

# THE USE OF BOTULINUM TOXIN AS A WAY OF TREATMENT FOR GINGIVAL SMILE: CASE REPORT

## ABSTRACT

Gingival smile is defined as excessive gum exposition. Its etiology may be related to several factors, among them a maxillary vertical excess, superior dentoalveolar protrusion, changed passive extrusion and or eruption of anterior-superior teeth and hyperactivity of superior lip lift muscle. In cases in which the etiological factor is from muscle, the use of Botulinum toxin typo A (BTX-A) should be indicated. To highlight the benefits obtained with therapeutic use of this substance, the authors describe a clinical case of a female young patient, in which the Botox® was applied to correct gingival smile as a way to complement the orthodontic treatment. The applications were performed in two lateral points on the nose wing in a single session. The result was very satisfactory and there was no need additional dose. The authors concluded that BTX-A is a safe option and minimum invasive for treatment of gingival smile when provoked by muscle hypercontraction. Its side effects are rare with discrete discomfort during the application.

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## KEYWORDS

Botulinum toxin type A. Orthodontics. Gum. Aesthetics. Smile. Clostridium botulinum.

## INTRODUCTION

The smile is one of the most important face expressions. It can mean joy, sensibility, affection, mood and gratitude. As it is a dynamics process, the beauty of smile does not depends only on the correct dental and skeleton position, but also on the anatomy and lip muscle working, and on it, Orthodontics need to recognize that has few or no control.

Concepts of symmetry, balance and harmony were already stablished by Greeks, what lead to the appearing of the Golden ratio, also known as 'divine or magic' – a mathematic formula to define the balance on the proportion of any figure, sculpture, structure or monument.<sup>1,2</sup> On the opposite of great part of dentist can wonder, the balance of smile is not determined only by the shape, position and teeth color, but also by the gum tissue, and the gingival margin should be as harmonious as the dental criteria in isolate.<sup>3</sup>

When smiling, the superior lip moves apically, exposing the anterior teeth and many times the gingival margins. In this case, it is considered that the ideal position when smiling can vary between  $\frac{3}{4}$  of crown and 2mm of gingival margin. In this way, when more than 2mm of gum are exposed, it is called "gingival smile or gummy smiles".<sup>2,4-8</sup>

Gingival smile etiology can be related to several factors, like vertical maxillary excess, superior dentoalveolar protrusion, changed passive extrusion and or eruption of anterior-

superior teeth and hyperactivity of superior lip lift muscle.<sup>3,4,6,9</sup> When the cause is from the muscle, the Botulinum toxin typo A (BTX-A) is indicated, a neurotoxin produced by the *Clostridium Botulinum*.<sup>3,6,7,10,14</sup>

The activity of smile is determined by several face muscles, like the superior lift lip and the nose wing, the lowest zygomatic, the major zygomatic, nasal septum depressor, orbicular oris and the risorius.<sup>3,6,7,11,15,16</sup> Among them, the three first play the main function and determine the quantity of lip elevation, and they should be the muscle treated with the Botulinum toxin.<sup>3,7,10,17-19</sup> Based on the excessive contraction of specific muscle groups, gingival smile can be classified as anterior, posterior, mixed or asymmetrical and the technique of application of BTX-A, should be different for each case.<sup>12</sup>

The application of BTX-A is presented as a safe and effective procedure. However, it can be related to possible conditions, including allergic reactions, transient hypoesthesia, pain and edema on the application place, erythema, temporary numbness, nausea, headache, extension on the local, leading to undesirable paralysis of adjacent muscles, xerostomia and changes on the voice.<sup>20-22</sup>

In the field of actuation of the surgeon dentist, there is potential for the use of BTX-A in cases like bruxism, hypertrophy of the masseter, TMD, drooling, migraine and headache, reduction of muscle strength in

some cases of implantology of immediate load and in patients with smile asymmetry or accentuated gingival exposition.<sup>14,20,21</sup>

It's action consists in the selective weakness of muscle, despite its therapeutic effect can have restricted duration.<sup>10,14,23</sup> It is believed that occurs because the muscle starts the formation of new receptors of acetylcholine after application of toxin, promoting a reestablishment of neuromuscular transmission and gradual return to the complete muscular function, generally with minimum side effects. Clinical effects can occur in a period from 1 to 7 days after the administration, and they are commonly noticed between 1 and 3 days. It is followed a period (between 1 and 2 weeks) of maximum effect and then the levels achieve a moderated baseline until the complete recover of the nerve in a period between 3 and 6 months.<sup>14,20,21</sup>

Despite considered effective, the therapeutic use of BTX-A in Dentistry is controversial regarding to the dosage indicated, the distance between the points of application and the interval between them. The lack of a protocol specifying its therapeutic use for each situation makes the clinical results described in the literature very diverse<sup>7,10,12,14,24,25</sup>.

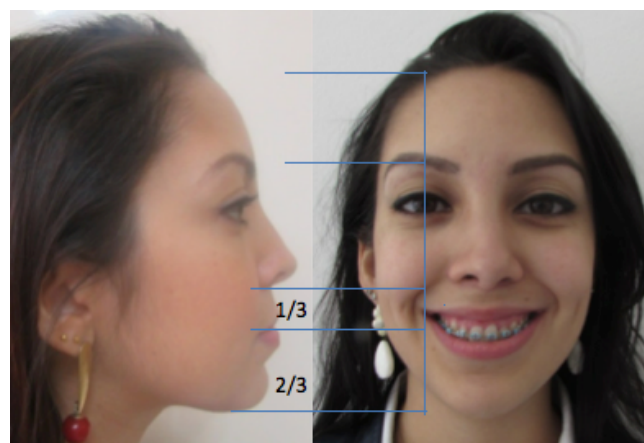
To better understand on the benefits of BTX-A in the treatment of gingival smile, the authors present a clinical case in order to

illustrate the efficacy of therapeutic method described.

## CASE REPORT

The patient D.C.S, 25 years, in final stage of orthodontics treatment, reported dissatisfaction with the treatment because of excessive gingival exposition during the smile. To achieve the diagnosis was necessary finding the cause of gingival smile, observing the following aspects: face analysis (frontal/lateral) in positions static and dynamic (Figure 1); checklist, to evaluate dental-labial characteristics; cephalometric analysis (Figure 2).

Figure 1. Face analysis in frontal and lateral view.



When the face analysis (Figure 1) the following characteristics were noticed: proportional facial thirds; straight profile; competent lip seal and excessive exposition during the smile.

The checklist revealed presence of superior lip of 21mm; inter-labial space of

2.5mm; exposition of superior incisive during rest of 4mm; proportion width/length of superior incisive teeth of de 80%; pleasant arch of smile; gingival exposition of 5mm in spontaneous smile.

Figure 3. Lateral teleradiography.



During the examination was possible observe that all the structures were inside the normal patterns, considering as the single cause for the gingival smile the hyper-function of superior lip. Before this, applications of BTX-A of commercial brand Botox® (BontA-ONA) in bottle sterile vacuum were proposed to the patient as therapeutic alternative for correction.

A detailed anamnesis was elaborated to evaluate the current health state of the patient, followed by guiding to alert regarding to the

recurrence of gingival smile after 6 months of application.

Photographs were taken to evaluate the regions of muscular hyper-function and select areas for application of BTX-A (Figure 4).

Figure 4. Gingival smile of 5mm caused by muscle hyper-function: superior lift lip, superior lift lip and wing nose and lower zygomatic.



The diagnosis revealed mixed gingival smile of 5mm, due to hypercontraction of the following muscles: superior lift lip, superior lift lip and nose wing and lower zygomatic.

Before the application the level where the superior lip will stay during the smile, after treatment was demonstrated to the patient (Figure 5).

Figure 5. Demonstration of lift level of lip after BTX-A application.





The skin surface was disinfected with chlorhexidine 2%, to remove oiliness, reducing the risk of local infection; next, the sequence of points of application was marked with pencil, nostril sideways on triangle (Yonsei Point) formed by the vectors of muscles: superior lift lip, superior lift lip and nose wing and lower zygomatic (Figures 6 and 7). To provide most comfort during the procedure, ice and topical anesthetic were applied (lidocaine 5%; tetracaine 7%) on the selected points (Figure 7).

Figure 6. Demarcation of points for application of BTX-A.

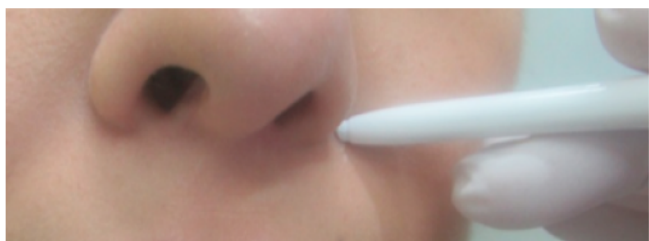
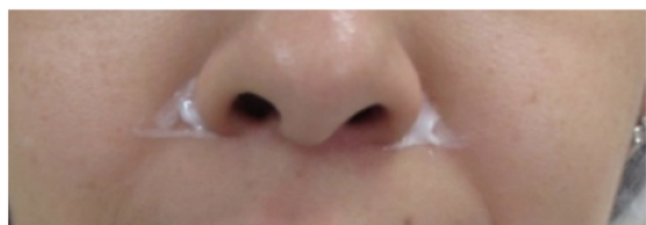


Figure 7. Analgesia with topical anesthetic post-application of ice on the place.



Botox® 100U was diluted carefully in 1ml of saline and maintained at 5°C temperature until the application moment. A new asepsis was performed to remove the anesthetic. Next, 2U were applied nostril sideways through syringe (0,3ml/30U) and insulin needle (8mm), carried out

perpendicularly to the tissue with the patient in semi-sit position (Figure 8 and 9).

Figure 8. Manipulation of Botox® in the application moment.



Figure 9. Application of 2U Botox®, each nostril sideways.



After treatment written instructions post-procedure were provided to the patient. There were no complaints or side effects. After 15 days of the application was possible observe a significant improve of spontaneous smile with reduction of 5mm without need of another application (Figure 10).

After six months was possible observe gingival exposition of 3mm, but the pretreatment base values pre-treatment were not achieved (Figure 11 to 13).

Figure 10. Smile 15 after application of Botox®.



smile, as well as the relation teeth with superior lip during the smile.<sup>2,4,5,6,9,26</sup>

Figure 11. Gingival smile pre-treatment 5mm.



Figure 12. Smile 15 days after Botox® application.



Figure 13. Gingival smile 6 months after application - 3mm.



## DISCUSSION

Gingival smile is determined by an excessive exposition of gum, compromising the aesthetics. Its etiologic factors are diverse and they need to be identified for an appropriate treatment. In this way, face analysis during the clinical examination of the patient is an important stage for diagnosis, and should be performed with the patient in front and lateral positions, in rest and smiling. The professional may evaluate the relation on the facial thirds, lip length, resting inter-labial space, arch of

The use of a checklist containing these characteristics is important for diagnosis. The inclusion of these data ensure that

fundamental information for therapeutic treatment do not be neglected or forgotten.<sup>9</sup>

During the smile, the ideal is an exposition of  $\frac{3}{4}$  of the superior incisive crown until 2mm of the gingival margin.<sup>2,4,5-8,15</sup> However, some authors consider the gingival smile is characterized by the exposition of more than 3mm of gingival tissue during the smile.<sup>11,12,27</sup> Before this, what should be considered is the need to the patient in treat the gingival smile because many people do not mind the aesthetic changes. However, other ones find orthodontic treatment trying to correct the problem.

Another important factor for diagnosis is cephalometric analysis, whose objective is evaluate the gingival exposition due to the excess of the maxillary vertical growth.<sup>3,19</sup> Hence, together other parameter is possible determine the etiologic factor of gingival smile and the indication of appropriate treatment. In cases in which the gingival smile is caused by the face excessive vertical growth, it makes difficult the rest seal lip and the indication is surgical-orthodontic treatment. When the maxillary horizontal projection is the cause, it is necessary an orthodontic therapy for correction. Gingival smile, in turn, can also be related to situations of passive eruption or gingival excess inserted, decreasing the height of clinical visible crown. In this situation the periodontal plastic surgery is indicated to remove the excess of gingival tissue. In some

situations, there is the need to regular the gingival concave arc through osteotomy in order to correct the portion height-width of clinic crown of teeth, reducing the gingival smile.

Another relevant aspect is the posture and format of lips in the face harmony. Hypotonic lips are generally associated to the lack of sealing lip in rest and require an integrated approach between orthodontics and speech-language pathologist. Finally, when the gingival smile is caused by muscle hyper-activity it can be corrected with aesthetic medicine through applications of BTX-A.<sup>6</sup>

In the clinical case reported, all the structures were inside the normal standards considered as the single cause the superior lip hyper-function. Before this, a treatment with application of BTX-A from the commercial brand Botox® (BontA-ONA), was proposed, in bottle sterile vacuum, as a therapeutic alternative for its correction.

Even considered effective by the literature, the therapeutic use of BTX-A in the dentistry presents controversies regarding to the dosage indicated, number of applications and interval between them. Gingival smile is traditionally<sup>12,15,23</sup> classified in: anterior, posterior, mixed and asymmetric, based on the excessive contraction of specific group of muscles, resulting in different areas of gingival exposition, and the technique should be different for each case. In this way, anterior

gingival smile should be treated with conventional technique through wing nose sideways applications. In cases of posterior gingival smile, the application should be involve higher and lower zygomatic muscles, with application of toxin in two different points, in a total of 4. In cases of mixed gingival smile, the application should be performed in all the points previously mentioned (6 points)<sup>3,12,15</sup>. In patients with exposition from 3 to 5mm are indicated<sup>7,8,17,18</sup> two points of application, on the muscle superposition area of superior lift lip and nose wing and superior lift lip; and four points in cases of exposition over 5mm. the first would be the point previously mentioned and the second on the super position of superior lift lip muscles and lower zygomatic. Some authors<sup>15,23</sup> considered that the depressor muscle of the nasal septum also have to be achieved by BTX-A, when occurring lower traction of nose during the smile.

Hwang et al.<sup>10</sup>, studying corpses, determined a safe point of application of BTX-A; a triangle formed by the encounter of three muscle vectors (superior lift lip, superior lift lip and wing nose and lower zygomatic), nose wing sideway, called Yonsei Point.

In cases whose the gingival smile is caused by lip hyper-contraction, the muscles with higher activity have to be identified. Thereunto, it is necessary that the professional

knows the origin and insertion of each muscle for the appropriate application.

Regarding to the storage, BTX-A should be maintained at temperature from 2 to 8°. After manipulated, the ideal is the application within 4 to 8 h. Despite there is no consensus regarding to the dose indicated, several authors<sup>3,8,17,24,27</sup> advocate between 2U and 5U each side of face, varying according to the gingival exposition. Clinical effects occur in 2 and 10 days after the injection, and the maximum effect noticed after 14 days.<sup>7,10,27</sup>

The effect of BTX-A last a medium of 6 months; however, incases more severe there is the recurrence earlier (3 months).<sup>7,24,27</sup> The interval for application is from 4 to 8 months, this period should be respected because there is the accumulation of anti-bodies, reducing the effect.<sup>7</sup>

In this report, the method of application was in two points (Yonsei Point), nose wing sideways. The application of 2U of Botox® each side and there was no need of additional application. After 2 days of application was possible observe a gradated improvement of gingival exposition with maximum effect noticed after 15 days, maintaining the clinical result for 6 months.

The application of BTX-A, despite a safe procedure, may be related to possible complications as allergic reactions, transient hypoesthesia, pain and edema on the local of application, erythema, temporary numbness,



nausea, headache, undesired paralysis of adjacent muscles, xerostomia and changes on the voice.<sup>20-22</sup> Aesthetic side effects as cheek sinking and changes on the face expression. During the smile might be caused by the paralysis of higher zygomatic.<sup>21</sup>

Contraindications to use BTX-A are related to cases of pregnancy; lactation; neuromuscular diseases (myasthenia gravis and Charcot's disease); and simultaneous administration of amino glycoside antibiotic, which potentiate BTX-A action.<sup>14,21,22,24,27</sup>

### CONCLUSION

Etiologic factors of gingival smile are diverse and they need to be identified to perform the appropriate treatment. In this way, some precaution should be taken as follows protocols; rules and indications; appropriate doses used carefully; application by qualified and experienced professional. In this report there were no complaints or changes due to the application. Therefore, BTX-A became a safe portion minimally invasive on the gingival smile treatment when provoked by muscle hyper-contraction. Its side effects are rare with minimum discomfort during the application. Despite to be recent in Dentistry, it is helping the patients' self-esteem.

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