

## Triangular Frenotomy: A Novel Technique for Gummy Smile Correction

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### Abstract

The goal of periodontal treatment is to improve periodontal health and aesthetic. A gummy smile is an aesthetic problem related to periodontal tissue. This case report aims to explain the minimally invasive surgery for gummy smile correction using triangular frenotomy technique. A 24 years old woman with an aesthetic problem. She complains her gingiva was visible excessively when smile. Intraoral examination on the maxillary anterior region: gingival margin at the normal position, normal texture, normal color of the gingiva, and normal crown size. The patient agrees to undergo the surgery. Triangular frenotomy technique was performed to reduce the severity of her gummy smile. Evaluation for six months, gummy smile was reduced significantly.

Triangular frenotomy technique is a novel technique for gummy smile correction.

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### Introduction

Aesthetics aspect becomes a crucial factor in current periodontal treatment. The attention of patient and dentist tend to the aesthetic aspect of the periodontal treatment outcome. The display of gingival tissue in the maxillary anterior region has a significant influence on the patient's appearance. Some clinical conditions of gingival tissue that interfere the appearance such as gingival recession, gingival enlargement, gingival hyperpigmentation, and gummy smile.

Gummy smile constitutes an excessive gingival display during smile. It can interfere with someone's appearance. An ideal smile was determined by the harmony between three parameters: the teeth, the gum, and the lips. There were several etiologies of gummy smile, such as delayed passive eruption, hyperactive lip elevator muscles, which were recognized as soft tissue factors. The short upper lip may also be the cause of gummy smile. The common length of the upper lip was 22–24 mm in young adult males and 20-22 mm in young adult females.

Moreover, skeletal factor, namely vertical maxillary excess, can also play an important role as an etiologic factor of gummy smile.<sup>1-3</sup>

Someone was categorized as being a gummy smile when the maxillary anterior gingival width in a vertical direction was more than 3 mm during smile. The smile profile was categorized in well-balanced when the cervical area of maxillary anterior teeth were located approximately 1 mm coronally from the lower border of the upper lip. Even though the gingival display when smiling was still around 2-3 mm, this condition was considered as aesthetically acceptable.<sup>4</sup>

Epidemiological study using over 450 adult samples, aged 20-30 years, demonstrated that gummy smile were found in 7% of men and 14% of women. The prevalence of gummy smile was decreased with age. This phenomenon occurred as a result of the decrease of lip muscle strength.<sup>3</sup>

There were a number of options to reduce the severity of gummy smile. It can be done either surgical or non-surgical approaches. Non-surgical correction can be performed with Botulinum toxin (Botox) injection for reducing the strength of the elevator smile muscles (eg: orbicularis oris, zygomaticus minor, levator labii superioris, and levator anguli). Another options for gummy smile correction can be achieved using surgical approach such as crown lengthening, apically positioned flap, lip reposition, and orthodontic approach.<sup>2-4</sup>

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Treatment options should be based on the etiologic factor and therapeutic endpoint required. This case report aims to explain the alternative surgical technique for gummy smile correction using triangular frenotomy.

### Case Report

A 24 years old woman visited Periodontics Clinic, Dental and Oral Hospital, Universitas Airlangga, with a complaint of her gingiva excessively visible when smile. Intraoral examination on the maxillary anterior region: thick gingival biotype, absence of inflammation and pocket, gingival margin at the normal position, and normal tooth-crown dimension. The upper lip was competent (Figure 1a). On the maxillary incisor region, the vertical dimension of gingival display when smile was approximately 8 mm (from the lower border of the upper lip to gingival zenith line), whereas on the canine region was around 10 mm (Figure 1b). The patient agrees performed surgical procedure on the maxillary gingiva anterior region to reduce the severity of gummy smile. The informed consent was obtained from the patient. Before the surgical procedure, the treatment protocol was explained to the patient about the possibility of discomfort after surgery.



Figure 1a. Competent upper lip.  
Figure 1b. Patient profile before treatment: the gingiva appears exaggerated when smiling.

### Surgical Procedures

The basic procedure of triangular frenotomy for gummy smile correction in this present case is conventional frenotomy that first introduced by Curran (1950).<sup>5</sup> Nevertheless, there are modified techniques in triangular frenotomy, consisted of extension of incision and suturing of the wound.

Prior to surgical procedure, antiseptic solution was applied to the surgical area. Injection of local anesthesia using 2 mL of 2%

Lidocaine containing 1:80.000 Epinephrine in the mucobuccal fold around the upper anterior labial frenum (Figure 2a). Thereafter, the upper lip was pulled upward and the frenum tissue was held using the mosquito hemostat which was inserted close and parallel to the attached gingiva with the tip of hemostat in the vestibule. Frenum tissue on the upper side (apical) and under side (coronal) of the hemostat were incised with #15c blade (Figure 2b). The apical incision was in the frenum, while the coronal in the attached gingiva about 5 mm from the gingival margin. Then, both incisions connected each other. Complete excision was performed on the frenum tissue that clamped with the hemostat until the hemostat was free, thus the frenum tissue was partially removed. Afterward, the coronal incision was extended horizontally until the distal area of the left and right maxillary central incisors, thus the wound becomes triangular in shape (Figure 2c). The wound was closed in two stages to reinforce the stability of remaining frenum attachment. First, the inner side suturing, connective tissue of the apical incision was stitched to the periosteum in the coronal incision area using 4.0 absorbable monofilament sutures. Then, the wound was closed horizontally with 4.0 nylon interrupted sutures (outer side suturing) (Figure 2d).

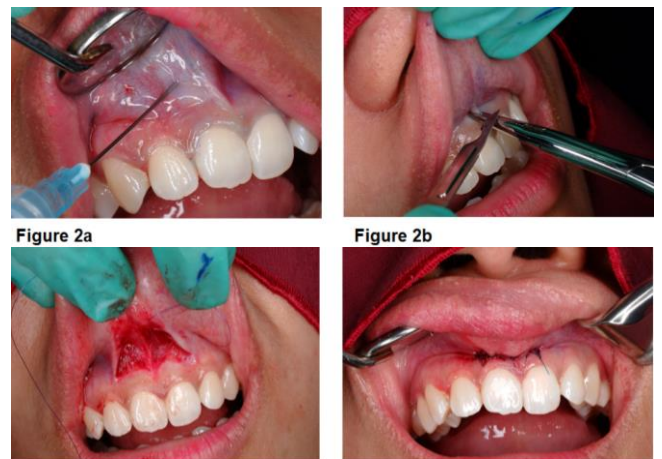


Figure 2a. Injection of local anesthesia in the mucobuccal fold.  
Figure 2b. Frenum incision on the upper side of hemostat.  
Figure 2c. Triangular wound shape after incision of the frenum  
Figure 2d. Closure the wound with interrupted sutures.

### Postoperative Care

The patient was prescribed 500 mg of Amoxicillin, three times daily, for five days and 500 mg of Mefenamic acid, three times daily, for three days. Besides that, the patient was advised to use 0.12% Chlorhexidine gluconate mouth rinse, three times daily for one week. The patient was followed-up after surgery on one week, three weeks, one month, three months, and six months.

### Post Operative Results



Figure 3a



Figure 3b



Figure 3c



Figure 3d



Figure 3e



Figure 3f

**Figure 3a.** Intraoral condition at one week after surgery.

**Figure 3b.** Intraoral condition at three weeks after surgery.

**Figure 3c.** Extraoral condition at one month after surgery.

**Figure 3d.** Smile profile at three months after surgery.

**Figure 3e.** Upper labial frenum at six months post triangular frenotomy.

**Figure 3f.** Smile profile at six months post triangular frenotomy.

In the first week after surgery (Figure 3a), the patient described some discomfort such as moderate pain and slight stiffness of the upper lip. Intraoral examination in the post-surgical area revealed mild inflammation and slight swelling. Extraoral examination revealed slight swelling and normal color of the upper lip. Three weeks

after surgery (Figure 3b), stiffness of the upper lip had started to reduce, the pain was minimal and no extraoral swelling. Intraoral examination confirmed in the post-surgical area appears slight reddish with minimal inflammation. The sutures stay intact and close the wound effectively. One month after surgery (Figure 3c), after the sutures were removed, the patient reported no discomfort. Three months after surgery (3d), the patient reported satisfactory aesthetic results. Six months evaluation showed that stable condition in the surgical area with complete recovery (Figure 3e) and very pleasing result (Figure 3f).

### Discussion

Recently, treatment procedures in dentistry are more likely using minimally invasive, including periodontal surgery. The advantages of minimally invasive periodontal surgery such as smaller incision hence minimal trauma to periodontal tissue, less pain, less bleeding, diminish the risk of infection and minimize the patient's sense of discomfort. These circumstances can accelerate the healing process, thereby enhance treatment success.<sup>6,7</sup>

Excessive gingival display when smile is the characteristic of gummy smile. This condition tends to cause aesthetic interferences rather than health problems. In this present case, gummy smile might be caused by the maxillary elevator muscle strength. In such case, the alternative treatment is Botox injection therapy. Nevertheless, the systemic effects that caused by Botox therapy need to be considered, such as nausea, tenderness, and allergy reaction.<sup>4</sup> In order to minimize the systemic effects resulting from Botox therapy, gummy smile can be corrected by surgical procedure. In this present case, gummy smile correction is performed using minimally invasive surgery, it is triangular frenotomy. This technique named triangular frenotomy, because the surgical wound is triangular in shape.

The basic principle of triangular frenotomy procedure is conventional frenotomy, but there is slightly different than conventional frenotomy. The difference is in the incision and suturing. The oval wound in common conventional frenotomy is sutured vertically,<sup>5,8</sup> while triangular frenotomy using horizontal suturing. In this case, the height of the coronal incision was made more coronal than the position of labial frenum attachment



before surgery. This position is stated as a new position of the upper labial frenum attachment. In triangular frenotomy, the coronal incision was extended horizontally. This extending incision is needed so that the wound can be stitched horizontally. Such horizontal suture is required in order to shorten the vertical dimension of the frenum. Shortening of the frenum can occur due to the apical incision is in the mobile tissue which is a part of the remaining frenum, whereas, the coronal incision is on the attached gingiva that is non-mobile tissue, thus, when closing the wound, the apical incision is pulled down until cohere to coronal incision on the attached gingiva. These conditions result in the upper lip pulled down, thus can cover the maxillary labial gingiva when smiling.

In principle, gummy smile correction using triangular frenotomy technique is similar to the common lip reposition mentioned in previous studies, which is generally, the upper lip was positioned more coronal.<sup>9-11</sup> The difference is in the width of the wound. In common lip repositioned, area of the wound extends to the premolar region.<sup>12,13</sup> In addition, common lip repositioned procedure involves frenectomy.<sup>14,15</sup> In this present technique, gummy smile correction is performed through minimal eliminated tissue and only frenotomy procedure, not frenectomy. The wound area was limited around the maxillary central incisors. Thus, this surgical technique is minimally invasive.

Primarily, this technique results in coronal retraction of the upper labial frenum in the anterior region, so the upper lip pulled down. Therefore, gummy smile correction using triangular frenotomy technique is appropriate in a case when gingival display in the anterior region is greater than the posterior region. In this present case, the width of gingival display in the posterior region is greater than the anterior region. However, in fact, this technique is still able to provide a significant good result.

The limitation of this technique is related to gingival biotype. In thin gingival biotype, the gingival tissue is easily ruptured and sutures become loose, even lost. The key to the success of gummy smile correction using this technique is the stability of remaining frenum tissue that is sutured on the attached gingiva. This suture plays an important role in preserve the stability of the new attachment position of the upper labial frenum.

## Conclusion

Gummy smile correction using triangular frenotomy technique demonstrates a favorable reduction of the excessive gingival display when smiling. This technique results in a decreasing degree of the gummy smile severity with the optimal healing outcomes. Minimal invasive in this surgical technique improves the successful treatment of gummy smile correction. The upper lip shows stable conditions in the new lower position when smiling.

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## Declaration of Interest

The authors report no conflict of interest.

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