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Clinical case series: Botulinum toxin and the reversible correction of gingival smile

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ABSTRACT

The aim of this study was to evaluate the effect of applying botulinum toxin type A (BTX-A) as a therapeutic alternative for the treatment of gingival smile. Four selected categories of female gender, aged 28–38 years, with gingival smile exposure between 4 and 9 mm, were selected. The evaluation was carried out 15 and 30 days after the initial application. All participants responded to a structured scored interview of initial and final satisfaction. All patients related satisfaction with the final gingival exposure, providing an improvement of their self-esteem. The gingival smile can be treated with botulinum toxin type A as an adjunct to treatments that involve ortho-surgical facial rehabilitation. Although the result is completely reversed after a complete elimination of the product, it can improve the patient's self-esteem. More clinical trials are important to confirm the results.

Keywords: Botulinum toxin, Gingival smile, Quality of life, Smile

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INTRODUCTION

The smile is, without a doubt, one of the main attractions of individuals. It is an important factor in facial aesthetics, and is directly related to happiness, well-being, sensuality, among others. However, when smiling, some people may present the well-known "gummy smile," which is characterized by the exposure of more than 3 mm of gum tissue during smiling [1, 2]. However, exposure of gum tissue is greater than 2 mm as gummy smile [3].

Thus, a gummy smile is considered to exist when there is gingival exposure of the maxilla above 2 mm, where it can be classified into three grades according to severity: Grade I (mild): 2–4 mm of gingival exposure from the

dentogingival edge, Grade II (moderate) 4–6 mm of gingival exposure from the dentogingival edge; Grade III (severe): 6 mm or more of gingival exposure from the dentogingival edge (Martínez et al., 2011) [4]. These levels, one should respect the variables, such as gender, age, and periodontal health, for the correct planning of a harmonious smile and its treatment [5].

Botulinum toxin is known for its aesthetic use in temporarily controlling hyperkinetic lines in the face. It is synthesized by the anaerobic gram-positive bacterium *Clostridium botulinum*, a protease that causes temporary chemical innervation of musculoskeletal fibers. There are seven different forms of this neurotoxin, and type A (BTX-A) is the most widely used for therapeutic purposes [6]. This procedure has been recognized by the Federal Council of Dentistry recognized by Resolution 198/2019 [7].

Botulinum toxin can also be used for therapeutic purposes, such as in cases of bruxism, temporomandibular dysfunction, accentuated gingival exposure, and other indications [1–3, 8–12]. Several facial muscles determine smile activity, such as the elevator of the upper lip and nose wing, orbicular of the mouth, risorius, nose wing, zygomatic major and minor [1–3, 8–12].

It is important to pay attention for each individual, and not the "standardization" of a treatment. It is worth emphasizing the importance of the study, since the gummy smile can affect up to 10.5% of the population, with a predominance of females (2:1), between 20 and 30 years of age [13–15]. Although the use of botulinum toxin for gummy smile treatment is well explored in literature, the present study aimed to present a series of cases in which the toxin was used and its relation to the patient's satisfaction with the smile appearance of the gingival exposure.

CASE SERIES

The proposal of the work is a clinical study of a series of cases. The work was carried out at a private Dental Clinic located in the Municipality of Rio de Janeiro–Brazil, after approval by the Institutional Ethics Committee, Protocol: 4.016.616. Four female individuals aged 28–38 years were selected, were informed and oriented about the objectives and methods of the work, where all signed an informed consent form for participation, prepared according to Resolution 196/96 of the Ministry of Health (National Health Council, 1996).

As for the inclusion criteria, patients with gingival exposure greater than 3 mm during smiling, and the presence of two upper central incisors were selected. Among the exclusion criteria were pregnant or lactating patients, and patients with autoimmune or neuromuscular diseases.

A satisfaction questionnaire was administered before and after the treatment, 15 days, or 30 days after the first application, when necessary. The questionnaire contained a smile score of 0–10 related the smile satisfaction. The patients answered the questions before the procedure and after 15 or 30 days after the botulinum toxin application.

Performed clinical procedures

After clinical assessment, the procedure consisted of placing the patient in a reclined position at 60° and demarcating two application points (one on the left hemiface and one on the right hemiface). The researcher measured the exposed gingival margin with an endodontic ruler and established a first application of 2.5 U of botulinum toxin bilaterally in a single point, located in the elevator muscle of the upper lip and nose wing (Figure 1). The region was sanitized with cotton and 70% alcohol before application.

After two weeks, the subjects returned to check the gingival height. In cases where the gummy smile was not satisfactorily corrected in the first application, the procedure was repeated after 15 days, following the protocol of the first application with the same quantity of units and at the same site. In case four, the patient presented facial asymmetry, and then 0.5 U was applied at the point of the muscle that lifts the upper lip and the nose wing, in the hemiface that presented the "lowest" smile.

The material used for the applications was botulinum toxin type A of the commercial brand Xeomin, manufactured by Biolab laboratory. It is composed of botulinum toxin type A (150 kDa) and is free of protein complexes. It was chosen because it has the best "Cost × Benefit" when compared to other brands available in the market. The great advantage of this brand is that it does not need to be stored in a refrigerated environment before handling, thus reducing the chance of the product's efficacy diminishing during transportation and storage before reaching the professional who will use the product.

A hypodermic syringe for insulin, 70% alcohol, gauze for cleaning the face, white pencil to mark the insertion point of the syringe needle, and a millimeter ruler for measurement were used. To avoid risks, the technique must be adequate and have precision in the application.

The handling and storage of the product must be ideal, following the manufacturer's orientation. However, local hematoma and facial asymmetry may occur. To remedy the problems that occur, the individual must be seen and clarified by the professional in charge before the procedure. In case of local hematoma, the local application of an ice compress is indicated. In the case of asymmetry, in the retouching appointment, a new application was carried out for correction.

CASE SERIES

Case 1

Female patient, 29 years old, with no reported systemic diseases, no detected oral health issues, but

presenting gingival exposure on clinical examination of 6 mm before treatment onset. She reported discomfort with the appearance of her smile and routinely felt uncomfortable when smiling, due to the large gingival exposure, evaluating her level of satisfaction with the appearance of her smile with a score of six (Figure 2A). Following the protocol, 2.5 U of botulinum toxin was applied to the elevator wing muscle of the nose and upper lip bilaterally. At the follow-up visit, after 15 days, the patient returned with a 3 mm gingival exposure when smiling. An additional 2.5 mm of botulinum toxin was applied bilaterally to the same site, and after two weeks, the patient came back to evaluate the result, showing no gingival exposure when smiling (Figures 2B and 3). After the result, the patient reported the confidence increasing when smiling, improving the smile satisfaction score to nine (Figure 4).

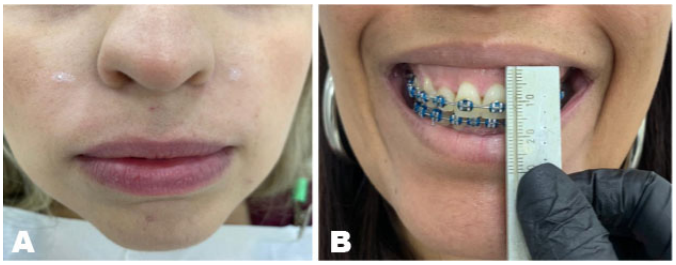

Figure 1: Yonsei point where the botulinum toxin was applied bilaterally (A). Gingival exposure measurement (B).

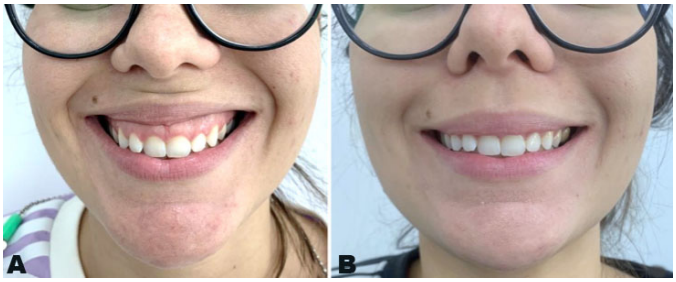

Figure 2: Clinical appearance before (A) and after (B) the botulinum toxin application in reported case 1.

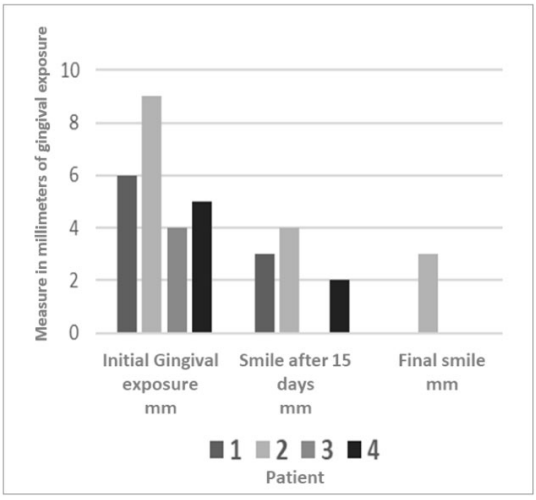

Figure 3: Graphic showing the gingival exposure before and after the treatment.

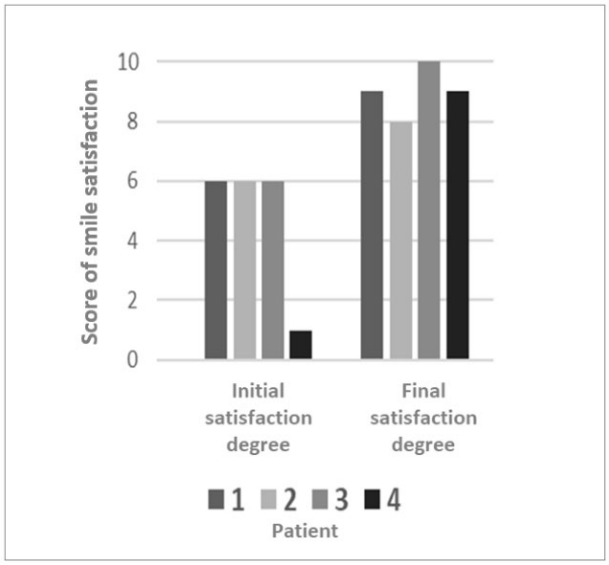

Figure 4: Graphic showing the patient's satisfaction with the results after treatment considering the gingival exposure.

Case 2

Patient, female, 38 years old, with no reported systemic diseases, no other detected oral health issues after clinical examination, reported great dissatisfaction with her smile, due to gingival exposure, although she enjoyed the arrangement of her teeth, therefore, she rated her smile with a grade of six for the level of satisfaction. In the first measurement, before the first application, the patient presented a severe gummy smile with 9 mm gingival exposure (Figure 5A). After two weeks, the patient returned for an extra dose already showing significant improvement in her condition, where the spontaneous smile was 4 mm of gingival exposure. Retouching was performed with the same initial protocol. After another 15 days, the patient returned for the result, presenting 3 mm of gingival exposure (Figures 5B and 6). There was a 1 mm improvement in the picture from the first to the second application. The patient related great improvement after the treatment, and her smile satisfaction score was eight (Figure 7).

Case 3

Patient, female, 28 years old, with no reported systemic diseases, no other detected oral health issues

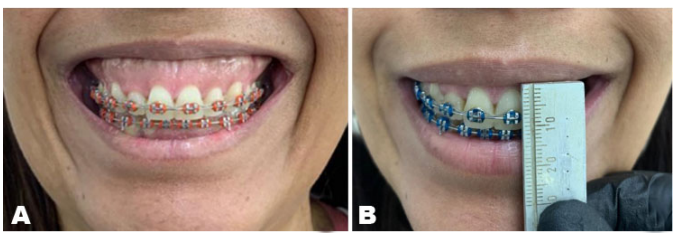

Figure 5: Clinical appearance before (A) and after (B) the botulinum toxin application in reported case 2.

after clinical examination, presented great dissatisfaction with the appearance of her smile, evaluated her smile with a grade of six before treatment. The patient presented 4 mm of gingival exposure when smiling (Figure 5A). In the first appointment, the standard protocol was followed. At the touch-up appointment, 15 days later, the patient had zero gingival exposure when smiling, and no further application was necessary (Figures 5B and 6). The patient evaluated with a score as 10 the degree of satisfaction with her smile after the procedure (Figure 7).

Case 4

A 29-year-old female patient, with no reported systemic diseases, no other detected oral health issues after clinical examination, presented complaining of gingival exposure and facial asymmetry when smiling, with the gingival exposure on the right hemiface being more evident than the gingival exposure on the left side. She rated her smile satisfaction as one of before the procedure. The previous gingival exposure was 5 mm (Figure 5 A). After the protocol was performed, the patient returned 15 days later with 2 mm of gingival exposure. In the retouching appointment, 0.5 U of botulinum toxin was applied at the same point on the left hemiface and 2.5 U on the right hemiface since the patient presented a clear facial asymmetry when smiling. At the end of the treatment, the patient returned after 30 days from the first appointment to evaluate the result, where she showed only 1 mm of gingival exposure, both on the left and right hemifaces (Figures 5B and 6). The patient reported she is very satisfied with the result and rated her new smile as a nine (Figure 7).

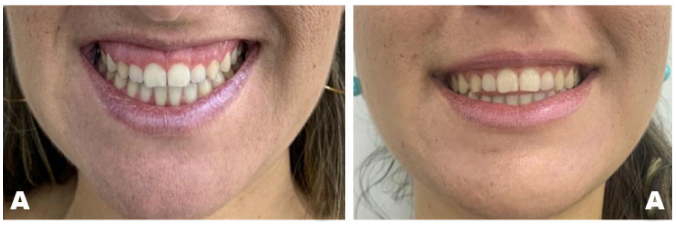

Figure 6: Clinical appearance before (A) and after (B) the botulinum toxin application in reported case 3.

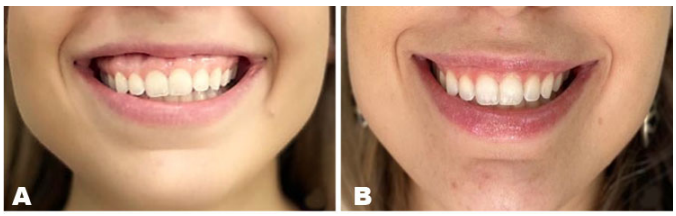

Figure 7: Clinical appearance before (A) and after (B) the botulinum toxin application in reported case 4.

DISCUSSION

In selected cases, they agree that the temporary nature of this cosmetic procedure, as well as its potential complications, although mild and transient, indicate that patients should be selected with care. They recall the importance of the patient being informed about the duration of the botulinum toxin effect, which varies from four to six months, and about the potential need to repeat the procedure and the potential complications that can arise after its injection into the muscles, as occurred in cases 1, 2, and 4. Therefore, it is essentially informed consent document signature for the botulinum toxin treatment [12, 16–18].

Regarding the durability of the results, according to the clinical findings [1, 18–20] after three months of follow-up, the same level of gingival exposure obtained on day 30 of the first application is found. It is worth noting that this result will tend to change due to the pharmacological mechanism of BTX-A, in a mean period of four to six months [20].

Given the results obtained in this study, it is in agreement with previous studies [12, 19–22] where improvement in facial aesthetics can be observed with a significant reduction in gingival exposure and an increase in self-esteem and smile satisfaction, through the questionnaire comparing pre- and post-treatment. In clinical case 1, we had improvement with smile satisfaction, an increase from score 6 to 9. In clinical case 2, the increase was from 6 to 8, and the result was even more satisfactory for the patient in clinical case 3, where her evaluation went from 6 to 10, which showed total satisfaction and well-being with her smile. In case 4, where the patient, besides the gingival smile, presented a severe asymmetry when smiling, which was also corrected with the treatment, the patient's smile satisfaction score went from 1 to 9. It was also observed that a dose of 2.5 U in a single point on the muscle that lifts the upper lip and the nose wing, is enough to obtain good results, and this result can be even more satisfactory with a reinforcement dose with the same unit and in the same point as the previous application [1–3, 8–12].

According to the results of the structured interviews, it is noticeable the significant improvement in self-esteem (Figure 6) and, consequently, quality of life of the patients submitted to the therapy proposed by this study. One should always observe the individuality of each person and, thus, propose a specific treatment for each one [19–21].

CONCLUSION

The study showed a significant increase in the improvement of personal satisfaction with the smile, and consequently, in the quality of life of the individuals, according to data obtained through structured self-evaluation interviews, answered before and after the

result of the proposed treatment.

As for the study's limitation, the size of the sample can be included. In this sense, there are explicit differences between qualitative and quantitative research. A small size makes it difficult to find meaningful relationships and generalizations from the data, since statistical tests require a larger sample size to ensure a trend, a representative distribution of groups of people, objects, processes, among others. The results of this pilot work served as an incentive for further research with larger numbers of individuals.

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Author Contributions

Júlia Rocha Mayhe – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Marília Fagury Videira Marceliano-Alves - Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Larissa Maria Assad Cavalcante – Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Eduardo Fagury Videira Marceliano – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.