Case Report

Diode-Laser–Assisted Maxillary Labial Frenectomy: A Case Report

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Abstract

The frena may jeopardize the gingival health when they are attached too closely to the gingival margin, either due to interference in the plaque control or due to a muscle pull. In addition to this, the maxillary frenum may present aesthetic problems or compromise the orthodontic result in the midline diastema cases, thus causing a recurrence after the treatment. The management of such an aberrant frenum is accomplished by performing a labial frenectomy, which is a common surgical procedure . Lasers are currently being employed in many fields of periodontics, providing alternatives to traditional scalpel techniques. Diode laser-assisted frenectomy (commonly 950 nm) offers a minimally invasive alternative to scalpel techniques—providing effective hemostasis, reduced postoperative pain, accelerated healing, and high patient acceptance. This article presents a case report of performing maxillary labial frenectomy in patients using diode laser.

KEYWORDS: Aberrant frenum; diastema; diode laser; frenectomy

INTRODUCTION

Aesthetic concerns have led to an increasing importance in seeking dental treatment, with the purpose of achieving perfect smile. The continuing presence of a diastema between the maxillary central incisors in adults has often been considered as an aesthetic problem. The frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, the gingiva, and the underlying periosteum. Labial thick and high attached maxillary frenum is commonly regarded as contributing etiology for maintaining midline diastema and delayed upper jaw development, so the focus on the frenum has become essential.

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The superior labial frenum, a triangular-shaped fold connecting the tubercle of the upper lip to the alveolar process, is a combination of epithelium and loose connective tissue[1] .Placek et al [2]. categorized labial frenum attachments into four types based on their insertion level: mucosal (terminating at the mucogingival junction), gingival (inserted within the attached gingiva), papillary (extending into the interdental papilla), and papilla-penetrating (crossing the alveolar process to attach up to the palatine papilla). Miller has recommended that the frenum should be characterized as pathogenic when it is unusually wide or there is no apparent zone of attached gingiva along the midline or the interdental papilla shifts when the frenum is extended.

Abnormal frena can be identified visually by applying tension to the frenum to observe movement of the papillary tip or blanching caused by localized ischemia. When such signs are present, surgical intervention may be considered. Management of aberrant frena involves either a frenectomy or a frenotomy.

A frenectomy involves the complete removal of the frenum along with its attachment to the underlying bone. In contrast, a frenotomy refers to making an incision in the frenum and repositioning its attachment. Frenectomy can be performed using conventional methods such as a scalpel, electrosurgery, or laser technology. The traditional "classical frenectomy" approach was first described by Archer [3] and Kruger [4].

Modifications to the classic frenectomy were developed, such as Miller's technique used for post-orthodontic

diastema cases, Z-plasty procedure used when the frenum has a low insertion combined with a short vestibulum, and V-Y plasty which is used for lengthening the area [5]

However, several studies have reported that the traditional scalpel method is associated with a higher risk of both intraoperative and postoperative complications compared to laser or electrosurgical techniques. These complications may include excessive bleeding during the procedure, which can hinder visibility, the necessity for sutures, increased postoperative pain and discomfort, and delayed or suboptimal wound healing.

With the growing acceptance of laser technology in dentistry in recent years, various types of lasers—including CO_2, Er:YAG, Nd:YAG, Er, diode, and combinations like diode with Er:YAG—have been employed for performing frenectomy procedures. Diode lasers are semiconductors using solid state elements as active media, with wavelengths varying between 810nm and 980nm. Because diode laser wavelengths approximate the absorption coefficient of pigmented tissue containing hemoglobin, melanin and collagen chromophores, they are indicated for soft-tissue surgeries.

CASE REPORT

A 20-year-old female reported to the Department of Periodontics with a chief complaint of a visible gap between her upper central incisors and discomfort while brushing. She also expressed aesthetic concerns regarding the appearance of her smile. The clinical examination revealed the presence of a high frenum attachment. The frenum appeared thick and broad [Figure 1]. According to Placek it is calssified as “Papillary”.

After complete evaluation and a detailed history, the treatment of choice was to perform laser frenectomy using specific laser parameters. After explanation of the intra and post operative aspects to the patient, informed consent was obtained to perform frenectomy. The frenectomy was performed with Fona diode laser, (Manufactured in Germany).

Procedure and Laser Parameters :

The frenectomy procedure was carried out using a diode laser with a wavelength of 950 nm. Prior to the procedure, the labial frenum was numbed using a topical anesthetic spray, followed by infiltration anesthesia to ensure patient comfort during the surgery. Once adequate anesthesia was achieved, the diode laser was activated and prepared for use.

A surgical fiber tip with a diameter of 400 µm was utilized in contact mode, operating at a power setting of 2 watts.[6] The incision was initiated from the base of the labial frenum, beginning at the attached gingiva and the interdental papilla between the maxillary central incisors. The laser cut was directed upwards, following the inner surface of the upper lip and extending to the depth of the vestibule. The incision formed a rhomboid-shaped area, effectively severing the fibrous tissue bands of the frenum.

Throughout the procedure, the laser provided excellent hemostasis, minimizing bleeding and eliminating the need for sutures [Figure 4]. Protective safety protocols were strictly followed—both the clinician and assistant, along with the patient, wore appropriate laser safety goggles to prevent ocular injury from laser exposure. The laser technique ensured precision, reduced postoperative discomfort, and promoted faster healing compared to conventional surgical methods.

PREOPERATIVE And SURGICAL

Figure1 *Frenum Attachment on papilla*

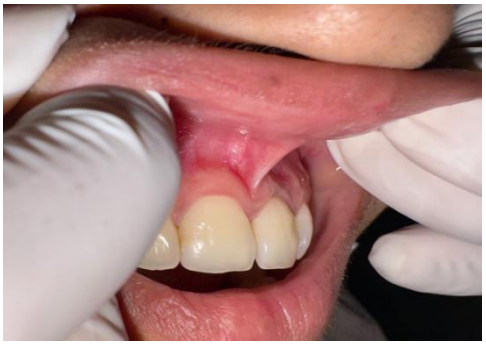

Figure 2 *Lateral view of frenum*

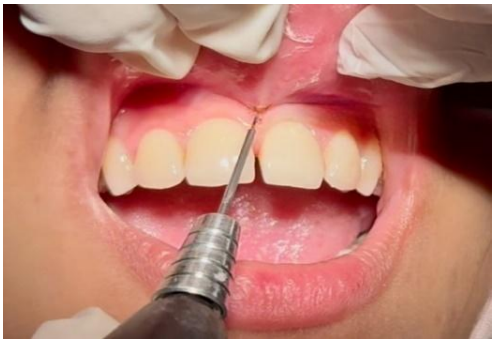

Figure 3 *Frenectomy Performed through Laser*

Figure 4 *Post Operative*

POST OPERATIVE

Figure 5 15 Day Post operative

Figure 6 1Month Post Operative

DISCUSSION

Lasers are becoming increasingly popular in the Field of dentistry providing alternative to conventional scalpel procedures. In recent years, lasers such as Nd:Yag, Er, diode, and diode in conjunction with Er:Yag have been used for frenectomy.

The diode laser was first introduced in the mid-1990s.[7] It utilizes a solid-state active medium made up of semiconductor crystals, typically comprising elements such as aluminum or iridium, gallium, and arsenic. Diode lasers operate within a wavelength range of 810 to 1064 nm. These lasers are particularly suited for soft tissue procedures, as their wavelengths closely match the absorption characteristics of pigmented tissues, including those rich in hemoglobin, melanin, collagen, and other chromophores.[8]

Diode lasers are gaining preference over traditional surgical methods due to their minimally invasive nature, which leads to decreased postoperative swelling. By sealing nerve endings during the procedure, they help minimize the inflammatory response. Additionally, the formation of a protective protein layer over the surgical site shields the wound from external irritants, resulting in reduced postoperative discomfort and often eliminating the need for pain-relieving medications. Photothermal interaction with tissue is the basic concept of surgical laser. In this process, radiant light is absorbed by the tissue and transformed to heat energy changing tissue structure. Laser light within is converted to thermal energy on contact with the tissue, causing laser tissue interaction, which when appropriately applied can produce reactions ranging from the incision, vaporization, to coagulation.[9]

Another clinical advantage is the decreased need for suturing. With effective hemostasis achieved through laser coagulation, most cases do not require sutures, simplifying postoperative care and reducing chair time. Furthermore, diode lasers have been associated with lower risks of infection and faster wound healing compared to conventional techniques.[10]

From a patient management perspective, laser frenectomy is generally well-tolerated, especially when combined with appropriate anesthesia protocols. The procedure can be performed efficiently, often in a single visit, and with reduced psychological stress for patients, particularly children or those with dental anxiety.

In the present case, the patient had no intraoperative complication such as pain, swelling, or bleeding, which is in accordance to many studies and reports (Aldelaimi and Mahmood)[11] reported that of 25 patients only two experienced mild pain during first 3 days postoperatively and were given analgesics.

In this case , near-complete healing was seen in 15 days and complete healing with no scar was seen after 1-month follow-up.

CONCLUSION

Frenectomy performed using a diode laser offers a highly effective, minimally invasive alternative to conventional surgical methods. Its ability to provide precise soft tissue cutting with excellent hemostasis, minimal postoperative pain, and reduced need for sutures makes it a preferred choice in clinical practice. The additional benefits of decreased inflammation, faster healing, and improved patient comfort further support its use. With proper technique and adherence to safety protocols, diode laser

frenectomy ensures predictable outcomes and enhances the overall patient experience in soft tissue management.

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