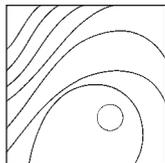


Modified Lip Repositioning with Esthetic Crown Lengthening: A Combined Approach to Treating Excessive Gingival Display



Isis M. Sánchez, DMD¹
Sadja Gaud-Quintana, DMD²
Jacob K. Stern, DMD, MSc³

Lip repositioning surgery to address excessive gingival display induced by different etiologies has received major attention recently. Several techniques and variations have been reported, including myotomy or repositioning of the levator labii superioris muscle, Le Fort impaction, maxillary gingivectomies, botulinum toxin injections, and lip stabilization. This study reports a case of excessive gingival display treated by a modified combined approach. A 25-year-old woman with a 4- to 8-mm gingival display when smiling caused by a combination of short clinical crowns induced by an altered passive eruption and hypermobility of the upper lip underwent a staged esthetic crown-lengthening procedure followed by a modified lip repositioning technique. A description of the technique and a comparison with other modes of therapy is discussed. This modified approach for treating the hypermobile lip included a bilateral removal of a partial-thickness strip of mucosa from the maxillary buccal vestibule without severing the muscle, leaving the midline frenum intact and suturing the lip mucosa to the mucogingival line. The narrower vestibule and increased tooth length resulted in a symmetric and pleasing gingival display when smiling that remained stable over time. With proper diagnosis and sequence of therapy, modified lip repositioning surgery combined with esthetic crown lengthening can be used predictably to treat excessive gingival display and enhance smile esthetics. Int J Periodontics Restorative Dent 2017;37:e130–e134. doi: 10.11607/prd.3124

A gummy smile, known medically as an excessive gingival display,¹ is prevalent in 10.5% to 29% of the population² and may be associated with social embarrassment.³ A gummy smile is caused by a variety of factors that can act alone or in combination. These factors include altered passive eruption, vertical maxillary excess, a short upper lip, and a hyperactive upper lip.² Generally, the diagnosis of a gummy smile is made when more than 2 to 3 mm of gingiva are displayed in a full smile.^{4,5}

The treatment method for correcting a gummy smile depends on the specific etiologic factor involved.² In pronounced cases involving excess growth of the maxilla, orthognathic surgery is required.⁶ This highly invasive procedure, performed in conjunction with orthodontic treatment, is completed under general anesthesia and is associated with hospitalization and a high morbidity rate. Cases in which the gummy smile is due to gum overgrowth can be more easily corrected via crown lengthening or a gingivectomy procedure where the excess gum is removed to expose the natural length of the teeth. If the cause of the gummy smile is hypermobility of the upper lip caused by the lip elevator muscles,² Botox injections may be used as a temporary solution to the problem.⁷

¹Private Practice, Atlanta, Georgia, USA.

²Resident, Advanced Education in Periodontics, The Dental College of Georgia at Augusta University, Augusta, Georgia, USA.

³Director, Advanced Education in Periodontics, The Dental College of Georgia at Augusta University, Augusta, Georgia, USA.

Correspondence to: Dr J. Kobi Stern, 1430 John Wesley Gilbert Dr, Augusta, GA 30912, USA. Fax: 706-723-0204.
Email: jastern@augusta.edu

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However, as the average gingival display will return to baseline values 6 to 8 months postinjection, a more permanent solution is desirable.⁸ In cases where multiple factors are involved, different treatment combinations might also be indicated.^{2,9}

Lip repositioning is recommended as an additional treatment modality for patients with excessive gingival display associated with hypermobile lip.^{2,9} The objective of lip repositioning is to shorten the vestibule and limit the retraction of the lip elevator muscles by removing a strip of mucosa from the maxillary buccal vestibule and attaching the lip mucosa to the mucogingival line, thereby reducing the gingival display at smiling.¹⁰ An accurate diagnosis and careful case selection are critical for the success of any lip repositioning procedure.² Contraindications of lip repositioning include severe vertical maxillary excess (> 8 mm) and the presence of a minimal zone of the attached gingiva, which can create difficulties in flap design, stabilization, and suturing. Previous reports have shown an increased chance of relapse, especially in cases with thin biotypes.² Because the stability of the lip in its new position is key to the overall success of the procedure, it is recommended to keep the flaps sutured in position for 10 to 14 days.

Variations of the surgical technique to avoid relapse have been reported in the medical literature. Ishida et al recommended myotomy of the levator labii superioris muscle to minimize the flap tension during suturing and prevent relapse of the smile height back to its original po-

sition.¹¹ Another method to prevent relapse is use of an allogeneic or autogenous tissue graft separator, which prevents muscle reattachment and superior displacement of the repositioned lip. However, less invasive modified lip repositioning with long-term stability has been recently accomplished alone and in combination with other treatments.^{2,10,12-18} Bohal et al recently offered a classification and guidelines for surgical techniques with the recommendation of removing the width of the mucosal tissue related to the severity of the excess gingival display.²

The aim of this article is to describe a modified lip repositioning technique performed in conjunction with esthetic crown lengthening to correct an excessive gingival display.

Case report

A 25-year-old woman with no significant medical history presented with a chief complaint of an undesired gummy smile. During the clinical extraoral examination, symmetric facial features were found with a normal upper lip length (22 mm) and moderate excess maxillary growth that caused an excess gingival display of approximately 4 to 8 mm at smiling (Fig 1). A periodontal examination revealed healthy non-inflamed gingiva with an adequate width of attached gingiva on the facial aspect covering prominent bony exostoses (Fig 1). Discrepancies in tooth proportions and gingival margins were found on esthetic analysis. Due to the aberration in the normal steps of eruption termed altered



Fig 1 Preoperative full smile.

passive eruption, 2 to 3 mm of the anterior crowns were submerged by excess gingiva, revealing short and squared maxillary anterior teeth (Fig 1). Based on Bhola et al's classification, excessive gingival display subclass 2² was diagnosed, caused by a combination of altered passive eruption type 1B,⁷ a moderate maxillary excess, and a hypermobile lip that revealed 4 to 8 mm of gingiva. Different treatment plan options were presented to the patient, and a combination of esthetic crown lengthening with lip repositioning was selected. After discussing the exact sequence of the therapy and the possible complications, informed consent was signed.

Surgical technique

With the plan to remove the thick bony exocytosis at time of surgery, a two-stage crown lengthening was carried out to increase predictability and precision. This necessitated performing ostectomy and osteoplasty at stage 1 and gingivectomy 6 to 8 weeks later, at stage 2.²⁰ Local anesthesia was given via local infiltration with Septocaine 4% with 1:100,000 epinephrine and



Fig 2 Buccal view of bone exostosis and bone level at the CEJ.



Fig 3 Bone was removed 3 to 4 mm from the CEJ, and buccal bone was recontoured.



Fig 4 Six weeks after crown lengthening. Note the hyperactive lip and persistence of the excessive gingival display.



Fig 5 Two strips of outlined mucosa removed with a tissue thickness of approximately 1 mm.

lidocaine 2% with 1:50,000 epinephrine. A full-thickness flap was elevated from canine to canine via intrasulcular incisions and vertical releasing incisions hidden distally. An osteotomy removed tooth-supporting bone 3 to 4 mm from the cemento-enamel junction (CEJ) to reestablish the biologic width from the future gingival margins. With pleasing tooth proportions and no restorative commitment, the CEJ served as the reference and esthetic crown lengthening was carried out, involving only the facial bone to be removed. In addition, buccal exostoses were removed and recontoured (Figs 2 and 3).

The flap was repositioned at its original position and sutured using polypropylene 5-0 sutures with single interrupted sutures. The

postsurgical instructions included a diet of soft foods, intermittent icing of the upper lip for the first day, avoidance of tooth brushing around the surgical site, and gentle rinsing with 0.12% chlorhexidine gluconate twice daily for 14 days. A Medrol Dosepak and ibuprofen 800 mg bid were prescribed for 7 days. The patient was seen for follow-up at 2, 6, and 12 weeks. After 2 weeks, healing was uneventful and the sutures were removed. At 6 weeks, moderate gingival recession exposing longer clinical crowns upon smiling were noted, but only a slight improvement of the gummy smile was achieved (Fig 4). At 12 weeks of healing, the desired tooth proportions and final gingival margins were esthetic and stable, the tissue maturation was complete, and the pa-

tient was ready for the modified lip repositioning surgery. The amount of epithelium to be excised was determined by doubling the amount of gingival display.²¹ In this case, the band was approximately 10 to 12 mm wide.

Surgical technique (lip repositioning)

After local anesthesia (Septocaine 4% with 1:100,000 epinephrine and lidocaine 2% with 1:100,000 epinephrine), the surgical area was demarcated with two elliptical forms in the vestibule. As recommended previously,^{2,21} based on a 1:2 ratio between the amount of excess gingival display and the amount of tissue removal from the maxillary first molars to the central incisors and leaving the anterior frenum attachment intact, a 10- to 12-mm-wide band was marked for removal (Fig 5). From the mucogingival junction, a partial thickness dissection was made by removing a thin strip of mucosal epithelium within the elliptical outline, leaving the underlying connective tissue exposed (Fig 5). Care was taken to avoid damage to the muscle tissue, nerves, and any minor salivary glands in the submucosa. The parallel incision lines were approximated with interrupted stabilization sutures along the borders of the incision to ensure proper alignment of the lip midline and to approximate both flaps using Vicryl 4-0. Other than limited facial movements during healing, postsurgical instructions and medications were the same as previously noted.

The patient was seen for a follow-up at 1, 2, 4, and 16 weeks after surgery. At 1 week, healing was uneventful and mild pain and tension and moderate swelling of the upper lip were reported. At 2 weeks, the sutures were removed and the slight tension and soreness below the upper lip were reduced. At 4 weeks of healing, tension and soreness had completely disappeared and a slight gingivectomy was performed to scallop the gingival tissue around the CEJ of all six anterior maxillary teeth. The suture area of the lip repositioning healed uneventfully in the form of a scar, which was not apparent when the patient smiled (Fig 6). The patient was very satisfied with the final esthetic outcome and her symmetric, harmonic smile, revealing adequate gingival display and desired tooth proportion (Fig 6). The new lip position and fullness at maximum smile were stable at 6 months after surgery (Fig 6).

Discussion

Lip repositioning was first reported as a corrective method for a gummy smile in 1973 by Rubinstein and Kostianovsky.²² In 2006 and 2007, the use of an elliptical surgical design was described.^{3,10} The surgical design used in the present case was described in 2010 and involved removing an elliptical band of epithelium whose width was twice that of the gingival display.²¹

Ishida et al have described a more invasive combined approach for treating excessive gingival display that included myotomy of the

levator labii superioris muscle, subperiosteal dissection of the gingiva, subcutaneous dissection of the lip, and frenectomy.¹¹ One of the disadvantages of this technique is the increased potential for postoperative morbidity and paresthesia due to the aggressive dissection around the infraorbital nerve. This nerve is protected by the floor of the premaxillary space, formed by the levator labii superioris and, at the inferior boundary of the space, the close relation with the maxillary ligaments.²³ Relapse following this technique is still possible and was found to occur in 8% of the cases treated.²⁴ Patient satisfaction also may be limited; at 3 months postsurgery with an average outcome of a 3-mm gingival display, only 66% of patients were satisfied with their outcome.²⁴

The modified lip repositioning surgery is considered safer, with low morbidity¹⁸ and designed to have fewer complications compared with muscle dissection and repositioning as well as orthognathic surgery.²² However, complications from lip repositioning surgery can still occur and include discomfort, ecchymosis, swelling of the upper lip, relapse, and an asymmetric smile.^{2,10,18} Good short-term results were reported in a few case reports,^{9,10,18,21} however, more studies are needed to determine the stability of the modified lip repositioning technique over time. Silva et al reported a high satisfaction rate with this treatment after 2.5 years; 70% of the patients considered the postoperative amount of gingival display to be "about right," and 90% of the patients said they would undergo the procedure again.¹⁸



Fig 6 After crown lengthening, gingivectomy, and lip repositioning. Note the changes in lip fullness.

In the case presented, a higher risk of postoperative gingival recession was expected considering the substantial osseous recontouring that was indicated, making a one-stage crown lengthening less predictable. To overcome this, a two-stage crown lengthening as described by Sonick in 1997²⁰ was preferred. Indeed, only a slight gingivectomy was indicated at stage two due to an anticipated recession. At stage one, the crestal bone levels were recontoured as recommended to achieve healthy and esthetic gingival margins. In conjunction, bony exostoses were removed to minimize the bulbous appearance of the soft tissue architecture and to allow a more relaxed, fuller upper lip at smile. Simultaneous crown lengthening and lip repositioning surgery was not possible in this case due to the need for extensive flap elevation at stage one.

Conclusions

Patients with a gummy smile due to a hypermobile lip can be very self-conscious about their smile. Modified lip repositioning surgery

combined with esthetic crown lengthening can be used predictably to treat excessive gingival display with less morbidity compared with orthognathic surgery. In addition to reducing the gummy smile, this technique often makes the upper lip look fuller and more attractive. Careful diagnosis, treatment, and patient selection are important in some instances. As was shown in this study, a combination of several modes of therapy may be indicated.

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