

Treatment of combined etiology gingival smile: case report

Tratamento de sorriso gengival de etiologia combinada: relato de caso

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ABSTRACT

The smile's aesthetics is the source of self-esteem and it has a fundamental role in society. Excessive gingival exposure when smiling is a recurring aesthetic complaint in the dentist's office. Gummy smile is defined as gingival exposure greater than three mm from the gingival margin to the upper lip line during spontaneous smile. The gummy smile has several etiologies, which can be alone or in combination. The treatment to be used depends directly on the etiological factor. The present case report aims to present a therapeutic option for a gummy smile of combined etiology, resulting from vertical maxillary excess, upper lip hypermobility and altered passive eruption. The proposed treatment involves the application of botulinum toxin type A in the elevator lips superioris muscles and the clinical crown augmentation. The therapeutic approach of choice is a less invasive option with satisfactory results. The recognition of the etiology of gummy smile guides the choice of treatment method and it ensures an adequate clinical result, returning aesthetics and self-esteem to the patient.

Keywords: Botulinum toxin type A. Clinical crown augmentation. Gingivoplasty.

RESUMO

A estética do sorriso é uma fonte da autoestima e possui um papel fundamental na sociedade. A exposição gengival excessiva ao sorrir é uma queixa estética recorrente no consultório odontológico. Considera-se sorriso gengival a exposição gengival maior que três mm da margem gengival até a linha do lábio superior durante o sorriso espontâneo. O sorriso gengival tem diversas etiologias e pode se apresentar isoladamente ou de forma combinada. O tratamento a ser empregado depende diretamente do fator etiológico. O presente relato de caso tem por objetivo apresentar uma opção terapêutica de um sorriso gengival de etiologia combinada, decorrente do excesso vertical de maxila, hiper mobilidade do lábio superior e erupção passiva alterada. O tratamento proposto envolve a aplicação de toxina botulínica do tipo A nos músculos elevadores do lábio superior e o aumento de coroa clínica. A abordagem terapêutica de escolha é uma opção menos invasiva e de resultados satisfatórios. O reconhecimento da etiologia do sorriso gengival direciona a escolha do método de tratamento e garante um resultado clínico adequado, devolvendo ao paciente a estética e a autoestima.

Palavras-chave: Aumento de coroa clínica. Gengivoplastia. Toxina botulínica tipo A.

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INTRODUCTION

A smile can express feelings of happiness, affection, sensuality and empathy. It is a way of socializing and communicating (Oliveira, G. O. Molina & Molina, 2011; Malkinson, Waldrop, Gunsolley, Lanning & Sabatini, 2013; Kuhn-Dall'Magro et al., 2015; Sthapak, Kataria, Chandrashekar, Mishra & Tripathi, 2015). A more harmonious smile is determined by the position, the shape, the color of the teeth and the gingival tissue, and it is an association of all these components (Kuhn-Dall'Magro et al., 2015; Sthapak et al., 2015).

Excessive gingival display while smiling is denominated a gummy smile. The diagnosis is confirmed if the distance from the gingival margin to the upper lip line is greater than 3 mm during a spontaneous smile (Oliveira et al., 2011; Machado, 2014; Sthapak et al., 2015). A smile is considered esthetically pleasing when this exposure is equal to or less than two mm (Gracco & Tracey, 2010).

Some etiological factors for gummy smile have been recognized, such as: gingival hyperplasia, altered passive eruption, vertical maxillary excess, subnasal depression in the anterior process of the maxilla, compensatory eruption of the maxillary anterior teeth, hyperactivity of the upper lip elevator muscles and short upper lip, as well as the combination of two or more etiologies (Oliveira et al., 2011; Kuhn-Dall'Magro et al., 2015; Senise, Marson, Progiante & Silva, 2015).

Therefore, the procedure of choice for the treatment of gummy smile is guided, guided by the etiological factor. Dental procedures available range from orthognathic surgery, esthetic clinical crown augmentation, application of botulinum toxin, orthodontic treatment, application of surgical cement or biovolume, surgical repositioning of the upper lip or lip fillers (Dym & Pierre, 2020; P. Wang, Chen, Wang, Bai & Guo, 2022).

The aim of this case report was to describe a therapeutic alternative for the treatment of gummy smile of combined etiology, associated with vertical excess of the maxilla, hypermobility of the upper lip and altered passive eruption (APE) by means of clinical crown lengthening surgery, frenectomy and application of botulinum toxin type A.

CASE REPORT

This case report was submitted to the Research Ethics Committee (CEP/CONEP) of University Center Unisep, under CAAE: 59573822.0.0000.5230, and approved under opinion number 5.511.154. All procedures and image used were authorized by the patient through the free and informed consent form recommended by the institution. The patient was informed of the possible complications that could arise from this procedure in the transoperative and postoperative periods.

Male patient, 23 year old, healthy, sought dental care at University Center Unisep - CEUUN, with the

main complaint of gingival exposure when smiling. An objective evaluation was made of the teeth/gingival tissue, lips, thirds of the face, length of the upper lip at rest and when smiling, tooth exposure at rest, elevation of the upper lip during smiling, in addition to the height/width proportion of teeth 13 to 23.

The patient had a gingival display of approximately 6 mm during spontaneous smiling and low insertion of the labial frenulum (Figure 1A). As a complementary evaluation, a cone-beam computed tomography (CBCT) examination was requested, with use of the soft tissue retraction technique to assess the size of the anatomical crown and assess the distance between the cemento-enamel junction (CEJ) and the bone crest. In addition, the lateral telerradiography exam was requested to assess the patient's facial profile.

The tests performed determined the diagnosis of EPA type 1B, according to the classification of Coslet et al. (1977), hypermobility of the upper lip elevator muscles and vertical excess of the maxilla. The treatment began with the procedure for correcting APE type 1B by means of lengthening the clinical crown, using the gingivoplasty technique with osteotomy and osteoplasty.

The surgical procedure for clinical crown augmentation began with external antisepsis of the face with 2% chlorhexidine digluconate solution (Riohex®) and internal antisepsis with 0.12% chlorhexidine digluconate mouthwash (Riohex®) for one minute. Local anesthesia was administered with 4% articaine hydrochloride associated with 1:100,000 epinephrine (DFL) in the infraorbital nerve bilaterally and the nasopalatine nerve. After this, a North Carolina periodontal probe (Hu-Friedy®) was used to analyze the proportions of height/width of the teeth and probing was performed to determine the CEJ.

Based on these assessments, the new gingival zeniths were demarcated using bleeding points that served as a guide for performing the incisions (Figure 1B). A round scalpel handle with a 15C blade (Swann-Morton®) was used to perform gingivoplasty by making an internal bevel incision followed by an intrasulcular incision of teeth 13 to 23.

A Gracey 5-6 curette (Hu-Friedy®) was used to help with removing the marginal gingival tissue (Figure 1C). On conclusion of the gingivoplasty procedure (Figure 1D), a full-thickness envelope-type flap was elevated with a Molt elevator (Millenium®) to allow exposure of the adjacent alveolar bone. Incisions in the papilla region were carefully made by dividing the tissue in order to maintain connective tissue filling the entire interproximal area to ensure nutrition and better adaptation of the flap during suturing.

After the exposure of the bone tissue, with the flap divided, the proximity of the alveolar bone crest to the CEJ

was observed, mainly in the central incisors and canines (Figure 1E). In order to restore the area of attachment of the supracrestal tissues after altering the gingival margin, the osteotomy was performed with an Ochsenbein micro chisel (Quinelato®).

An osteoplasty was performed with the aid of a spherical diamond tip 1016 (Kavo®) mounted in a high speed handpiece (Kavo®), under constant irrigation with saline solution. Thereby, obtaining reanatomization of the bone and delimitation of new escape grooves to provide better gingival accommodation, the area was abundantly washed with serum/ physiological solution. The flap was repositioned and stabilized by means of suspensory sutures, using 5.0 nylon thread (Procure®) (Figure 1F).

To control pain and edema, both with 500 mg sodium dipyron every six hours and 100 mg nimesulide every 12 hours were prescribed for three days. On conclusion of the

procedure, the patient was instructed not to brush the areas involved for one week and to use light mouthwashes with 0.12% chlorhexidine digluconate (Riohex®) as from 24 hours after the procedure. The patient was informed about the other postoperative recommendations. The stitches were removed seven days after the procedure.

At 30 days after the clinical crown augmentation, upper labial frenectomy was performed by the modified Archer technique (Figure 2A-C). The procedure began with the above-mentioned asepsis protocol. Anesthesia of the infraorbital nerve was performed bilaterally, the anesthesia was complemented by local infiltration in the buccal vestibule and of the nasopalatine nerve with 2% mepivacaine hydrochloride + epinephrine 1:100,000 (DFL). The frenectomy technique began by positioning a curved hemostat in the labial frenulum near the bottom of the vestibule.

Figure 1

Clinical sequence of treatment of altered passive eruption with esthetic clinical crown lengthening.



Source: The authors.

Note. (A) Initial appearance of the smile. (B) Demarcation of the bleeding points. (C) Removal of marginal gingival tissue with a Gracey 5-6 curette. (D) Final appearance after gingivoplasty. (E) Partial-thickness flap in the interproximal region and full-thickness flap in the cervical region. (F) Repositioning of the flap with suspensory suture after osteotomy and osteoplasty.

A 15C scalpel blade (Adantive®) was used to make two vertical incisions on each side of the frenulum, touching the periosteum from the most cervical portion towards the lip until the hemostat clamp was found, forming a “V”. After this, an incision was made over the hemostat to remove the frenulum (Figure 2B). Right after this, a pair of curved iris scissors (Golgran®) were used to

dissect the tissues to remove the adhered fibers.

The remaining muscle fibers were removed with a Molt detacher (Millenium®). Irrigation was performed with saline solution, and suturing with simple stitches, using 4-0 silk thread (Procure®) for better patient comfort (Figure 2C).

The control of pain and edema was obtained by

prescription of nimesulide 100 mg every 12 hours; and also dipyron sodium 500 mg every six hours, both for three days. The use of mild 0.12% chlorhexidine digluconate mouthwash (without alcohol) was recommended to

complement hygiene, in addition to the postoperative guidelines. The patient returned to the dental clinic after seven days, for suture removal and evaluation.

Figure 2

Upper labial frenectomy using the modified Archer technique.



Source: The authors.

Note. (A) Initial appearance of the upper labial frenulum. (B) Appearance after excision of the frenulum. (C) Single suture in the mucosal region.

For the treatment of labial hypermobility and smoothing the vertical excess of the maxilla, the application of botulinum toxin type A was used. The nasolabial fold was used as a reference for demarcation of the points of application, while the patient smiled spontaneously (Figure 3). After this, one unit of botulinum toxin (*Botox*®) was

injected into each point (Figure 4). After fifteen days, the patient returned for evaluation, and it was not required.

In the four month postoperative follow-up period, it was possible to observe a significant reduction in gingival display during spontaneous smiling, with a maximum gingival display of two to four mm (Figure 5).

Figure 3

Demarcation of reference points in the nasolabial folds.



Source: The authors.

Figure 4

Application of botulinum toxin in the points marked.



Source: The authors.

Figure 5

Final appearance at four months after the gingivoplasty, the osteotomy, the osteoplasty, the upper labial frenectomy and the application of type A botulinum toxin.



Source: The authors.

DISCUSSION

The etiology of the gummy smile can be associated with gingival, bone, dental or muscular factors (Kuhn-Dall'Magro et al., 2015). Possible causes of gingival smile are as a result of the APE or from hyperplastic gingival overgrowth. The etiological factor of bone origin is related to the excessive vertical growth of the maxilla, while the excessive eruption of the maxillary incisors characterizes the etiological factor of dental origin.

When the aforementioned factors are normal, a muscular etiology should be suspected, such as hypercontraction of the upper lip elevator muscles, or an abnormal length of the lip (Kuhn-Dall'Magro et al., 2015). In the present case report, the patient had a gummy smile of multiple etiologies, associated with vertical excess of the maxilla, hypermobility of the upper lip and APE.

Due to the multiple possible etiologies, the

identification and management of the etiological factors were directly associated with successful treatment. Thus, the professional must perform a facial analysis and thoroughly evaluate the relationships between dentition, gum, bone and lip to determine the etiology involved (Gibson & Tatakis, 2017). In cases of APE, the choice of surgical technique is influenced by the relationship of the marginal gingiva with the bone crest, of the bone crest in relation to the CEJ, and with the width of the keratinized tissue strip (Chu, Karabin & Mistry, 2004). In accordance with Coslet et al. (1977), the APE is classified into two types, both based on the location of the mucogingival junction in relation to the alveolar bone crest. Moreover, it is divided into two subgroups, based on the position of the alveolar bone crest in relation to the CEJ (Mele et al., 2018).

The APE type 1 is characterized by a band of attached gingiva, corresponding to the measurement of the gingival margin to the mucogingival junction, being greater than the mean width of 3.0-4.2 mm in the maxilla (Bowers, 1963; Ainamo & Loe, 1966). In APE type 2, the attached gingival band appears to range within the normal mean width recommended by the literature. However, in these cases, the entire attached gingiva is located at the anatomic crown, with the mucogingival junction located at the level of the CEJ (Bowers, 1963; Ainamo & Loe, 1966). In subgroup A, the distance between the alveolar bone crest and the CEJ is normal, allowing the gingival connective tissue fibers to have space to insert normally into the cementum (Mele et al., 2018). In subgroup B, the alveolar crest is at the level of the CEJ or very close to it (Clozza, Suzuki & Mohajer, 2014; Mele et al., 2018).

In the present case, the choice of the gingivoplasty technique followed by osteotomy was based on the type of APE. The patient in question had condition of an altered passive eruption of type 1B (Bowers, 1963; Ainamo & Loe, 1966). The wide band of keratinized tissue made it safe to perform the gingivoplasty technique. After performing the technique, a band of keratinized tissue wider than two mm was maintained, thereby ensuring the periodontal health (Cortellini & Bissada, 2018). The osteotomy was indicated to reestablish the biological space, intended for accommodating the supracrestal tissues and maintaining the result in the long term. The subsequent vestibular osteoplasty allowed better adaptation of the upper lip and accommodation of the gingival tissue (Ferreira, Brandão, Martinelli & Pignatton, 2016; Moura et al., 2017).

In this case, the indication of frenectomy was considered due to the low frenal attachment that was at the height of the gingival margin. The traction of the frenum during clinical examination showed ischemia of the papilla between teeth 11 and 21. Because of the low frenal attachment, the stress generated at the gingival margin can cause gingival recession or other periodontal complications over time (Delmondes, Gutierrez, Imperato

& Baggio, 2021). Furthermore, the presence of the frenulum close to the gingival margin resulted in an unsatisfactory esthetic appearance, due to the increase in interproximal tissue volume. The option adopted was to perform the frenectomy procedure in a second surgical approach to avoid risks of tissue necrosis, since the incisions needed to remove the frenulum would be very close to the new gingival margin created by the gingivoplasty.

A gummy smile resulting from skeletal deformities, such as increased vertical height of the maxillary arch, observed in the present case, usually requires orthognathic surgery (Gibson & Tatakis, 2017). Le Fort I surgery with impaction is the most recommended therapeutic approach. However, the surgery represents a complex, invasive, irreversible and costly procedure (Gibson & Tatakis, 2017). The patient in question, however, did not present a significant craniofacial discrepancy, and did not have specific complaints about facial harmony. In view of this context, the presence of muscular hypermobility and according to the evidence in the literature, the application of botulinum toxin type A was presented as a less invasive, safer, temporary and effective alternative. The technique provides harmonious and pleasing results for the patient, when applied to the appropriate muscles and respecting the dose and type of smile (Nasr, Jabbour, Sidaoui, Haber & Kechichian, 2016). In addition, because it is reversible, the botulinum toxin is an option for temporary correction of gummy smile for patients willing to perform more invasive and definitive procedures in the future (Nasr et al., 2016).

The botulinum toxin type A is a neurotoxin from the bacteria *Clostridium botulinum*. When used in small amounts, it will cause localized chemical denervation and thus temporarily reduce muscle contractions (Small & Hoang, 2013). The toxin acts by leading to muscle relaxation that blocks acetylcholine, a neurotransmitter that transmits messages from the brain to muscle fibers, then preventing muscle contraction. This toxin has been widely used in the treatment of gummy smile, and has shown a notable improvement in the lip profile, in addition to considerably reducing the gummy smile (Gracco & Tracey, 2010; Sucupira & Abramovitz, 2012; Moreira, Possidônio, Souza, Kinoshita & Silveira, 2019). In the case presented, additionally to reduce gingival exposure during a spontaneous smile, the application of botulinum toxin contributed to alignment of the upper lip during the smile.

Within the limitations of this technique, the temporary effect of lasting approximately four to six months is outstanding. The short duration is due to the formation of new acetylcholine receptors, hence causing a gradual return of muscle contraction, with minor side effects (R. R. Martins, Silveira, Raulino, Martins & Pessoa, 2016; Vasconcelos, Sotero & Lage, 2019).

CONCLUSION

The present case report demonstrates the importance of a good diagnosis and the identification of the etiological factors of gummy smile for a correct treatment. Association of the treatments proposed, according to their

specific indications, achieved satisfactory results. Both techniques were shown to be effective, safe and less invasive methods within their respective indications and etiologies of gummy smile.

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