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Lip Repositioning Surgery- A Boon in Perioesthetics

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ABSTRACT

A beautiful smile comprises of a perfect balance of white and pink. An imbalance in the gingiva-tooth ratio results in dominance of gingival appearance often referred to as “gummy smile” which is a major concern for patients visiting the dentist. Esthetics has now become an integral part of periodontal treatment plan. Excessive gingival display can be managed by a variety of treatment modalities. Lip repositioning is a novel conservative surgical technique used to treat excessive gingival display. The objective of lip repositioning procedure is a surgical correction of unesthetic gummy smile by limiting the retraction of elevator smile muscles resulting in narrow vestibule and restricted muscle pull thereby reducing gingival display during smiling. This case series throw light on the management of excessive gingival display by surgical lip repositioning procedure.

KEYWORDS

Lip Repositioning Surgery; Perioesthetics

INTRODUCTION

Beauty lies in the eyes of the beholder. The harmony of the smile is determined by the shape, position, color of teeth and the gingival tissues. Elements of an esthetic smile are the gingival scaffold, lips and teeth. For diagnostic purposes, smiles have been categorized using the relationship between the lower border of the upper lip and gingival margin of maxillary incisors as low, normal and high smile lines. A normal gingival display is between the inferior border of the upper lip and the gingival margin of the maxillary central incisors during a normal smile which is about 1 mm - 2 mm. When gingival display exceeds a distance of 3mm or more is termed as excessive gingival display (EGD) or gummy smile which has been a case of esthetic embarrassment for many patients [1]. The dominating visual feature in gummy smile is the gingiva when compared with teeth and lips giving an unpleasant appearance. This would definitely affect the self-esteem, confidence and psychosocial behavior of the patient.

A detailed history, careful diagnosis and a proper treatment plan are imperative for achieving an esthetic and predictable result in the treatment of such situations. The etiology of excessive gingival display can be short upper lip, vertical maxillary excess, altered passive eruption and hyperactivity of the upper lip muscles. Based on the diagnosis, gummy smile may require various treatment approaches such as esthetic crown lengthening, orthognathic surgery, orthodontic intrusion, surgical lip repositioning and non-surgical procedures like botox injections [2].

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Moderate gingival display that ranges between 4 mm and 8 mm which is due to vertical maxillary excess not of skeletal origin can effectively be treated by surgical repositioning of maxillary lip [3]. This technique is contraindicated in patients having inadequate width of attached gingiva. Surgical lip repositioning procedure was first described by Rubinstein and Kostianovsky in 1973 as part of medical plastic surgery. Later, it was introduced into dentistry by Rosenblatt and Simon in 2006, after being modified.

Management of EGD by lip repositioning surgery is innovative and effective, less time consuming and is performed under local anesthesia and fewer postoperative complications while orthognathic surgery is a complicated procedure and requires team work with hospitalization and general anesthesia.

Another aggressive approach for treating EGD includes myectomy and partial resection of the LLS [4].

The appearance of the lip framework is determined by the activity of various facial muscles, such as the orbicularis oris, levator labii superioris, the levator labii superioris alaeque nasi, and the zygomaticus minor muscles.

Lip elevation on smiling can also be limited by placing a silicon spacer between elevator muscles of the lip and the anterior nasal spine [5].

Modifications of lip repositioning surgery are laser assisted lip repositioning [6,7] and Modified lip repositioning technique [8-10].

The aim of this article is to describe the lip repositioning technique for surgical correction of gummy smile by limiting the retraction of elevator smile muscles by reducing the depth of the upper vestibule.

CASE REPORT

Three patients, aged from 18 to 35 years, presented between with the chief complaint of “unpleasant gummy smile and requesting smile enhancement” reported to the Department of Periodontics, PMS College of Dental Science and Research, Trivandrum, Kerala, India. The patients were systemically healthy and were focusing on their esthetic concerns. The first two cases had previously undergone orthodontic therapy. Written informed consent was obtained after a discussion of the benefits, risks, possible complications, and alternatives to lip repositioning technique. Both intraoral and extraoral photographs were taken for treatment planning and records. On extraoral examination, the face was apparently symmetrical with incompetent lips. A high smile line was noted during dynamic smile with an excessive gingival display. In all the three cases, crown lengthening was done due to short clinical crown length in the Department of Periodontics.

Case 1

A 23-year-old female patient presented to the Department of Periodontics with the chief complaint of “gummy smile” (Figure1). The patient was previously undergone orthodontic therapy. During a dynamic smile, the excessive gingival display (EGD) extended from maxillary right second premolar to maxillary left second molar. Esthetic crown lengthening was done using electrocautery (Figure 2). Clinical measurements such as facial proportions, width of attached gingiva, maxillary lip length and lip mobility were assessed (Figure 3), and examination revealed a sufficient amount of keratinized gingival and vestibular depth.

Figure 1: Excessive gingival display of the patient before surgery.

A B

Figure 2: Crown lengthening using electrocautary. (A) Pre-operative image (B) Post-operative image.

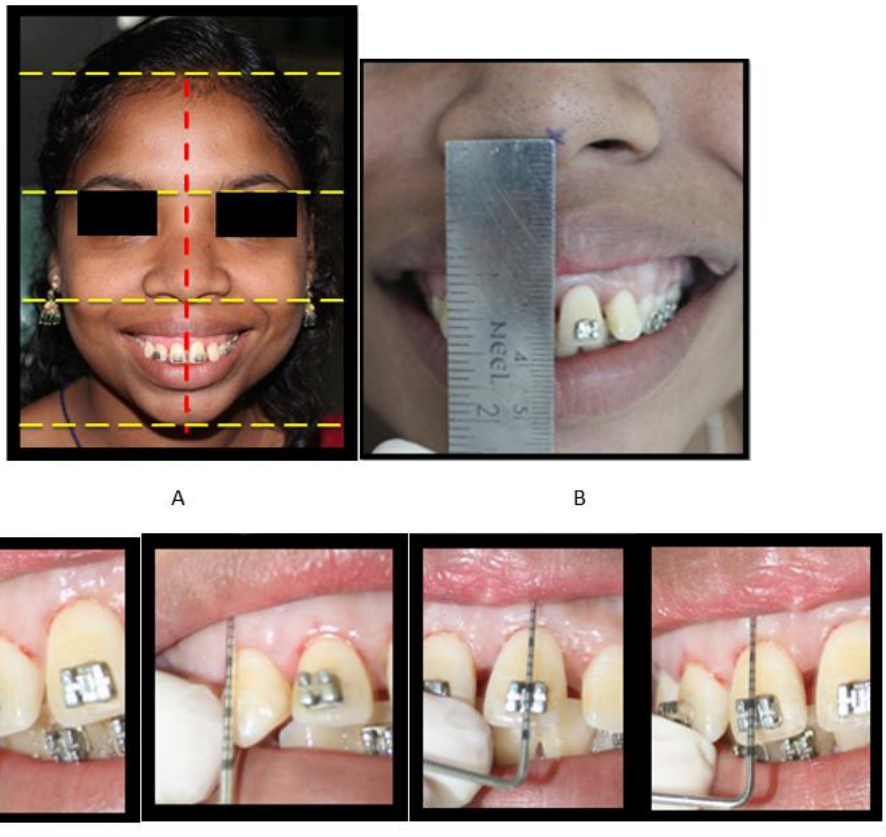


Figure 3: (A) shows the measurement of facial proportions (B) shows the measurement of the upper lip length and (c) shows the measurement of the width of attached gingiva.

Disinfection was done with 2% betadine followed by administration of local anesthetic (Lidocaine HCl 2% with 1:100,000 epinephrine) at the vestibular mucosa and lip from the maxillary right second premolar to the maxillary left second premolar region. Thereafter, the borders of the surgical incision area were marked using a surgical marker (Figure 4).

Figure 4: Surgical borders are marked.

The general rule of lip repositioning surgery is that the ratio of vertical extension is 2:1, with the incision height being twice the measurement of EGD at full dynamic smile. The surgical area was started at the mucogingival junction, which extended 8-10 mm superiorly in the vestibule since the EGD was 4 mm. Parallel incisions were made in the surgical area and the outlined mucosa was removed by partial thickness incisions using a scalpel exposing the underlying connective tissue (Figure 5). Care must be taken to avoid damage to the minor salivary glands in the submucosa. Local anesthetics and prolonged compressions with cotton and gauze were used to control bleeding.

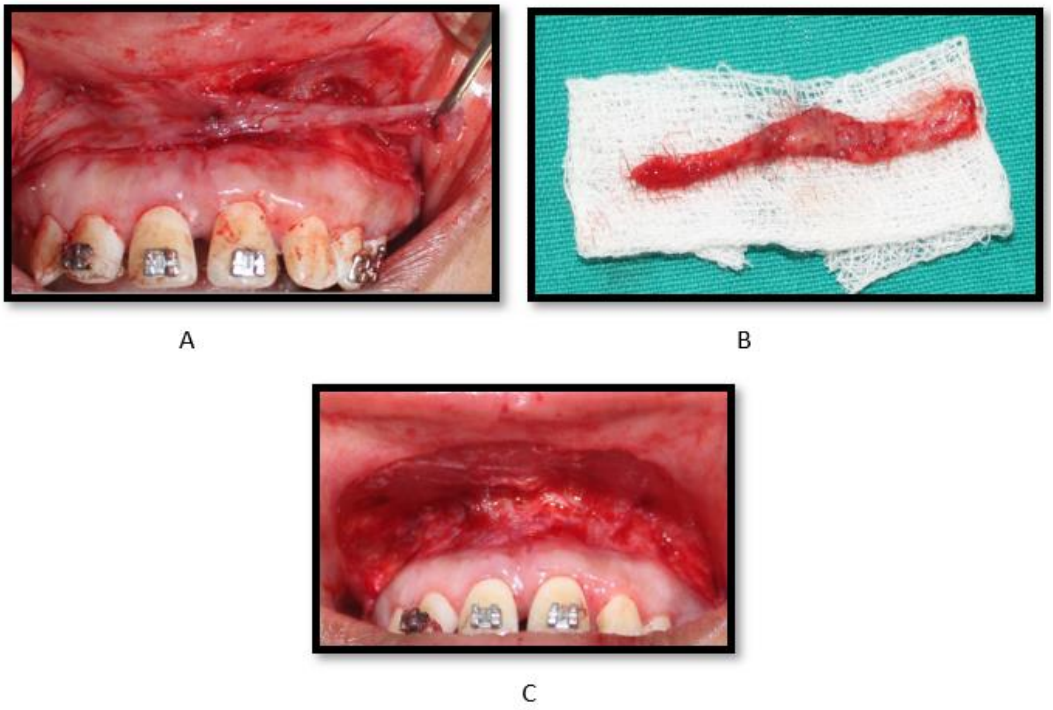


Figure 5: Partial thickness dissection. (A) Parallel incisions made in the surgical area (B) outlined mucosa removed (c) Surgical site after the removal of mucosa.

The margin of the wound at lip side was sutured in a coronal position to the keratinized gingiva over the alveolar ridge to approximate the parallel incision at the midline and to pull the lip down and reposition it in a coronal position by placing interrupted sutures using 3-0 black silk suture which is a non-resorbable material. Then the sutures were placed midway between the midline and the most distal aspect of the dissection (Figure 6A). Additional sutures were then placed ~ 3 mm apart to approximate the wound edges (Figure 6B). Periodontal

dressing was placed to close the surgical site (Figure 6C).

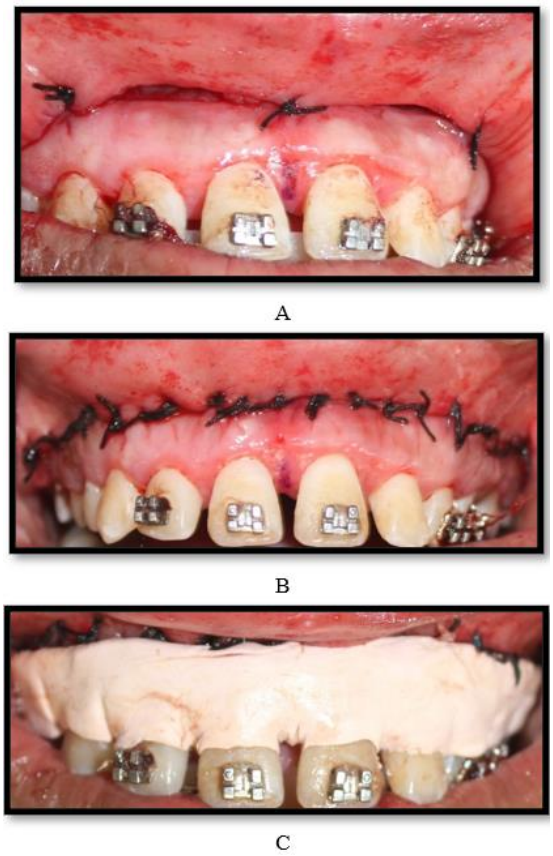


Figure 6: Suturing to approximate the parallel incisions. (A) Initial sutures at the midline and then at the midway between the midline and the most distal aspect of the dissection (B) Suturing completed to approximate the wound edges (c) Periodontal dressing placed.

Figure 7: Preoperative and 6 months post-operative frontal view of the patient.

Case 2

An 18-year-old male patient reported to the Department of Periodontics with the chief complaint of gums showing while smiling (Figure 1).

The patient was previously undergone head gear therapy in the Department of Orthodontics. During a dynamic smile, the extension of gingival display was from maxillary right canine to maxillary left canine. Clinical measurements such as facial proportions, width of attached gingiva, maxillary lip length and lip mobility were assessed.

Disinfection was done with 2% betadine followed by administration of local anesthetic (Lidocaine HCl 2% with 1:100,000 epinephrine) at the vestibular mucosa and lip from the maxillary right canine to the maxillary left canine region. Thereafter, the borders of the surgical incision area were marked using a surgical marker (Figure 2).

The distance between the superior and inferior borders must be twice the length of gingival exposure in the dynamic smile. The surgical area was started at the

mucogingival junction, which extended 8mm superiorly in the vestibule since the EGD was 4mm.

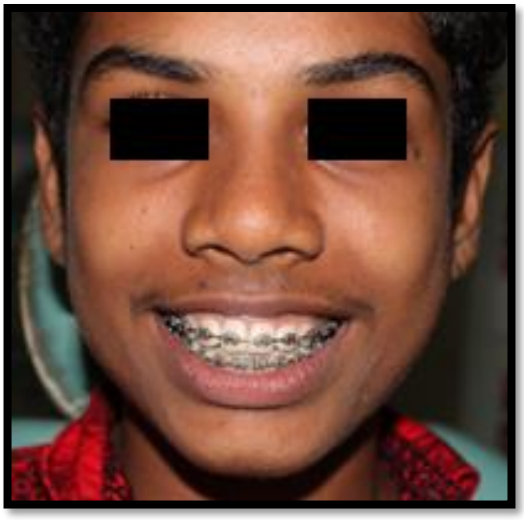


Figure 1: Excessive gingival display of the patient before surgery.

Figure 2: Surgical borders are marked.

Parallel incisions were made in the surgical area and the outlined mucosa was removed by partial thickness incisions using a scalpel exposing the underlying connective tissue (Figure 3). Care was taken to avoid damage to the minor salivary glands. Local anesthetics and prolonged compressions with cotton were used to control bleeding.

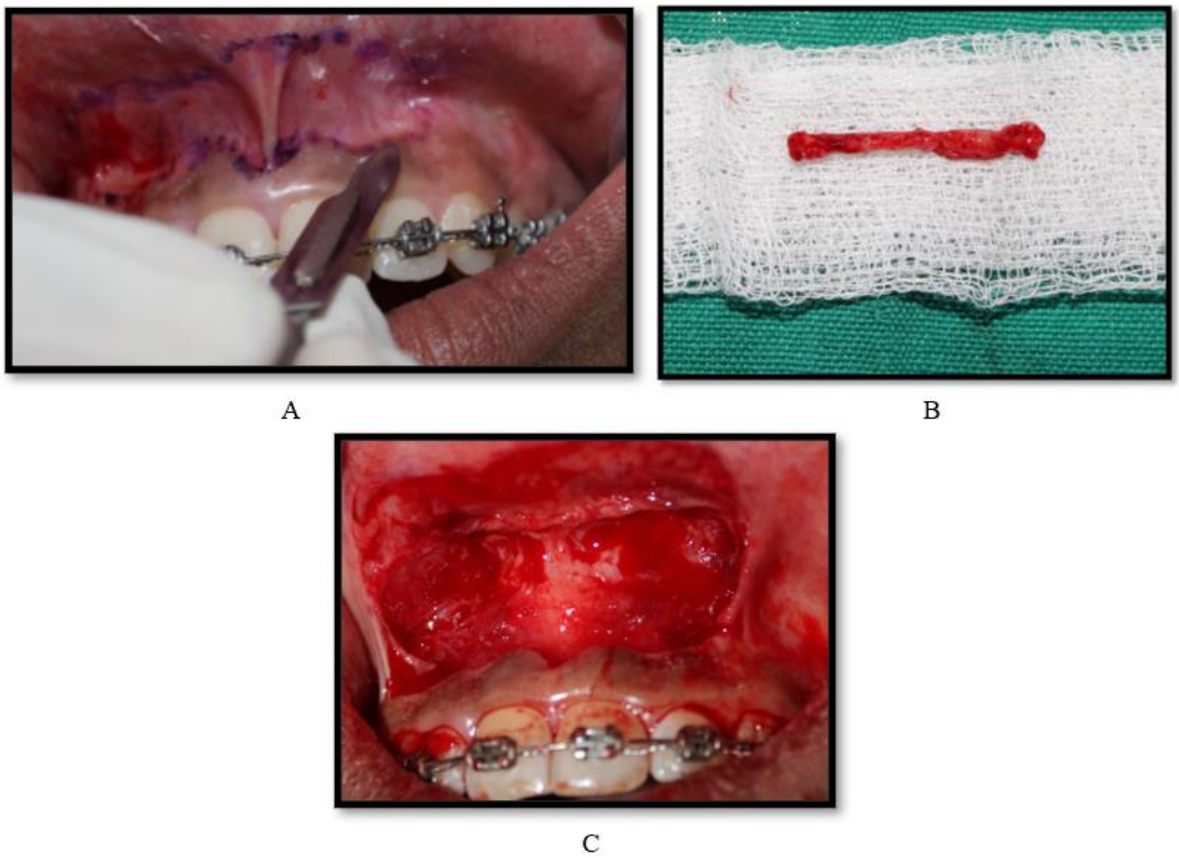


Figure 3: Partial thickness dissection. (A) Parallel incisions made in the surgical area (B) outlined mucosa removed (C) Surgical site after the removal of mucosa.

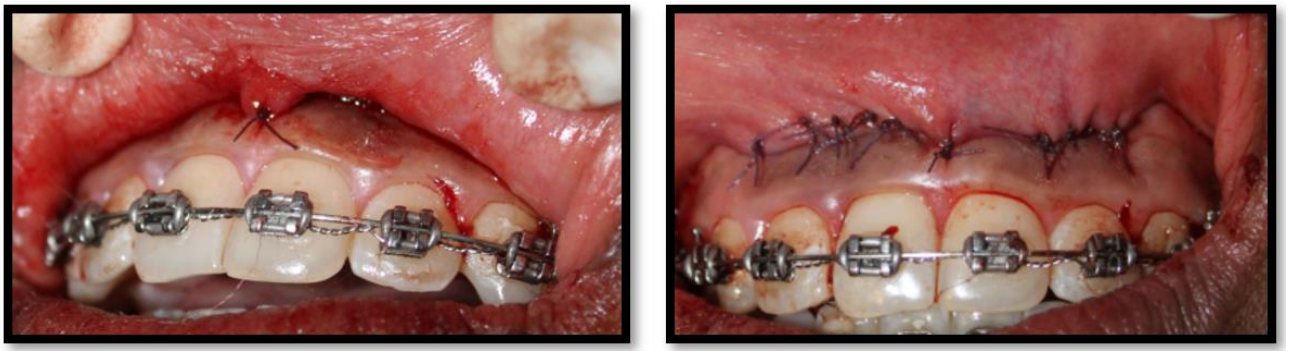


Figure 4: Suturing to approximate the parallel incisions. (A) Initial sutures at the midline and then at the midway between the midline and the most distal aspect of the dissection (B) Suturing completed to approximate the wound edges.

Suturing was initiated to approximate the parallel incision at the midline by placing interrupted sutures using 3-0 black silk suture which is a non-resorbable material. Then the sutures were placed midway between the midline and the most distal aspect of the dissection (Figure 4A). Additional sutures were then placed ~3 mm apart to approximate the wound edges (Figure 4B). Periodontal dressing was placed to close the surgical site.

Figure 5: Preoperative and 6months post-operative frontal view of the patient.

Case 3

A 34-year-old female patient reported to the Department of Periodontics with the chief complaint of gummy smile (Figure1). Patient declined orthodontic treatment. Oral prophylaxis was performed and customized oral hygiene instructions were provided to control gingival inflammation. Oral mouthwash was recommended at bedtime to counter mouth breathing sequelae. During a dynamic smile, the excessive gingival display (EGD) extended from maxillary right second premolar to maxillary left second molar.

Figure 1: Excessive gingival display of the patient before surgery.

Surgical crown lengthening was done (Figure 2).

Clinical measurements such as facial proportions, width of attached gingiva, maxillary lip length and lip mobility were assessed.

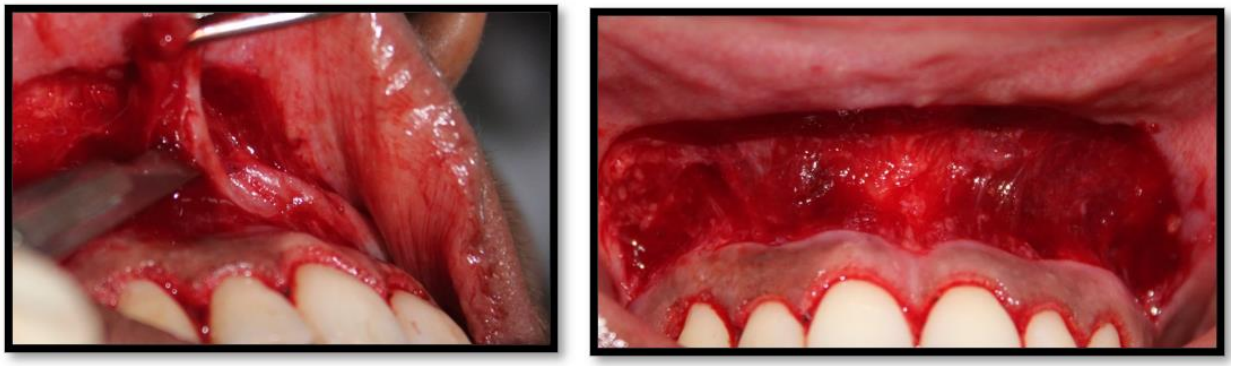
A

B

Figure 2: Surgical crown lengthening. (A) Pre-operative image (B) Post-operative image.

Figure 3: Surgical borders are marked.

Disinfection was done with 2% betadine followed by administration of local anesthetic (Lidocaine HCl 2% with 1:100,000 epinephrine) at the vestibular mucosa and lip from the maxillary right canine to the maxillary left canine region. Thereafter, the borders of the surgical incision area were marked using a surgical marker (Figure 3).



A B

Figure 4: Partial thickness dissection. (A) Parallel incisions made in the surgical area (B) Surgical site after the removal of mucosa.

The distance between the superior and inferior borders must be twice the length of gingival exposure in the dynamic smile. The surgical area was started at the mucogingival junction, which extended 8mm superiorly in the vestibule since the EGD was 4 mm. Parallel incisions were made in the surgical area and the outlined mucosa was removed by partial thickness incisions using a scalpel exposing the underlying connective tissue (Figure 4). Care must be taken to avoid damage to the minor salivary glands in the submucosa. Local anesthetics and prolonged compressions with cotton and gauze were used to control bleeding.

Suturing was initiated on the margin of the wound at lip side in a coronal position to the keratinized gingiva to approximate the parallel incision at the midline and to pull the lip down and reposition it in a coronal position by placing interrupted sutures using 3-0 black silk suture which is a non-resorbable material. Then the sutures were placed midway between the midline and the most distal aspect of the dissection (Figure 5A). Additional sutures were then placed ~ 3 mm apart to approximate the wound edges [Figure 5B]. Periodontal dressing was placed to close the surgical site.

A B

Figure 5: Suturing to approximate the parallel incisions. (A) Suturing completed to approximate the wound edges (B) Periodontal dressing placed.

A B

Figure 6: Preoperative and 6months post-operative frontal view of the patient.

POSTOPERATIVE INSTRUCTIONS

The patient was given instructions to minimize lip movements while talking and smiling for 1 week, to have soft diet, to avoid brushing over the surgical site for two weeks, and placing ice packs over the upper lip. The patient was advised to rinse gently with 0.2% chlorhexidine gluconate twice daily for 2 weeks. Postoperative medications include oral antibiotics (amoxicillin 500 mg three times a day) and non-steroidal anti-inflammatory drug (ibuprofen 400 mg twice a day) for 5 days were prescribed.

FOLLOW UP AND RESULTS

In all the cases in this series, patients reported with slight pain, little swelling and restriction while moving the upper lip after a week. Sutures were removed followed saline irrigation at the 2-week postoperative visit. At this visit, the swelling subsided, the surgical site showed good healing and the lip restriction was better. The suture line healed in the form of a scar and since it was concealed in the upper lip mucosa it was not visible while smiling. Six months follow up examination showed a reduction in the excessive gingival display of the patient and the patient was satisfied with her smile.

DISCUSSION

Various surgical approaches are applied to improve gummy smile according to its etiology**.** In this case series, we describe the minimally invasive surgical procedure for correction of gummy smile caused by hypermobile lip. The conventional lip repositioning surgery was first reported by Rubinstein and Kostianovsky in 1973 in the medical literature. Proper diagnosis of the etiological factors is the first step to select the right treatment protocol. One of the common causes for a compromised smile is excessive gingival display. An ideal smile is the exposure of the entire length of maxillary teeth with 1 mm visibility of the midfacial maxillary gingiva. The exposure of gingiva within a permissible limit of 3 mm may be considered esthetically acceptable. Gingival display exceeding 3 mm is unpleasant and termed as “excessive gingival display (EGD)” or as “gummy smile”. The

etiology of excessive gingival display includes vertical maxillary excess [1], hyperactivity of upper lip muscles, deficient maxillary lip length and altered passive eruption [2]. Based on etiology EGD can be classified into: EGD A: Altered passive eruption; EGD B: Bony maxillary excess; EGD C: Condition causing gingival enlargement; EGD D: Deficient maxillary lip length; EGD E: Excessive mobility of maxillary lip. From this classification, management of excessive gingival display [EGD B, EGD D and EGD E] can be done by lip repositioning surgery. EGD B (vertical maxillary excess) of degree I (2-4mm) and degree II (4-8mm) gingival exposure can be managed by this procedure but not degree III vertical maxillary excess [VME (>8mm)] which can be managed only by orthognathic surgery as advocated by the following authors, Humayun et al. (2010) and Bhola et al. (2015) [3,11-16].

EGD resulting from vertical maxillary excess, typically requires orthognathic surgery [6]. Altered passive eruption, can be corrected by crown lengthening surgery (CLS), achieved through gingivectomy or apically positioned flap with/without ostectomy depending on gingival width and alveolar bone crest location relative to cemento-enamel junction (CEJ) [8]. When hyperactive upper lip is the underlying EGD etiology [7]. either non-surgical botulinum toxin injections [17] or surgical approaches can be used for treatment. Because of the multiple possible etiologies, patients presenting with EGD should be carefully diagnosed and treatment planned accordingly. The clinician must evaluate the relationships between dentition, alveolar bone, gingiva, facial skeleton and lip to determine the underlying EGD etiology.

This surgical procedure is designed to be shorter, less aggressive, and have fewer postoperative complications when compared to orthognathic surgery. Lip repositioning is contraindicated with severe VME degree III of [>8 mm] gingival show according to [3] and with a limited amount of KAG or a short vestibule according to [18].

Bleeding associated with conventional lip repositioning procedures results in hematoma postoperatively, complicating the healing process. This serves as a reservoir for bacteria and tends to loosen the sutures in the initial healing period.

The major disadvantage of lip repositioning surgery is relapse. Relapse is commonly seen during the initial 6–8 weeks. Conventional lip repositioning technique described in our case series within the 6months follow-up without lip relapse to its original position or further postoperative complication such as the formation of mucocele, paresthesia, or transient paralysis was reported.

Relapse can be due to one of these common conditions: (1) Using this technique in cases with inadequate width of attached gingiva, (2) Cases having high muscle pull (3) Incising deep into the connective tissue and muscle fibres (4) Not following the 2:1 ratio of vertical extension with the incision height (5) Incising on the keratinized attached gingiva [3,11,17-19]. When there is relapse, resolution can be done by either revisiting the surgical site to incise more mucosa as needed or by the use of Botox injections as it was suggested in the articles by Humayun et al. (2010), Bhola et al. (2015), Rosenblatt and Simon (2006), Polo (2008) and Patel (2013) [3,11,17-19].

This procedure provides fasFter recovery time and less postoperative complications. More investigations and researches with longer follow up duration and larger sample size are required to verify and evaluate the outcome of this technique.

CONCLUSION

Majority of the self-referred patients who are interested to correct their gummy smile have EGD (GD≥4 mm). The lip-repositioning procedure is a predictable surgical

technique for treatment of EGD. This case report demonstrates that conventional lip repositioning surgery may be used for treatment EGD caused by degree I VME combined with hypermobile upper lip. It is less invasive, has fewer postoperative complications, and provides a faster recovery compared to orthognathic surgery. Our results indicate good stability at 6months follow-up. A proper diagnosis and case selection are essential prior to considering this procedure. For patients desiring a less invasive alternative to orthognathic surgery, the conventional lip repositioning surgery is a viable alternative. Long-term follow-up studies are needed to evaluate the stability and effectiveness of conventional lip repositioning surgery as a treatment modality.

COMPETING INTERESTS

The authors deny any conflict of interest.

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