

Management of Gummy Smile with Botulinum Toxin Type-A

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ABSTRACT

Aim: The aim was to evaluate the effect of botulinum toxin (Botox) injections as a conservative treatment for gummy smile.

Materials and methods: An experimental in vivo study was conducted at the Dr. Prit's Cosmodent Centre, India in May 2015 to May 2017. The study included 15 female patients who ranged from 18 to 40 years and were treated with Botox injections due to excessive maxillary gingival display. Photos were taken of the patient's smile before and after the treatment and smile satisfaction score was obtained from the patient.

Results: A total of 15 female patients received treatment to improve their gummy smile. Improvement was clear 2 weeks after Botox injection. Overall satisfaction of patient was high with no complication during or after the procedure.

Conclusion: Botox type I is an effective conservative technique to improve gummy smile caused by muscular hyperfunction. Improving the quality of life with least painful experience and immediate results was the major advantage for Botox type A.

Keywords: Botulinum toxin, Gummy smile, Smile correction, designing.

INTRODUCTION

According to Hulse, A smile is one of the most effective means by which people convey their emotions.¹ The smile, along with speech, is what most visibly displays the results of smile designing procedures; therefore, smile esthetics becomes a major goal in a cosmetic treatment. Often, the main reason people seek smile designing treatment is to improve dental esthetics.¹ 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.¹ Over time,

different solutions were proposed to treat this disorder that ranged from complicated to simple. Orthognathic surgeries, such as Le-Fort I osteotomy and bone resection, orthodontic treatment by incisor intrusion, crown lengthening, gingivoplasty, and botulinum toxin (Botox) injections are all different methods of treating a gummy smile depending on the patient's situation.^{2,3} Since the discovery of the cosmetic use of botulinum toxin, it has been rapidly incorporated into the arsenal of effective treatments for the improvement of unaesthetic facial conditions in the last two decades. In addition to being the first-choice treatment for wrinkles located on the upper third of the face, botulinum toxin is also widely used in the

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prevention and correction of changes caused by muscle contraction in the middle and lower thirds of the face and neck, including gummy smile.

Botox is the trade name for the neurotoxin protein botulinum toxin type A produced by fermentation of anaerobic bacterium *Clostridium botulinum*. Type A is one of the seven distinct botulinum toxins produced by different strains of the bacterium. It is a stable, sterile, vacuum-dried powder that is diluted with saline solution without preservatives for it to be injected. Effect of Botox is seen within 5-10 days and lasts about 6 months, with a range of 4 to 8 months, at which time the patient can return to repeat the process. Injection with Botox-A at preselected sites is a novel, cosmetically effective, minimally invasive alternative for temporary improvement of gummy smiles caused by hyperfunctional upper labial muscle activity.

MATERIALS AND METHODS

This study included 15 female patients who ranged from 18 to 40 years who met the following inclusion criteria: excessive maxillary gingival display due to muscle hyperfunction. We excluded patients with gummy smile due to short clinical crowns or long maxilla, pregnant patients, or patients who were breastfeeding, as well as patients with neuromuscular disorders. The study was conducted at the Dr. Prit's Cosmodent Centre, India in May 2015 to May 2017. Included patients received a Botox injection to improve their smile by a consulting Maxillofacial surgeon. Botox is available in a freeze-dried powder that clumps at the bottom of the vial. Botulinum toxin-A is diluted by adding 4.0 ml of 0.9% normal saline solution without preservatives to 100 U of vacuum-dried C botulinum type A neurotoxin complex, according to the manufacturer's dilution technique. This results in a 2.5 U/0.1 ml dose.⁴ During reconstitution, the rubber seal on the vial should be wiped with an alcohol swab before using a 5 ml, 25-gauge needle syringe to inject the desired volume of normal preservative-free saline. Rotating the vial during injection also assists a gentle reconstitution. Botox should be reconstituted after the journey. Agitation during transport may denature the toxin and greatly reduces its duration of action. Almost all of the injections are intramuscular and not subcutaneous. One ml tuberculin or insulin syringes

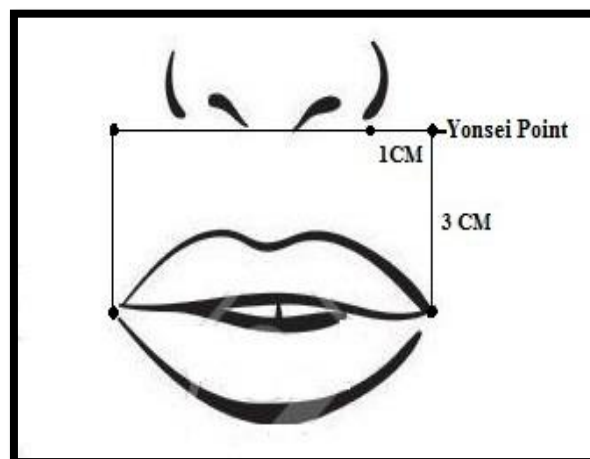


Fig 1: Yonsei point (One CM lateral to the Ala of nose & 3CM superior to the corner of mouth).



Fig 2: Photograph of patient before the procedure.

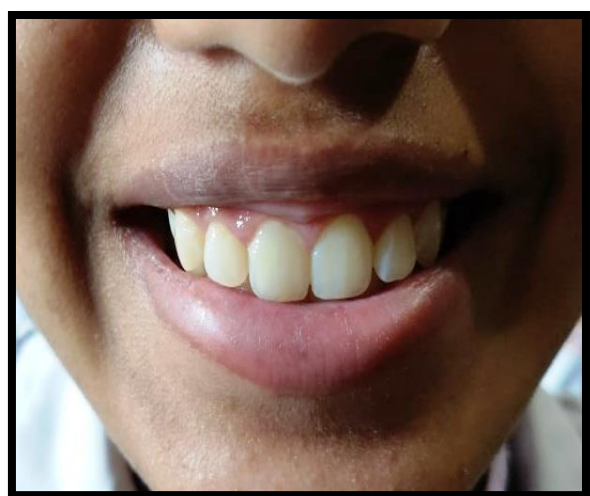


Fig 3: Photograph of patient after two weeks of the procedure.

can be used as it gauges the dose accurately in minute quantities also.^{5,6} A safe and reproducible injection point for Botulinum toxin A around the converging area of the three muscles has been proposed and proved effective in clinical applications. Intramuscular injection for correction of excessive gingival display is given at Yonsei poing.⁴ [Figure-1] After the injection, the patient was instructed to avoid lying down, exercising, or massaging the injection site for 4 hours.² Two weeks later, post injection photos were taken at the same position of the pre injection.

RESULTS

A total of 15 female patients received treatment to improve their gummy smile. It is a simple, elective day care procedure. The patients age ranged from 18 to 40 years. Informed consent was obtained from all individual participants included in the study. Through open discussion with patients, their expectations were asked and complete procedure with expected outcome was explained.[Figure-2] Improvement was clear 2 weeks after Botox injection. The patient satisfaction score was obtained after 2 weeks from patients after performing the procedure. Patient were asked to give a score between 5 points to 0 point depending on their satisfaction or dissatisfaction with the results and also on basis of the complete procedure performed. The patient satisfaction score was 5 for Ten patients; the satisfaction score was 4 for three patients and 3 for two patient. However, two patients had very high and unrealistic expectations. Nevertheless, a very high patient satisfaction rate was noted in our study. No complications were observed during the procedure or during the 6-month follow-up. The patients were informed that the results could last for approximately 4 to 8 months after the injection. Overall satisfaction of patient was high with no complication during or after the procedure. [Figure-3]

DISCUSSION

Smile is the most recognized expression in the world and is the cornerstone of social interaction. Smile is considered as the universal friendly greeting in all cultures. The value of attractive smile is undeniable. Just as a nice smile can act as a powerful communication tool, an unpleasing smile can have the equally powerful negative impact. Tjan

et al reported gender differences in the smile line.⁷ In men, the authors report that the low smile line is predominant (2.5:1), whereas high smile lines are predominant in women (2:1).⁷ Goldstein classified the smile line (consisting of the lower edge of the upper lip during the smile) according to the degree of exposure of the teeth and gums into 3 types: high, medium, or low.⁸ One of the most common reasons for seeking smile designing treatment is excessive display of gingival tissue on smiling, usually referred to as a gummy smile, which is often esthetically displeasing. Some people with excessive gingival display are self conscious or embarrassed about it, and some are psychologically affected. A non surgical treatment would be advantageous. Recently a non surgical and minimally invasive treatment option for correction of gingival smile has been suggested, which is use of Botox. Botox is indicated when the gummy smile is due to hyper functional upper lip elevator muscles (muscular capacity to raise the upper lip is higher than average).

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.⁹ Serotypes Food-borne botulism was the first form of the disease to be recognized. Botulinum toxin exists in seven different serotypes, designated A, B, C, D, E, F, and G.^{10,11} Botulinum toxin is synthesized by *C. botulinum*, *C. butyricum*, and *C. baratii*, all of which are anaerobic spore forming bacilli.^{12,13} The action of Botulinum toxin at the neuromuscular junction is to interrupt transmission and in effect to denervate muscle. This chemodenervation effect persists for weeks to months. The duration of effect may depend on serotype. The mechanism for this extended duration has been hypothesized to arise from either continued protease activity within the cell or from persistent interference by cleaved substrate with normal membrane fusion. Currently, there is no known way to reverse the paralytic effects of Botulinum toxin after it has been internalized. Both active and passive immunization can inactivate toxin in the circulation, but antibody cannot enter nerves to neutralize internalized toxin.^{14,15} It is important not to give injections prematurely (before the effects of the treatment

have worn off), as this can result in a buildup of antibodies to Botox that would dilute the effect of further treatments.

Niamtu has been performing Botulinum toxin injections for excessive gingival show since 1999.¹⁶ In 2005 Mario Polo used botulinum toxin for the treatment of gummy smile. Injection with Botulinum toxin type A at preselected sites is a novel, cosmetically effective, minimally invasive alternative for the temporary improvement of gummy smiles caused by hyper functional upper lip elevator muscles.¹⁷ According to Ezquerro et al,¹⁸ the smile is considered to be low when only part of the teeth are seen below the upper lip. It is medium when 1 to 3 mm of the gum is visible, and it is high when more than 3 mm of the gingiva is shown. It has been demonstrated that people with 0 to 2 mm of gingival exposure have the most attractive smile.¹⁹ In another study by Peck et al²⁰ the approximate percentage of smile types in the population illustrated that people with a low smile line are <75%, while the medium or average smile was approximately 75 to 100%. An accurate examination should be performed to provide a correct diagnosis. A gummy smile needs to be diagnosed via a facial examination in which facial symmetry and proportions are measured in both the frontal and lateral views.²¹ Treatment methods have been developed and modified based on the different causes of a gummy smile. For example, if there is a skeletal imbalance, then orthognathic surgeries and orthodontic intervention will be suitable solutions. In addition, delayed passive eruption could be treated by periodontic intervention. Finally, muscular hyperfunction was usually treated by plastic reconstructive surgery and has only recently been treated by Botox injections.²¹ In addition, orthodontic treatment was provided to treat a gummy smile caused by intruding incisors.^{2,3} The introduction of Botox type I to cosmetic dentistry was of great value.²² Botox has been recently considered one of the first treatment options for gummy smile because of its easy and safe application, low risk, and reversible effects. Perhaps most importantly, it has a rapid cosmetic effect.² On the contrary, Botox lasts between 4 and 6 months depending on muscle activity and thickness. The authors reported that there was a significant difference in the amount of improvement of gummy smile, which is in

agreement with Durgekar et al.²³ In a significant number of patients, reduced gum exposure after several applications of botulinum toxin has been noticed even after the effect of the drug has declined. This fact can be explained by the decrease in muscle strength that is likely to occur after several consecutive applications of botulinum toxin for any particular indication making it last for a longer period of time. It is important that the physician identify such cases, in subsequent applications, and reduce the dose to avoid an exaggerated effect.⁹ Patients should not be treated or treated with extreme caution who are: Psychologically unstable or who have questionable motives and unrealistic expectations, Afflicted with a neuromuscular disorder (e.g. myasthenia gravis, Eaton-Lambert syndrome), Allergic to any of the components of Botox-A or Botox-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 botox (e.g. aminoglycosides, penicillamine, quinine, and calcium blockers), Pregnant or lactating (botox are classified as pregnancy category C drugs).⁶

Adverse effects observed after treatment with botulinum toxin are common, localized and not of a serious nature: common with any percutaneous injection, mild stinging, burning or pain with injection, edema, erythema around injection site, mild headache, ecchymosis lasting for 3 to 10 days, asymmetry, oral incompetence and asymmetric smile, lack of intended cosmetic effect, rare and idiosyncratic numbness and paresthesias, focal tonic movements (twitching), mild nausea and occasional vomiting, mild malaise and myalgias.⁶

CONCLUSION

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. These procedures are easy to accomplish by general dentists with proper training.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Hulsey CM. An esthetic evaluation of lip-teeth relationships presents in the smile. *Am J Orthod. Dentofacial Orthop.*1970; 57 (2):132-144.
2. Mazzuco R, Hexsel D. Gummy smile and botulinum toxin: a new approach based on the gingival exposure area. *J Am Acad Dermatol* 2010 Dec;63(6):1042-1051.
3. Indra AS, Biswas PP, Vineet VT, Yeshaswini T. Botox as an adjunct to orthognathic surgery for a case of severe vertical maxillary excess. *J Maxillofac Oral Surg* 2011 Sep;10(3):266-270.
4. Mario Polo,Botulinum toxin type A (Botox) for the neuromuscular correction of excessive gingival display on smiling (gummy smile).*Am J Orthod Dentofacial Orthop* 2008;133:195-203.
- 5.Woo-Sang Hwang: Surface Anatomy of the Lip Elevator Muscles for the Treatment of Gummy Smile Using Botulinum Toxin. *Angle Orthod.*2009; 79:70–77.
6. Kate Coleman moriarty: Botulinum Toxin in Facial Rejuvenation; revised; 2006.
7. Tjan AH, Miller GD, The JG. Some esthetic factors in a smile. *J Prosthet Dent.*1984;51(1):24-28.
8. Mazzuco and Hexsel: Gummy smile and botulinum toxin: A new approach based on the gingival exposure area. *J AM Acad Dermatol*, vol 63, no 6, 1042-1051.
9. Textbook of microbiology, seventh edition- 2005,reprint, Ananthnarayan and paniker.
10. Fenicia L, Franciosa G, Pourshaban M, Aureli P. Intestinal toxemia botulism in two young people, caused by *Clostridium butyricum* type E. *Clin Infect Dis.* 1999; 29:1381–7. DOI: 10.1086/313497.
11. Harvey SM, Sturgeon J, Dassey DE. Botulism due to *Clostridium baratii* type F toxin. *J Clin Microbiol.* 2002;40:2260–2.
12. Handbook for epidemiologists, clinicians and laboratory workers. Atlanta: The Centers; 1998.
13. Dolman CE, Murakami L. *Clostridium botulinum* type F with recent observations on other types. *J Infect Dis.* 196 ;109:107–28. 4
14. Rossetto, O., Caccin, P., Rigoni, M., Tonello, F., Bortoletto, N., Stevens, R.C., Montecucco, C., 2001a. Active-site mutagenesis of tetanus neurotoxin implicates TYR-375 and GLU-271 in metalloproteolytic activity. *Toxicon* 39, 1151–1159.
15. Kate Coleman moriarty: Botulinum Toxin in Facial Rejuvenation; first print, 2004.
16. Niamtu, J. 3rd. The cosmetic use of botox in maxillofacial surgery. *Selected Readings in Oral and Maxillofacial Surgery.* 2004; 12: 1–22
17. Mario Polo, Botulinum toxin type A in the treatment of excessive gingival display, *Am J Orthod Dentofacial Orthop*, 2005; 127:214-8.
18. Ezquerria F, Berrazueta MJ, Ruiz-Capillas A, Arregui JS. New approach to the gummy smile. *Plast Reconstr Surg* 1999 Sep;104(4):1143-1150.
19. Hunt O, Johnston C, Hepper P, Burden D, Stevenson M. The influence of maxillary gingival exposure on dental attractiveness ratings. *Eur J Orthod* 2002 Apr;24(2):199-204.
20. Peck S, Peck L, Kataja M. The gingival smile line.*Angle Orthod* 1992 Summer;62(2):91-100.
21. Silberberg N, Goldstein M, Smidt A. Excessive gingival display – etiology, diagnosis, and treatment modalities. *Quintessence Int* 2009 Nov-Dec;40(10):809-818.
22. Sepehr A, Chauhan N, Alexander AJ, Adamson PA. Botulinum toxin type a for facial rejuvenation: treatment evolution and patient satisfaction. *Esthetic Plast Surg* 2010 Oct;34(5):583-586.
23. Durgekar SG, Nagaraj K, Naik V. The ideal smile and its orthodontic implications. *World J Orthod* 2010 Fall;11(3):211-220.