CASE REPORT

Smile Designing by Surgical Lip repositioning with Gingival Depigmentation and Crown Lengthening

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Abstract
Background: Excessive gingival display (EGD) / gummy smile refers to an overexposure of maxillary gingiva during smile. The prevalence of excessive gingival display is seen in 10% of population between age of 20-30 years and it is more seen in women than men¹. Variety of treatment modalities are available depending on the specific diagnosis. Gingival pigmentation is a physiological presentation found on keratinized tissue. It may/may not be associated with any systemic conditions/ diseases. However, a normal person is conscious of “black gums” with a high smile line. This case report describes the successful treatment of excessive gingival display by lip repositioning technique and depigmentation followed by crown lengthening.

Results: Satisfactory surgical healing with minimal post-operative sequelae was observed and significant reduction in gingival display was observed after 1 week, 4 weeks and 4 months follow-up.

Conclusion: This procedure is minimally invasive alternative technique to orthognathic surgery for the management of excessive gingival display with slight vertical maxillary excess and hypermobility of the upper lip.

Keywords: Gummy smile, crown lengthening, surgical flap, pigmentation, vertical maxillary excess.

Introduction
A smile is an important, non verbal method of communication and is an interaction between the teeth, lip framework and the gingival scaffold. Gingival health and appearance are essential components of an attractive smile². Excessive display of gingival while smiling is referred to as “gummy smile” and it is found frequently in general population. Excessive gingival display (EGD) is a frequent cause of patient dissatisfaction that can occur because of various intraoral and extraoral etiologies³. Extraoral causes are vertical maxillary excess (VME), hypermobile upper lip (HUL), short upper lip (SUL, measured from sub nasale to inferior border of upper lip) 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 males⁴. Intraoral causes of EGD include plaque/ drug induced gingival enlargement, delayed/ passive eruption⁵, disharmony of dental arches¹, dentoalveolar extrusion¹, short clinical crown length. Various treatment modalities have been tried till date for the treatment of EGD which includes orthognathic surgeries for correcting jaw deformity, performing myectomies to detach smile muscle attachment¹,³, use an alloplastic or autogenous separator which are placed with a nasal approach between elevator muscles of lip and anterior nasal spine which is associated with significant morbidity and requires hospitalization. Lip repositioning have also been performed in combination with rhinoplasty. Recently, injections of botulinum toxin type A have been suggested for treatment of hypermobile upper lip (HUL) but this may provide only temporary
benefits. Delayed eruption is treated by esthetic crown lengthening. Thus, it is imperative that the clinician evaluates the essentials of patient’s smile and consider the dynamic relationship between the patient’s dentition, gingivae and lips while smiling. The lip line assessed when the patient is in full smile was classified as “very high smile line” according to the classification of smile line [Table 1]. The skeletal condition when assessed was found to be degree I according to the classification of vertical maxillary excess [Table 2]. We report the use of surgical lip repositioning which aims to reduce EGD by shortening the vestibular depth.

Gingival pigmentation occurs in all races of man. The intensity and distribution of pigmentation of the oral mucosa is variable, not only between races, but also between different individuals of the same race and within different areas of same mouth. Gingival pigmentation results from melanin granules, which are produced by melanoblasts. Melanin pigmentation is frequently caused by melanin deposition by active melanocytes located mainly in the basal layer of the oral epithelium. The degree of pigmentation depends on melanoblastic activity and density of melanophores in gingiva which is correlated to severity of gingival inflammation. Gingival pigmentation which is a benign condition does not present any medical problem. However, a normal person is conscious of “black gums” with a very high smile line. In this condition, depigmentation can be performed to achieve esthetic results.

<table>
<thead>
<tr>
<th>Class type</th>
<th>Description</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score 0</td>
<td>“Low smile line”</td>
<td>IDG: &lt;25% visible; M: Not visible, teeth masked.</td>
</tr>
<tr>
<td>Score 1</td>
<td>“Average smile line”</td>
<td>IDG: 25-75% visible; M: Visible on individual teeth.</td>
</tr>
<tr>
<td>Score 2</td>
<td>“High smile line”</td>
<td>IDG: &gt;75% visible; M: &lt;3mm visible (overall).</td>
</tr>
<tr>
<td>Score 3</td>
<td>“Very high smile line”</td>
<td>IDG: completely visible; M: &gt;3mm wide maxillary blind of gingiva visible beyond the mucogingival line “gummy smile”.</td>
</tr>
</tbody>
</table>

Table 1 Classification of smile line (3)

IDG: Interdental gingival; M: Marginal gingival

<table>
<thead>
<tr>
<th>Degree</th>
<th>Gingival and mucosal display (mm)</th>
<th>Treatment modalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2-4</td>
<td>Orthodontic intrusion, orthodontics and periodontics, periodontal and restorative.</td>
</tr>
<tr>
<td>II</td>
<td>4-8</td>
<td>Periodontal and restorative, orthognathic surgery.</td>
</tr>
<tr>
<td>III</td>
<td>&gt;8</td>
<td>Orthognathic surgery with or without adjunctive periodontal and restorative therapy.</td>
</tr>
</tbody>
</table>

Table 2 Classification of vertical maxillary excess (5),(7)

**Case Report**

A 23 year old female patient reported to the Department of Periodontology and Implantology at A.J. Institute of Dental Sciences, Mangalore, India with a chief complaint of black gums and excessive display of gums on left side on smiling. There was no significant medical or family history and the patient was medically sound and fit for the surgical procedure. Informed consent was taken prior to the surgical procedure and surgery was planned in two stages. 1) Gingival depigmentation and crown lengthening 2) Surgical lip repositioning.

**Aim of the technique:**

Gingival depigmentation procedure was planned for good esthetic results followed by crown lengthening in relation to left maxillary canine. To correct unesthetic gummy smile, surgical lip repositioning was planned to limit the retraction of the elevator smile muscles (Zygomaticus minor, levator anguli oris, orbicularis oris and levator labii superioris) which creates narrow vestibule and restricted muscle pull and results in reduced gingival display during smiling.

**Examination:**

Extraorally during an extensive smile, there was a deviation of upper lip on left side and smile line which expresses the position of upper lip relative to the maxillary incisors and gingiva. A unilateral “very high smile line” from maxillary left central incisor to maxillary left second premolar was observed. Excessive gingival display made the patient conscious about pigmentation, irregularities and disharmony in the alignment of gingival margin which in turn affected smile esthetics. Intraorally, hyperpigmentation was seen in both upper and lower arch, short clinical crown length in relation to maxillary left canine, degree I.
skeletal condition, high smile line and moderate gingival display was seen (unilaterally on left side) during smiling which extended from the maxillary left central incisor to maxillary left second premolar. Occlusal plane was examined by drawing an imaginary line connecting the commissures of lips and 2/3rd the height of retromolar pad and was found to be satisfactory. The anterior and posterior segments were in harmony with one another with no major discrepancies. A comparison between the anatomic crown height (incisal edge to cementoenamel junction) and clinical crown height (incisal edge to free gingival margin) showed a short clinical crown in relation to left maxillary canine. The width and thickness of keratinized attached gingiva was found to be adequate and gingival biotype was found to be normal. Based on all these findings treatment protocol was prepared.

**Contraindications for Lip Repositioning**

**Technique:**

Patients with inadequate attached gingiva in maxillary anterior sextant as limited amount of tissue creates difficulty in flap design, stabilization, and suturing that could lead to relapse, severe vertical maxillary excess (VME), where orthognathic surgery is the treatment of choice.

**Surgical Technique**

Complete extraoral and intraoral mouth disinfection was carried out with 2% Betadine, followed by infiltration of local anaesthesia (2% lignocaine hydrochloride with 1:80,000 epinephrine). Gingival depigmentation procedure was carried out under LA extending from maxillary right second premolar to maxillary left second premolar using electrocautery. After removing the entire pigmented epithelium along with a thin layer of connective tissue, the surgical area was covered with a periodontal dressing and healing was uneventful. Since there was uneven gingival contour in relation to left maxillary canine, crown lengthening procedure was done and patient was recalled for lip repositioning procedure on 3rd visit. Thereafter, the surgical area was demarcated with the help of an indelible pencil (Figure 2B). The surgical area started at the mucogingival junction and extended 6–8 mm superiorly in the vestibule. Incisions were made in the above mentioned surgical area and both superior and inferior partial thickness flaps were raised from maxillary left central incisor to maxillary left second premolar. The incisions were then connected with each other on the distal end in an elliptical outline (Figure 2C). The epithelium was then removed within the outline of the incision, leaving the underlying connective tissue exposed (Figure 2D). The parallel incisions were approximated with interrupted stabilization sutures at the midline (Figure 2E) and other locations along the borders of the incision to ensure proper alignment of the lip midline with the midline of the teeth; then continuous inter-locking sutures were used to approximate both flaps (Figure 2F). The sutures were resorbable in nature. The patient was followed up after 1 week (Figure 2G), 4 weeks (Figure 2H) and 4 months (Figure 2I). A scar formation can be observed after several weeks of healing.

**Results**

Satisfactory surgical healing with minimal post-operative sequelae was observed and significant reduction in gingival display was observed after 1 week, 4 weeks and 4 months follow-up.

**Discussion**

The procedure was first described in the literature of plastic surgery in 1973 by Rubinstein AM and Kostianovsky which was advocated again by Litton and Fournier for correction of EGD in presence of short upper lip. Jaw deformities can cause excessive gingival display and require orthognathic surgery. This was performed by oral & maxillofacial surgeons. 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.

Unilateral excessive gingival display can deviate the upper lip and does not limit the amount of gingiva when a person smiles which can express concern as a dental procedure. Surgical lip repositioning treatment can be performed to reduce the labial retraction of the elevator smile muscles and minimize excessive gingival display. This technique is mostly used in plastic surgery procedures to prevent reattachment of smile muscles. To obtain esthetic results, the gingival form, tooth anatomy and relationship of underlying bone to CEJ must be understood. In this technique, adequate attached gingiva was present. Lip repositioning has also been performed in conjunction with rhinoplasty. The nasal approach allows both surgical procedures to be combined; the surgical site is extended only minimally. This should be done only if rhinoplasty is to be performed and if the patient desires a remedy for excessive gingival display. The procedure is safe and has minimal side effects. There might be possibility of mucocele formation due to severity of minor salivary glands which resolve on its own over a period of time. Surgical lip repositioning is an effective procedure to reduce gingival display by coronally positioning the upper lip. In the present case, surgical lip repositioning technique was carried out successfully with tangible results as a dental procedure.

Surgical lip repositioning holds promise as an alternative treatment modality in esthetic rehabilitation.
Melanin pigmentation is a physiologic process which occurs in all races with no significant differences between males and females. The saturation of melanin pigments can cause unaesthetic dark gingival display more so in people with high lip line since people with high lip line expose broader zone of gingival tissue. In the present case, the depigmentation procedure was carried out successfully using electrosurgery and healing was satisfactory. Although electrosurgery requires skill and expertise compared to scalpel surgery precautions was taken to avoid periosteum, alveolar bone and vital tooth and repeated application of electric current which causes undesirable tissue destruction was also taken care of.

Post-surgical repigmentation of gingiva has been reported. Repigmentation is described as spontaneous and has been attributed to the activity and migration of melanocytes from surrounding areas. There was no evident repigmentation at the end of four months follow-up and patient was satisfied with the results. However, the case is being followed up to evaluate the long term stability of the results.

**Conclusion**

As the rate of infection due to MRSA is increasing, Surgical lip repositioning is an innovative and effective way to improve the gummy smile of the patient. This technique is an easy and cost-effective technique to produce a satisfactory result for the patient.

Depigmentation of hyperpigmented gingival is simple, easy to perform and above all causes less discomfort and is aesthetically acceptable to the patient.

**References**

A. Surgical area was demarcated with an indelible pencil.

B. Incisions were made starting from mucogingival junction extending 6-8mm superiorly in the vestibule and connected with each other on the distal end in an elliptical outline.

C. The epithelium was removed leaving the connective tissue exposed.
E. The parallel incisions were approximated with interrupted stabilization suture at the midline.

F. Continuous interlocking sutures were given to approximate the flaps.

G. 1 week post-operative

H. 4 weeks post-operative

I. 4 months post-operative