

Gummy Smile: Go the Botox Way

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Abstract: The subject of the smile and facial animation as they relate to communication and expression of emotion is of great interest to in dentistry. Obtaining a beautiful smile is always the main objective of any aesthetic dental treatment. The gummy smile is a condition characterised by an excessive display of maxillary gingivae during smiling. One cause of excessive gingival display is the muscular capacity to raise the upper lip higher than average. Several surgical procedures have been reported to improve the condition, but surgery always involves risk and is costly. Botulinum toxin type A (BTX-A) (Botox; Allergan, Irvine, Calif) has been studied since the late 1970s for the treatment of several conditions associated with excessive muscle contraction or pain. Injection with BTX-A at preselected sites is a novel, cosmetically effective, minimally invasive alternative for the temporary improvement of gummy smiles caused by hyperfunctional upper lip elevator muscles.

Keywords: Botulinum toxin, excessive gingival display, unesthetic smiles, facial muscles.

I. Introduction

Smile is one of the most important expression contributing to facial attractiveness. An attractive or pleasing smile enhances the acceptance of individual in the society by improving interpersonal relationships.^[1] A smile is considered the universal friendly greeting in all cultures. An attractive smile in modern society is often considered an asset in interviews, work settings, social interactions, and even the quest to attract a mate. A pleasant smile is a composite outcome of structural & harmonious balance between variouselements of face including harmonious relationship between teeth, gingival scaffold & the lipframework. The importance of physical and facial attractiveness has been related to initialimpressions, social interactions. A smile demonstrating minimal gingival display has been deemed more esthetic than a smile withexcessive gingival display.^[2-4]

The gummy smile is a condition characterised by an excessive display of maxillary gingivae during smiling. The muscular capacity to raise the upper lip higher than average (hyperfunctional muscle) can cause excessive gingival display.^[5] Sexual dimorphism in smile types indicates that females are twice as likely as males to have gummy smiles. Etiologic factors can be skeletal, gingival, muscular, iatrogenic, or some combination of these. Garber and Salama^[6] have suggested that the relationships between the three primary components—the teeth, the lip framework, and the gingival scaffold—determine the esthetic appearance of a smile. Hyperfunction of the upper lip elevators muscles (levator labii superioris, levator labii superioris alaque nasii, levator anguli oris, and the zygomaticus muscles) can all play a major aetiological role in gummy smile and vertical maxillary excess may also be a contributory factor.^[7] Most cases of gummy smile will have skeletal gingival and muscular factors. Gingival inflammation resulting from medication or exacerbated by orthodontic appliances contributing to a reduced effectiveness of tooth cleaning can also cause excessive gingival show. Another possible reason for a gummy smile is altered passive eruption when the gingivae does not recede to a normal level after the teeth have erupted. Also when a person has parafunctional habit such as bruxism, this can lead to excessive tooth wear and the teeth will appear short, and the gingivae excessively prominent.

There are a number of different treatment methods described in the literature for the treatment of gummy smile. These includes both surgical and non-surgical options including; Le Fort 1 osteotomy, crown lengthening procedure, maxillary incisor intrusion, self-curing silicone implant injected at the anterior nasal spine and finally myectomy and partial resection of the levator labii superioris or muscle repositioning.^[8] Surgical treatment may lead to many complications such as post-operativen pain, swelling and infection, permanent or temporary nerve damage, root damage during osteotomy, surgical and/or orthodontic relapse, possible need for blood transfusion, and finally a less than optimal occlusal outcome.

A non-surgical alternative for reducing excessive gingival display may therefore offer a desirable treatment option for number of selected patients. Botulinum Toxin, 'Botox' have been used in medicine since the 1970s for treating excessive muscular contraction as seen in strabismus and cerebral palsy and in dentistry

for treating facial pain and headaches.⁸ Since 1987 its use has increased dramatically in cosmetic treatment of overactive facial muscles which cause wrinkles. BOTOX (Allergan, Irvine, Calif) means Botulinum toxin produced by the anaerobic bacterium *Clostridium botulinum*.^[9] There are 7 serotypes of BTX. BTX-A is the most potent and the most commonly used clinical type. BTX-A isolated from the fermentation of *C botulinum*. It is a stable, sterile, vacuum-dried powder that is diluted with saline solution without preservatives

II. Effects of botox:

- ❖ 2 weeks postinjection, mean gingival display declines to 0.09 mm (± 1.06 mm). The average lip-drop at 2 weeks is about 5.1 mm.
- ❖ Gingival display gradually increased from 2 weeks postinjection through 24 weeks, but, at 24 weeks, average gingival display does not return to baseline values.

III. Point of injection^[10]

The appearance of the lip framework is determined by the activity of various facial muscles, such as the levator labii superioris (LLS), the levator labii superioris alaeque nasi (LLSAN), and the zygomaticus minor (ZMi)/major muscles (ZMj). Among these, the LLS, the LLSAN, and the ZMi determine the amount of lip elevation that occurs during smiling. The LLS originates from the orbital rim of the maxilla and inserts into the upper lip; the LLSAN originates from the frontal process of the maxilla and inserts into the upper lip and the skin tissue of the ala of the nose. The ZMi originates from the zygomatic bone and inserts into the skin tissue of the upper lip. (Figure 1, 2, 3). LLSAN, LLS, and ZMi converge toward the lateral area with regard to the ala, the three muscle vectors all pass through a triangular area the frequency of the muscle vectors (LLS, LLSAN, and ZMi) passing through each circle is presented the center of the triangle was suggested as an appropriate injection point and was named the the “Yonsei point”.

IV. Mechanism of action^[9]

Botox (Allergan, Irvine, Calif) is a purified BTX-A isolated from the fermentation of *C. botulinum*. It is a stable, sterile, vacuum-dried powder that is diluted with saline solution without preservatives. BTX-A weakens skeletal muscles by cleaving the synaptosome associated protein SNAP-25, thus blocking the release of acetylcholine from the motoneuron and enabling the repolarization of the postsynaptic terminal. As a result, the muscular contraction is blocked. The production of acetylcholine is not affected by this blockade of the neuromuscular transmission. The effects last 3 to 6 months, although some investigators have reported a longer duration in patients exposed over a prolonged period of time. (Figure 4 and 5)

V. Figures

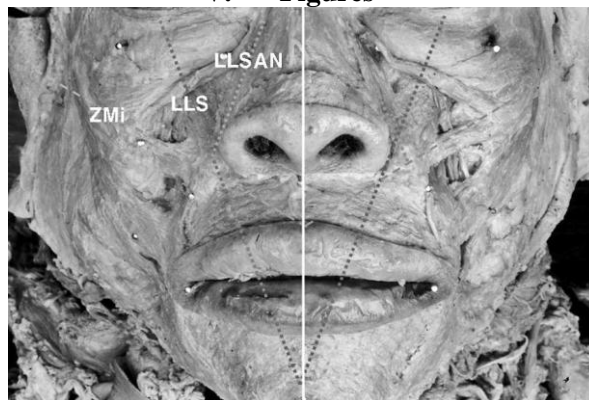


Figure 1. Vectors showing the direction of muscle fibers (Taken from- Woo-Sang Hwang and others el. Surface Anatomy of the Lip Elevator Muscles for the Treatment of Gummy Smile Using Botulinum Toxin. Angle Ortho.2009; 79; 70-77)

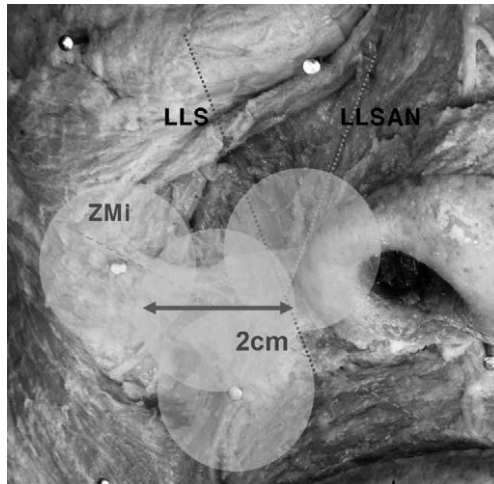


Figure 2. Circles with a 1 cm radius (2 cm diameter) drawn on each photograph represent the effective range of botulinum toxin. (Taken from- Woo-Sang Hwang and others el. Surface Anatomy of the Lip Elevator Muscles for the Treatment of Gummy Smile Using Botulinum Toxin. Angle Ortho.2009; 79; 70-77)

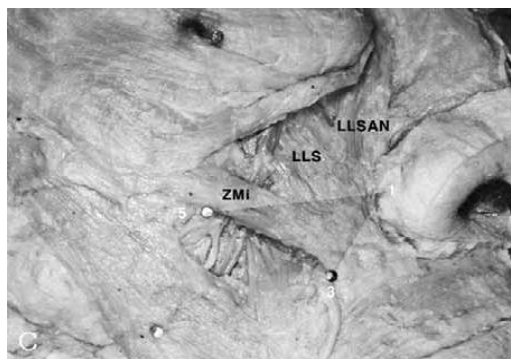


Figure 3. Convergence of the LLSAN, the LLS, and the ZMi on the lateral ala area.(Taken from- Woo-Sang Hwang and others el. Surface Anatomy of the Lip Elevator Muscles for the Treatment of Gummy Smile Using Botulinum Toxin. Angle Ortho.2009; 79: 70-77)



Figure 4. Photograph of patient's smile before Botox treatment.



Figure 5. Photograph of patient's smile after Botox treatment.

VI. Dosage

BTX-A is diluted according to the manufacturer's recommendations to yield 2.5 units per 0.1 mL by adding 4.0 mL normal saline solution to 100 units of vacuum-dried Clostridium botulinum toxin type A.

VII. Other Uses^[11-16]

BTX-A has been used to treat strabismus, cervical dystonia, blepharospasm and hemifacial spasm, hyperfunctional larynx, juvenile cerebral palsy, spasticity, pain and headache, occupational dystonia and writer's cramp, temporomandibular disorders, myofascial pain and oromandibular dystonia and bruxism, and several other conditions.

Cosmetic uses: BTX-A has been widely used for the cosmetic treatment of hyperfunctional facial lines.^[17]

VIII. Orthodontic significance

Ideal occlusion is certainly the primary functional goal of orthodontics, the esthetic outcome is also critical for patient satisfaction and therefore essential for the overall treatment objectives. The importance of an attractive smile is unquestionable. The subject of smile greatly interests orthodontists as it forms a key aspect of communication & expression of emotions. For some of the patients with unesthetic smiles, patients with overretraction of upper lip with no obvious malocclusion needs correcting this method can be used. Botox can provide a medium term solution provided that the patient is willing to undergo repeated injections every 6 months.

IX. Advantages:

- Non surgical
- Very less time is needed for the Botox treatment to complete.
- Noticeable improvement can be seen in few days
- Recovery time is very fast

X. Disadvantages:

- Chances of relapse.
- Effects of Treatment last for about only 6 months
- Heavy doses may lead to serious illness
- Expensive

XI. Contraindications:

- Hypersensitivity to any botulinum toxin preparation.
- Infection at the proposed injection site.

11.1 Use in specific populations

- Pregnancy: Based on animal data, may cause fetal harm
- Pediatric Use: Safety and efficacy are not established in patients under 18 years of age
- Myasthenia Gravis or Eaton Lambert Syndrome- Increase systematic effects.

11.2 Safety issues:

- Generally, the Botox treatment is safe when used in proper consultation and in right quantity.
- However, there are some common side effects such as -
Headache,
Flu-like syndrome,
Temporary eyelid droop,
Nausea

XII. Conclusion

BTX under proper case selection may be a favorable treatment supplement for patients with excessive gingival display. Injection with BTX-A provides effective, minimally invasive, temporary improvement of gummy smiles for patients with hyperfunctional upper lip elevator muscles.

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