

# Treatment of Gingival Smile: A Case Report

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## Abstract

There are various alternatives for correcting a gingival smile, ranging from techniques such as gingivectomy to more complex and invasive procedures such as orthognathic surgery. Gingival smile is one of the most common complaints of patients seeking an aesthetic smile. This article describes the alternative treatments available for lip repositioning and improving smile aesthetics, and presents the clinical course of a gingival smile patient after undergoing the surgical technique of gingival recontouring (GR) associated with lip repositioning with restorative aesthetic treatment. The surgery performed corrected altered passive eruption of the maxillary anterior teeth and lengthened the lateral beam of the elevator muscle of the upper lip and wing of the nose, and achieved containment with sutures, reducing the gingival smile. After surgery, it was apparent that the high smile line had been successfully corrected without compromising labial harmony. The patient expressed high satisfaction with the treatment. The surgical technique proposed in this study may be a therapeutic option for lip repositioning to achieve smile harmony.

**Key words:** *aesthetic surgery, dental aesthetics, gingival recontouring, gummy smile, gums*

## Introduction

Many patients seek dental treatment to improve not only their oral health but also their smile. Thus, it is necessary for health professionals to stay abreast of new forms of treatment for gingival smile correction (Gaddale *et al.*, 2014; Storrer *et al.*, 2014).

Many dental professionals consider that a harmonious smile requires the upper lip be positioned at the level of the gingival margin of the maxillary central incisors. The field of dentistry concerned with both diseases of the teeth and facial aesthetics is periodontology (Seixas *et al.*, 2011; Gaddale *et al.*, 2014).

Excessive exposure of the gums (more than 3 mm) while smiling is known as a gingival smile. Its aetiology is varied, including gingival enlargement, lip hyperactivity, vertical maxillary excess (VME), altered passive eruption (APE), or combinations thereof (Allen, 1988; Garber and Salama, 1996; Robbins, 1999; Monaco *et al.*, 2004; Ribeiro *et al.*, 2012).

The aesthetics of a smile involve relationships between the teeth, the shape of the lips, and the gingival anatomy

(Garber and Salama, 1996). Depending on the patient's teeth and the shape of their lips, the clinician should determine the optimal type of smile – high, medium or low (Lee, 2004). Where there is a gingival smile, it must be diagnosed and classified prior to the formulation of a treatment plan (Sahoo *et al.*, 2012).

According to Garber and Salama (1996), a smile can be high, medium or low. A high smile or 'gummy' smile is exhibited when the patient presents a substantial amount of soft tissue above the upper teeth. This feature can be the result of the combination of several factors, including gingival enlargement, lip hyperactivity, VME or APE. We propose a modification of Garber and Salama's (1996) classification system for the diagnosis and treatment of various forms of gingival smile (*Table 1*).

If the tooth crown anatomy is larger in width (mesio-distal) than in height (cervical-incisal), the problem results from APE. Lee (2004) proposed the utilization of cosmetic prostheses in such cases, after first evaluating the biological width of each tooth, and identifying whether or not clinical crown augmentation procedures are required. If tooth shape is not changed but there is a considerable amount of gingival tissue (attached gingiva) from the bottom vestibule to the line of the gingival zenith, the result is VME. In most cases, however, a gingival smile is a consequence of both APE and VME. Efforts to improve smile aesthetics and dental-facial imbalances have led to the development of new surgical techniques to correct gingival smiles via correct diagnoses.

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**Table 1.** Diagnosis and treatment of gingival smile

Condition	Treatment
APE Type 1A: Normal biological space	GR and/or periodontal surgery lip repositioning
APE Type 1B: Without biological space (bone crest coincides with CEJ)	GR with retail survey and osteotomy and/or periodontal surgery lip repositioning
APE Type 2: Short teeth without excess gum tissue	Realization of aesthetics prosthesis with or without osteotomy
VME Grade 1: Mucosa and gingival range 2 – 4 mm	Orthodontic intrusion, periodontics or orthodontics and periodontics and aesthetic restorative treatment
VME Grade 2: Mucosa and gingival range 4 – 8 mm	GR + lip repositioning and restorative aesthetic treatment or orthognathic surgery
VME Grade 3: Mucosa and gingival range <sup>3</sup> 8 mm	GR + lip repositioning and aesthetic restorative treatment or orthognathic surgery
APE + VME Grade 2 or 3	GR with or without osteotomy + lip repositioning and restorative aesthetic treatment or orthognathic surgery

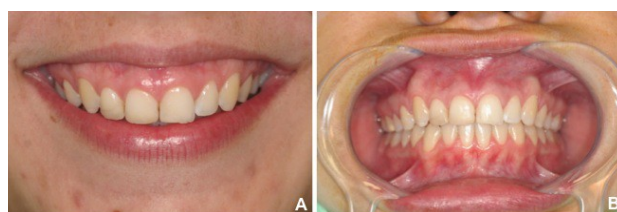
APE, altered passive eruption; VME, vertical maxillary excess; CEJ, cemento-enamel junction; GR, gingival recontouring

While some previous studies have approached gingival smile as a muscular problem caused by a hyperactive upper lip (Sahoo *et al.*, 2012; Storrer *et al.*, 2014) the etiological causes of gingival smile evidently include skeletal (VME), gingival (APE) and muscular factors. The use of botulinum toxin is considered a minimally invasive technique involving the administration of toxin injections into the hyperactive muscle of the upper lip to treat the defect (Sahoo *et al.*, 2012). In some cases it is not possible to treat the patient solely via gingival recontouring (GR), however, because the amount of gingival display remains significant (Storrer *et al.*, 2014).

This report describes the alternative treatments available for lip repositioning and improving smile aesthetics, and presents the clinical course of a gingival smile patient after undergoing the surgical technique of GR associated with lip repositioning with restorative aesthetic treatment.

### Case description and results

A 23-year-old female Brazilian patient attended the dental clinic at Positivo University reporting excessive exposure of her gums when she smiled. On clinical examination, it was noted that the periodontium was healthy, and periodontal clinical parameters were within normal limits. However, the patient was dissatisfied with the cosmetic appearance of her teeth, stating that they seemed ‘very small’ and her gums ‘very large.’ During a happy natural smile, the patient’s teeth were visible from the maxillary right second pre-molar to the maxillary left second pre-molar, with 8 mm of excessive gingival tissue display among the incisor teeth from the gingival margin to the bottom edge of the upper lip. During extravagant smiling, we could observe an overexuberant lip raising, which led to a diagnosis of a hyperactive upper lip (Figure 1).



**Figure 1.** A) Vestibular aspect of gingival smile correction before surgery. Modified Garber and Salama (1996) classification; APE + VME grade 2. B) Intraoral view with gingival exposure. The distance from the lip edge to the gingival margin was 8 mm. Increasing the clinical crown of the incisors and lip repositioning were proposed to improve smile aesthetics in this case. APE, altered passive eruption; VME, vertical maxillary excess.

It was suggested to the patient that surgery would be required for the resolution of her case. After evaluation of the medical and family history of the patient, it was determined that she was medically fit for surgery. With the aid of a millimeter periodontal probe, her anterior teeth were then probed to the upper right and left canine, identifying a probing depth of 4 mm and an absence of bleeding and periodontal pockets. The patient had tooth crown anatomy larger in width than in height, a considerable amount of gingival tissue (attached gingiva) display and lip hyperactivity. Thus, she was diagnosed with APE Type 1A or 1B and AVM Grade 2, and the treatment planning was GR with or without osteotomy plus lip repositioning and restorative aesthetic treatment to improve the height and width of the dental crown, and minimize the gummy smile, as orthognathic surgery was not the patient’s option. The lip repositioning technique selected was the one first described by Storrer *et al.* (2014) where the elevator muscle of upper lip and wing of nose (EMULWN) is tensioned and contained.

This muscle is described as being long and slender, extending from the frontal process of the maxilla at the corner of the eye to the upper lip. EMULWN is divided into medial and lateral cords: the lateral cord raises and everts the upper lip and raises, deepens and increases the curvature of the upper part of the nasolabial groove (Storrer et al., 2014).

In a sterile environment, following external and internal asepsis using antiseptic solution, blocking the anterior superior alveolar nerve and middle superior alveolar nerve bilaterally induced local anaesthesia. Measurements of the gingival sulcus and maximum groove depths were labeled with Crane Kaplan forceps (Figure 2). Incisions were made with a 15C scalpel blade, and previously defined points were superficially joined via clamps. The marked areas were deepened using the same blade to generate an internal bevel type incision, which was performed incisally and apically, following the contour of the gingival margin. Intra-sulcular incisions were also made, maintaining the blade as parallel as possible with the tooth axis, to facilitate the removal of excess gingival tissue covering part of the anatomical crown of the teeth. With a dissector a flap of total thickness was raised to verify whether bone recontouring would be necessary. Where the bone crest was less than 3 mm from the cemento-enamel junction (CEJ), osteotomy was performed to negate a recurrence of the free marginal gingiva encroaching over the teeth, and so as not to invade the biological space (Figure 3). The osteotomy was performed with spherical carbide burs at high speed under irrigation with saline. After the re-establishment of biologic width, the flap was repositioned with simple sutures, and some additional sutures were applied after repositioning.

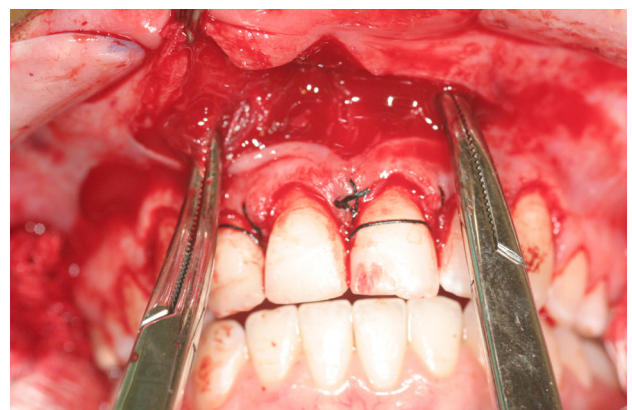


**Figure 2.** Delimitation of the maximum depth of the grooves (4 mm) by means of perforations made at the gingival margin with a Crane Kaplan clamp.



**Figure 3.** Osteotomy, performed with a round carbide bur, for the maintenance of biological space and to minimize the risk of relapse.

For the lip repositioning, a vertical incision was made in the labial frenum and two more horizontal incisions were made in the mucogingival line, starting from the frenum incision up to the canines and exposing the tissues to the same height as the lateral incisors and canines bilaterally. Subsequently, the lateral bundle of the EMULWN was pulled up with hemostat bows and the wing of the nose was positioned downward, as close as possible to the highest portion of keratinized gum (Figure 4). Simple sutures with mononylon wire 5.0 (Ethicon, São José dos Campos, SP, Brazil) were utilized to maintain the repositioning of the muscle bundle (Figure 5). For the epithelial sutures, the horizontal incisions and the labial frenum, simple points with 4-0 silk thread (Ethicon) were used. The external sutures were removed 10 days after the procedure.



**Figure 4.** Traction elevation of muscles of the upper lip and the wing of the nose bilaterally.





**Figure 5. Simple sutures and suspension in the immediate postoperative period.**

Postoperative recommendations included avoiding physical exertion for at least 48 hours, ice packs on the upper lip, limiting facial movements for a period of 7 days and using chlorhexidine gluconate 0.12% for 7 days. Amoxicillin 500 mg every 8 hours for 7 days, nimesulide 100 mg every 12 hours for 3 days and tramadol 50 mg every 6 hours for 3 days were utilized for the control of pain.

Follow-up was performed after 7, 30, 60 and 90 days. During the postoperative period, bruising, swelling or hematoma were not observed, but some tension while smiling was seen during the first three months. The patient also reported no pain when smiling or talking. After 90 days, no notable scar was seen on patient smiling. There was improved harmony between her lips, teeth and gums with noticeable indications of periodontal health including pale pink coloration and embrasures completely filled by the papillae. Change in lip symmetry after surgical treatment was not observed (Figure 6).



**Figure 6. A) Patient 30 days postoperatively. B) Patient 90 days postoperatively, exhibiting maximum smile.**

In order to achieve harmony and improved smile aesthetics, aesthetic restorative treatment was conducted after 90 days. The patient had Class IV restorations on teeth 11, 12 and 21 due to fractures resulting from a fall 8 years prior. The replacement of these restorations was indicated by deficiency of shape, color and surface texture. Teeth 13, 22 and 23 exhibited asymmetry and deficiency of form, which indicated cosmetic recontouring. Diagnostic

wax analysis of the upper anterior teeth was conducted in the laboratory to assist the achievement of occlusal contacts, disocclusion guides, and axial positioning of the teeth. We performed modified absolute isolation and poor restorations were removed. Wire retractors were placed into the gingival sulcus to ensure a tight adhesive procedure. Acid etching with phosphoric acid at 37% was performed in conjunction with an adhesive application system. A condensation-derived palatal silicone matrix was used to generate the palatine portion of translucent restorations with composite resin. A composite opaque resin was applied to the dentin, with a clear-blue composite applied at the incisal edges. The restorations were completed with a translucent composite in the vestibular portion. Finishing and polishing was performed with a 12C scalpel blade, metal sandpaper strip, polyester sanding strip, sequential sanding discs, fine-grained diamond abrasive rubber and a felt disc with diamond paste. The patient returned after 7 days for final adjustments of the anatomy, surface texturing of the buccal surfaces and final polishing (Figure 7).



**Figure 7: Smile aspect one year after the aesthetic restoration of anterior teeth.**

## Discussion

Numerous aesthetic dental-gingival treatments have now become relatively common, and this has increased the expectations of patients with regard to achieving a harmonious smile. Such harmony can only be achieved if there is due attention paid to the aesthetic proportionality between the teeth and gum tissue. One of the main obstacles to achieving this aesthetic proportionality is APE.

Some studies have suggested that APE may contribute to periodontal disease, as the maintenance of oral hygiene may be hindered by excessive gum coverage over the teeth and an absence of connective tissue attachment on the root cementum, both of which can hamper periodontal defenses. APE directly affects the height of the smile, and can result in an aesthetic impression that the patient has very small teeth and a thick gum line (Alpiste-Illueca, 2011).

Several factors have been implicated in the occurrence of APE, including occlusal interference during the eruptive phase, the presence of thick and fibrotic gums, and hereditary conditions. During the active eruption phase, the gum moves with the crown until the erupting tooth reaches the occlusal plane of its antagonist. In the passive eruption stage, the gum migrates apically until the gingival margin arrives at a stable cervical level. Notably, however, some authors have reported that when the bony crest coincides with the CEJ, gum migration in an apical direction does not occur (Alpiste-Illueca, 2011). This phenomenon potentially explains what may have occurred during the passive eruption process in the case reported herein.

Once APE has been diagnosed, the indication is surgical GR with or without repositioning of the elevator muscle of the upper lip and the wing of the nose (Alpiste-Illueca, 2011; Gaddale *et al.*, 2014). The nasal septum muscle containment surgical technique has been suggested by some authors as an alternative for the treatment of gingival smile, as this muscle has a strong influence on the smile and has been associated with excessive lifting of the upper lip. In the current study, a technique incorporating bilateral muscle restraint resulted in favorable lowering of the upper lip. To correct upper lip asymmetry, where the patient raises one side more than the other when smiling, restraint can be applied on one side only (Storrer *et al.*, 2014).

In 2014, Storrer *et al.* proposed a muscle repositioning technique to lift the upper lip and nose wing via resorbable muscle sutures positioned close to the alveolar process. In the case reported herein, an amendment to that suture technique was utilized to minimize the recurrence of adverse repositioning. To increase the visible dental crown, recontouring gingival surgery was also performed. The necessity for osteotomy in some regions was due to the fact that after the folding of the flap, it was apparent that the patient had APE in addition to the previously diagnosed VME. Thus, the CEJ of some teeth coincided with the bone crest. Therefore, osteotomy was utilized to avoid the recurrence of gum encroachment.

The surgical lip repositioning technique in conjunction with GR performed in the case reported herein resulted in an adequate smile height, with a lower line and improved aesthetics. The gingival display at baseline was 8 mm, among the incisive teeth, and decreased to 2 mm in the medial line and 4 mm at the lateral incisors within 24 months of follow-up. It is also important to note that the proportion of the size of the clinical crown was restored after GR surgery and restorative procedures. At the beginning (*Figure 1*), the patient had crowns with a square format. After the restorative and surgical procedures, the mesio-distal proportion of the clinical crown has been re-established (*Figure 7*).

The GR techniques resulting in lip repositioning were achieved in a single operation, which was performed under local anesthesia. In addition, the procedure may be associated with relatively less discomfort after surgery than other methods in patients with no recurrence, as the sutures do not need to be changed to mononylon. With regard to synthetic yarn, nylon yarn is reportedly associated with better biocompatibility with tissue, generating only a small and brief inflammatory response that evidently does not damage the tissues used for internal sutures (Castelli *et al.*, 1978).

Notably, both GR and surgical lip repositioning are considered safe with regard to the risk of relapse, as long as a regimented surgical protocol is followed and the patient has adequate postoperative follow-up. Various cases treated with corrective cosmetic surgery have been reported in the literature, including patients with facial paralysis. In such cases, silicone implantation in the foyer of the fund at the base of the nasal spine, administration of botulinum toxin, and resective procedures in the muscles responsible for upper lip mobility are techniques commonly used for corrections. Such techniques have reportedly proved successful when utilized solely for the cosmetic correction of smile height (Seixas *et al.*, 2011).

Botulinum toxin generates muscle paralysis-induced depression of the nasal septum, and thus reduces movement of the upper lip, resulting in the appearance of less gingival tissue during smiling. However, 'limited action time lock' and the potential for undesired muscle anesthesia are negative aspects of this technique. In the case reported herein, the surgical technique used to contain the muscle was more intrusive than the use of botulinum toxin, but the result was more aesthetically favorable, and longer lasting. In the current study, as well as upper lip lowering there was also apparent avoidance of eversion, resulting in excellent aesthetic results (Storrer *et al.*, 2014). Only in cases of silicone implantation in the foyer fund would the methods reported herein be contraindicated for the aesthetic resolution of gingival smile. The current case has now been followed up for more than 1 year post-surgery, and it can be concluded that the gingival recontouring and surgical lip repositioning procedures utilized represent an excellent option for the correction of gingival smile.

## Conclusion

Within the limitations of this case report, it can be concluded that the surgical technique proposed in this study may be a therapeutic option for lip repositioning to achieve smile harmony. However, a careful anamnesis and management of correct diagnosis should be considered to achieve success.

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