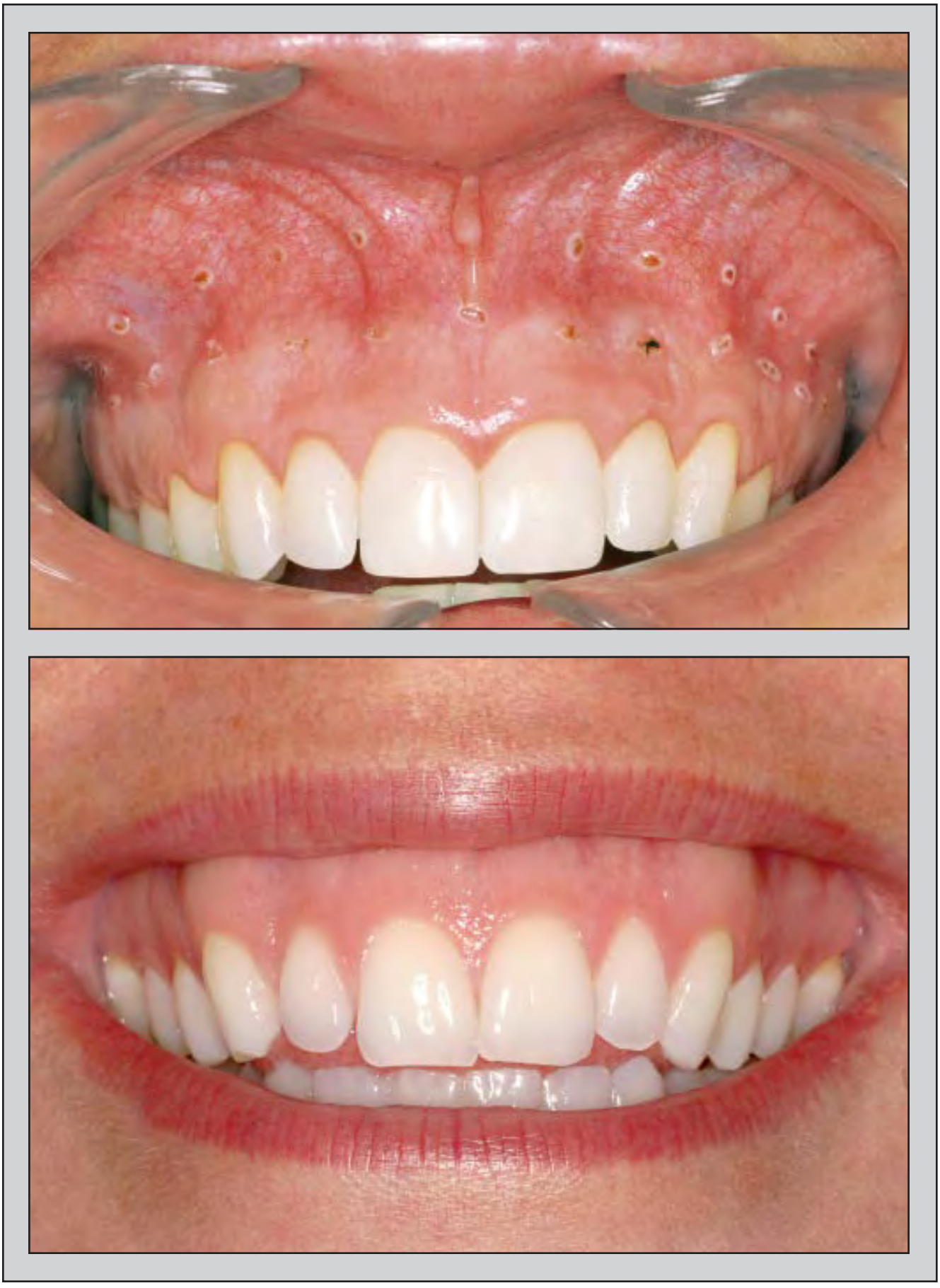
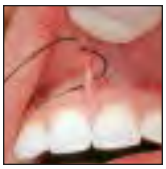


Lip Repositioning with Reversible Trial for the Management of Excessive Gingival Display: A Case Series



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Lip repositioning surgery is a largely unknown and underutilized treatment modality for excessive gingival display. It involves precise resection of maxillary mucosal tissues with reattachment of the lip in a more coronal position. This limits lip elevation on smiling and increases lip fullness. While this is an elective treatment, no reported cases have yet offered patients the ability to preview the outcome in a reversible manner. This case series presents seven patients who were successfully managed with trial, and then definitive, lip repositioning. (Int J Periodontics Restorative Dent 2013;33:169–175. doi: 10.11607/prd.1483)

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A high smile line is a challenge well known to any esthetically minded dentist. An estimated 50% of patients show some amount of gingiva above the central incisors when smiling.[1] Many patients with this characteristic have a natural and attractive smile, and it is a concern only in that gingival symmetry and restoration margins must be paid the utmost detail. However, a subset of this patient population exhibits an upper lip that lies far enough above the maxillary gingival zenith that it is described as unattractive.[2,3] This condition is known as excessive gingival display (EGD) and may occur at repose, but is typically most evident on smiling. While not pathologic, the effects of this "gummy smile" appearance can, for some patients, be debilitating. These patients may be self-conscious of their smile and, as a result, avoid social interaction and suffer the same psychosocial ramifications as many patients with nonintact anterior dentitions or otherwise unattractive smiles.

A number of patients who exhibit EGD and have short clinical crown heights may be managed with anterior gingivectomy or crown

lengthening only. These are individuals where the sole etiology is due to altered eruption—passive or active. The diagnosis and treatment of this condition have been well described in the literature.[2,4–7] In these patients, restoring correct tooth proportions by raising the gingival zenith can alleviate and sometimes entirely solve the issue. However, if not completely resolved, additional etiologic factors must be considered. These patients then fall into the category of patients who would be candidates for the surgical treatment presented in this paper.

Specifically, the target population for the discussed procedure consists of patients with EGD, in spite of having anterior teeth with appropriate length and width dimensions. In these cases, one or more etiologic factors other than eruption are at play. A number of authors have written in detail on the diagnostic approach to this situation, and generally, the diagnoses considered are a hypermobile upper lip, short upper lip, and/or vertical maxillary excess.[8,9] Most of these patients display skeletal Class II relationships and vertical growth patterns, while skeletal Class III patients are virtually absent from this group.[10] In many patients, the etiology is likely a combination of one or more diagnoses.[6]

The most frequently presented solutions to this problem have, thus far, been treatments either vast in scope or duration. Apart from the suggestion that it is untreatable, patients are often informed they may undergo LeFort osteotomy, orthodontic intrusion, and/or osseous crown lengthening to attempt correction.[10] Besides requiring significant time and financial investments, these therapies have multiple inherent risks and give no guarantee of the results.[11] Indeed, each of the aforementioned methodologies focuses mostly on the repositioning superiorly of the teeth, jaw, and/or gingival margins. What has largely been lacking is the reverse—an effort to correct this deformity by the manipulation and repositioning of the lip and soft tissues inferiorly. While not widely used, a surgical technique for doing exactly this has been developed. It is known as lip repositioning surgery (LRS).

The case series presented here discusses the lip repositioning procedure with novel technique variations, but also with an important addition to the treatment sequence—a fully reversible trial lip repositioning. Each of the seven patients presented had the opportunity, prior to any definitive surgery, to preview their surgical result. All seven elected to go ahead with treatment, but any could have—after seeing the trial—reversed course with no permanent change. The authors believe this technique is an important addition to the treatment sequence when planning and carrying out an elective esthetic surgery such as LRS.

Method and materials

Patient profiles and consent

Seven patients, aged 21 to 59 years, presented between January 2005 and December 2011 with the chief complaint of a "gummy smile." None had active dental or periodontal disease or other pathology. Two had previously been treated with orthodontics and esthetic crown lengthening. One patient had been treated with LeFort I osteotomy, orthodontics, and genioplasty. At the time of presentation, all seven had acceptable anterior tooth positioning, as well as normal clinical crown length–width proportions. All were categorized as having EGD. Each patient was counseled on management options. Patient expectations were elucidated and realistic outcomes were presented, including the possibility of full or partial relapse. Preexisting asymmetries in patients' smiles were pointed out to them, as these may be more apparent when the lip is in closer proximity to the teeth. Written informed consent was obtained following a discussion of risks, benefits, and treatment alternatives. All seven opted to undergo the lip repositioning surgery with a reversible trial. Intra- and extraoral photographs were taken for planning and records.

Surgical procedure

The treatment sequence for each patient consisted of reversible lip repositioning, patient evaluation and approval, and definitive surgical repositioning. Initial anesthesia consisted of bilateral infraorbital blocks with 4% articaine (1:100,000 epinephrine). The infraorbital block was used to avoid thickening of the

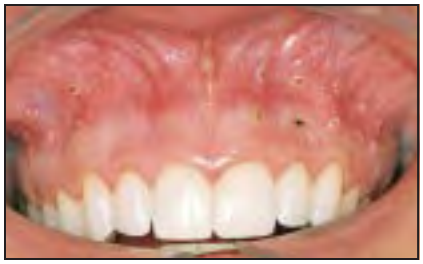
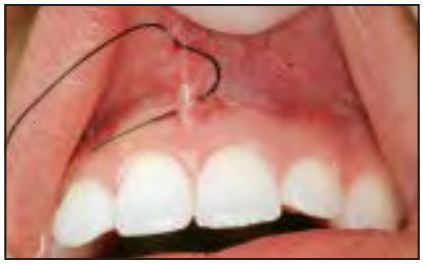


Fig 1 *Diode laser markings outline the proposed tissue resection.*



Figs 2a and 2b *Suture placement for reversible trial lip repositioning.*

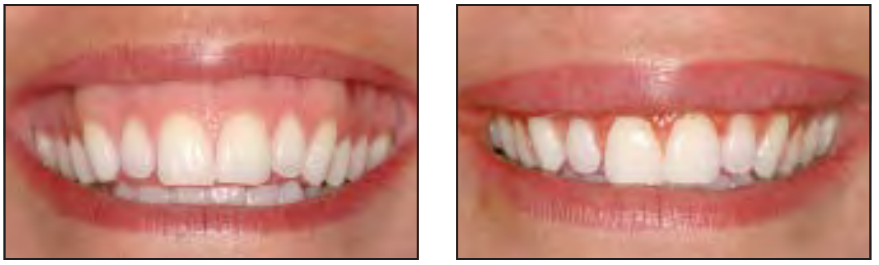
lip and tissues with anesthetic fluid, allowing the trial to be a more realistic representation of the projected final result.

To begin the reversible lip repositioning, the proposed surgical resection was marked with a diode laser set to a 0.8-watt continuous wave (Fig 1). When applied to the tissues, this laser setting does not cut but leaves a dark mark that cannot be smeared or wiped away (the mark will fade if left for 1 to 2 days). Small dashed markings of this type were placed every 3 to 4 mm surrounding the proposed site of tissue excision. The inferior border of this is defined by the mucogingival junction from the mesial aspect of the first molars bilaterally. The superior border is best described as moustache-shaped—slightly inferior in the area of the labial frenum, cresting in the area of the canine, and tapering toward the posterior. As a general rule, it has been suggested that the distance between the superior and inferior borders be twice the length of repositioning desired in the smile.[12]

Once the area was marked, sutures were used to complete the reversible procedure. Three to five 3-0 silk sutures (Ethicon, Johnson & Johnson) were placed approximately at the labial frenum, above both canines and premolars, as needed (Figs 2a and 2b). Suture design for this reversible procedure involved a vertically oriented tissue bite taken at the superior border (movable mucosa) of the excision site followed by a horizontal tissue bite at the mucogingival junction. This allowed the upper border to be drawn down to the mucogingival junction—inverting and tucking behind the tissue proposed for excision.

At this point, photographs were taken and the patient was able to evaluate the potential result (Figs 3 and 4). They were given a chance to view the photographs and use a mirror. Patients were encouraged to point out any concerns and given time to affirm their desire for definitive treatment. For this purpose, one patient chose to go home overnight prior to the definitive surgery, while the other six decided to immediately proceed with surgery. The practitioner may also evaluate the trial repositioning at this time. Primarily, the maximum gingival display is observed, and a more or less aggressive resection can be planned. Additionally, any asymmetry or other desired changes to be addressed in the definitive procedure are noted.

For the patients who chose to move forward immediately, anesthesia was supplemented with local infiltration from the maxillary right to the left first molar for hemostatic control. For the patient who chose an overnight evaluation, anesthesia was repeated. Next, the temporary sutures were removed and the laser markings identified. A partial-thickness incision was made first across the superior border, then the inferior—connecting in the posterior bilaterally. The epithelium bounded by these incisions was then removed in one to two segments beginning on the side away from the surgeon (Fig 5). The tissue thickness was approximately 1 mm. In all



Figs 3a and 3b *Comparision of preoperative smile* (left) *and trial lip repositioning* (right).

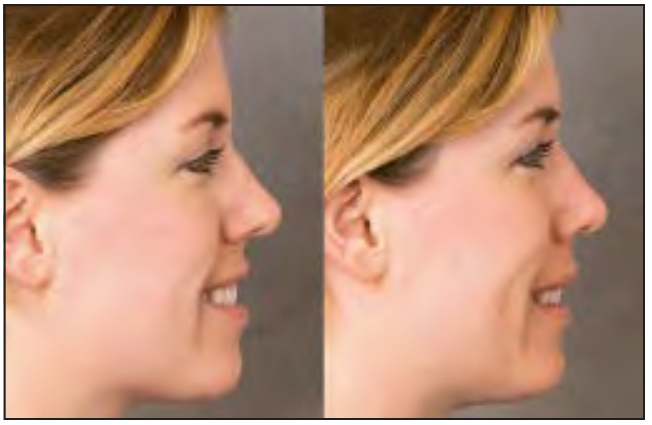


Fig 4 *Profile comparison of preoperative smile* (left) *and trial lip repositioning* (right).

patients, midline tissues were first approximated with a simple interrupted suture to ensure symmetry and proper midline placement. The remaining closure was completed with either continuous interlocking or interrupted sutures using 3-0 chromic gut (Ethicon, Johnson & Johnson) or 3-0 silk (Figs 6a and 6b). To further hemostasis, tissues were compressed with wet gauze for 3 to 5 minutes.

Postoperative instructions were then given. A soft diet was recommended for 24 hours. Patients were asked to avoid high smiling for 1 week, to avoid pulling on the lip to examine or display the wound, and to avoid brushing in the area for 3 days. They were told they could gently brush after 3 days and were instructed not to use an electric toothbrush or an oral irrigator for 1 week. Nonsteroidal anti-inflammatory drugs were recommended for pain control, and cold packs were given to patients to be used in the first 24 hours following surgery.

Results

Patients were seen the day after surgery for follow-up. All but one reported good analgesia with over-the-counter ibuprofen. Periodic follow-up occurred for suture removal, when necessary, and for photographs. The mean preoperative gingival display on smiling for the seven patients was 5.3 ± 1.5 mm, measured at the central incisors. The corresponding mean postoperative measurement was 1.1 ± 2.5 mm below the gingival zenith. Thus, a mean reduction in gingival display of 6.4 ± 1.5 mm was achieved.

Six of the seven patients expressed complete satisfaction with their surgical outcomes. The seventh patient, at long-term follow-up, expressed regret at not having had a more aggressive resection.

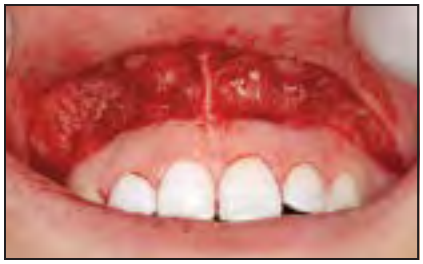
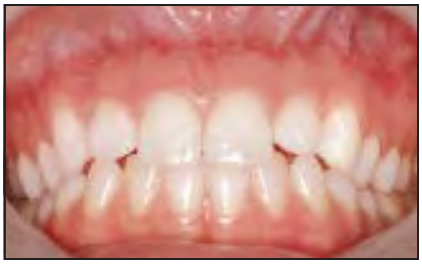


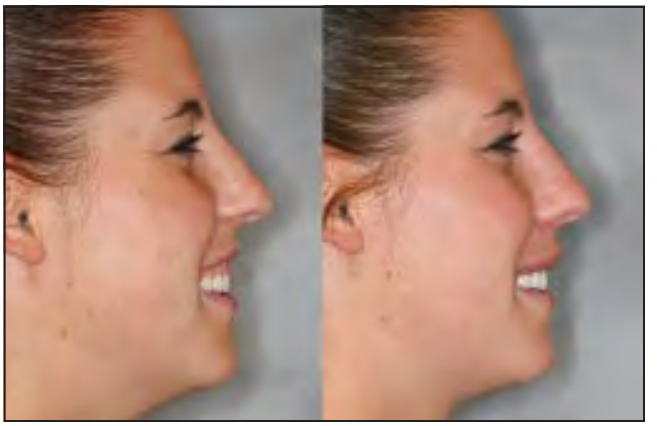
Fig 5 *Vestibule following definitive mucosal resection.*



Figs 6a and 6b *Definitive closure with continuous interlocking sutures* (left) *and view of site 11 days postsurgery* (right).

Figs 7a to 7c *Representative full facial smiles at presurgery and following definitive LRS.*

During evaluation of the reversible trial, this patient had opted to remove less tissue than advised. For the remaining patients, the more inferior position of the upper lip has been maintained at each follow-up to date, ranging from 1 month to 3 years (Figs 7a to 7c). In addition to the chief complaint being addressed, profile photographs demonstrate the desirable, fuller upper lip that was achieved due to its eversion and repositioning (Figs 8a to 8c). Indeed, the patients all state that their families and friends are in awe of the change, and they themselves report for the first time being confident when smiling in public.



Figs 8a to 8c *Representative patient profiles at presurgery and following definitive LRS; note the increased lip fullness.*

Discussion

This case series demonstrates the predictable management of excessive gingival display with LRS, including a novel reversible trial repositioning prior to definitive treatment. Successful treatments with variations of LRS were first described in the medical literature in 1973 by Rubinstein and Kostianovsky.[13] In 1979, Litton and Fournier described gummy smile correction with LRS, including elevator muscle detachment in cases with a short upper lip.[14] Miskinyar, in 1983, reported little success with LRS, but saw no relapse in 27 patients treated with myectomy and partial resection of either one or both of the levator labii superioris muscles bilaterally.[15] Ellenbogen and Swara reported success in limiting lip elevation on smiling (maximum correction, 6 mm) by partially transecting the lip elevator muscles and implanting a silicone spacer.[16] Ezquerra et al presented a successful treatment for EGD using a combination of crown lengthening and subperiosteal dissection.[8] In 2010, Ishida et al reported a significant reduction in gingival exposure (mean at 6 months, 3.31 ± 1.05 mm; $P < .001$) in 14 patients treated with levator labii superioris myotomy, subperiosteal dissection, and frenectomy.[17]

In the dental literature, multiple authors have presented case

reports of single patients successfully treated with LRS .[9,12,18,19] Two of these describe the treatment of patients diagnosed with vertical maxillary excess.[9,12] While "prediction of the final outcome…is important in treating cases of excessive gingival display," until this case series, no reported cases have proposed a method for previewing results.[7,p816]

Using a nonsurgical approach, Polo reported successful temporary management of patients with a hyperfunctional upper lip using botulinum toxin type A.[20] Thirty patients with EGD were injected, with effects projected to last up to 32 weeks. He recommended only treating patients with > 4 mm of gingival display, based on patients' reported postoperative satisfaction with the new lip level. In perhaps his most telling observation, he states "improvement in self-esteem changes the scope of several of these cosmetic procedures to another level: therapeutic."[20,p195]

No side effects due to LRS, other than mild discomfort for 24 to 48 hours, were found in this case series. Overall, few side effects have been reported. Miskinyar noted one patient with 2.5 months unilateral paresthesia, and Rosenblatt reported one patient with a mucocele that resolved without treatment.[15,19] Relapse over the long term cannot be ruled out, and future research should aim to evaluate stability of the result. Here, the authors demonstrated positioning of the lip slightly below the zenith, in anticipation of some small amount of relapse following complete healing.

Conclusions

Lip repositioning is an excellent alternative to the more costly and time-consuming treatments available for excessive gingival display. The authors believe that using the reversible procedure prior to definitive surgery is currently the best way for both the patient and doctor to preview the intended result before moving forward with elective surgery. The psychosocial benefits of lip repositioning, especially in light of the minimal risk, are enviable.

Acknowledgment

The authors reported no conflicts of interest related to this study.

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