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ORIGINAL ARTICLE

Evaluation of patient perceptions after labial frenectomy procedure: A comparison of diode laser and scalpel techniques

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ABSTRACT

Background: Frenectomy is the complete excision of the frenum along with its attachment to the underlying bone. It can be done by conventional technique, electrosurgery or soft tissue lasers. **Aim:** To evaluate the effects of diode laser and scalpel technique on degree of post-operative pain and discomfort experienced by patients on the 1st, 3rd and the 7th post-operative days after frenectomy. **Materials and Methods:** Ten patients who required frenectomy were randomly assigned to undergo treatment with diode laser or scalpel. The data were analyzed with paired *t*-test and intragroup comparison was determined by ANOVA. **Results:** Intergroup comparison of the mean VAS scores for discomfort and pain for both the groups showed significant difference. The VAS scores of pain and discomfort within scalpel group between 1st and 3rd day did not show any significant difference, however between 7th day versus 3rd and 1st day difference was highly significant. The VAS scores of pain and discomfort within laser group between all the days showed significant difference. **Conclusion:** Taking into consideration the clinical outcome, the diode laser is a dependable alternative as it is an efficient and satisfactory option for procedures like frenectomy.

Key words
Diode laser, frenectomy, scalpel

INTRODUCTION

A frenum is a fold of mucous membrane, generally through enclosed muscle fibers, that attaches the lips and cheeks to the alveolar mucosa and/or gingiva and underlying periosteum.[1] A frenum that is closely attached to the gingival margin would compromise the health of the gingiva either by not permitting proper placement of a tooth brush resulting in poor oral hygiene practice and by muscle pull leading to opening of the gingival sulcus eventually leading to gingival recession and midline diastema, which may be of high esthetic concern and sometimes leading to speech difficulties.[2] The facial surface between the maxillary and mandibular central incisors along with canine and premolar areas is the area that is most prone to frenal problems.[3]

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Removal of the abnormal frenum is facilitated by either frenotomy or frenectomy. Frenotomy is the incision and relocation of the frenal attachment, whereas frenectomy is the complete excision of the frenum along with its attachment to the underlying bone.[2] Frenectomy can be done by conventional technique, electrosurgery or soft tissue lasers.[4,5] Among the various lasers, CO_2 and neodymium-doped yttrium aluminum garnet (Nd: YAG) have been quite efficient in soft tissue surgeries such as gingivectomy, frenectomy etc.,[6,7] The aim of this study was to evaluate the effects of diode laser or scalpel technique on the degree of postoperative pain and discomfort experienced by patients on the 1st, 3rd and the 7th postoperative days after frenectomy.

MATERIALS AND METHODS

The study sample was selected from among patients who had been referred to various private clinics between July 2013 and September 2013. Systemically healthy patients with maxillary papillary or papillary penetrating type frenal attachment were only included.

Ten patients who required frenectomy were randomly assigned to undergo treatment with diode laser or scalpel group with five patients in each group. Informed written

consent was obtained from all the patients. Six males and four females with age ranging from 18 to 30 years were included in the study.

For the conventional technique, after sufficient anesthesia was achieved once the area was anesthetized with 2% lignocaine with 1:80,000 adrenaline [Figure 1], the frenum was held with a hemostat engaging to its full depth and excision was carried out removing the frenum along with its alveolar attachment using a No. 15 blade [Figure 2]. The wound was closed using 3-0 silk interrupted sutures [Figure 3].

For the laser technique, a diode laser (Sunny, MSI, Bengaluru) with an 808 nm wavelength was used. A 300 μm fiber with an initiated tip at 1.5-2 W continuous mode was used. Prior to the laser assisted excision procedure, surface anesthesia was achieved with a topical gel applied with small cotton pellets over the frenum [Figure 4]. For patients who still had complained of pain during the procedure, a small amount of local anesthetic was infiltrated in the vicinity of the frenum. After the frenum was engaged with a pair of hemostats, the laser fiber tip was used in a contact mode and moved, in a paint brush stroke, from the base to the apex of the frenum thereby excising it. Postirradiation with the laser tip, any remnant fibers over the periosteum were removed by gently sweeping the laser tip at a reduced power and the ablated remnant tissue was cleaned with gauze soaked in saline [Figure 5]. Sutures were not given post the laser treatment. Both groups received postoperative instructions and the use of any analgesic was left to the patient's discretion.

Method of scoring

The patients were asked to separately rate the pain and discomfort associated with eating and chewing on a 100 cm visual analog scale (VAS) immediate postoperatively, 3rd day and 7th day.

The patient was asked to make a vertical mark between two endpoints on the pain scale. Related to the pain scale, the left end point was nominated as "no pain," whereas the right end point was nominated as "worst pain imaginable." Regarding the discomfort scale associated with chewing and speech, the two endpoints were nominated as "no discomfort" on the left side and "extreme discomfort" on the right side. A single trained operator was engaged in recording the scores.

Statistical analysis

Statistical analysis was performed using IBM Statistical Program for Social Sciences Version 17.0 (SPSS Inc, Chicago Illinois, USA). The statistical significance of data for all pain and discomfort scores between the groups was determined by the paired *t*-test and intragroup

Figure 1: Preoperative figure showing papillary penetrating frenum

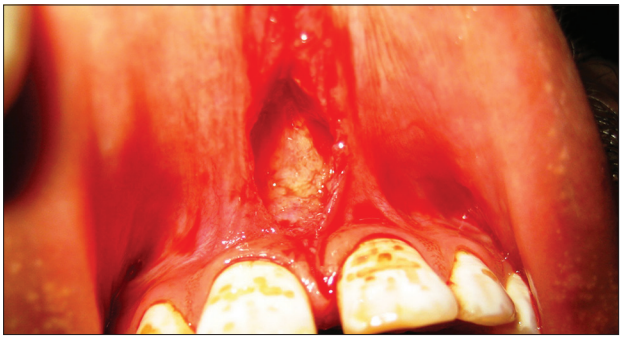

Figure 2: After excision of the frenum with scalpel

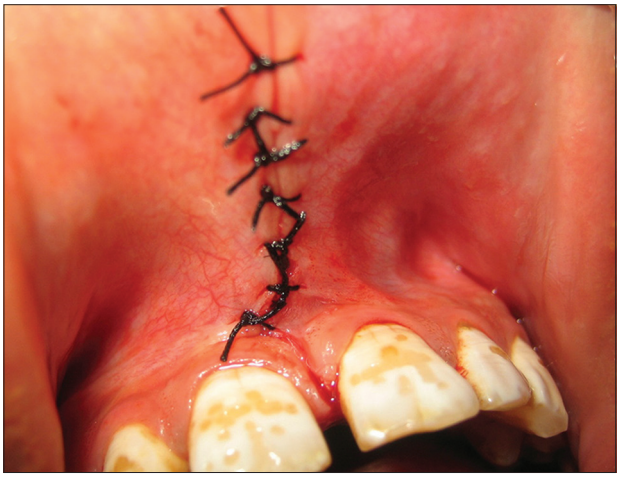

Figure 3: Suturing of the site

Figure 4: Preoperative figure showing papillary penetrating frenum

comparison was determined by ANOVA. Changes were considered significant at the $P < 0.05$ levels and highly significant at the $P < 0.001$.

RESULTS

A total of 10 subjects were enrolled in the study and all of them completed both the comparisons. Comparison of the mean VAS scores of the levels of pain, for both groups, observed on the 1st, 3rd and the 7th day of the study is summarized in Table 1 and Figure 6. Analysis showed that there was a significant difference in VAS scores of pain, when both the treatment methods are compared on the 1st, 3rd and the 7th day ($P < 0.05$), with the laser group displaying significantly lower VAS scores.

Comparison of the mean VAS scores for discomfort associated with speaking and chewing, for both groups, observed on the 1st, 3rd and the 7th day of the study is summarized in Table 2 and Figure 7. Further analysis suggested that there was a significant difference of the VAS scores of discomfort associated with chewing and speaking between both groups on the 1st, 3rd and the 7th days, with the laser group displaying significantly lower VAS scores.

Table 3 analyzes the intragroup comparison of pain and discomfort VAS scores within the scalpel group. The VAS scores of pain and discomfort on the 3rd day did not show any significant difference when compared with those on the 1st day. However, when the scores from the 7th day were compared with those on the 3rd and the 1st day, a highly significant difference was found ($P < 0.001$).

Table 4 analyzes a similar comparison within the laser group. However, within the laser group, the difference in the VAS scores of pain and discomfort on the 1st, 3rd and the 7th days, when compared with one another, were found to be highly significant ($P < 0.001$).

Table 1: Intergroup comparison of VAS scores of pain (between groups comparison)

	Scalpel	Laser	*P* value
1st day	87.6000±5.59	65.00±4.30	0.002*
3rd day	79.800±7.91	37.40±5.45	0.005*
7th day	37.0000±4.69	13.8±3.86	0.02#

*P<0.001: Statistically highly significant, #P<0.05: Statistically significant. VAS - Visual analog scale

Table 2: Intergroup comparison of VAS scores discomfort (between groups comparison)

	Scalpel	Laser	*P* value
1st day	81.8000±4.96	53.80±4.86	0.001*
3rd day	74.6000±4.72	30.80±6.79	0.001*
7th day	21.0000±2.91	7.40±2.40	0.001*

*P<0.001: Statistically highly significant. VAS - Visual analog scale

DISCUSSION

Patients who undergo conventional frenectomy procedures using a scalpel often experience postsurgical pain and discomfort, which is further aggravated when sutures come in contact with food. One feasible alternative that can be considered is a laser, as it offers various advantages, that is, relatively bloodless surgery, sterilization of wound, no suturing required in most cases, less surgical time, periodontal dressing not required, less postsurgical pain and discomfort and increased patient acceptance.[8-11]

Figure 5: Excision of the frenum with laser

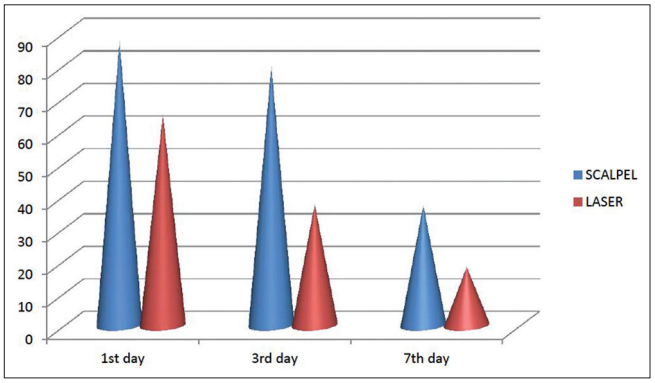

Figure 6: Intergroup comparison of visual analog scale scores of pain

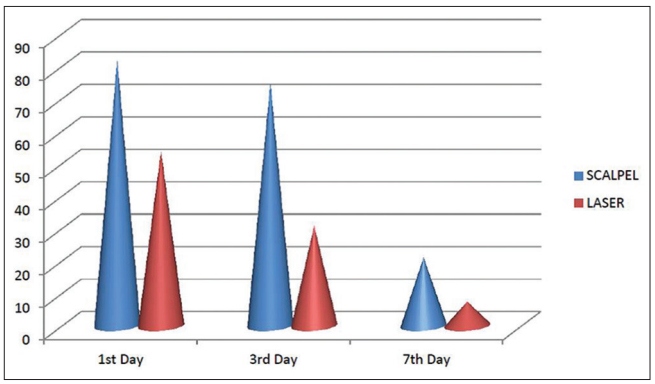

Figure 7: Intergroup comparison of visual analog scale scores of discomfort

Lasers such as Nd: YAG, Co_2, and erbium: YAG had been used for frenectomy procedures. Among these, Co_2 laser was the most frequently used one. In the present study diode laser, which characteristically uses a blend of gallium, arsenide, and other elements such as aluminum and indium was used. The wavelength of this laser is feebly absorbed in water, but extremely absorbed in hemoglobin and other pigments. As diode laser is considered as an excellent soft tissue laser as it doesn't interact with dental hard tissues. Smaller size of units and lower financial costs are few other advantages.[12]

There are indeed a not many studies comparing the postoperative effects of diode laser and scalpel postfrenectomy. Kara[13] compared Nd: YAG laser to conventional scalpel surgery and reported that patients treated with laser reported higher levels of satisfaction, less postsurgical pain and discomfort. Haytac and Ozcelik[6] compared 20 frenectomy procedures performed with Co_2 laser to an equal number performed with conventional scalpel surgery and reported that patients treated with laser experienced less pain after 1st day and 7th day.

In this study, it was observed that patients treated with the diode laser experienced less pain and discomfort when compared with those treated with scalpel. It has also been observed that the reduction in pain and discomfort levels from the 1st to the 3rd and further to the 7th day is much more significant for the laser group. The increased pain perception associated with the scalpel frenectomy might be attributed to the fact that it is a more intrusive surgical procedure involving blood loss, wide surgical wound and suturing [Figure 8]. The sutures also contribute to the discomfort postoperatively since they interfere with regular functions such as speech and intake of food.

On the contrary, the decreased pain and discomfort in the laser group might be ascribed to the protein coagulum formed over the wound, which acts like a biological dressing, aids in sealing of the ends of sensory nerves.[14,15] Absence of any sutures post the laser procedure might have contributed to lesser discomfort levels [Figure 9]. There have been a number of prior studies that corroborated that lasers cause less bleeding with minimal scarring, less postoperative pain and a minimal number of cases requiring suturing with quicker wound healing.[7-10]

Although the decision to use an analgesic was left to the patient's discretion, an observational study was done to analyze the use of analgesics in both the groups. The

Figure 8: One week postoperative view of the site

Figure 9: One week postoperative view

Table 3: Intragroup comparison of VAS scores of pain and discomfort in scalpel group (intragroup comparison)

Scalpel group	Pain	Comparision	*P* value	Discomfort	Comparision	*P* value
1st day	87.6000±5.59	1st day versus 3rd day	0.159#	81.8000±4.96	1st day versus 3rd day	0.052
3rd day	79.800±7.91	3rd day versus 7th day	0.001*	74.6000±4.72	3rd day versus 7th day	0.001*
7th day	37.0000±4.69	1st day versus 7th day	0.001*	21.0000±2.91	1st day versus 7th day	0.001*

#*P*>0.05: Statistically not significant **P*<0.001: Statistically highly signifi cant. VAS - Visual analog scale

Table 4: Intragroup comparison of VAS scores of pain and discomfort in laser group (intragroup comparison)

Laser group	Pain	Comparision	*P* value	Discomfort	Comparision	*P* value
1st day	65.00±4.30	1st day versus 3rd day	0.001*	53.80±4.86	1st day versus 3rd day	0.001*
3rd day	37.40±5.45	3rd day versus 7th day	0.001*	30.80±6.79	3rd day versus 7th day	0.001*
7th day	18.0±4.0	1st day versus 7th day	0.001*	7.40±2.40	1st day versus 7th day	0.001*

**P*<0.001: Statistically highly significant. VAS - Visual analog scale

study revealed that among the five patients considered for each group, only one patient (20%) from the laser group used an analgesic whereas three (60%) of the scalpel group patients used an analgesic.

CONCLUSION

The results presented in this paper support the use of diode lasers in soft tissue procedures like frenectomy. Diode lasers provide better patient perception in terms of reduced operative time, pain, and discomfort than that obtained by the scalpel technique. Taking into consideration the admirable clinical outcome, the diode laser is a dependable alternative as it is an efficient, secure, and satisfactory option for soft tissue surgeries like frenectomy.

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