

CASE REPORT

LIP STAT

A NEW HORIZON IN PERIODONTICS: A CASE REPORT

ABSTRACT

Excessive gingival display (EGD) is a complex aesthetic problem which has a multitude of underlying aetiologies, therefore must be treated in a sequential manner. Recent advances have seen the introduction and usage of a novel technique called lip repositioning, either alone or in conjunction with existing methods. It can be used in certain cases as an easier, less complicated alternative to major surgical methods providing a pleasant satisfactory camouflage effect with lower morbidity. This case report presents the preparatory and surgical steps used to treat a 21-year-old female patient with EGD using lip repositioning technique as an alternative to invasive surgery with satisfactory results that has been stable for 1 months.

Keywords: Aesthetics, gummy smile, vertical maxillary excess, hyperactive upper lip, plastic surgery, lip repositioning surgery.

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INTRODUCTION

A dazzling and beautiful smile can work wonders for anyone's personality. A smile is an expression denoting pleasure, joy, happiness, or amusement. No matter one's background, colour, or religion, everyone can understand what a smile is, and smiling is a universal way to express emotions. Smile aesthetics is based on numerical, physical, physiological and psychological data regarding beauty, while considering the desires of the patient. The harmony of the smile is determined by the shape, the position, and the colour of teeth and by the gingival tissues. The interactions between the teeth, the lip framework, and the gingival scaffold were identified by Garber and Salama as the three primary components that make up the essence of a smile.¹

The extent of visibility of the periodontium rests on the position of the smile line, which explains the relationship between the upper lip and the visibility of gingival tissues and teeth.³ The frame of a smile is formed by the correlation of lips and smile line. Smile line is considered to be a valid and universally applicable tool to evaluate dentofacial esthetics.² It is

defined as an imaginary line following the lower margin of the upper lip and usually has a convex appearance.³ According to Kokich et al 1999, smile line could be classified based on the inter relationship between the upper lip interdental and marginal gingiva [Table 1].⁴

The equilibrium of smile is considered to be good when the lower border of the upper lip is 1mm from the gingival margin at normal smile.³ Various classification has been proposed for smile by many authors, one among them is elaborated in Table 1.⁵ The hallmark of an "ideal smile" entails the exposure of the entire length of the maxillary teeth with approximately 1-3 mm of gingival exposure.³ The components of a balanced smile includes smile line, smile arc, upper lip curvature, smile symmetry, lateral negative space, smile symmetry, occlusal frontal plane and dental gingival components.

Tjan et al 1984, classified smile as high, medium, or low smile.⁴ [Figure 1-3]

Table 1: Classification of smile line

Class	Type: Description	Evaluation
Score 0 masked	"Low smile line"	IDG: <25% visible , M: not visible, Teeth
Score 1	"Average/ideal smile line"	IDG: 25-75% visible M: Visible on individual teeth
Score 2	"High smile line"	IDG: >75% visible M: < 3mm visible
Score 3	"Very high smile line"	IDG: Completely visible M: >3 mm wide Maxillary band of gingiva visible beyond the mucogingival line "gummy smile"

IDG: interdental gingiva, MG: marginal gingiva



Figure 1: Low smile



Figure 2: Average



Figure 3: High smile

Classification of smile

The prevalence of high smile line is reported to be 10.57% to 38.9%.⁶⁻⁷ High smile line is significantly more prevalent in women and poses a significant challenge to clinicians in various fields of dentistry.⁶⁻⁷

Excessive gingival display is one of the major causes of patient's embarrassment. An excessive gingival display of 4mm or more is classified as unattractive by dentist.⁴ An imbalance in the gingiva-tooth ratio results in dominance of gingival appearance often referred to as "gummy smile." To improve the smile, the balance and harmony between all the three components of smile: lips, teeth and gingivae are integral.

Excessive gingival display (EGD), commonly referred to as gummy smile, and can be classified into four distinct types according to different exposure sites of gingiva. A continuous band of excessive gingival display (type 1 EGD) is the most common type. Excessive display of posterior gingiva (type 2), unilateral (type 3) EGD, and EGD of the anterior part (type 4) of the maxillary gingiva are the other types.⁸

For the proper treatment execution knowing different etiological factors owing to EGD plays a crucial role. These may be altered passive eruption, vertical maxillary excess, anterior dentoalveolar extrusion, gingival enlargements, short/ hyperactive lip, or a combination of these factors.⁹⁻¹⁰ Based on the identified etiologies, various approaches could be proposed for treatment of EGD, including crown lengthening, apically repositioned flap with or without osseous reduction, Botox treatment, lip repositioning, orthodontic treatments, and orthognathic surgery.¹¹

Lip repositioning was initially proposed by Rubinstein and Kostianovsky and later elaborated with different guidelines.¹² Other synonyms of lip stat includes Lip repositioning surgery, Mucosal coronally positioned flap, Mucosal strip technique, Reverse vestibuloplasty, Coronally positioned vestibule. The above conservative technique was later modified by Ribeiro-Júnior¹³ et al and Silva et al¹⁴ to maintain the labial frenum with a follow-up period of 6 months. Miskinyar et al, reported a low success rate and high recurrence rate with lip repositioning

and proposed a new technique including myectomy and partial resection of the levator labii superioris muscle.¹⁵ Other, more aggressive procedures were reported with short term follow-up periods to increase predictability and prevent the possibility of relapse, including the following:

- (1) Detachment of labial muscles¹⁶
- (2) Use of a silicone implant spacer¹⁷
- (3) Lip elongation with rhinoplasty¹⁸
- (4) myotomy of the levator labii superioris using a nasal approach associated with subperiosteal dissection of gingiva and lip elongation with frenectomy.¹⁹

Botulinum toxins are yet another treatment approach with transient esthetic results and is indicated where there is hyperactivity of upper lip predisposes to gummy smile. The effect of which varies in duration from 3 to 5 months.²⁰

The aim of the present case report was to demonstrate the clinical outcome of a novel conservative approach for lip repositioning in treatment of excessive gingival display.²⁰

Clinical case report

A 21 year old female patient presented to the department of Periodontics, Varakala, Trivandrum 2022 with the chief complaint of gummy smile. Her medical history was noncontributory, with no known allergies. Dental history revealed an orthodontic treatment done before 4 years. Thorough clinical and radiographic examination revealed type 1 EGD and degree 2 vertical maxillary excess. In addition to the longer lower facial third, lateral cephalometric analysis confirmed the findings. Hyperactive upper lip was also noted. During her dynamic smile, the gingival display was about 5 mm in the anterior maxillary region.

Our measurements were done starting with detecting the patient's smile type by both visual inspection during the dialogue and a photo shooting session guiding the patient. The patient had a high smile line and a Duchene type of smile²¹ that extends up to the second premolar on both sides given in (Figure 4.)



Figure 4. Duchene smile

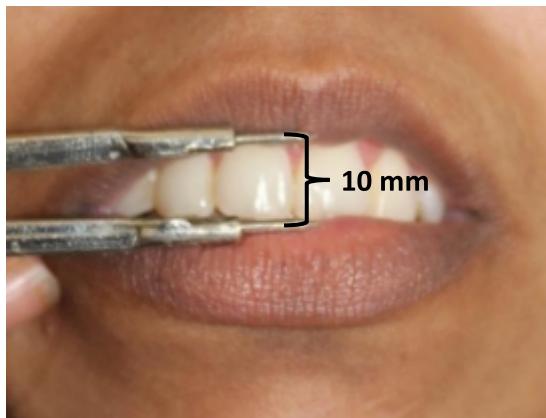


Figure 5. Interlabial distance at rest

The patient was asked to pronounce the letter "M" so that the amount of incisal exposure at rest was measured according to Sarver 2004 (Figure 5).²²

The lip length at rest measured was 33mm following the guidelines given by Peck et al.1992 as shown in (Figure 6).²³ Also, both gingival and teeth display during full smile were measured using a periodontal probe and a caliber as shown in Figure 7 and Figure 8. The incisal edge status is a significant point to focus on and presence of attrition should be noted if present. Amount of the Keratinized attached gingiva (KAG) was measured in the periodontal chart which ranged from 5 to 7 mm. The average gingival display was verified by measurements on clinical photo-graphs of the patients with dynamic smile. By the end of her visit, a preliminary diagnosis was explained to the patient. Analysis of the data and the interpretation of the measurements were done which lead to the confirmation of the diagnosis of Vertical Maxillary Excess (VME II) 1 and

Hypermobile Upper Lip (HUL). After the available treatment options and their associated risks and benefits were explained, the patient chose lip repositioning surgery. Informed consent was obtained from the patient according to the guidelines of

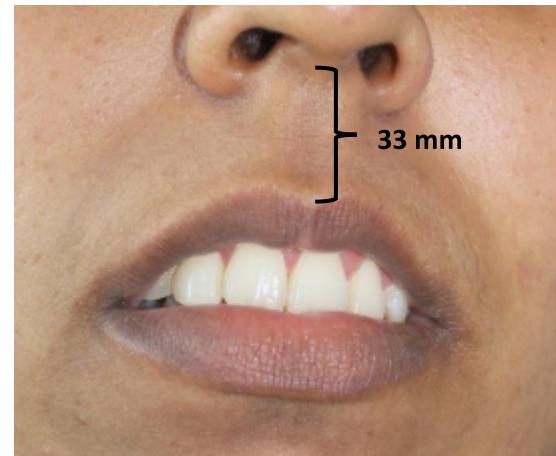


Figure 6. Lip length at rest



Figure 7. Assessing clinical crown

Gingival display (mm) 4.5-4-5-5-5-5-4.5-4



Tooth display (mm) 8-8-10-11-11-10-8-8

Figure 8: Showing gingival display and teeth from 14 to 24.

Helsinki Declaration of 1975, revised in 2013, after a detailed description of lip repositioning procedure. The importance of plaque control and maintenance care was also emphasized to the patient.

Surgical procedures

Full mouth disinfection was done, followed by the application of topical gel. Then local anesthetic solution [Lidocaine HCl 2% with 1:100,000 epinephrine] was administrated to cover the vestibule area from tooth #15 to #25. Initially markings of the incisions were done using an indelible pencil as shown in Figure 9. A partial thickness incision was made 1mm just apical to the mucogingival junction from the mesial aspect of the maxillary first premolars bilaterally. The second partial-thickness incision was made in the labial vestibule. The distance between the superior and inferior incisions was two times the initial gingival display.²⁴ Clinical judgment should be a factor based on the desired amount

of reduction in gingival display. The most important consideration is to avoid proximity of the incision line to the vermillion zone. The parallel incisions were connected in the posterior area bilaterally (Figure 9). A layer of epithelium approximately 1 mm thick was excised (Figure 10-11). Then suturing was done using the simple interrupted technique by a 3-0 vicryl absorbable suture for both anchoring and stabilizing. First suture was placed at the midline to maintain proper symmetry as shown in the Figure 12. Then, closing the gaps with stabilizing sutures to help keeping the lip in the new position coronally (Figure 13).

Follow up and post-operative instructions

Post-operative instructions according to Humayun et al. (2010),²⁴ Rosenblatt and Simon (2006)²⁵ and Simon et al. (2007)²⁶ were explained to the patient



Figure 9. Markings of initial incisions



Figure 11. Surgical area after the removal of partial thickness flap



Figure 10. Partial thickness flap excised



Figure 12. Placement of first suture at the midline

emphasizing on minimum lip movements as much as possible. Ibuprofen 600 mg twice daily were also prescribed to the patient for 3days. Patient was instructed on using icepacks for 20minutes interval during the first 24hr. Regular oral hygiene methods were advised to stop for 2days. Chlorhexidine mouthwash 0.12% twice daily for 2weeks was given to the patient and advised to swish and spit.

Follow up and results

At the 1st week follow up visit, the decrease in the gingival exposure by 3mm was found to be consistent and healing was reported to be satisfactory. Patient was extremely satisfied by the result. Complete healing of the surgical site was observed in the next recall on the 2nd week. No post-operative complication were reported. Patient was also advised to do lip training practices such as blowing and lip stretching exercises, 4-5 times daily. Figure



Figure 13. Placement of suture

14 and 15 shows extra oral pre-operative condition and post-operative photographs after 1 month of follow up.

Discussion

The present case report demonstrated that there is a reduction in the gingival display achieved by about 3mm by lip repositioning technique as a less invasive method to manage EGD with a combined underlying cause of moderate VME and HUL. The technique was described as a cosmetic surgery by Rubinstein and Kostianovsky (1973)¹² for correction of gummy smile caused by HUL. The earlier technique was done by detaching the muscles from the bone in order to coronally position the upper lip with no reported complications. In this case we have utilized this conventional technique since this procedure doesn't have any side effects such as paraesthesia as stated in the case report by Miskinyar et al 1983.

Miskinyar, et al 1983 later modified the original technique due to the occurrence of relapse which incorporated myectomy and partial resection of the Levator labii superioris instead of complete separation from the bone.¹⁵ This resection was believed to reduce chances of relapse. The author also reported that one patient out of seven had post-operative paraesthesia. Later, this method was brought back into the dentistry field by Rosenblatt and Simon in 2006²⁵ and Simon et al. in 2007.²⁶ They used a partial thickness elliptical-shaped incision at the alveolar



Figure 14. Preoperative photographs (frontal and lateral view)

mucosa keeping the muscle fibers intact. They arbitrarily removed an area of 10-12 mm of mucosa with good results for a maximum follow up period of 8months.

Later, Humayun et al. (2010)²⁴ and Bhola et al. (2015)¹⁰ started to implement the instructions and applied the technique to lessen the quantity of gingival display for a patient with simple VME and HUL. In their case report, Humayun et al. (2010) referred to the surgery as Mucosal Coronally Positioned Flap (MCPF) and they were the primary authors to promote the rule of “Twice the gingival display”. They were able to achieve excellent and stable results for up to 1 year.²⁴ In this case we have utilized this rule for eliminating any chance for relapse. Proper case selection and diagnosis is critical for success. Diagnosis is done following a series of examination such as facial analysis, dental analysis, lip analysis and periodontal analysis. Based on these measurements treatment plan is designed and executed. Lip repositioning procedure is indicated in cases of simple VME degree I of [2-4mm] gingival display, moderated VME degree II of [4-8mm] gingival show and in cases of HUL as advocated by the following authors, Humayun et al. (2010) and Bhola et al. (2015).^{10,24} For this patient, the measurements revealed VME degree II since the amount of gingival display ranged between [5-6mm] according to (Garber and Salama, 1996)¹ classification and after calculations, the degree of lip mobility was 12mm which exceeds the normal range of [6-8m] according to Peck et al. (1992) and

McLaren and Rifkin (2002).^{23,27} Hence, the selection of this type of surgery was suitable here.

On the other hand, lip repositioning is contraindicated with severe VME degree III of greater than 8mm gingival show according to Bhola et al. 2015¹⁰ and with a limited amount of KAG or a short vestibule according to Rosenblatt and Simon et al 2006.²⁵ According to the literature, this surgical method produces satisfactory outcomes, improving the condition by 75-80% in more severe and problematic cases and by up to 100% in stable situations.

Other advantages of this procedure that are mentioned in the previous literature includes the versatility in use and various modifications which could be implemented while performing the procedure and it could also be reversed by vestibuloplasty, if the patient is not satisfied with the outcome or repeated again in case of relapse.²⁴ By incorporating a trial step after the measurements using sutures without actually cutting helps in prediction of the final outcomes.²⁴

The main disadvantage of this technique is relapse. Relapse is seen during the first 6-8 weeks and it can be due to one of the common mistakes or conditions shown below.^{12,24,25}

Causes of relapse^{12,24,25}

1. Not following the rule of “Twice the gingival display” during the incision
2. Cutting in the KAG



Figure 15. Postoperative photographs (frontal and lateral view)

3. Using the technique in a case with limited amount of KAG
4. Cutting deep into the connective tissue and muscle fibres
5. Cases with high muscle pull

Relapse can be treated by either returning to the surgical site to remove additional mucosa as necessary or by administering Botox injections, as suggested in the following articles. Humayun et al. 2010, Bhola et al. 2015 and Rosenblatt and Simon 2006.^{24,10,25} There are common post-operative complications range from minor discomfort and some lip movement restriction to swelling, bruising and paraesthesia. Some rare complications are also reported such as mucocele which occurs due to damage to minor salivary glands and it resolves on its own.

It is a cutting-edge predictable treatment that seems to supply significant remedies to numerous challenging cases with varied etiologies, and it need to be taken into consideration as a feasible option in periodontal plastic procedures.

Conclusion

Gummy smile is a multifactorial condition that needs meticulous examination, to detect the causative etiologies. Within the limitations of the present study, this novel technique resulted in a successful clinical and patient centered outcome in treating excessive gingival display with various etiologies. The satisfactory result remained stable over a period of one months. The more severe the case is, the more is the need for collaborative multiple treatment modality approach.

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