



## SMILE CORRECTION USING LIP REPOSITIONING, CROWN LENGTHENING AND DEPIGMENTATION

### Periodontology

**Rekha Bilichodmath** Postgraduate Student, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India.

**Anju Cecil** Postgraduate Student, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India.

**Shivaprasad Bilichodmath\*** Professor, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India. \*Corresponding Author

### ABSTRACT

The aim of this case report was to evaluate the clinical outcomes following modified lip repositioning and gingivectomy along with depigmentation in a patient with excessive gingival display. A 22 year old female patient came with the chief complaint of gummy smile and blackened gums. On evaluation, the patient presented with hyperactive lip and moderate vertical maxillary excess. A less invasive modified lip repositioning procedure was carried out. A partial thickness strip of mucosa was removed leaving the midline frenum intact and the lip mucosa was sutured to the mucogingival line. As the clinical crown length was shorter than the anatomic crown length, crown lengthening by gingivectomy was performed. Laser depigmentation was carried out to treat gingival hyperpigmentation. The patient was evaluated after 2 weeks, 1 and 6 months respectively. An approximate reduction in gingival display of around 3 mm was found and the results were stable at the end of 6 months. Gingival repigmentation had occurred at the end of 6 months, therefore depigmentation procedure was repeated in order to maintain the esthetics. In this case, we emphasize on the stable and satisfactory treatment outcome of a non invasive approach made to treat excessive gingival display instead of more invasive surgical treatment.

### KEYWORDS

Gummy Smile, Crown Lengthening, Surgical Flap, Pigmentation, Vertical Maxillary Excess.

### INTRODUCTION:

A smile is an interaction between the teeth, the lip framework, and the gingival scaffold and is a vital gestural method of communication.<sup>1</sup> The shape, position, and the color of teeth and gingival tissues determine the congruence of the smile. The relationship between the upper lip and the visibility of gingival tissues and teeth, governs the position of the smile line.<sup>2</sup> Lip line can be defined as the vertical position of the lower border of the lip. It is important to evaluate the lip line when smiling (smile line). The smile line is an imaginary line following the lower margin of the upper lip and usually has a convex appearance.<sup>3</sup> It can be low, medium or high. The lip line is considered low when only part of the tooth is visible below the upper lip, medium when 1 to 3 mm of the marginal gingiva is exposed during a smile and high i.e gummy smile when more than 3mm of the gingiva is visible.<sup>1</sup> Gingival health and appearance are essential components of an attractive smile. Gingival pigmentation results from melanin granules, which are produced by melanoblasts. The degree of pigmentation depends on melanoblastic activity. Although melanin pigmentation of the gingiva is completely benign and does not present a medical problem, complaints of 'black gums' are common particularly in patients having a very high smile line (gummy smile).<sup>4</sup> In this condition, depigmentation can be performed to achieve esthetic results.

Excessive gingival display (EGD) is an esthetic dilemma characterized by excessive exposure of maxillary gingiva during smiling<sup>5</sup> resulting in a gummy smile appearance that can negatively impact the emotional and psychologic status of patients.<sup>6</sup> The prevalence of EGD has been reported to be 14% in females and 7% in males.<sup>7</sup> EGD is associated with various extraoral and intraoral etiologies. Extraoral causes are vertical maxillary excess (VME), hypermobile upper lip (HUL), short upper lip (SUL) or asymmetric upper lip. The average length of maxillary lip is 20-22 mm in young adult females and 22-24 mm in young adult males. There is a correlation between gender and type of smile with a predominance of gummy smile in females (2:1) and low lip lines in males (2.5:1).<sup>8</sup> Intraoral causes of EGD include plaque/ drug induced gingival enlargement, delayed/ passive eruption,<sup>9</sup> disharmony of dental arches, dento alveolar extrusion,<sup>10</sup> and short clinical crown length.

In cases where EGD is caused by altered passive eruption, it can be corrected by gingivectomy or an apically repositioned flap associated with or without osseous resection.<sup>10-15</sup> Dentoalveolar extrusion is usually treated with orthodontic intrusion and severe vertical maxillary excess with orthognathic surgery.<sup>18,14-17</sup> In patients with

hyperactive lip, various techniques such as botulinum toxin injection,<sup>18,19</sup> lip elongation associated with rhinoplasty,<sup>20</sup> detachment of lip muscles<sup>21</sup> myectomy and myotomy,<sup>22</sup> and lip repositioning<sup>9,23</sup> has been demonstrated with variable treatment outcomes. Lip repositioning procedure was first described in 1973 by Rubinstein and Kostianovsky as part of medical plastic surgery, which was later modified in 2006 by Rosenblatt and Simon and introduced into the field of dentistry. It is a less invasive conservative approach to treat EGD. The surgery aims to limit smile muscle pull (zygomaticus minor, levator anguli, orbicularis oris, and levator labii superioris) by reducing the depth of the upper vestibule.<sup>24</sup> Lip repositioning is attempted when there is adequate amount of attached gingiva and vertical maxillary excess is mild or moderate. In this case report we have attempted to correct excessive gingival display by modified lip repositioning technique and gingivectomy followed by depigmentation.

### CASE PRESENTATION:

A 26 year old female patient came to the Department of Periodontology, Rajarajeswari Dental College with a chief complaint of blackened and excessive display of gums while smiling. Her medical and family history was non contributive. On extra oral examination, the face was bilaterally symmetrical, lips were competent. Intraorally, a 4.5 mm of excessive gingival display was seen during smiling which extended from the maxillary right premolar to maxillary left premolar with generalized hyperpigmentation of gums (Figure 1). The clinical crown length was shorter than the anatomic crown length with respect to the maxillary anterior teeth. The width of attached gingiva was adequate and gingival tissues were of thick biotype (Figure 2). A diagnosis of moderate vertical maxillary excess with hypermobility of upper lip was given. As the patient preferred a less invasive procedure to address her chief complaint, a modified lip repositioning procedure along with crown lengthening and gingival depigmentation was planned. An informed consent was obtained after explaining the treatment modalities, benefits and possible complications for a lip repositioning procedure.



**FIGURE 1: Preoperative view showing excessive gingival display**



**FIGURE 2: Intraoral view showing adequate width of attached gingiva and hyperpigmentation of gums**

**Surgical Technique:**

Extraoral disinfection was carried out using 2% Betadine solution and intraoral disinfection using 0.12% chlorhexidine mouthwash. Local infiltration with 2% lignocaine hydrochloride with 1:80000 epinephrine was used for anesthesia. The surgical site was dried and demarcated with sterile indelible pencil and the procedure was initiated at one side of the maxilla (Figure 3). A partial thickness horizontal incision was made using no. 15 C blade, 1mm coronal to the mucogingival junction extending from the midline to the distal of second premolar. Two vertical incisions were made at the extremities of the first incision. A second horizontal incision was made parallel to the first incision, joining the two vertical incision at a distance double the amount of gingival display. The resulting outline of the surgical site was elliptical. After the incisions are made, the epithelium was excised leaving the connective tissue exposed (Figure 4). The mucosa was advanced and sutured at the mucogingival junction using continuous interlocking sutures (Coated VICRYL® polyglactin 910) and the procedure was repeated on the contralateral side leaving the midline frenum intact (Figure 5).

Crown lengthening procedure was carried out by gingivectomy due presence of adequate width of attached gingiva and thick gingival biotype. An inverse bevel incision was given 0.5-1mm from the gingival margin following the contours of the marginal gingiva using a no. 15 blade, following which an intrasulcular incision was given resulting in removal of the collar of the gingival tissue (Figure 6). In this case of crown lengthening, care was taken not to violate the biologic width as it can lead to periodontal breakdown.

Depigmentation was done using diode laser of 940 nm wavelength. Using a handpiece with a fiber optic filament 400µm in diameter, in contact mode and directed cervicoapically, tissue ablation was carried out. Remnants of ablated tissue was removed with gauze dipped in saline. Procedure was repeated until a layer of epithelium was removed (Figure 7) and following the procedure Periodontal Coe-Pak was placed.

Oral antibiotics (amoxicillin 500mg three times daily) and analgesics (Ketorolac 20 mg stat, then 10 mg every 4-6 hours) for 1 week was prescribed after the surgery. The patient was advised application of ice packs and was told to minimize lip movement when smiling and talking for 1 week.

The patient was recalled after two weeks, 1 month and 6 months for review. After two weeks suture removal was done. Healing was uneventful with no history of ecchymosis or swelling.



**FIGURE 3: Surgical site marked with indelible pencil**



**FIGURE 4: Postoperative view**



**FIGURE 5: Sutures placed**



**FIGURE 6: After Crown lengthening**



**FIGURE 7: After laser depigmentation**

**RESULTS:**

An approximate reduction in gingival display of around 3 mm was found at the end of 1 month (Figure 8) and the results were stable at the end of 6 months (Figure 9). However repigmentation was seen at the 6 month follow up. So depigmentation was carried out to maintain the esthetic outcome of the performed procedure.



**FIGURE 8: After 1 month**



**FIGURE 9: After 6 month**

**DISCUSSION:**

The aim of this article was to evaluate the clinical outcomes of treatment procedure attempted to decrease gummy smile. Proper diagnosis of the etiological factors is the first step to select the right treatment protocol. Factors to be evaluated are the hyperfunction of the upper lip elevator muscle, facial symmetry in all three horizontal thirds, distance between the gingival margin and CEJ, and the crown length-height relation. Surgical lip repositioning treatment can be performed to reduce the labial retraction of the elevator smile muscles and minimize excessive gingival display. This technique was designed to be shorter, less aggressive and to have fewer postoperative complications compared to orthognathic surgery.<sup>25</sup> This technique cannot be performed in cases with minimal zone of attached gingiva which can create difficulties in flap design, stabilization and suturing and in patients with several vertical maxillary excess (VME). Degree II VME has gingival and mucosal display of 4 to 8 mm and in degree III VME more than 8 mm of soft tissue are seen. In both cases, an interdisciplinary approach is required.<sup>25</sup>

In the modified technique of lip repositioning employed here, labial frenulum is maintained and two mucosal strips, one at each side of the frenulum, are removed. Leaving the frenulum intact helps maintaining the position of the labial midline, prevents changes in lip symmetry and decreases the morbidity associated with the procedure, but limits the possibility of correcting EGD in the region of the maxillary central incisors. Incomplete anatomical crown exposure may be the principle factor in the esthetics of a case, therefore an estimation of clinical and anatomic crown lengths in patients with a high lip line is important. Crown lengthening can be done in different ways. In this case internal bevel gingivectomy was considered the treatment of choice in order to maintain the periodontal health and postoperative esthetics of the patient. The amount of attached gingiva and gingival biotype needs to be assessed. It has been shown that there should be 2-3 mm of attached gingiva to maintain periodontal health.<sup>26</sup> In this case due to adequate attached gingiva and thick gingival biotype crown lengthening was done.

The extent of upper lip mobility reduction is variable. In this case a reduction of 3 mm of lip movement was achieved after the end of 3 months following lip repositioning. This outcome was comparable with studies by Rosenblatt, Simon<sup>9</sup> and Humayun et al.<sup>25</sup> The systematic review published by Tawfik et al. showed that lip repositioning successfully improved EGD by 3.4 mm.<sup>24</sup>

Post surgical repigmentation of gingiva has been reported in earlier cases. Repigmentation is described as spontaneous and has been attributed to the activity and migration of melanocytes from surrounding areas.<sup>27</sup> In this case repigmentation was seen at the 6 month follow up. Depigmentation procedure was carried out to restore the esthetics.

**CONCLUSION:**

Excessive gingival display is a growing esthetic concern in this era and is the most demanding treatment for which patients approach dentist. Appropriate diagnosis of the etiology underlining the condition is a major factor which determines the outcome of the treatment. Surgical lip repositioning is a conservative approach to treat the condition if not associated with severe vertical maxillary excess. However the stability of the results cannot be predicted. In the present case there was adequate reduction of excessive gingival display following the procedure and results were stable at 6 month follow up and patient was completely satisfied with the results.

## REFERENCES

1. Garber, D.A., Salama M.A. (1996). The aesthetic smile: Diagnosis and treatment. *Periodontology* 2000, 11, 18–28.
2. Gaddale, R., Desai, S.R., Mudda, J.A., Karthikeyan, I. (2014). Lip repositioning. *Journal of Indian Society of Periodontology*, 18(2), 254–258.
3. Townsend CL. (1993). Resective surgery: An esthetic application. *Quintessence International*, 24, 535–542.
4. Gupta, K.K., Srivastava, A., Chandra, C., Tripathi, V. (2011). Lip Repositioning with Crown Lengthening & Gingival Depigmentation: A Case Report. *Journal of Periodontology and Implant Dentistry*, 3(1), 38-42.
5. Matthews TG. (1978). The anatomy of a smile. *Journal of Prosthetic Dentistry*, 39, 1281-34.
6. Terry, D.A., McGuire, M. (2002). The perio-aesthetic-restorative approach for anterior reconstruction – Part I: Evaluation and periodontal surgery. *Practical Procedures & Aesthetic Dentistry*, 14, 283-291.
7. Diamond, O. (1996). Facial esthetics and orthodontics. *Journal of Esthetic and Restorative Dentistry*, 8, 136-143.
8. Peck, S., Peck, L., Kataja, M. (1992). The gingival smile angle. *The Angle Orthodontist*, 62, 91-100.
9. Rosenblatt, A., Simon, Z. (2006). Lip repositioning for reduction of excessive gingival display: A clinical report. *International Journal of Periodontics and Restorative Dentistry*, 26, 433-437.
10. Silberberg, N., Goldstein, M., Smidt, A. (2009). Excessive gingival display- Etiology, diagnosis, and treatment modalities. *Quintessence International*, 40, 809-818.
11. Evian, C.I., Cutler, S.A., Rosenberg, E.S., Shah, R.K. (1993). Altered passive eruption: The undiagnosed entity. *Journal of American Dental Association*, 124, 107–110.
12. Dolt, A.H III., Robbins, J.W. (1997). Altered passive eruption: An etiology of short clinical crowns. *Quintessence International*, 28, 363–372.
13. Weinberg, M.A., Eskow, R.N. (2000). An overview of delayed passive eruption. *Compendium of Continuing Education in Dentistry*, 21, 511–514.
14. Allen, E.P. (1988). Use of mucogingival surgical procedures to enhance esthetics. *Dental Clinics of North America*, 32, 307–330.
15. Allen, E.P. (1993). Surgical crown lengthening for function and esthetics. *Dental Clinics of North America*, 37, 163–179.
16. Kokich, V.G. (1996). Esthetics: The orthodontic periodontic restorative connection. *Seminars in Orthodontics*, 2, 21–30.
17. Kim, T.W., Kim, H., Lee, S.J. (2006). Correction of deep overbite and gummy smile by using a mini-implant with a segmented wire in a growing class II division 2 patient. *American Journal of Orthodontics and Dentofacial Orthopedics*, 130, 676–685.
18. Polo, M. (2005). Botulinum toxin type A in the treatment of excessive gingival display. *American Journal of Orthodontics and Dentofacial Orthopedics*, 127, 214–218.
19. Mazzucco, R., Hessel, D. (2010). Gummy smile and botulinum toxin: A new approach based on the gingival exposure area. *Journal of American Academy of Dermatology*, 63, 1042–1051.
20. Ezquerra, F., Berrazueta, M.J., Ruiz-Capillas, A., Arregui, J.S. (1999). New approach to the gummy smile. *Plastic and Reconstructive Surgery*, 104, 1143–1150.
21. Litton, C., Fournier, P. (1979). Simple surgical correction of the gummy smile. *Plastic and Reconstructive Surgery*, 63, 372–373.
22. Miskinyar, S.A. (1983). A new method for correcting a gummy smile. *Plastic and Reconstructive Surgery*, 72, 397–400.
23. Rubinstein, A.M., Kostianovsky, A.S. (1973). Cirugia estetica de la malformacion de la sonrisa. *La Prensa Medica Argentina*, 60, 952.
24. Tawfik, O.K., El-Nahass, H.E., Shipman, P., Looney, S.W., Cutler, C.W., Brunner, M. (2018). Lip repositioning for the treatment of excess gingival display: A systematic review. *Journal of Esthetic and Restorative Dentistry*, 30, 101-112.
25. Humayun, N., Kolhatkar, S., Souiyas, J., Bhola, M. (2010). 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. *Journal of Periodontology*, 81, 1858-63.
26. Maynard, J.G. Jr., Wilson, R.D.K. (1979). Physiological dimensions of the periodontium significant to the restorative dentist. *Journal of Periodontology*, 50, 170-177.
27. Manjunath, N., Sheth, M., George, R.S. (2015). Smile Designing by Surgical Lip repositioning with Gingival Depigmentation and Crown Lengthening. *International Dental Journal of Student Research*, 2(4), 23-28.