



## CASE REPORT

# Diode Laser-Assisted Maxillary Labial Frenectomy: A Case Series With 6-months Follow-Up

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## ARTICLE INFO

## Article history:

Received 06.09.2024

Accepted 31.10.2024

Published 15.12.2024

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<https://doi.org/>

[10.38138/JMDR/v10i2.19](https://doi.org/10.38138/JMDR/v10i2.19)

## ABSTRACT

A frenum is a fold of mucous membrane, maybe with enclosed muscle fibers, which attaches the lips and cheeks to the alveolar mucosa or gingiva and underlying periosteum. In case of aberrant frenum attachment, it has to be relieved for better function and aesthetics. There are various techniques to relieve aberrant frenum. In this case series, we assessed the outcome of laser frenectomy and VAS scores for pain perception. On comparing all the cases we concluded that the laser frenectomy can be used as a better alternative to the scalpel technique for frenectomy and showed superior results in pain perception, patient comfort, and healing.

**Keywords:** Diode Laser; Diastema; Frenectomy

## 1 INTRODUCTION

A frenum is a fold of mucous membrane, maybe with enclosed muscle fibers, which attaches the lips and cheeks to the alveolar mucosa or gingiva and underlying periosteum.<sup>(1)</sup> It is classified according to various aspects by various authors. The most commonly used classification according to the site of attachment of muscle fibers is given by Placek et al<sup>(2)</sup> in 1974 as follows : mucosal attachment of the frenum, means an attachment of the frenum to the mucogingival junction; gingival attachment, means attachment of the frenum to the attached gingiva; papillary attachment, means an attachment of the frenum to the papilla; papillary penetrating attachment is in those cases when the attachment of the frenum passes right up to the papilla, while inserting in attached gingiva.

The other classification base on morphology was given by Sewerin in 1971 as follows:<sup>(3)</sup> normal frenum, simple frenum with a nodule, simple frenum with appendix, simple frenum with nichum, bifid frenum, persistent tectolabial frenum,

double frenum, and wider frenum.

In 2014 Mohan et al modified this classification and gave as follows:<sup>(4)</sup>

- Simple frenum- single, double, triple
- With nodule- at labial third, middle third, or alveolar third
- With appendix- at labial third, middle third, or alveolar third
- Tectolabial - simple, with nodule, or with an appendix
- With Nichum - Inverted- Y-shaped
- Bifid
- Trifid
- With two or more variations
- Finally, the absence of frenum

According to Olivi et al clinical indications for frenum, removal include the following:<sup>(5)</sup> Anomalous frenum associated with inflamed gingiva, resulting from poor oral hygiene; anomalous frenum associated with gingival recession; Max-

illary frenum associated with a diastema after the complete eruption of the permanent canines; Abnormal or anomalous maxillary frenum (class III or IV), resulting in the presence of a diastema during mixed dentition; Anomalous mandibular frenum with high insertion, causing the onset of gingival recession.

There are various techniques to relieve frenum like conventional, V-Y plasty, Z plasty, frenectomy using Laser, and electrosurgery. The conventional frenectomy using a scalpel showed more discomfort and pain to the patient due to many bleeding sites.

Out of these various techniques, laser frenectomy is less invasive, safe, easy, predictable, and reproducible, with less discomfort and post-operative complications. So, the present study aimed to evaluate Diode laser-assisted frenectomy in effective healing and post-operative comfort using Visual Analogue Scale (VAS) by Hayes and Patterson<sup>(6)</sup> with a follow-up of 6 months.

## 2 CASE SERIES

The clinical study was done at the Department of Periodontics in Sri Ramakrishna Dental College and Hospital, Coimbatore. A total of six patients were included. All patients were informed and explained about the laser frenectomy procedure and signed the informed consent that included the procedure and consequences of the surgery. The patients had various chief complaints and some cases were referred from the Department of Orthodontics for removal of the aberrant frenal attachment. The patients were clinically examined and the frenum was classified according to the Placek 1974 classification.

The diode laser of 980nm at a power ranging between 2 to 2.5 Watts was used for the frenectomy procedure. The patients who underwent the laser-assisted frenectomy were protected with eyeglasses and masks. Upon receiving written informed consent, all patients were treated under local anesthesia with lidocaine 2% with adrenaline 1:80000. The lip was retracted and the frenum was tensed (Figures 1 and 2). Then using the laser fiber tip, the frenum was relieved from the attached gingiva and interdental papilla between central incisors to the attachment in the upper lip up to the vestibule (Figures 3 and 4). Figures 5 and 6 reveals the immediate post-operative view of the patient. Then adequate hemostasis was achieved, and the patient was given post-operative instructions and was explained about the VAS for pain and post-operative comfort level assessment.

All the patients who underwent the procedure were asked to fill out the VAS forms provided on the 1<sup>st</sup>, 3<sup>rd</sup>, and 7<sup>th</sup> day. All the patients were recalled for a follow-up visit at 1 week, 3 months, and 6 months.



**Fig. 1: Preoperative image of Subject I showing positive tension test with high maxillary labial frenal attachment**



**Fig. 2: Preoperative image of Subject II showing positive tension test with high maxillary labial frenal attachment and prominent midline diastema**



**Fig. 3: Intraoperative image maxillary labial frenectomy performed using diode Laser in subject I**



**Fig. 4: Intraoperative image maxillary labial frenectomy performed using diode Laser in subject II**



**Fig. 5:** Immediate post-operative image after laser frenectomy showing relief in the frenal tension pertaining to maxillary labial frenum of Subject I



**Fig. 6:** Immediate post-operative image after laser frenectomy showing relief in the frenal tension pertaining to maxillary labial frenum of Subject II

### 3 RESULTS

At 1 week, the healing was uneventful. In VAS, the interpretations are 0 means no pain or discomfort; 0.1–3.0 means slight pain or discomfort; 3–6 moderate pain or discomfort, and 6–10 severe pain or discomfort. The patients were instructed to give the score accordingly. The mean VAS scores showed  $2 \pm 0.63$ ,  $1 \pm 0.63$ , and  $0.33 \pm 0.52$  on 1<sup>st</sup>, 3<sup>rd</sup>, and 7<sup>th</sup> day respectively (Tables 1 and 2). The 3<sup>rd</sup> and 6<sup>th</sup> month follow-up visits showed complete healing of the operative site (Figures 7 and 8).

**Table 1:** The VAS scores for six patients on Day 1, Day 3 and Day 7

Subjects	Day 1	Day 3	Day 7
I	2	2	1
II	2	1	0
III	1	1	0
IV	3	1	0
V	2	1	1
VI	2	0	0

**Table 2:** VAS scores of pain (Mean  $\pm$  SD) for 6 participants at Day 1, Day 3, and at Day 7

Parameter	VAS score for pain
DAY 1	$2 \pm 0.63$
DAY 3	$1 \pm 0.63$
DAY 7	$0.33 \pm 0.52$



**Fig. 7:** 6 months post-operative image of the maxillary labial frenum showing complete healing and negative tension test in Subject I



**Fig. 8:** 6 months post-operative image of the maxillary labial frenum showing complete healing and negative tension test in Subject II

### 4 DISCUSSION

Lasers have emerged to be the most sought-after technology that can be used for a variety of dental procedures. When performing some periodontal treatments such as gingivectomy, gingivoplasty, frenectomy, frenotomy, operculectomy, and laser-assisted flap surgery, this equipment is used in instead of the traditional scalpel technique. For frenectomy, a variety of soft tissue lasers, including diode, Er:YAG (Erbium-doped yttrium-aluminum-garnet), and Nd:YAG (Neodymium-doped yttrium aluminum garnet) lasers, have been used. Of these, diode laser is the one that is utilised most frequently. There are four wavelengths for the diode lasers: 810–830 nm, 940 nm, 980 nm, and 1064 nm.<sup>(7)</sup> We used a 980 nm laser in this work, with a power output of two to 2.5 Watts.

With its distinct benefits, laser procedures offer new insights into periodontics and help to mitigate some of the challenges associated with using the standard scalpel method. Better hemostasis and reduced patient pain perception provide a clear field for precise and painless incisions. This enhances patient cooperation and lessens anxiety and

panic related to surgical operations.<sup>(8)</sup>

There are various studies in the literature comparing conventional frenectomy using a scalpel and laser frenectomy. Lebret et al 2021 did a systematic review that aimed at comparing the various parameters between scalpel and laser techniques for a frenectomy.<sup>(9)</sup> They included studies that compared the pre-operative, and post-operative parameters and concluded that patient satisfaction was highest in laser-assisted frenectomy procedures with shorter duration of operating time, no suturing, less post-operative pain, and discomfort. This less pain and discomfort in laser frenectomy were explained by the fact that the laser causes protein coagulation that forms a biological dressing sealing the extremities of the sensory peripheral nerves.<sup>(9)</sup>

Zaaba et al in 2021 did a study to evaluate healing following frenectomy done by scalpel and laser in 51 outpatients.<sup>(10)</sup> They assessed the healing following the procedures using the healing score index with photographs up to 3 weeks. They concluded that the laser frenectomy showed better healing outcomes than the conventional scalpel technique. Due to longitudinal incisions done using the scalpel technique, more edema and swelling were associated with the scalpel technique. Whereas in laser technique, less scar tissue formation and minimal swelling. Thus, the procedure with laser could provide the ideal outcomes with fewer complications.

Considering all the above-mentioned consequences we used the laser frenectomy technique for our cases and measured the outcome using VAS scores. The results showed satisfactory outcomes following laser frenectomy procedures with less pain perception, and more comfort in the healing period without any swelling and edema from the patient's perspective. This is in accordance with the study done by Vincent et al in 2023 in thirty-six subjects to assess various parameters like ooze from the surgical site, pain, wound healing, and discomfort or acceptance of the procedure.<sup>(11)</sup> The parameters were evaluated at day 1, day 7 and at day 14.

The pain perception between these two procedures with VAS score analysis showed less score for pain perception observed in the laser frenectomy group at all the recall visits. This was explained by the fact that the sensory nerve endings which are responsible for pain perception were sealed by the heat generated with laser procedure and renders it unable to anastomose with one another. From the operator's perspective, the procedure is more convenient as it has less time consumption, a clear operating field, and more control over the procedure.

## 5 CONCLUSION

The laser frenectomy has various advantages over the scalpel technique in pain perception, healing, discomfort, hemostasis, and time consumption. Thus, laser can be considered as an ideal alternative to conventional scalpel technique as it satisfies the treatment needs with fewer complications.

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