



Review Article

An amelioration in the field of Botox

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ABSTRACT

The power of beauty to modify perception and behaviour in our colleagues and peers, friends and family has led to self rejuvenation making it an important aspect of our industry. In today's world, facial appearance is one of the most important factors influencing our perception of beauty and attractiveness. The face is an integral aspect of a person's identity and a visible marker of one's age. Therefore, a person's autonomous decision is an indicator for esthetic treatments that will improve their self-image, self-esteem and appearance to others. Botox injections are noted primarily for the ability to reduce the appearance of facial wrinkles. They're also used to treat conditions such as neck spasms (cervical dystonia), excessive sweating (hyperhidrosis), an overactive bladder and lazy eye. Dental health care professionals have started considering facial areas in relation to esthetic dentistry as dentists are familiar in this area than any other healthcare practitioner. This article gives you an insight into what is botulinum and how does it work, dental uses of Botox, non dental uses and dermal fillers that are becoming a very popular part of cosmetic dentistry known for their great ability in diminishing the signs of aging in the skin.

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1. Introduction

The human body is the best work of art while beauty is 'an attitude with combination of qualities— including grace of form and charm of coloring that delights the sight or other senses. Facial expressions have a degree of universality that transcends time and place and the most powerful and profound facial expression of them all is the "Smile". Smiling is definitely one of the best beauty remedies considered to be a way of displaying joy. It is a way of communicating our internal world with people on the outside, and it can be a greeting sign to new people adding up to the personality of an individual, which in turn produces an increase in the self-esteem. Self-rejuvenation has become a huge industry because of the power of beauty to modify perception and behavior in our colleagues and peers, friends and family.

The adroitness in dentistry works for enhancing the esthetics and restoring beautiful smile of an individual. The Perfect integration of the facial and dental composition results in harmonizing an esthetic smile. The facial composition includes the hard and soft tissues of the face, while the dental composition relates mores specifically to teeth and their relationship with the gingival tissues.¹

The only real solution to aging is ultimately death, as humans our central mode of dealing with that inevitability is to delay and deny it. The recent proliferation of Botox procedures and the rise of numbers of relatively young women injecting the drug shows the ungraceful acceptance of aging among the peers. Although the human desire to beat the clock is not a recent phenomenon, the rise of anti-aging consumer culture and self-rejuvenation has hertily magnified and intensified the moral imperative to fight aging. This paper thus focuses on various cosmetics and non-cosmetic implications of the Botulinum Toxin

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2. History

2.1. *Clostridium botulinum* (Purified Neurotoxin Complex)

1. **1895** - *C. botulinum* first identified - 7 serotypes (A, B, C, D, E, F, G).
2. **1920** - Type “A” first isolated.
3. **1950s** - Type “A” shown to block release of Acetylcholine.
4. **1973** - Therapeutic potential to relax extraocular muscles investigated by Dr. Alan Scott (San Francisco, CA).
5. **1978** - FDA approves type A (Oculinum) for human testing.
6. **1989** - Allergan leads Oculinum through FDA testing and receives approval for Strabismus & Blepharospasm.
7. **1991** - Allergan acquires rights to Oculinum - name changed to Botox®.
8. **2000** - FDA approves Botox® for treatment of Cervical Dystonia.
9. **2002** - FDA approves Botox Cosmetic® for Glabellar Lines.

3. Pharmaceutical Basis and Mechanism of Action of Botox

Botulinum toxin is a neurotoxin protein produced by the bacterium *Clostridium botulinum*.² Currently, seven botulinum neurotoxin serotypes (A, B, C1, D, E, F, and G) produced by *Clostridium botulinum*, are recognized. Types A and B are capable of causing disease in humans, and are also used commercially and medically and are also used in medicine to treat various muscle spasms.³ Even though botulinum toxin is lethal, as a natural substance, it can be used as an effective and powerful medication.⁴

Botulinum toxins A and B are currently into commerce worldwide. Different strains of *Clostridium botulinum* bacteria are used in its composition and have both distinct and overlapping properties. Both type A & B comprises of a heavy chain and a light chain bonded by a disulphide bond. During biosynthesis the formation of a neurotoxin complex results in both types A & B which are enveloped by non-toxic proteins.

The exocytosis of acetylcholine on cholinergic nerve endings of motor nerves are inhibited by Botulinum toxin type-A,⁵ preventing the vesicle from binding where the acetylcholine is stored to the membrane where the neurotransmitter are 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.⁶ 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.⁷

4. Botox Cosmetic Indications

BOTOX Cosmetic (onabotulinumtoxinA) can help achieve temporary refinements in the appearance of:

1. Horizontal Forehead Lines
2. Glabellar Frown Lines
3. Peri-orbital Area
4. Cervical Area

5. Horizontal Forehead Lines

The action of the anterior frontalis portion of the occipitofrontalis muscle are responsible for the production of Horizontal forehead lines.

5.1. Dosing and Technique⁸

One must locate the following horizontal treatment rows by light palpation of the forehead at rest and maximum eyebrow elevation to achieve the desired results:

1. Superior margin of frontalis activity: approximately 1 cm above the most superior forehead crease.
2. Lower treatment row: At least 2 cm above the eyebrow, midway between the superior margin of frontalis activity and the eyebrow,
3. Upper treatment row: midway between the superior margin of frontalis activity and lower treatment row.

Inject 4 Units/0.1 mL of reconstituted BOTOX Cosmetic into 5 sites in the frontalis muscle for a total of 20 Units/0.5 mL. Place the 5 injections at the intersection of the horizontal treatment rows by locating the following vertical landmarks:

1. On the lower treatment row at the midline of the face, and 0.5–1.5 cm medial to the palpated temporal fusion line (temporal crest); repeat for the other side.
2. On the upper treatment row, midway between the lateral and medial sites on the lower treatment row; repeat for the other side.

6. Glabellar Frown Lines

The corrugator superciliaris, orbicularis oculi, procerus and depressor supercilia are responsible for pulling down action of the brows.

6.1. Dosing and technique⁸

Recommended dose is to inject Units/0.1mL into each of the 5 sites—2 in each corrugator muscle and 1 in the procerus muscle—for a total dose of 20 Units.

To reduce the risk of ptosis:

1. Near the levator palpebrae superioris the injection should be avoided, especially in those patients with larger brow-depressor complexes.

2. Precautions should be taken to place the lateral corrugator injections at least 1 cm above the bony supraorbital ridge.
3. The dose should be kept to a minimum kept to a minimum, ensuring the accurate injected volume and dose.
4. Do not inject botulinum toxin closer than 1 cm above the central eyebrow.

7. Peri-Orbital Area (CROW'S FEET)

Crow's feet are produced by the vertically oriented fibres of the orbicularis oculi and by the elevators and retractors of the corner of the mouth, zygomaticus and risorius. Weakening only the lateral part of orbicularis oculi is the aim of this treatment. The injections cause a very segmental weakening of the more lateral vertically arranged fibres of the orbicularis, relaxing the radial skin folds as they extend posterior to the bony lateral orbital margin.⁹

7.1. Dosing and technique

It is advisable to inject the crow's feet with the face relaxed as if one injects during forced contraction of the orbicularis and zygomaticus, botulinum toxin may in fact be injected more inferiorly and zygomaticus may be paralysed, resulting in the appearance of an ipsilateral facial palsy. The doses of Dysport used have been reported from 8 to 60 U. We do not yet have a recommended dosing for botulinum toxin B (MYOBLOC, Neurobloc).¹⁰

8. Cervical Area

8.1. Horizontal 'Necklace' Lines

Horizontal neck wrinkles present as linear depressions or furrows which occupy the anterior half of the neck.¹¹ The subcutaneous muscular aponeurotic system attachments from platysma to the overlying skin results in two to three horizontal 'necklace' lines in chubbier individuals.

8.2. Dosing and technique

Along each 'necklace' line 1-2U of BOTOX should be administered while massaging the area. Since this is area does not bruise easily, raising a wheal as in a deep dermal injection is always preferred. Also due to the close proximity of the muscles of deglutition and speech it is advisable to administer more than 10-20U per session.

9. Vertical Platysmal Bands

The vertical platysmal bands are external to the muscles of deglutition, speech and neck flexion.

9.1. Dosing and technique

Two techniques are used in this area:

1. Dividing the site into three along each band, injecting approximately 15U of Botox is the commonest approach.
2. Alternate method is by passing the needle across the width of the muscle ensuring that the needle remains in position inside the muscle.

Proponents of this technique argue that it is more accurate with a better response from a lower dose and a lower likelihood of complications. However, it is more uncomfortable for the patient and requires special equipment. Both techniques are reasonable and effective.¹²⁻¹⁵

10. Adjunctive Uses

Several other cosmetic enhancement procedures have been done in conjunction with Botulinum toxin resulting in more clarified, bright and also prolonging the effect of some procedures as well.

10.1. With surgical brow lift

Botulinum toxin is used alone to create a mild brow lift. However, surgery is indicated when brow ptosis is moderate to severe. Greater stability of brow elevation can be achieved by preoperative and postoperative relaxation of the brow depressors with botulinum toxin A during the first 3 months after surgery when the brow skin is binding to its new position.¹⁶⁻¹⁸

10.2. With ablative and non-ablative laser resurfacing

The muscles of facial expression eventually refolds the new dermal collagen created by the laser treatment, producing a more sausage-like appearance to the crow's feet and a thicker and more clumsy look to the glabellar frown line because of repeated usage. This can be delt by regular postoperative injections every 6 months which prolongs, expands and refine the laser resurfacing procedures.¹⁹⁻²¹

10.3. With lower eyelid ectropion and 'round eye' repair

After certain procedures dehiscence of the temporal incision in repair of lower eyelid ectropion can often occur, and weakening of the area over orbicularis that is pulling against the incision can allow it to heal with no complications.^{22,23}

10.4. With repair of facial wounds

Even when orientated properly along the relaxed skin tension lines, certain wounds have a tendency to widen. A good example is horizontal forehead incisions often show a degree of widening, that should otherwise heal well. Treating of these brow depressors with botulinum reduces

the pull on the incision during the time needed to attain strength in the healing wound, improving the final result.²⁴

10.5. With upper and lower eyelid blepharoplasty

Prior to upper lid blepharoplasty it is important to use botulinum toxin to achieve a minor brow lift and also to attempt to equalize brow height. A permanent angry and hostile expression can be produced by over-resection of upper eyelid skin on the side with the lower brow. This is only appropriate for individuals with mild asymmetry while those having more marked asymmetry may require a coexisting brow lift. With lower eyelid blepharoplasty, treatment of the crow's feet relaxes the skin, allowing for a more accurate assessment of the amount of skin to be resected during surgery and better placement of the incision, so that it is hidden within the orbital margin.^{25,26}

10.6. Rhytidectomy (face-lift)

During the refinement of the cervical mental angle the separated vertical platysmal bands are sutured together in the mid-line. An effortless approach is to use chemodenervation with BOTOX to achieve similar results. Botulinum toxin treatment is also beneficial in 'bow-stringing' of platysma after platysmal plication from occurring during the healing phase, and can improve it if it develops.

11. Recent Researches in Botox

11.1. Osteoarthritis

Knee osteoarthritis is a common condition that happens when the cartilage that cushions the knee joint starts to wear down. Because it can shut down nerve cells, doctors can use it to ease muscle spasms. The theory is that it might permanently deaden nerves and offer relief. There's not enough evidence to know if it works. The most common causes of knee pain observed by the physicians includes Iliotibial band syndrome (ITBS) and Superolateral fat pad impingement (SLFPI).^{27,28}

Iliotibial band syndrome (ITBS) is characterized by pain around the lateral knee during activity^{29,30} widely thought to result from compression of the fat layer between the iliotibial band (ITB) and lateral femoral condyle.³¹ while Superolateral fat pad impingement (SLFPI) is characterized by pain in the anterolateral region of the knee.^{32,33} Usually occurring at the lateral aspect of the patellofemoral joint, activating inflammation and causing subsequent fibrous hyperplasia.

A study was conducted in 2016 by Stephen JM et al,³⁴ to investigate the effect of an ultrasound-guided botulinum toxin (BT) injection into the tensor fasciae latae (TFL), followed by physical therapy, in patients classified with lateral patellofemoral overload syndrome (LPOS) who

failed to respond to conventional treatment. The primary outcome measure was a change in self-reported knee pain using the Anterior Knee Pain Scale (AKPS; Kujala score) before and after treatment.³⁵ They concluded that an injection of BT into the TFL, combined with physical therapy, would result in a significant improvement of symptoms in patients with LPOS, which was maintained at 5-year follow-up. This resulted from reduced lateral TFL/ITB tension or to an increase in GMed activity in response to inhibition of the TFL.

11.2. Shoulder pain

Shoulder pain is one of the most common musculoskeletal complaints in modern societies, second only to low-back pain in patients seeking care for musculoskeletal disorders in the primary-care setting. The frequently encountered aetiological factor for shoulder pain is the glenohumeral osteoarthritis, rotator cuff tear (full or partial), impingement, tendinitis, adhesive capsulitis, and subacromial bursitis.³⁶ Commonest being the rotator cuff, accounting for over two-thirds of cases of shoulder pain.³⁷

In 2018 a study was conducted by Cinone N et al wherein 6 subjects were treated with IncobotulinumtoxinA (100 U Xeomin; Merz Pharmaceuticals GmbH, Frankfurt, Germany) by injecting it into the symptomatic glenohumeral joint. The study concluded that an Intra-articular BoNT-A is effective and minimally invasive. The effectiveness of BoNT-A injection for the management of this syndrome resulted in pain reduction with an increase in shoulder articular range of motion.

11.3. Lateral epicondylitis

Often called "tennis elbow," a common cause of elbow pain. Studies have reported reduced pain and improvement in daily activities after BoNT-A injection. In some reports, reductions in finger movement and grip strength have occurred due to the (temporary) motor effects of BoNT-A.

Placzek and colleagues used a composite measure comprising pain associated with four isometric or passive movements and localized tenderness at the lateral epicondyle.³⁸ Espandar and colleagues measured primarily pain at rest, but they also included levels of pain during maximum grip or maximum pinch.³⁹

11.4. Chronic exertional compartment syndrome

Chronic exertional compartment syndrome (CECS) is an overuse injury first described by Mavor in 1956 that typically affects young endurance athletes, classically distance runners. CECS occurs primarily in the lower leg, predominantly in the anterior compartment, although it has been reported elsewhere in the body.

Isner-Horoboti et al, performed abobotulinum toxin A injections into the anterior and anterior/lateral

compartments in 16 individuals with a mean follow up of 4.4 months (range 3–6 months). Fifteen (95%) patients were asymptomatic after intervention with fourteen (88%) exhibiting normalized post-exercise compartment pressures. Using manual muscle testing, they determined that 11 patients displayed decreased strength though did not produce noticeable subjective weakness. Another case report by Baria and Sellon presented the first long-term follow up (14 months) of a CECS case treated with botulinum toxin injections (Botox) in which the patient reported continued pain relief and had resumed her active lifestyle without adverse effects. Thus, based on limited evidence, it can be concluded that BoNT-A injections may be a safe and effective treatment, in some cases avoiding the need for surgery.

11.5. Migranes

Botox treatments has shown reductions in the symptoms of migraine headaches, including nausea, vomiting, and sensitivity to lights, sounds, and smells. It is usually administered once every three months, injected into specific points along the bridge of your nose, your temples, your forehead, the back of your head, your neck, and your upper back. It may take as long as 10 to 14 days for you to experience relief after receiving the dose.

11.6. Overactive bladder

Botox has also been put to use to treat overactive bladder symptoms such as a strong need to urinate with leaking or wetting accidents, going too often, and the strong, sudden need to urinate. BOTOX is injected into the bladder muscle about every 6 months to target the source of your OAB. Clinical trials showed that the majority of patients receiving BOTOX had at least a 50% reduction of daily leakage episodes, some patients even reported reducing their leakage episodes by 75% while Approximately 1 in 4 of these patients reported leakage episodes stopped completely.

11.7. Hyperhidrosis

Hyperhidrosis, more commonly known as excessive sweating, can significantly affect a person's quality of life. In 2004, the U.S. Food & Drug Administration (FDA) approved BOTOX (onabotulinumtoxinA) for the treatment of severe primary axillary hyperhidrosis (excessive sweating of the underarms) in patients unable to obtain relief using antiperspirants. The toxin works by blocking the nerve signals responsible for sweating, ultimately stopping the sweat glands from producing too much sweat at the sites where it is injected. Since the nerves regenerates, retreatment is often required.

11.8. Contraindications and precautions

1. Neuromuscular disorders: Like Myasthenia gravis and ALS (amyotrophic lateral sclerosis or Lou Gehrig's

disease are considered to be prime contraindication for botulinum toxin A therapy is since it could amplify the affect of the neurotoxin.

2. Pregnancy: In Pregnant or breast feeding women, cosmetic neurotoxin should not be used.
3. Skin disorders.
4. Medications: Co-administration of BOTOX and aminoglycosides or other agents interfering with neuromuscular transmission (eg, curarelike compounds) can cause drug interactions and should only be performed with caution as the effect of the toxin may be potentiated.

12. Conclusion

Botox is a feminized cosmetic practice and an enhancement drug. These botulinum toxins provide the patient with most predictable, minimally invasive, esthetics and most notable outcomes. Various clinical trials have been done to enlighten the benefits of Botulinum toxins other than cosmetics and a lot of research is still going on. The success of botulinum treatment not only depends on mastering the art of technique but also on the patient's education because ultimately the prime goal is the patient's satisfaction. Thus, patients should be educated about the potential adverse effects, contraindications and unrealistic desires to look appealing. However, understanding the barriers of treatment and having the ability to acknowledge and manage complications are paramount.

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None.

14. Conflict of Interest

None.

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