

Aesthetic Crown Lengthening: Case Reports

Alargamiento de Corona Estético: Reporte de Casos

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ABSTRACT: The crown lengthening is indicated for aesthetic purposes, exposure of subgingival caries, crown fractures or a combination of these, which can be characterized as aesthetic or functional, related to restorative indications, and restoration of biological width. Several factors need to be evaluated in the aesthetic planning for optimizing the smile, with the inclusion of an increase in the clinical crown, emphasizing the quality of the thin or thick periodontal phenotype, an adequate band of keratinized tissue and the size of the biological width. A correct diagnosis of the gummy smile etiology, as well as an assessment of clinical characteristics and anatomical dimensions, is of fundamental importance prior to the patient's approach. It determines and guide decisions regarding the possibilities of treatment and prognosis of cases. The aim of this study was to report two cases of cosmetic periodontal surgery with techniques commonly used for this purpose: gingivectomy and flap surgery with osteotomy.

KEY WORDS: crown lengthening, gingivectomy, osteotomy, esthetics.

INTRODUCTION

Surgeries with the purpose of clinical crown lengthening (CCL) are indicated for aesthetic improvement, exposure of subgingival caries, crown fractures or both. These procedures can be characterized as aesthetic or functional, with the term "functional" related to restorative indications, and restoration of the biological width (Hempton & Dominici, 2010).

In the context of aesthetic surgery, CCL is frequently performed on anterior sextants, mainly due to the presence of gummy smile. The aim of cosmetic surgery is to imitate, as much as possible, the natural appearance of gingival tissues and give a harmonious appearance to the surgical area, and thus, several factors need to be evaluated in aesthetic planning for smile optimization (Marzadori *et al.*, 2018).

The gummy smile (> 3 mm of gingival display during smile) may result in compromised esthetics, and its etiology varies and determines the appropriate treatment, which may require esthetic CCL (Silva *et*

al., 2012). It has muscular and skeletal influences and may be the result of excessive maxillary growth, or when the upper lips are shorter than normal, due to hyperactivity of the levator labii superioris muscle (Malkinson *et al.*, 2013). It occurs in patients with greater than normal facial heights and abnormal eruption of the upper teeth, resulting in the appearance of short clinical crowns. Thus, in the presence of a midline or high line, this condition is more pronounced, and, in some cases, treatment includes a combination of orthognathic surgery, orthodontics, and periodontal surgery (Hempton & Dominici, 2010; Malkinson *et al.*, 2013).

The prevalence of excessive gingival exposure has been estimated at 10 % of the population between 20 and 30 years old and is seen more in women than in men (Malkinson *et al.*, 2013). Its influence on smile aesthetics and the opinions of dental professionals and laypeople were investigated (Kokich Jr. *et al.*, 1999) and demonstrated the importance of a harmonious smile. Patients' self-perception of smile

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attractiveness showed that the visibility and size of the teeth and the position of the upper lip were critical factors, according to Van Der Geld *et al.* (2007). Gummy smile can have an adverse effect on a patient's perception, being related to attractiveness, friendliness, confidence, intelligence, and self-confidence (Malkinson *et al.*, 2013).

Altered passive eruption (APE), one of the main etiologies of gummy smile, is described as the apical displacement of the periodontium where the gingival margin exceeds the cemento-enamel junction (CEJ). As a result, the CEJ is positioned very close to the bone crest, leaving little or no space for the dentogingival structures, which can lead to the persistence of an excessive amount of soft tissue on the enamel surface (Batista Jr. *et al.*, 2013).

The APE can be classified into two types, with subtypes A and B: type 1A where the mucogingival junction (MGJ) is located apically to the cemento-enamel junction (CEJ) and the buccal bone crest. The distance between the CEJ and the bone crest is physiological for connective tissue attachment (CTA). In type 1B, the bone crest is located at the level or coronal to the CEJ, and there is no physiological space for CTA. Type 2A is characterized by the MGJ located at the level or coronal to the CEJ, and the distance between the CEJ and the bone crest is physiological for CTA. In type 2B, the bone crest is located at the level or coronal to the CEJ, and there is no physiological space for CTA (Mele *et al.*, 2018).

Arias *et al.* (2015), showed that an accurate diagnosis of the causes associated with a gummy smile, as well as an evaluation of clinical characteristics and anatomical dimensions, is fundamental prior to approaching the patient, to determine and guide decisions regarding treatment possibilities and prognosis of cases. Therefore, knowledge about the dimensions of the periodontal biological space is essential for proper planning of periodontal aesthetic procedures, as the position of the gingival margin is primarily defined by the alveolar bone crest (Marzadori *et al.*, 2018).

The dimension of the gingival sulcus was 0.69mm, the junctional epithelium was 0.97mm, and the supracrestal connective tissue was 1.07mm, resulting in a total length of 2.73mm [10]. Based on these measurements, it is suggested that 3mm of supracrestal tooth structure should be obtained during the clinical crown lengthening procedure (Chu & Hochman, 2008).

The stability of the results appears to depend on technical issues related to soft and hard tissues. The diagnosis, planning, and treatment should include clinical and radiographic evaluation, with transperiodontal probing measurements to estimate the length of the anatomical crown, the thickness of soft and hard tissues, as well as the location of the CEJ. However, this still provides limited information to the professional about anatomical characteristics (Deas *et al.*, 2004).

The use of cone beam computed tomography (CBCT) has been suggested to diagnose and characterize the anatomical individualities of soft and hard tissues in teeth affected by APE and to present a new combined surgical approach for their correction based on biometric information obtained through CBCT. Surgical planning using CBCT allowed for efficient evaluation of the involved anatomical characteristics. Comparisons of crown lengths measured directly on study models and those obtained directly from CBCT revealed high agreement, and intra-examiner precision was also high, although there are still technical limitations. Thus, cone beam tomography enables precise diagnosis of the distance between the CEJ and the bone crest, as well as the exact determination of anatomical crown length and other factors to be considered in surgical planning, such as the thickness of the buccal bone plate. Despite the advantages, currently, CBCT can only be justified when low radiation doses are used, and no additional diagnostic and/or treatment options are available (Batista Jr. *et al.*, 2013).

Possible periodontal treatment options for a gummy smile include gingivectomy and periodontal flap surgery with or without osteotomy. These surgical procedures should be able to reduce excess gingival tissue, expose desirable clinical crowns, and restore proper biological width, as its integrity is considered a necessary step in rehabilitations to achieve and maintain healthy soft tissues (Hempton & Dominici, 2010).

When there is keratinized tissue (KT) and adequate biological space that allows for surgical modification of the gingival margins without the need for osseous contouring, gingivectomy becomes the procedure of choice. However, there are cases that involve osseous contouring and gingival resection to accommodate aesthetics and function, making it a more delicate procedure that requires exposure of the root surface, positioning of the gingival margins at the desired level, and apical reestablishment of the biological width (Mele *et al.*, 2018).

The indication of minimally invasive technique (without flap) was compared to the traditional technique (full-thickness flap) in 28 individuals with a gummy smile, using a split-mouth randomized clinical trial design to evaluate clinical outcomes, morbidity, and patient satisfaction up to 1 year after surgery. Both therapies were found to be effective, and there were no significant differences between the groups. However, some factors may influence the choice of technique, such as the height of KT and the patient's bone and gingival tissue phenotype (Ribeiro *et al.*, 2014).

In a prospective study, clinical outcomes and patient satisfaction were evaluated in individuals undergoing aesthetic crown lengthening (ACL). Results showed that the procedure improved patient satisfaction with gingival and dental display, both while smiling and speaking. The surgery resulted in 77 % of patients being very satisfied with the size and shape of their maxillary anterior teeth, with most patients (81 %) being very satisfied with the overall experience of the procedure and its outcome. Considering the overall experience (the procedure, postoperative course, and result), 100 % of patients would likely choose to undergo the procedure again. Similarly, all patients would recommend this procedure to someone with a similar issue, and correction of excessive gingival exposure can be an important factor not only in terms of smile aesthetics but also in terms of patient self-esteem (Silva *et al.*, 2015).

Therefore, the present study aimed to report the case of two aesthetic clinical crown lengthening procedures, using gingivectomy for one case and flap surgery with osteotomy for the other, subsequently evaluating the results.

CASE REPORTS

The case reports were obtained from the data of the research project submitted and approved by the Research Ethics Committee of UFJF with the number CAAE 73830817.0.0000.5147.

Case report 1

Female, 26 years old, non-smoker, without any significant systemic alterations, complaining of gingival bleeding and having small-sized teeth. Periodontal clinical conditions were assessed using a North Carolina periodontal probe (PC PUNC 15, Hu Friedy, IL, USA). She presented a wide band of keratinized

tissue, a thick periodontal phenotype, with characteristic melanin pigmentation (Fig. 1A). Periodontal pockets with probing depths between 4 and 6 mm were diagnosed in the maxillary anterior teeth on the buccal aspect, with features of gingival hyperplasia (Fig. 1B).

Subgingival scaling was performed using a Gracey 5-6 curette and ultrasonic tips (Dabi Atlante, Brazil), followed by a reevaluation after 20 days when gingivectomy was scheduled to correct the pseudopockets and subsequent aesthetic crown lengthening (ACL).

After anesthesia, the pockets were marked, and an external beveled incision was made at their base using a no. 15c surgical blade (Figs. 1C,D). The incised tissue was completely removed using a Goldman Fox 3 curette and Orban's gingivectomy knife, followed by scaling with a Gracey 5-6 curette and gingivoplasty with a Castro-Viejo scissors and Kirkland's gingivectomy knife (Fig. 1E). Coe-Pack® surgical dressing was applied over the operated area and kept in place for 7 days. Postoperative care included the use of analgesics and rinsing with 0.12 % Chlorhexidine mouthwash for one week. Figure 1F shows the result after 60 days.

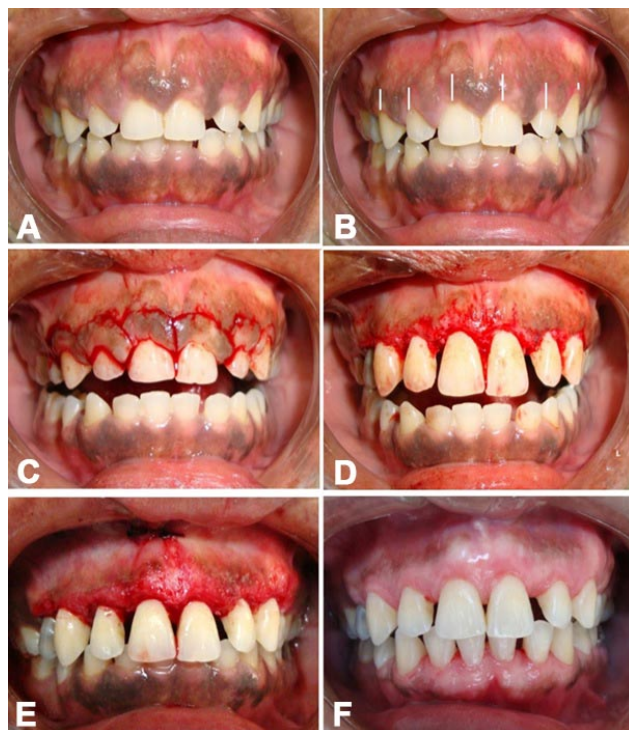


Fig. 1. 1A – Initial clinical status, 2^a – Periodontal pockets, 3A – Incision, 4A – Incised tissue removed, 5A – Gingivoplasty and 6A – Follow up after 60 days.

Case report 2

Male, 19 years old, non-smoker, without any significant systemic alterations, with an aesthetic complaint in the upper anterior area due to gingival unevenness. The periodontal clinical conditions were assessed using a North Carolina periodontal probe (PC PUNC 15, Hu Friedy, IL, USA). He presented a thick phenotype, with probing depths between 1 and 3 mm in the maxillary teeth on the buccal aspect, and an aesthetic crown lengthening (ACL) procedure was scheduled for gingival correction using flap surgery (Fig. 2A).

Preoperative medication was administered using a corticosteroid, Dexamethasone 4 mg. After anesthesia, the ideal size of the teeth was marked, and an internal beveled incision was made using a no. 15c surgical blade to outline the ideal size. The incised tissue was completely removed using a Goldman Fox 3 curette and contoured with a Castro-Viejo scissors (Fig. 2B).

Next, a full-thickness flap was reflected in the buccal area from the distal aspect of tooth 13 to the distal aspect of tooth 23, allowing access to the underlying bone for evaluation and possible correction of the biological width (Fig. 2C). Using an Ochsenbein chisel no. 1 and a high-speed drill with a 1016 bur, osteotomy was performed to correct the biological width and create

an appropriate concave bone arch and osteoplasty (Fig. 2D). Sutures were placed using 4.0 silk thread (Ethicon®) and removed after one week (Fig. 2E). Postoperative care included the use of analgesics and rinsing with 0.12 % Chlorhexidine mouthwash for one week. Figure 2F shows the result of the procedure after one year.

DISCUSSION

An increasing demand for aesthetic enhancement is part of current periodontal practice. The aesthetic treatment of a smile line is often a scenario where teeth, periodontal tissues, and lip position interact. Aesthetic crown lengthening requires efficient planning to avoid potential over-resection or inadequate resection of the gingival tissue, leading to a partial resolution (Cairo *et al.*, 2012). There are crucial factors for indicating this surgical procedure, including the quality of the periodontal phenotype, adequate width of KT, and the dimension of the biological width, according to Marzadori *et al.* (2018).

Gingival hyperplasia is characterized by an excessive increase in gingival tissue and is one of the factors that can lead to an unfavorable aesthetic appearance and impair periodontal health. It is related to a variety of etiological factors and pathogenic processes, such as dental biofilm, medications (such as phenytoin, calcium channel blockers, and cyclosporine), local irritation from orthodontic appliances, or it can result from inflammation associated with systemic issues such as diabetes and pregnancy (Almeida & Dias, 2004; Mele *et al.*, 2018).

Correction of hyperplasias in the upper anterior areas through gingivectomy is a form of periodontal therapy that determines an aesthetic crown lengthening. In clinical case 1, the individual presented gingival hyperplasia with a wide band of keratinized tissue and probing depths between 4 and 6 mm, making them suitable for crown lengthening. The chosen technique for treatment was gingivectomy due to an adequate amount of attached gingiva, absence of bone loss, no need for intervention in the alveolar crest, and the patient's gummy smile, which resulted in aesthetic concerns (Almeida & Dias, 2004; Ganji *et al.*, 2012).

In case report 2, the option chosen was flap surgery due to the intention of improving the gingival contour, recovering the biological width, and avoiding potential marginal gingival recession. Individuals undergoing aesthetic crown lengthening demonstrated that, six months after the procedures, the teeth



Fig. 2. 2A - Initial clinical status, 2B – After incisions, 2C - Flap was reflected for evaluation and possible correction of the biological width, 2D – After osteotomy, 2E – Sutures and 2F – Follow up after one year.

exhibited a marginal recovery of the soft tissues, resulting in a reduction of the surgically established crown height. This was particularly observed when the flap margin was positioned closer to the bone crest. These findings reflect the periodontium's tendency to heal by reforming a new supracrestal gingival unit to recover the dimension of the biological width, reported by Deas *et al.* (2004). Cairo *et al.* (2012) showed that the final position of the gingival margin was apical to the baseline position but coronal to the bone crest, resulting in minimal gingival margin reformation after healing, which is consistent with the findings of the previous study. After one year of healing, this case showed minimal marginal recovery.

The periodontal phenotype can influence the extent of tissue alteration after crown lengthening. There is a different healing pattern among different phenotypes, with coronal gingival relapse in the interproximal and vestibular/lingual areas being significantly more pronounced in individuals with a thick phenotype than in those with a thin phenotype. Therefore, flap surgery with osteoplasty/osteotomy would be more indicated in cases of a thick periodontal phenotype to better predict the final position of the gingival margin and reduce the chances of tissue relapse (Perez *et al.*, 2007; Ribeiro *et al.*, 2014; Marzadori *et al.*, 2018). In case report 2, the choice of flap surgery was also made due to the individual's thick phenotype.

Suturing the post-surgical flap less than 3 mm from the bone can result in significant marginal recovery of the soft tissues. Therefore, positioning the flap slightly coronal to the alveolar crest results in a more predictable and stable amount of surgically created crown length (Deas *et al.*, 2004; Cairo *et al.*, 2012; Arora *et al.*, 2013). In case 2, recovering the distance of at least 3 mm from the CEJ to the bone crest was certainly crucial for maintaining the surgical outcome.

An option for aesthetic crown lengthening is to use minimally invasive approaches, which, however, may impede the creation of an adequate bone arch. Minimal changes were shown at the gingival margin level after 12 months when comparing the full-thickness flap technique and the flapless technique, both with osteotomy. This result was attributed to the 3 mm distance obtained from the bone crest to the gingival margin, according to Ribeiro *et al.* (2014). However, this finding differs of the Pontoriero & Carnevale (2001) study that demonstrated, during a

12-month healing period following apically positioned flap surgery and osteotomy, a tendency of marginal periodontal tissue to grow in a coronal direction from the level defined in surgery. The lesser bone reduction with flap placement at the bone crest after suturing could have contributed to the observed higher relapse. This growth occurred three months after clinical crown lengthening in studies of Deas *et al.* (2004), and Arora *et al.* (2013), which also supported that tissue recovery was related to the position of the post-surgical flap.

The flapless technique has several disadvantages and is contraindicated in cases where KT is limited, as it requires incisions that may create mucogingival problems. Additionally, there is the inability of the surgeon to visualize anatomical and biological structures for bone removal, necessitating tactile sensitivity to locate the bone level relative to the CEJ during the procedure. Therefore, it would be a highly sensitive technique, requiring training and experience (Ribeiro *et al.*, 2014; Mele *et al.*, 2018).

Aesthetic crown lengthening is a procedure with increased demand, and the technique of choice is flap surgery, which allows for the possibility of biological space recovery and proper bone contouring, thereby increasing the stability of the result.

CONCLUSIONS

1. The surgical techniques employed allowed for aesthetic crown lengthening.
2. Gingivectomy is better indicated in areas with gingival hyperplasia.
3. Recovery of the biological space is crucial for the stabilization of the post-surgical result.

SOUZA PASSARONI, B.; VIEIRA FALABELLA, M.E. & MENDONÇA FALABELLA, M. Alargamiento de corona estético: Reporte de casos. *Int. J. Odontostomat.*, 18(2):194-199, 2024.

RESUMEN: El alargamiento clínico de corona está indicado con fines estéticos, exposición de caries subgingivales, fracturas coronarias o alguna combinación de estas, y puede caracterizarse como estético o funcional, relacionado con indicaciones restaurativas y restauración del espacio biológico. Varios factores deben ser evaluados en la planificación estética para optimizar la sonrisa, con la inclusión del aumento clínico de coronas, destacando la calidad del fenotipo periodontal delgado o grueso, la gama adecuada de tejido queratinizado y la dimensión del espacio biológico. Un diagnóstico correcto de las causas asociadas a la sonrisa gingival, así como una valoración de las carac-

terísticas clínicas y dimensiones anatómicas, son de fundamental importancia antes de abordar al paciente, para determinar y orientar decisiones respecto a las posibilidades de tratamiento y pronóstico de los casos. El objetivo de este estudio fue reportar dos casos de cirugía periodontal estética con técnicas comúnmente utilizadas para este fin: gingivectomía y cirugía de colgajo con osteotomía.

PALABRAS CLAVE: alargamiento de corona, gingivectomía, osteotomía, estética.

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