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KEY WORDS
Gingival display, vertical maxillary excess, smile, plastic surgery, altered passive eruption, case report.

INTRODUCTION
Facial expressions and the smile are key components for nonverbal communication. The smile has an important role in the determination of the first impression of a person. An esthetic or pleasing smile is composed of 3 primary components: the teeth, lip framework, and the gingival scaffold. 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. Excessive GD is a clinical finding with many etiologies 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; 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. VME can often be treated alone by orthognathic surgery. 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. Delayed eruption as a cause of excessive gingival display and its treatment by esthetic crown lengthening are well documented. Soft and hard tissue resection is an effective method to restore normal tooth dimensions and dentogingival relationships. Orthognathic surgery for the treatment of vertical maxillary excess can restore normal occlusal relationships and reduce gingival display. However, this surgery is associated with significant morbidity and requires hospitalization. Therefore, lip repositioning is recommended as an alternative treatment for excessive gingival display. The objective of lip repositioning is to minimize the gingival display by limiting the retraction of the elevator smile muscles (eg, zygomaticus minor, levator anguli, orbicularis oris, and levator labii superioris). This is accomplished by removing a strip of mucosa from the maxillary buccal vestibule and creating a
partial-thickness flap between the mucogingival junction and the upper lip musculature. The lip mucosa is then sutured to the mucogingival line, resulting in a narrower vestibule and restricted muscle pull, thereby reducing gingival display during smiling. This procedure was originally described in the plastic surgery literature 40 years ago. When analyzing a smile, one must bear in mind that a certain amount of gingival exposure during a smile is considered esthetically pleasing, which gives the expression of a youthful look.

CASE DESCRIPTION AND RESULTS

In November 2012, a 24-year-old female presented to our private dental office, for a consultation regarding a gummy smile (Fig.1). 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 21 mm, which is considered to be within normal limits (Fig. 2). Severe maxillary gingival display. But, with no exaggerated smile, the patient’s teeth were visible from the maxillary right first premolar to the maxillary left first premolar (#4 to #13), with 4 to 8 mm of excessive gingival tissue display.

An intraoral examination revealed abnormality, tooth shape that is somewhat square instead of a more attractive elliptical or ovoid form with a diastema between the two incisive centrals. A periodontal examination was performed and her probing depths (PDs) ranged from 1 to 2 mm. Her gingiva appeared pink, firm, and knife edged with no bleeding on probing. No crestal bone loss was noted radiographically (Fig. ) and the distance between the cemento-enamel junction and the alveolar bone crest was < 2 mm, wide band of attached gingiva, this case was diagnosed as altered passive eruption -type I-B. The gingival line in the maxillary anterior sextant was found to be asymmetric (Fig.3). The clinical crowns of teeth #4, #5, #12, and #13 were measured and found to be within an average range, whereas the clinical crown of tooth #6, #7, #8, #9, #10 and #11 was short.
Two treatment options were presented to the patient: maxillary orthognathic surgery with adjunctive aesthetic crown lengthening (ACL) of anterior teeth, or with adjunctive aesthetic crown lengthening of anterior teeth. 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. The patient was educated regarding post-surgical complications including possible scar formation, mucocele formation, postoperative bruising, and extraoral swelling. The two procedures were planned to be done separately we began by the aesthetic crown lengthening and then the MCPF.

**Aesthetic Crown Lengthening (ACL)**

Profound anesthesia was achieved in the vestibule from #4 to #13. Scalloped incisions were made using a no.15c blade to mark the extent of soft tissue removal, Soft tissues were removed and the true lengths of the clinical crowns were exposed. Full mucoperiosteal flaps were elevated buccally to expose the bony architecture. Osseous crests were found approximating the level of the CEJ, thus not allowing for the proper biologic width. Osseous recontouring provided at least 2mm space between the CEJ and the crest of the alveolar bone from teeth #4 to #13. The flap was repositioned apically using continuous sling resorbable sutures (Fig. 4). The sutures were removed at the 1-week postoperative visit (Fig. 5).

At the 4-week follow-up visit, the gingiva was healed; the ACL procedure was unsuccessful in reducing the all amount of GD (FIG. 6). The second part of the treatment plan was scheduled.

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1. Ubistesin forte 4% Articaine, with adrenaline 1/100.000
Mucosal Coronally Positioned Flap (MCPF)

Local anesthetic was administered in the vestibular mucosa and lip from #4 to #13. A marking pencil was used to outline the incisions on the dried tissues (Fig. 7) 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 #13 (Fig. 8). A partial-thickness dissection was made. The epithelium was excised (Fig. 9), exposing the underlying connective tissue (Fig. 10). Tissue tags were removed. The mucosal flap was advanced and sutured at the mucogingival junction using 6-0 polypropylene sutures and 5.0 chromic gut sutures (Fig. 11).

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.

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 (Fig. 12). The patient reported noticing a difference in the amount of gingival exposure when she talked and laughed (Fig. 13). At the 2-week postoperative visit, no bruising or extraoral swelling were seen (Fig. 14) and the patient reported no discomfort. The remaining sutures were removed at the 2-week postoperative visit (Fig. 15). A follow-up examination -- months later showed a reduction in the patient’s excessive gingival display (Fig. 16).

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2 † DemeTech’s Nylon suture, non-absorbable, 6-0.
3 ¶ DemeTech - Polyglycolic Acid Suture absorbable, 5-0.
4 # GUM® PAROEX® non-alcohol rinse.
DISCUSSION

Many articles have been written and courses taught over the years on concepts of smile design to develop a treatment plan to get an esthetic outcome for the patient.\textsuperscript{16,22} MCPF procedure originated as a plastic surgical treatment for the reduction of excessive gingival display but has rarely been described in the dental literature.

It is not unusual for a patient with excess gingival display to present with multiple etiologies. While this complicates the formulation of a treatment plan, multiple etiologies are not a significant concern when the previously discussed diagnostic procedures are applied. For example, it is not uncommon for a patient with vertical maxillary excess to also present with altered passive eruption. In this circumstance, gingival surgery is first accomplished to determine the ultimate length of the clinical crowns.

This report documents the use of MCPF for the management of excessive GD seen with VME. This surgical procedure was designed to be shorter, less aggressive, and was thought to have fewer postoperative complications compared to orthognathic surgery. A literature search revealed five reports discussing this technique with the longest follow-up being 8 months.\textsuperscript{14} A technique similar to MCPF was originally described as cosmetic surgery by Rubinstein and Kostianovsky\textsuperscript{16} for correction of a gummy smile caused by a hypermobile lip. The procedure was advocated again by Litton and Fournier\textsuperscript{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.

Miskinyar,\textsuperscript{23} Modified the original technique,\textsuperscript{14} due to relapse in results, 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.
Recently, two case reports again described this procedure.\textsuperscript{14,24} Rosenblatt and Simon\textsuperscript{14} and Simon et al.\textsuperscript{24} 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\textsuperscript{14} reported an 8-month follow-up. Another third case report, Humayun et al.,\textsuperscript{25} described the same surgical procedure, which consisted of an elliptical mucosal excision followed by coronal advancement of the flap. The coronal boundary was at the mucogingival junction and was used as a reference point to mark the apical boundary at a distance of two times GD. This procedure aimed to limit the activity of the elevator muscles and it’s a 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.

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.\textsuperscript{14,23} 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 orthognathic and periodontal surgery, or restorative treatment. In our patient, we found the degree I VME to have less 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.\textsuperscript{14,23} Our patient had a thick biotype, which may have contributed to the stability of results seen at -- year.

**Conclusion**

GD, require a multiple interdisciplinary approach, which may include orthognathic and periodontal surgery, or restorative treatment. This case report demonstrates that MCPF may be used for treatment of excessive GD caused by degree I VME and it is less invasive, has fewer postoperative complications, and provides a faster recovery compared to orthognathic surgery. 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.

**References**