Case Report

Mucosal Coronally Positioned Flap for the Management of Excessive Gingival Display in the Presence of Hypermobility of the Upper Lip and Vertical Maxillary Excess: A Case Report

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Background: *Excessive gingival display is a frequent finding that can occur because of various intraoral or extraoral etiologies. This report describes the use of a mucosal coronally positioned flap for the management of a gummy smile associated with vertical maxillary excess and hypermobility of the upper lip.*

Methods: *A 24-year-old female presented for consultation regarding a gummy smile. At full smile the average gingival display ranged from 2 to 4 mm. A clinical examination revealed hypermobility of the upper lip and absence of generalized altered passive eruption. A cephalometric analysis pointed to the presence of vertical maxillary excess. The surgical procedure consisted of an elliptical mucosal excision followed by coronal advancement of the flap. This procedure aimed to limit the activity of the elevator muscles and reestablish the depth of the vestibule.*

Results: *Rapid surgical healing with minimal postoperative sequelae was observed. The patient reported significant reduction of gingival display at 1 week, which was maintained at the 1-year postoperative visit. Reduction in the amount of gingival display at the 1-year follow-up visit was stable.*

Conclusions: *For patients desiring a less invasive alternative to orthognathic surgery, the mucosal coronally positioned flap is a viable alternative. We demonstrate short-term successful use of this technique for the management of excessive gingival display in the presence of slight vertical maxillary excess and hypermobility of the upper lip. Long-term follow-up studies are needed to determine stability of the results.*
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KEY WORDS

Case report; esthetics; gingiva; maxilla; plastic surgery; surgical flap.

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Already smile conveys a friendly nature, and reflects happiness and confidence. A smile is an important non-verbal method of communication and is an interaction between the teeth, the lip framework, and the gingival scaffold.[1] In the western world, a medium smile line with minimal gingival display (GD) is considered to be the most pleasing. When an excessive amount of gingiva is visible while smiling, this condition is commonly referred to as a "gummy smile" and it is found frequently in the general population. In a sample of over 450 adults, aged 20 to 30 years, 7% of men and 14% of women were found to have a gummy smile.[2]

Excessive GD is a clinical finding with many etiologies[3] and may include extraoral or intraoral components. Some extraoral causes of a gummy smile are vertical maxillary excess (VME), hypermobile upper lip (HUL), or a short upper lip. A visual diagnosis of VME is made when the lower third of the face is longer than the remaining thirds;[3] cephalometric analysis can be used as an additional aid. VME can often be treated alone by orthognathic surgery. A Le Fort I procedure down-fractures the maxilla, allowing for segmentalization and three-dimensional repositioning of the dento-alveolar complex.[4] Most patients who undergo this procedure require a hospital stay and a few days for recovery. Postoperative complications can include significant swelling, edema, bruising, and discomfort.[5] In some cases of VME, a multidisciplinary approach with either orthognathic surgery, orthodontic treatment, periodontal treatment, or restorative dentistry is required.[1]

Excessive GD can also be seen in patients with a short upper lip (measured from the subnasale to the inferior border of the upper lip). The average length of the maxillary lip is 20 to 22 mm in young adult females and 22 to 24 mm in young adult males.[6] Hypermobility of the upper lip is caused by hyperfunction of the lip elevator muscles[7] and often results in excessive GD. HUL is considered the primary etiologic factor in excessive GD when the maxillary

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lip length is within a normal range and the lower third of the face is proportionate to the remaining thirds. Treatment for most extraoral or intraoral causes of gummy smile, with the exception of a short or hypermobile lip, has been well documented.[3,7-12] Recently, the injection of botulinum toxin type A has been suggested for treatment of HUL,[13] but this may only provide temporary benefits.

A handful of authors have discussed the surgical correction of HUL, or a short upper lip.[8,14-18] Most of these surgical techniques aim at reducing GD by reestablishing the depth of the vestibule. The earliest report describes a surgical procedure aimed at limiting the activity of the elevator muscles, and was recommended to be performed in the absence of dental alveolar abnormality.[16] Other authors recommended partial resection of the levator labii superioris muscle.[15] However, the stability of this surgical procedure has not been documented beyond 8 months.[17]

Although the surgical management of VME is well reported and a few authors have described surgical intervention for a short upper lip and HUL,[8,14-18] the surgical management of a clearly diagnosed combination case of VME and HUL has not yet been described. We report on the use of a minimally invasive surgical procedure for the management of a gummy smile associated with slight VME and HUL. The mucosal coronally positioned flap (MCPF) aims to reduce GD by shortening the vestibular depth. We report on the short-term stability of our results at the 1-year follow-up.

CASE DESCRIPTION

In March 2009, a 24-year-old female of Middle Eastern descent presented to the School of Dentistry, University of Detroit Mercy, Detroit, Michigan, for a consultation regarding a gummy smile (Figs. 1A and 1B). Her medical history was unremarkable and she denied any history of smoking. A thorough extraoral and intraoral examination was performed. Her upper lip when measured from the subnasale to the inferior border of the upper lip was 20 mm, which is considered to be within normal limits (Fig. 1C).[6]

An intraoral examination revealed no abnormality and the patient had been receiving routine dental care at University of Detroit Mercy, which included regular oral prophylaxis and restorative and endodontic treatment. In 2000, she underwent non-extraction orthodontic treatment for 6 months. A periodontal examination was performed and her probing depths (PDs) ranged from 1 to 3 mm. Only one site had a PD of 4 mm, which was recorded on the distal aspect of tooth #16. Her gingiva appeared pink, firm, and knife edged with no bleeding on probing. No crestal bone loss was noted radiographically (Fig. 2A), and the distance between the cemento-enamel junction and the alveolar bone crest was ≥2 mm. No extruded teeth were seen and minimal attrition was detected. The gingival line in the maxillary anterior sextant was found to be asymmetric. The clinical crowns of teeth #6, #8, #9, and #11 were measured and found to be within an average range,[19] whereas the clinical crown of tooth #10 was 1 mm shorter than tooth #7. Bone sounding under anesthesia was done, and a distance of 3 mm from the mid-facial free gingival margin to the osseous crest on tooth #10 was recorded. A diagnosis of type IA[20] altered passive eruption limited to tooth #10 was made.

A thorough cephalometric analysis was performed (Fig. 2B). The distance between the incisal edge and the palatal vault was measured, and found to be ≥4 mm than average, which is one standard deviation away from the average. The SNGoGn angle (Fig. 2B), which measures the inclination of the mandibular plane to the anterior base of the cranium, was 41.4°. This is considered to be ≈2 standard deviations away from normal.[21] This indicated that the patient's skeletal growth pattern was predominately vertical. A diagnosis of degree I VME[1] was based on clinical evaluation and confirmed with a cephalometric radiograph.

During the patient interview, it was noted that her posed smile (Fig. 1A) did not display as much gingiva

Figure 1.
A) *Preoperative posed smile.* ***B)*** *Preoperative image of the dynamic smile, which extends to the mesial aspect of the first molar, showing 2 to 4 mm of gingival display.* ***C)*** *The length of upper lip, when measured from subnasale to the vermilion border, was 20 mm.*

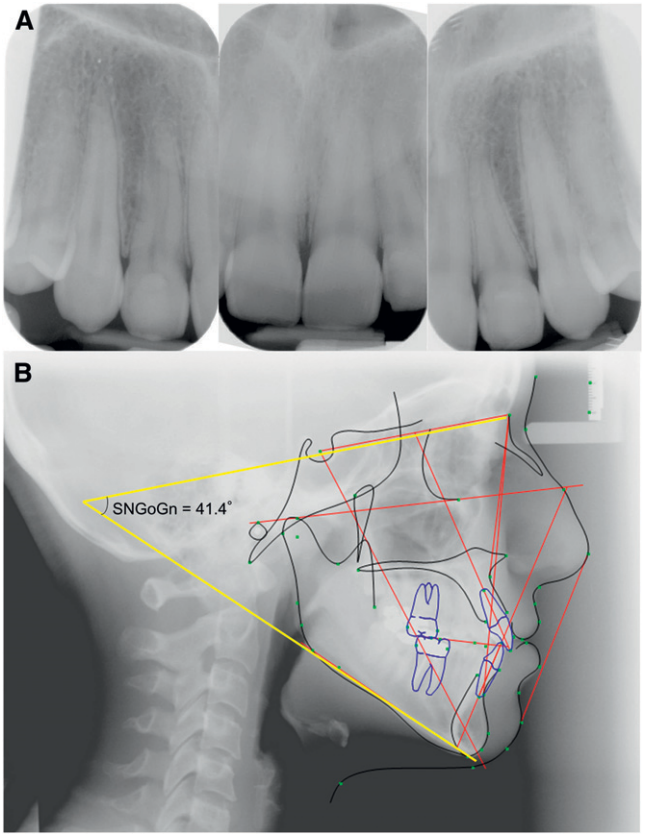

Figure 2.
A) *Radiographs of maxillary anterior teeth reveal no crestal bone loss.* ***B)*** *Lateral cephalometric radiograph is characterized by a steep mandibular plane, and an SNGoGn of 41.4°, which is two standard deviations away from normal (yellow line).*

as her dynamic smile (Fig. 1B), which was noticeably wider. The GD ranged from 2 to 4 mm with the posterior extent of the dynamic smile extending to the mesial aspect of the first molars. During a full smile, the average upper lip mobility ranges from 7 to 8 mm,[22] whereas 11 mm of mobility was measured in our patient. Additional diagnoses included HUL and localized altered passive eruption on tooth #10.

Two treatment options were presented to the patient: maxillary orthognathic surgery with adjunctive esthetic crown lengthening of tooth #10, or MCPF with adjunctive esthetic crown lengthening of tooth #10. It was anticipated that the second approach would address the patient's chief complaint of excessive GD during a full smile and correct the asymmetry between the lateral incisors. After careful discussion of both options, the patient opted to have the MCPF procedure performed, citing the fact that it was minimally invasive, less aggressive, and had the potential for fewer postoperative complications. Although the posterior limit of her smile extended from tooth #3 to tooth #14, the patient requested to have the procedure performed between tooth #5 and tooth #12. Written informed consent was obtained and the patient was educated regarding post-surgical complications including possible scar formation, mucocele formation, postoperative bruising, and extraoral swelling.[17]

Profound anesthesia was achieved.‡ A marking pencil§ was used to outline the apical, coronal, and lateral boundaries of the elliptical incision (Fig. 3A). The coronal boundary was at the mucogingival junction (Fig. 3B) and was used as a reference point to mark the apical boundary at a distance of two times GD. The coronal and apical incisions were parallel to each other and the apical incision gradually angled downward to meet the coronal incision at teeth #5 and #12. A partial-thickness dissection was made. The epithelium was excised (Fig. 3C), exposing the underlying connective tissue (Fig. 3D). Tissue tags were removed. The mucosal flap was advanced and sutured at the mucogingival junction using 6-0 polypropylene sutures‖ and 4.0 chromic gut sutures¶ (Fig. 3E). No periodontal dressing was placed. Postoperative instructions included recommendations for limited facial movements, no brushing around the surgical site for 14 days, and placing ice packs over the upper lip. The patient was advised to rinse gently with 0.12% chlorhexidine gluconate# twice daily for 2 weeks. Postoperative pain was managed with 600 mg ibuprofen, as needed for pain.**

RESULTS

At the 1-week postoperative visit, the patient reported very slight discomfort, minimal postoperative bruising, and extraoral swelling. Intraorally, the surgical site had minimal swelling and slight erythema at the mucogingival junction. Most of the resorbable sutures were no longer present. The patient reported noticing a difference in the amount of gingival exposure when she talked and laughed. At the 2-week postoperative visit, no bruising or extraoral swelling were seen and the patient reported no discomfort. The remaining sutures were removed at the 2-week postoperative visit. At the 4-week follow-up visit, no extraoral swelling was present and the MCPF procedure was successful in reducing the amount of GD (Fig. 4A). The patient was satisfied with the outcome of the procedure. The presence of scar formation at the mucogingival junction was noticed (Fig. 4B). In the following 11 months, stability of reduction in the amount of GD when the patient smiled was seen (Fig. 5).

At the 1-year postoperative visit, a minor secondary procedure was performed to address the localized

‡ Benco Dental, Wilkes-Barre, PA.
§ Austin Surgical, Caledonia, MI.
‖ PROLENE, Ethicon, Somerville, NJ.
¶ Ethicon.
# Peridex, 3M ESPE, St. Paul, MN.
** Amneal Pharmaceuticals, Hauppauge, NY.

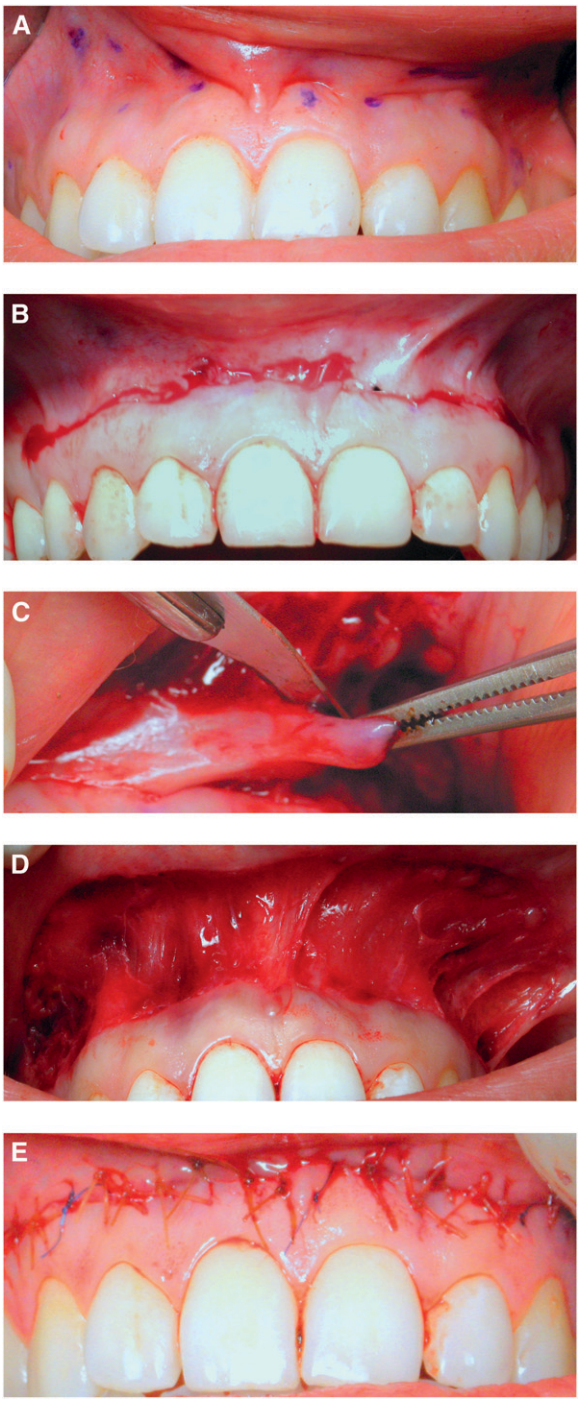

Figure 3.
A) *A marking pencil was used to identify the apical, coronal, and lateral boundaries of the incision.* ***B)*** *The first incision was made at the mucogingival junction.* ***C)*** *Epithelial excision.* ***D)*** *Exposed connective tissue.* ***E)*** *The mucosa was advanced and sutured to the attached gingiva at the mucogingival junction using multiple interrupted sutures.*

altered passive eruption on tooth #10. After profound anesthesia,†† an external bevel incision 1 mm from the gingival margin of tooth #10 was made, creating symmetry between the maxillary lateral incisors. The patient was followed for an additional 2 weeks, and no adverse sequelae were seen.

DISCUSSION

This report documents the use of MCPF for the management of excessive GD seen with VME and HUL. A literature search revealed five reports discussing this technique with the longest follow-up being 8 months.[17] A technique similar to MCPF was originally described as cosmetic surgery by Rubinstein and Kostianovsky[16] for correction of a gummy smile caused by a hypermobile lip. This surgical procedure was designed to be shorter, less aggressive, and was thought to have fewer postoperative complications compared to orthognathic surgery. The procedure was advocated again by Litton and Fournier[18] for the correction of excessive GD in the presence of a short upper lip. This was accomplished by detaching the muscles from the bony structures to coronally position the upper lip, and no complications were reported.

Because of a relapse in results, Miskinyar[15] modified the original technique,[16] but did not report when or how much relapse had occurred. The treatment group consisted of seven patients who had to be reoperated and a more aggressive approach was used, which included myectomy and a partial resection of the levator labii superioris with nerve repositioning before amputation of the muscle. Muscle resection was thought to eliminate muscle regeneration making the results more permanent. The author reported that one patient experienced postoperative parasthesia that lasted 2.5 months.

After a period of 25 years, two case reports again described this procedure.[14,17] Rosenblatt and Simon[17] and Simon et al.[14] used an elliptical-shaped incision at the mucogingival junction and the alveolar mucosa, reflected a partial-thickness flap, and excised 10 to 12 mm of epithelium. The authors described good results and one study[17] reported an 8-month follow-up.

Proper diagnosis and an appropriate case selection are critical for the success of any surgical procedure. Contraindications to MCPF include the presence of a minimal zone of attached gingiva, which can create difficulties in flap design, stabilization, and suturing, and severe VME.[14,17] Degree II VME has gingival and mucosal display of 4 to 8 mm, whereas >8 mm of soft tissue display is seen in degree III VME. Both categories of VME require a multiple interdisciplinary approach, which may include orgthognathic and periodontal surgery, or restorative treatment. In our patient, we found the degree I VME to have less

†† Benco Dental.

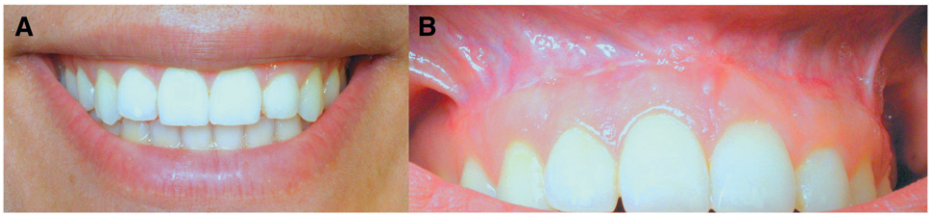

Figure 4.
A) *At the 4-week postoperative visit there was a reduction in the amount of gingival exposure when the patient smiled.* ***B)*** *Presence of a scar at the mucogingival junction was noted at the 4-week postoperative visit.*

Figure 5.
One-year postoperative visit showing good stability of results.

gingival and mucosal display (2 to 4 mm) and therefore a more conservative approach was chosen. Previous reports have alluded that thin biotypes have a higher likelihood of relapse.[14,17] Our patient had a medium biotype, which may have contributed to the stability of results seen at 1 year.

From a surgical design standpoint, the amount of epithelium to be excised has varied considerably. In the first report,[17] although an elliptical-shaped incision was used, the amount of epithelium to be excised was not specified. In the present study, to achieve optimal results the MCPF was advanced a distance of two times GD. Arbitrarily excising 10 to 12 mm,[14,17] and in some instances up to 20 mm,[15] of epithelium as described in previous reports would have over-rectified the excessive GD in our patient.

The current study indicates that after a 1-year follow-up, the MCPF procedure can produce stable results. This can be considered as short-term evidence of its usefulness. MCPF can have minor postoperative complications including bruising, discomfort, and swelling of the upper lip. In one instance, mucocele formation caused by severing of the minor salivary glands was reported; however, it resolved without any intervention within 4 weeks.[14]

CONCLUSIONS

This case report demonstrates that MCPF may be used for treatment of excessive GD caused by degree I VME combined with HUL. It is less invasive, has fewer postoperative complications, and provides a faster recovery compared to orthognathic surgery. Our results indicate good stability at the 1-year follow-up. A proper diagnosis, evaluation of the severity of VME, HUL, or a short lip, and case selection are essential before considering this procedure. For patients desiring a less invasive alternative to orthognathic surgery, the MCPF is a viable alternative. Long-term follow-up studies are needed to evaluate the stability and effectiveness of MCPF as a treatment modality.

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