sessions with Botox and dermal fillers [50]. The Indian Academy of Facial Aesthetics (IAOFE) in conjunction with the American Academy of Facial Aesthetics (AAFE) is also offering Botox and dermal fillers training course for dentists and physicians [51].

CONCLUSION

BOTOX has important clinical uses as an adjunct therapy in temporomandibular joint (TMJ) and bruxism cases, and for patients with chronic TMJ and facial pain. BOTOX is also used to complement surgical treating high lip-line cases, for denture patients who experience facial pain, in dentinal joint (TMJ) and bruxism cases, and for patients with chronic TMJ and facial pain. BOTOX is a neurotoxin that works by preventing the release of acetylcholine at the neuromuscular junction. It does this by attaching to the presynaptic membrane and inhibiting the release of acetylcholine, which is required for muscle contraction. BOTOX is therefore used to temporarily weaken muscle tone and reduce muscle activity.

REFERENCES


http://www.iaofe.com/about.html.