

DENTINO
JURNAL KEDOKTERAN GIGI
Vol V. No 2. September 2020

**COMBINATION OF FRENOTOMY AND GINGIVECTOMY TREATMENT WITH
LASER DIODES AS AESTHETIC CORRECTIONS: A CASE REPORT**

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ABSTRACT

Background: High tension on the frenum in some cases may generate chronic inflammation. Chronic inflammation can trigger gingival enlargement, thereby resulting in unfavorable aesthetic appearance. Frenotomy and gingivectomy are surgical procedures that are often performed in periodontics field to overcome such condition. The use of lasers in frenectomy/frenotomy and gingivectomy methods is still uncommon but more convenient than using a scalpel. Diode lasers exhibit several advantages over conventional methods because it can control the bleeding and is also painless that may reduce the need of anesthesia. **Objectives:** To report the likelihood of diode lasers instead of conventional methods using scalpels in frenotomy and gingivectomy for aesthetic corrections. **Case:** A 20-years-old female patient arrived at Periodontics Department of Airlangga University to repair gums in upper and lower jaw region. Patient felt less confident with the state of her gum which discerned to cover the portion of her teeth and wished to receive surgical treatment for aesthetics improvement. No involvement of systemic disease and drug consumption was noted in this case. **Case Management:** The management of such aberrant frenum was accomplished by performing labial frenotomy and removing enlarged tissues which is a common surgical procedure in the field of periodontics. Dental lasers are currently being employed in many fields of periodontics, providing alternatives to traditional scalpel techniques. **Conclusion:** Surgical treatment in cases of aberrant frenum and gingival enlargement using diode lasers (Epic X, Biolase) for aesthetic correction provides satisfactory results with minimum pain and rapid healing.

Keywords: *Aberrant frenum, Diode laser, Frenotomy, Gingivectomy*

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INTRODUCTION

Frenums in the oral cavity are termed into three categories based on its anatomical attachment, namely labial, lingual and buccal. The labial frenum itself is differed into superior and inferior labial frenum in reference to its position.¹ When observed on the level of attachment, the frenums are classified as follows: (1) Mucosal, as frenum fibres attach to mucogingival junction; (2) Gingival, as frenum fibres attach to attached gingiva; (3) Papilla, as frenum fibres attached extensively to interdental papilla; (4) Papillary penetration, as fibres are beyond the alveolar and overextend to the palatine papilla.² The attachment of frenum onto interdental papilla and the attachment that penetrates into the papilla are clinically considered as pathological conditions.³

The site of muscle tension that affects the frenum may be identified through visual examination of abnormal frenum attachment that can be performed by maximum stretching of the upper lip. As the frenum pulled away, pale area can be observed consequently.⁴ Involvement of superior labial frenum will result in central diastema and reduction in aesthetic aspect of the patient. Moreover, this condition may also hinder any treatment provided from other departments such as orthodontics or prosthodontics.^{4,5}

If no treatment or dental health education is delivered to maintain oral hygiene of the patient, gingival recession and plaque accumulation may be developed. Excessive accumulation of the plaque will promote gingival inflammation and result in the

occurrence of gingivitis.⁶ Inflamed gingiva will later cause inadequate dental cleansing due to pain and bleeding on tooth-brushing, so that patients become anxious to brush their teeth. In addition, food debris will be accumulated inside the pocket and unable to be eliminated completely. Persistent condition will constantly instigate gingival enlargement as the consequence of gingival response to bacteria.^{6,7}

To anticipate such circumstances, surgical approach called frenectomy (eliminating the whole frenum) or frenotomy (re-positioning the frenum to be more apical or in some aspects to be more coronal) is necessary. This procedure will be followed by gingivectomy to manage the gum that is enlarged.^{4,6,7} Frenectomy is a procedure that can be performed using scalpel, electro-surgery, and laser.⁹ Laser is remained a peculiar method for frenectomy/frenotomy and gingivectomy, yet diode laser is known as a method that is more convenient than scalpel.^{10,11,12} The utilization of diode laser is distinctly beneficial as it controls and even minimizes the bleeding so that the operative area can be more visible to the operator.¹³

Soft tissue responds to laser beam in four typical ways which are scattered, transmitted, reflected, or absorbed. Most lasers for dental treatment employ the type of beam that can be absorbed which is influenced by wavelength, soft tissue composition, and mineral content in the tissue. Mechanism that occurs in the use of diode laser involves ablation or *photochemical* and temperature or *plasma-mediated*. In laser diode, the heat is produced by fibre tip and resulted in thick coagulated layer on gingival surface.^{14,15}

This case report presents a surgical procedure using diode laser (Epic X, Biolase) at 810 nm - 980 nm wavelength.

CASE

A 20-year-old female patient arrived at Periodontics Department of Airlangga University to refine her upper and lower gums. Patient felt less confident as the gum was partially covered her teeth, and she desired to receive surgical procedure for aesthetic improvement. Neither evidences of systemic condition nor history of drug consumption were recorded. Upper labial frenum was attached onto interdental papilla together with the enlargement of gingiva to the coronal portion of upper and lower anterior region. No pain was identified around the frenum area as well as on the upper and lower region of anterior gingiva. Local factor such as plaque was visible on the central incisors and lower anterior teeth area. The presence of redness and inflammation

around central incisor and lower anterior gingival was observed.

CASE MANAGEMENT

One week prior to the treatment, scaling and root planning was performed in all regions along with the provision of DHE about appropriate and efficient way for tooth-brushing. The instruction to maintain oral hygiene was also specified.

Patient visited the hospital on the following week (Figure 1A and 1B) to evaluate oral hygiene status that was assessed by the dental health care provider. No bleeding, inflammation or calculus was visible at the time of control. Patient conducted plaque control procedure well, thus performing the surgical treatment was doable.



Figure 1. Oral cavity condition a week after scaling and root planning. **A.** At the time of occlusion, **B.** At the time of mouth opening.

This case was managed with frenotomy and gingivectomy using diode laser (Epic X, Biolase) that was aimed to reduce the bleeding and promote patient comfort during the treatment since patient would experience high level of anxiety. The procedure was

also accentuated on the aesthetic aspect, therefore the use of blade, suture material and periodontal pack were eluded.

To restore the aesthetic function, operator planned the treatment in two separate surgical visits so that the aesthetic could be well-established and optimal wound healing may be achieved. First visit included the procedure of gingivectomy on lower anterior gingival region.

The next surgical treatment was performed to correct aesthetical aspect of upper gingival region within one month post initial surgery. Second surgical procedure was comprised of gingivectomy and frenotomy on the upper gingival region. Post-operative evaluation was arranged three times including 7 days, 14 days and 4 weeks after surgery.

Case 1

The first case was managed by performing gingivectomy on the lower anterior region of gingival enlargement to restore gingival anatomy into its normal shape so that sufficient aesthetic can be established at the end of treatment. The procedure involved several steps; first was asepsis technique to sterilize operative field and surrounding area of the oral cavity using povidone iodine. Second was the administration of anesthesia into vestibular area via local infiltration technique of adrenaline and lidocaine combination (pehacaine) at 1:80.000 ratio.

The third step included the marking of gingival border using pocket marker forcep (PMF) in three sites that are mesial, apical and distal. Fourth was tissue removal using diode laser (EpicX, Biolase), adjusted at gingivectomy mode. Fifth was to cover the operating area using periodontal dressing (Orascar). Post-operative instruction was delivered and patient was mandated to evaluate her condition a week after the surgery (Figure 2F).

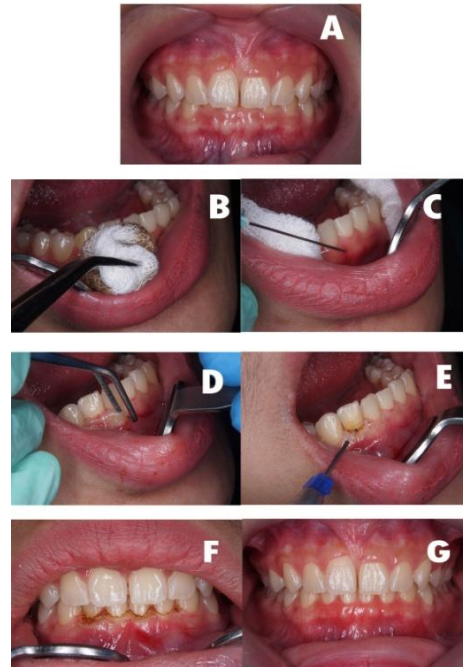


Figure 2. Surgical procedures of lower anterior gingivectomy: **A.** Pre-operative condition. **B.** Asepsis of surgical field. **C.** Anesthesia of the surgical field. **D.** Gingivectomy using diode laser. **E.** Final result. **F.** Post-operative evaluation on the following week

Case 2

Patient resumed her treatment on the following month after the gingivectomy of the lower gum. Previous treatment rendered a satisfying result so that the patient was willing to continue her therapy for aesthetic purpose on upper gingival region that included gingivectomy and frenotomy. The diastema was also schemed to be restored to close the gap between central incisors (Figure 3).

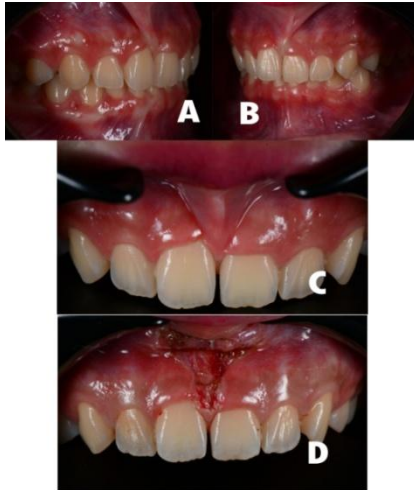


Figure 3. Frenum before and after surgery. **A&B.** Lateral view of the frenum (before frenotomy). **C.** Frontal view of the frenum. **D.** Frenum after surgical procedure using diode laser.

Surgical procedure was initiated with frenotomy and followed by upper anterior gingivectomy. Procedures included the asepsis of surgical field and surrounding area of the oral cavity using povidone iodine, the anesthesia of vestibular area using local infiltration technique with adrenaline and lidocaine mixture (pehacaine) in a ratio of 1 : 80.000, the marking of excised frenum using single hemostat technique located on the most apical and the most coronal portion of the frenum, and the removal of the tissue using diode laser adjusted at gingivectomy mode to detach fibrous tissue from the bone (Figure 3D).



Figure 4. Healing process of the frenum. **A.** Pre-operative condition of the frenum. **B.** Fourteenth day evaluation after surgery. **C.** Six-month evaluation after frenotomy.

The treatment subsequently proceeded to gingivectomy procedure for upper anterior region with the following steps: first, delineation of gingival border that was going to be excised using pocket marker forcep (PMF) on three points that are mesial, apical and distal site (Figure 5A). Second, tissue removal was performed using diode laser (Epic X, Biolase) adjusted on gingivectomy mode. Third, crown ratio for mesial distal and coronal apical was measured using Chu's gauges (Hu-friedy) in upper anterior region (Figure 5D and 5E). When the surgical procedures were finished, application of periodontal pack using periodontal dressing (Orascar) was managed. Post-operative instruction was pronounced and patient was instructed to evaluate her condition on the following week.

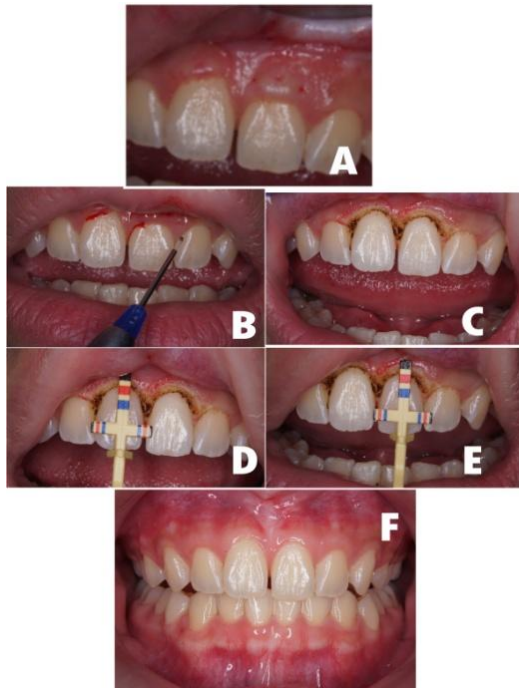


Figure 5. Gingivectomy procedures of upper anterior region. **A.** Utilization of pocket marker forcep (PMF). **B.** The use of diode laser. **C.** Post-gingivectomy result. **D & E.** Measurement using Chu's gauges. **F.** One month post-surgical procedure.



Figure 6. Evaluation before and after gingivectomy. **A.** Pre-operative condition. **B.** A month after surgery. **C.** Six-month evaluation after surgery.

DISCUSSION

Surgical procedures of frenotomy and gingivectomy may be served in two methods including conventional technique using scalpel or minimal invasion using laser at various wavelength. Recently, the use of laser has been gradually more frequent for the management of soft tissue surgery.

The utilization of diode laser at relatively long wavelength (810 nm - 980 nm) results in the acceleration of wound healing process since no excessive inflammation is generated in comparison to the use of scalpel. This phenomenon may occur as diode laser is not significantly invasive or damaging to the tissue. The heat produced by diode laser encloses the tip of nerve ending rapidly, therefore the inflammatory response is also depleted.^{13,15,17}

When compared to Nd:YAG, the heat from diode laser is lower so that it is safe to be used for soft tissue. It does not injured the periosteum or the hard tissue below the gingiva.¹⁶

A study by Gabric *et al* compared the management of soft tissue using conventional technique and diode laser on study animals that concluded the use of diode laser at high wavelength (810 nm - 980 nm) may accelerate wound healing process by reducing excessive inflammatory reaction when compared

with scalpel.¹⁷ This statement is also in accordance to Shanthala *et al* that revealed the result of soft tissue surgery using diode laser at 810 nm - 980 nm wavelength which established better coagulation and hemostasis.¹⁸

Advisable wavelength for periodontal treatment is ranged between 810 nm - 980 nm. A wavelength of 810 nm can be deployed for periodontal pocket therapy, while a beam under 810 nm wavelength is commonly used to detect caries and subgingival calculus.^{19,20} Wavelength higher than 1000 nm may also be practicable for the preparation of enamel and dentin.²¹

Laser has been significantly beneficial to manage aesthetic cases as it controls bleeding very well so that the surgical field becomes more visible to the operator. By improving operator visibility, the time required to finish the surgery will be reduced thus improving patient comfort. Laser is also favorable in suppressing the need for anesthesia that it is reported to be dispensable in some cases managed with diode laser. Nonetheless in this case, local anesthesia was administered in the adjacent tissue of surgical area to anticipate any pain during the procedure since the patient was moderately anxious. Wound healing process also transpires swiftly owing to the fact that blood vessels and nerve tissues are less damaged than the bearing of scalpel. Prescribed analgesic was not necessarily consumed considering no discern of pain after surgery.^{18,19,20,21}

During surgical treatment, gingival sculpting can be easily achieved especially on the interdental and marginal site. It can be established by the support of diode laser tip that is small enough (200 um, 300 um and 400 um) to obtain fine detail and more predictable result.²¹

Bone sounding is a procedure that is suggested to define the need for gingivectomy, especially when determining the treatment for patient in this case report. It is an instrument that is used to measure the biological width. Normal biological width is ± 2 mm (0.97 mm of the epithelial attachment and 1.07 mm of the connective tissue) with 0.69 mm of sulcus depth.²² From the measurement, it is obtained that the biological width of 11 and 21 was >5 mm and 32, 31, 41, 42 was >3 mm so gingivectomy and gingivoplasty was recommended to restore the biologic width and the gingival shape into its normal state. Chu's gauge (Hu-friedy) was also used to examine mesial-distal and coronal-apical ratio of the crown in which the line and colour codes should be analyzed whether it is located at the same position or not. If there is inconsistency in crown ratio analysis but bone sounding is revealed to be normal, future treatment will require crown lengthening with the reduction of alveolar crest.²³

This case had been managed with gingivectomy after the examination using Chu's gauge and bone sounding. The measurement from both instruments obtained normal result hence the crown lengthening procedure was not necessary to perform.

The management for high-attached frenum may include frenotomy that cuts part of the frenum to be located more apical than its prior position. This treatment was proposed when the patient intended to receive aesthetic correction for central diastema, since high frenal attachment may complicate restorative adaptation and restorative retention (tends easily to be released). Frenotomy can also promote the maintenance of oral hygiene in the patient. Initial examination demonstrated moderate to poor oral hygiene category, specifically on the upper anterior region. Higher frenum may ravel the cleansing of food debris at tooth-brushing that debris accumulation will be more inclined around the frenum.

Patient was evaluated on the seventh, fourteenth, and thirtieth day after surgery to assess inflammation and soft tissue healing (Figure 5 and 6). One of the succeeding factors for frenotomy was plaque control in which patient was reinforced every the end of surgical treatment and follow-up visit to maintain oral hygiene and regularly perform proper tooth brushing technique. On the fourteenth day, inflammation was no longer apparent and oral hygiene had been well-maintained so that the upcoming follow-up was scheduled on the thirtieth day after surgery. On the thirtieth day, oral hygiene and soft tissue condition were clinically observed to be normal without further complain on patient condition. Six month after surgery, patient re-visited Periodontics Department of Airlangga University for a follow-up visit and post-operative condition was remained considerably well (Figure 5C and 6C). Soft tissue that was managed with surgical approach did not revealed any changes and patient was fully satisfied with the outcome. However, aesthetic correction for central incisive had yet been attempted.²⁴

In this report, author only performed post-operative evaluation six month after surgery while wound healing theory affirmed that the healing process might take two years to be fully established. This later commenced the author to resume the follow-up bi-annually.⁸

This case report eventually offers a conclusion that surgical treatments for aberrant frenum and gingival enlargement using diode laser (Epic X, Biolase) for aesthetic corrections provide satisfying results with minimum pain and rapid healing.

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