

CASE REPORT

Correction of Gummy Smiles with Botulinum Toxin: Case Report and Review

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ABSTRACT:

The essential goal of dentists has been to achieve an esthetically pleasing smile irrespective of their specialty. The value of an attractive smile is undeniable. The framework of a smile is formed by the lips, teeth and gingiva. Excessive gingival display during smile is considered undesirable and less pleasing. Various treatment options are available for the correction of a gummy smile. Recently, the use of botulinum toxin has been advocated in the treatment of a gummy smile. Minimally invasive injections of botulinum toxin into the hyperactive muscles of the upper lip, reduces the upward movement of the lip thus, resulting in a less gummy smile. Keywords: Gummy smile, Botulinum toxin, Smiles.

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Received: 04-09-2014

Revised: 12-09-2014

Accepted: 14-09-2014

This article may be cited as: Pandey V. Correction of Gummy Smiles with Botulinum Toxin: Case Report and Review. J Adv Med Dent Sci Res 2014;2(3):137-141.

Introduction:

Smile is the most recognizable signal in the world; it is one of the most effective means of conveying your emotions [1]. We all can do a magnificent job of making teeth look great and giving people a healthy and beautiful smile. This concept of framing the smile properly is essential in order to perform a complete smile analysis and any associated aesthetic treatment.

Aesthetic dentistry has been an absolute boom over the last 30 years when it comes to such innovative techniques as teeth whitening and minimally invasive veneers. However we, as dentists, have become so tooth-centric that we forget that it is very important for the peri-oral areas to look as good as the teeth. How many times have you seen an aesthetic dental case involving beautifully restored teeth that are left surrounded by wrinkled and thin lips, and

deep nasolabial folds? Perhaps the patient has been given beautiful teeth but not a complete and beautiful smile.

A beautiful smile would be ideally a perfect set of teeth along with pleasing peri-oral & facial esthetics. Peri-oral esthetics looked upon by dentists are lips, gums, chin, marionette lines, nasolabial folds and labiomental folds. Relationships between three components of teeth, lip framework, and the gingival scaffold determine the esthetic appearance of smile [2, 3].

One of the most common reasons for seeking orthodontic treatment is excessive display of gingival tissue on smiling, usually referred to as a “gummy smile”, which is often esthetically displeasing. When an excess of gingiva superior to the maxillary anterior teeth is displayed upon full smile, it is termed a gingival smile. The gingival smile is known

by a variety of terms including “gummy smile, high lip line, short upper lip, and full denture smile.” Perhaps this variety in terms is indicative of the many different causes of a gummy smile [4]. In order for us to understand how to incorporate this extremely valuable treatment modality in our clinical practice we must first explore the basic principles of functional smile musculodynamics [5, 6].

Rubin (1974, 1999) described three types of functional smiles in his studies [5,6].

(i) Mona Lisa Smile (approximately 67% of patients studied):

Characterized by a sharp elevation of the corners of the mouth and a mild elevation of the central upper lip. This resultant smile will typically expose approximately 80% of the upper central incisors and canines and often all of the lateral incisors. In such cases the dominant muscles are zygomaticus major and to a lesser extent zygomaticus minor.

(ii) Canine smile or Cuspid smile (31- 35% of patients studied):

In such patients a high central elevation of the upper lip occurs initially before the corners of the lip are elevated. The dominant muscles here are the levator labii superioris and levator labii superioris alaeque nasi and to a lesser extent depressor septi nasi. If excessive activity of these centre lip elevators occurs during the smile dynamics then an excessive gingival display is likely as well as well pronounced nasio-labial furrows. This smile is also known as *Commissure smile*.

(iii) Full denture smile/ Complex smile (approximately 2% of patients studied):

This is characterized by all the upper and lower lip retractors contracting simultaneously to reveal a large percentage of the upper and lower dentition. Hence a comprehensive assessment of the patient must be made prior to treatment to establish

the musculodynamics of the smile and themselves the relative position of the free gingival margins of the upper and lower incisors.



(a): Monalisa smile



(b): Cuspid smile



(c): Complex smile

CAUSES OF A GUMMY SMILE [2,4, 7,8]

1. Pre-Treatment
 - Sex Predilection
 - Musculature and Lip Incompetence
 - Altered Passive Eruption
 - Skeletal Disharmonies
2. Possible Causes of Gummy Smile Development During Orthodontic Treatment
 - Extrusive Forces
 - Anterior-Posterior
 - Position of the Maxilla
 - Unexpressed Vertical Growth

CASE REPORT

A female aged 28 years reported with the complaint of gummy smile with the desire to achieve the best possible results without any surgical intervention. On examination it showed that the patient had a short upper lip with normal maxilla. All the possible treatment modalities were explained. The patient was convinced for the botulinum toxin injections and was instructed to avoid taking aspirin or related products, such as ibuprofen or naproxen if possible after the procedure to keep bruising to a minimum. At the beginning of the treatment extra-oral smiling photographs were taken (Figure 1).



Figure 1: Preoperative photograph showing excessive gingival display



Figure 2: Location of Yonsei Point

Preparation for botox injection was done. Botox® is available in a freeze-dried powder that clumps at the bottom of the vial. During reconstitution, a 5 ml, 30-gauge needle syringe to inject the desired volume of normal preservative-free saline.

Botulinum toxin type A (BTX-A) was diluted by adding 4.0ml of 0.9% normal



Figure 3: Post operative photograph showing esthetically pleasing smile after 15 days

saline solution without preservatives to 100 U of vacuum - dried C botulinum type A neurotoxin complex, according to the manufactures dilution technique (table 1). This resulted in a 2.5 U/0.1 ml dose.

Diluents added (0.9% Sodium Chloride injection)	Resulting dose Units per 0.1 mL
1.0 mL	10.0 units
2.0 ml	5.0 units
4.0 ml	2.5 units
8.0 ml	1.25 units

Table 1: Recommended diluents and resulting dose as per manufacturer

The appearance of lip framework is determined by activity of various muscles involved in facial expression: Levator labii superioris (LLS), Levator labii superioris alaeque nasi (LLSAN), zygomaticus minor & major (ZMi, ZMj). LLS, LLSAN & ZMi determine the amount of lip elevation during smiling [8]. 1.25U per side was injected in both the right and left levator labii superioris and levator labii superioris alaeque nasi muscle (LLS) and an additional 1.25 U per side at the overlap areas of the levator labii superioris and zygomaticus minor muscles (LLS/ZM). Aspiration before BTX-A, injection was done to avoid involuntary deposition of the toxin into the facial arteries.

Recently Hwang et al; Yonsei University College of Dentistry, Seoul, Korea have proposed a injection point for botulinum toxin-A, and named it as **YONSEI POINT** (figure 2) and they recommend a dose of 3U at each Yonsei point [10].

Yonsei point is located at the centre of the triangle formed by:

1. Levator labii superioris [LLS],
2. Levator labii superioris alaeque nasi [LLSAN], and
3. Zygomaticus minor [Zmi].

RESULT

The patient began to show improvement approximately 15 days after the injections (Figure 3). After 4 weeks results were definitely observed with a decrease from 6 mm gingival exposure to 3 mm, which was considered as normal gingival display for an adult during smiling.

DISCUSSION

Botulinum is derived from the Latin word *botulus*, meaning sausage, and botulism was originally called “sausage poisoning” because it occurred after ingestion of poorly prepared blood sausage. Justinus Kerner (1786-1862) was the first to describe the features of botulism. Botulinum toxin is synthesized by *C. botulinum*, *C. butyricum*, and *C. baratii*, all of which are anaerobic spore forming bacilli [11]. Botox works by blocking the acetylcholine receptors on the muscle side of the junction. Then when the nerve sends a signal to the muscle to contract, acetylcholine is released as before, but it can't bind anywhere on the muscle. The muscle has no idea it is supposed to contract. It is essentially paralyzed, but not because it or the nerve have been damaged [12,13]. This acetylcholine blockade is not reversible and begins within 48 hours. The clinical effects of a Botox injection become noticeable between 5-10 days [12,13].

In cases involving asymmetry caused by muscle contraction, bilateral injection of botulinum toxin is recommended, with a higher dose on the hyperkinetic side. An exception to this recommendation should be made when the asymmetry of the smile is a result of facial paralysis, in which case it is recommended that botulinum toxin is injected only into the hyperkinetic side [14]. The best orthodontically treated subjects may not be satisfied by the treatment, if soft tissue problem is not corrected. Botox is indicated when the gummy smile is due to hyperfunctional upper lip elevator muscles (muscular capacity to raise the upper lip is higher than average) and botox is an excellent non-surgical alternative [14]. According to Sarver, a slight amount of gingival exposure is acceptable and that contrary to posed smile, an unposed smile is natural in that it expresses authentic human emotion [15].

CONCLUSION

With plastic surgeons, dermatologists, internal medicine physicians, obstetricians gynecologists, ophthalmologists, podiatrists, nurses, physicians' assistants, and medical aestheticians (who may not even be medically trained) delivering BOTOX to patients in the oral and maxillofacial areas, it is certainly time to recognize that dentists can be just as proficient in injections than any of these healthcare providers. Dentists also have much expertise in the oral and maxillofacial areas. We are also trained to be experts in the muscles of mastication and the muscles of facial expression which routinely receive these treatments. It is time to broaden our horizons as a profession and use all of the tools available to us. BOTOX therapy is a conservative, minimally invasive treatment that can expand our therapeutic options for the benefit of our patients and is a natural progression of where we are going in the dental industry.

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Source of Support: Nil

Conflict of Interest: None declared