ORIGINAL RESEARCH PAPER

Volume-7 | Issue-10 | October-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION OF HEALING FOLLOWING LABIAL FRENECTOMY: A COMPARISON OF SCALPEL, ELECTROSURGERY AND DIODE LASER TECHNIQUES.

Periodontology

Dr. Madhuri Kotha MDS Private Practice, Bangalore.Department of Periodontology, RajaRajeswari Dental College & Hospital, Bangalore.

Dr. Rekha BM MDS Private Practice, Bangalore.Department of Periodontology, RajaRajeswari Dental College & Hospital, Bangalore.

Dr. Vinaya Kumar R* MDS Professor, Department of Periodontology, RajaRajeswari Dental College & Hospital, Bangalore. *Corresponding Author

ABSTRACT

Background: An aberrant frenum can initiate periodontal infection and therefore this mucogingival discrepancy has to be corrected by frenectomy/frenotomy to maintain health. The aim of our study was to assess the healing outcome following frenectomy done using the scalpel, electrosurgery and diode laser.

Materials and Methods: Fifteen patients with aberrant frenal attachment were recruited. They were randomly assigned to undergo frenectomy by one of the three procedures (n=5x3). Group I was treated with scalpel, Group II by electrocautery and Group III with laser. The healing was assessed by the Landry, Turnbull and Howley Index.

Results: The results indicated a statistically significant improvement in healing in all the groups with highly significant improvement noted in the laser group (P<0.001).

Conclusion: Based on our findings, the diode laser seems to be ideal for frenectomy. Although the scalpel and electrosurgery techniques exhibited similar results, the laser's added clinical benefits ensure better patient experience.

KEYWORDS

Frenectomy, Scalpel, Electrosurgery, Laser, Healing.

INTRODUCTION

The word frenum is derived from the Latin word 'frēnum' which means bridle.[1] A frenum is a fold of mucous membrane, usually with enclosed muscle fibers, that attaches the lips and cheeks to the alveolar mucosa and/or gingiva and underlying periosteum.[2] If adequate gingiva is present coronal to the frenum, there is usually no need to remove it surgically. However, an abnormal frenum is capable of initiating periodontal disease by retracting healthy gingival margins and hence must be removed. If left untreated, it can result in gingival recession, diastema formation or accumulation of debris by reflection and opening of the sulcus. The frenum must also be removed when it is thick and wide as it may interfere with optimal mechanical plaque control, thus promoting inflammation and periodontal breakdown, or when it will hinder orthodontic movement.[3]

Depending on the attachment of fibers, frenum has been classified as follows:

- Mucosal: Fibers that are attached upto mucogingival junction
- Gingival: Fibers inserted within attached gingiva
- Papillary: Fibers extended into interdental papilla
- Papilla penetrating: When the fibers cross the alveolar process and extend up to the palatine papilla.[4]

Frenectomy and frenotomy are surgical procedures that differ in degree.[2] Frenectomy is the complete removal of the frenum, including its attachments to the underlying alveolar process while frenotomy is the simple excisional release of the frenum from the apex of its insertion to its base and down to the alveolar process.[3] In the past, the most common surgical procedure was frenectomy, an excision-type operation, which was often carried over to the palatal aspects. However, a frequently observed complication may be an undesirable loss of the interdental papilla between the maxillary central incisors. For this reason, the frenotomy, which represents a more gentle operation, will produce esthetically preferable results. With frenotomy, the attachment of the frenum to gingiva and periosteum is severed, and the insertion of the frenum is relocated several millimeters up on to the alveolar mucosa.[5]

Frenectomy can be done by conventional scalpel technique, electrosurgery, or soft tissue lasers.[4] However, each of the techniques differ from the following perspectives: anesthetic requirements, cutting characteristics, hemostasis, healing time, undesirable effects and cost involved.[6] Traditionally, the tool of choice for surgical incision has been the scalpel owing to its advantages of user-friendliness, cost effectiveness, precision, control, conservation of tissue integrity and superior associated wound healing.[6,7] Disadvantages of the scalpel include greater requirement of anaesthesia, necessity of suturing, poor hemostasis which obscures the operative field, adverse post-operative sequelae such as pain, swelling and discomfort.[8] Electrosurgery has been used since 1928 in dentistry for a variety of soft tissue procedures. Their coagulative effect ensures a bloodless area and clear view of the operative field. However, the thermal injury resulting from heat dissipation may result in delayed healing and increase the risk of wound dehiscence.[9]

Lasers are rapidly replacing the traditional treatment modalities due to their advantages of improved precision and visualization, minimal or no bleeding, reduced patient discomfort, shorter healing time and no unfavourable post-operative sequelae. Lasers, such as the Nd:YAG, CO_2 and Er:YAG lasers are minimally invasive in soft tissue procedures such as frenectomy. Diode lasers are semiconductor and indicated for soft tissue surgeries as their wavelength approximates the absorption coefficient of pigmented tissues containing hemoglobin, melanin and collagen chromophores.[4]

The aim of the present study was to assess the healing outcome following frenectomy performed using the scalpel, electrosurgery and diode laser as well as document any adverse effects or complications arising from each of the above techniques.

MATERIALS AND METHODS

This clinical study was conducted between December 2015 and May 2016 at the Department of Periodontology, RajaRajeswari Dental College & Hospital, Bangalore. The research protocol was submitted to the Institutional Ethical Committee and Review Board and ethical clearance obtained.

Study Sample

For the study, patients with papillary or papillary penetrating type of frenal attachment in the maxillary anterior region were selected from the outpatient department of the hospital. A total of 15 patients (7 males, 8 females) with an age range of 20 to 60 years participated. The patients exhibited good oral hygiene and did not have any systemic disease(s).

Study Design

The selected subjects were randomly assigned to one of the following three treatment groups.

Group I - 5 subjects were treated with the traditional scalpel surgical technique
Group II- 5 subjects were treated with electrosurgery
Group III - 5 subjects were treated with diode laser

Surgical Procedure

Conventional scalpel technique:

The area was adequately anaesthetized with 2% lignocaine containing 1:80,000 adrenaline. The frenum was held with a hemostat engaging to its full depth and excision was carried out removing the frenum along with its osseous attachment using a #15 blade. The wound was closed with 3-0 interrupted silk sutures. A periodontal dressing was then used to protect the surgical site. The subjects were recalled on day 7 for suture removal and day 30 for review (Figure 1).

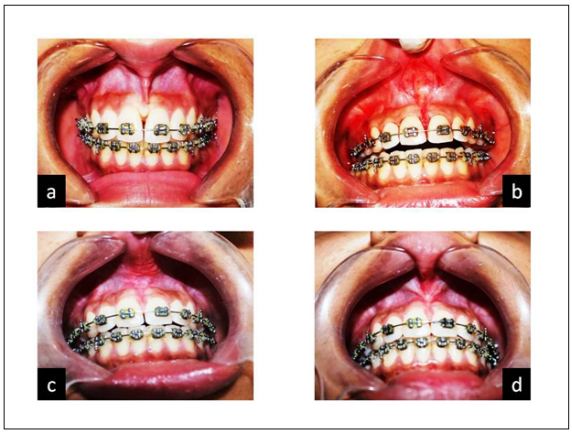

FIGURE 1. Case pictures of Scalpel group. a) Pre-operative b) Immediate post-operative c) 7-day post-operative d) 30-day post-operative

Electrosurgery:

The surgical site was locally infiltrated using 2% lignocaine with 1:80,000 adrenaline. The BONART electrosurgery unit (Model: ART-E1, Taiwan) was utilized for the procedure. The unit was turned on to cutting mode (CUT) and intensity set at 6 RF/2MHz. Using a fine wire electrode (T4), the frenum was excised upto the desired depth. In order to prevent heat buildup and unwanted tissue destruction the electrode tip was used intermittently in a 'shaving' motion and kept moving accompanied by irrigation with normal saline to allow adequate tissue cooling. Following electrosection, the unit was switched on to coagulation mode (COAG 1) and the heavy ball electrode (T9) was used to arrest any minor bleeding and achieve optimal hemostasis. The wound was then covered with a periodontal dressing. No sutures were placed and the wound was allowed to heal by secondary intention. The follow up assessment was scheduled on day 7 and 30 (Figure 2).

FIGURE 2. Case pictures of Electrosurgery group. a) Pre-operative b) Immediate post-operative c) 7-day post-operative d) 30-day post-operative

Diode laser excision:

2% lignocaine with 1:80,000 adrenaline was used to anesthetize the surgical area. A 970 nm diode laser (SIROLaser Xtend, Germany) at a power setting of 1.5 W was employed. A 400 µm initiated tip was used in contact mode, moving it in a 'paintbrush' stroke thereby excising the frenum from its base to the apex. After the desired excision was achieved, the wound was cleansed with saline soaked gauze and covered with a periodontal dressing. Similar to the electrosurgical technique, no sutures were required to be placed. The patients were recalled on day 7 and 30 for post-operative evaluation (Figure 3).

FIGURE 3. Case pictures of Laser group. a) Pre-operative b) Immediate post-operative c) 7-day post-operative d) 30-day post-operative

Assessment of Healing

Healing immediately following the procedure, at day 7 and 30 was assessed using the criteria of Landry, Turnbull and Howley (1988)[10] as follows:

Score	Interpretation	Parameters
1	Very Poor	• tissue colour: ≥50% of gingiva red • response to palpation: bleeding • granulation tissue: present • incision margin: not epithelialised, with loss of epithelium beyond incision margin • suppuration present
2	Poor	• tissue colour: ≥50% of gingiva red • response to palpation: bleeding • granulation tissue: present • incision margin: not epithelialised, with connective tissue exposed
3	Good	• tissue colour: ≥25% and <50% of gingiva red • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed
4	Very Good	• tissue colour: <25% of gingiva red • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed
5	Excellent	• tissue colour: all tissues pink • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed

Post-operative Instructions

For the patients of all the three groups, post-operative instructions were given as per the technique performed. They were instructed to take an analgesic (Divon Plus) should the need arise and report to the dental office in case of any complication/emergency.

STATISTICALANALYSIS

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) for Windows, Version 22.0 (IBM Corp, Armonk, NY). Descriptive analysis of all study parameters was done using mean, standard deviation for continuous data and frequency and percentage for categorical data. One-way ANOVA test followed by Bonferroni's Post hoc analysis was used to compare the mean wound healing scores between the three study groups. Repeated measures of ANOVA followed by Bonferroni's Post hoc analysis was used to

compare the mean wound healing scores between different time intervals within each group. The level of significance (P-value) was set at P<0.05.

RESULTS

All 15 patients (8 females and 7 males) who enrolled completed the study. Comparison of the study participants based on their demographic characteristics revealed no statistically significant difference (Table 1).

DISTRIBUTION OF STUDY PARTICIPANTS BASED ON THEIR DEMOGRAPHIC CHARACTERISTICS								
Variable	*Categories*	*Laser*		*E.Surgery*		*Scalpel*		*P-Value*
		Mean	SD	Mean	SD	Mean	SD	
Age	Mean & SD	29.6	17.1	29.0	4.0	25.2	5.8	0.78[a]
		n	%	n	%	n	%	
Gender	Males	2	40%	4	80%	1	20%	0.15[b]
	Females	3	60%	1	20%	4	80%	

Note: a. One-way ANOVA Test, b. Chi Square Test

TABLE 1. Demographic characteristics of the study participants

Comparison of mean wound healing scores at different time intervals within each group has been summarized in Table 2 and graphically depicted in Figure 4. Analysis showed that there was a statistically significant improvement in the wound healing scores from day 0 to day 30 in all the three groups with the improvement being highly significant in the laser group (P<0.001).

COMPARISON OF MEAN WOUND HEALING SCORES BETWEEN DIFFERENT TIME INTERVALS WITHIN EACH STUDY GROUP USING REPEATED MEASURES OF ANOVA FOLLOWED BY BONFERRONI'S POST HOC ANALYSIS									
Groups	*Time Intervals*	*N*	*Mean*	*SD*	*Std. Error*	*Greenhouse Geisser*		*Sig. Diff*	*P-Value*
						F	*P-Value*		
Laser	Day 0	5	2.0	0.0	0.0	61.000	0.001*	T1 Vs T2	1.00
	Day 7	5	2.2	0.4	0.2			T1 Vs T3	<0.001*
	Day 30	5	4.8	0.4	0.2			T2 Vs T3	0.009*
E. Surgery	Day 0	5	2.6	0.5	0.2	26.000	0.002*	T1 Vs T2	0.10
	Day 7	5	3.8	0.4	0.2			T1 Vs T3	0.001*
	Day 30	5	4.8	0.4	0.2			T2 Vs T3	0.10
Scalpel	Day 0	5	2.4	0.9	0.4	13.778	0.005*	T1 Vs T2	0.30
	Day 7	5	3.2	0.8	0.4			T1 Vs T3	0.01*
	Day 30	5	4.6	0.5	0.2			T2 Vs T3	0.16

Note: * - Statistically Significant, T1 - Day 0, T2 - Day 7, T3 – Day 30

TABLE 2. Comparison of wound healing scores between the study groups

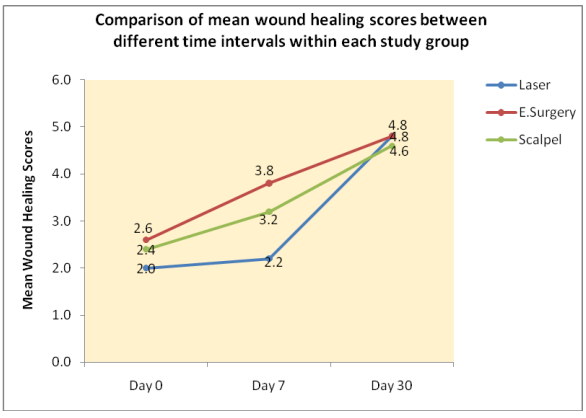

FIGURE 4. Comparison of mean wound healing scores between the study groups at different time intervals

Another interesting finding in our study was that the healing scores lagged initially (day 7) in the scalpel (3.2±0.8) and laser (2.2±0.4) groups when compared to the electrocautery (3.8±0.4) group. At the day 30 evaluation, the healing scores in both the laser and electrocautery groups were identical and higher (4.8±0.4) when compared to the scalpel group (4.6±0.5). However, this difference was not statistically significant.

DISCUSSION

Frenectomy performed using a surgical scalpel often results in post surgical pain and discomfort.[11] Thus, newer modes of treatment such as electrosurgery and lasers appear to be viable alternatives due to the following advantages: a clear operative field owing to their ability to achieve excellent hemostasis, sterilization of the wound site, suturing and periodontal dressing not essential in a majority of cases, reduced treatment time and unfavourable post-operative sequelae while achieving sizeable patient acceptance.[6,11]

Only a few studies are available in literature that have compared the healing following frenectomy done using the scalpel, electrosurgery and diode laser. Hence, this study was undertaken to address and evaluate this important aspect of patient management.

In our study, 80% of the patients in the laser and electrocautery groups showed excellent healing (Score 5) when compared to 60% only in the scalpel group demonstrating the superiority of the former two techniques when compared to the latter in performing frenectomy. Moreover, 2 patients in the scalpel group complained of pain and swelling in the immediate post-operative period which was not reported in either the electrocautery or laser group. This observation could be explained as follows. The invasiveness of the scalpel and the necessity of suturing when using the scalpel technique may be attributable to the greater incidence of edema and swelling seen.[12] On the other hand, a thin layer of denatured collagen forms on the surface of lased tissue that acts as a relatively impermeable membrane or dressing. This serves to reduce the tissue irritation from physical or biochemical agents resulting in minimal or no post-operative pain.[8]

The findings of our study are similar to a study done by Gandhi & Gandhi (2017) who undertook a study to compare the degree of healing in patients after frenectomy with surgical scalpel, electrocautery and diode laser. Other parameters such as bleeding, pain, swelling, presence of infection and patient comfort were also evaluated. Wound healing at 7th day and 1 month showed statistically significant difference for all the groups with better outcome in the laser group as patients in this group reported lesser post operative pain and required fewer analgesics as compared to the patients in the other two groups. Based on the above findings, the authors opined that diode lasers provide better patient perception and an efficient and satisfactory option for frenectomy.[13]

Studies have also been conducted to evaluate the effects of diode laser and scalpel technique on the degree of post-operative pain and discomfort experienced by patients after frenectomy. The patients rated the pain and discomfort experienced post-operatively on a Visual Analogue Scale (VAS). All the studies concluded that patients treated with the diode laser had lesser post-operative pain when compared to patients treated with the surgical scalpel technique. In addition, the patients treated with diode laser had fewer functional complications and required fewer analgesics when compared to those treated with the scalpel technique.[4,11,14]

Kafas et al (2009) performed upper labial frenectomy in a 9-year old patient using lidocaine spray but without infiltrated local anesthesia. They highlighted another distinct advantage of the diode laser by stating that diode laser frenectomy in pediatric dentistry is of great advantage as with the correct parameters needle infiltrated anesthesia can be avoided.[15]

Although the patients treated with electrocautery showed similar results to the laser with regards to healing in our study, electrosurgery has certain disadvantages such as inability to be used in patients with pacemakers and can cause greater tissue damage. On the basis of all the above findings, it can be concluded that the diode laser is a safe and effective treatment option for performing frenectomy in patients of all age groups.

REFERENCES

1. Random House Unabridged Dictionary. Random House, Inc. 2018 [internet]. Available from: https://www.dictionary.com/
2. Newman MG, Takei HH, Klokkevold PR, Carranza FA. Carranza's Clinical Periodontology. Volume II. 11th Edition, Elsevier, New Delhi. 2012. Pg 926.
3. Cohen ES. Atlas of Cosmetic and Reconstructive Periodontal Surgery. 3rd Edition, People's Medical Publishing House, Shelton, Connecticut. 2009. Pg 83.
4. Patel RM, Varma S, Suragimath G, Abbayya K, Zope SA, Kale V. Comparison of labial frenectomy procedure with conventional surgical technique and diode laser. J Dent Lasers 2015;9(2):94-9.
5. Lindhe J. Clinical Periodontology and Implant Dentistry. Volume 2. 5th Edition. Blackwell Publishing Ltd, Oxford. 2008. 1274-5.
6. Bashetty K, Nadig G, Kapoor S. Electrosurgery in aesthetic and restorative dentistry: A literature review and case reports. J Conserv Dent 2009;12(4):139-44.
7. Loh SA, Carlson GA, Chang EI, Huang E, Palanker D, Gurtner GC. Comparative

Healing of Surgical Incisions Created by the PEAK PlasmaBlade, Conventional Electrosurgery, and a Scalpel. Plast Reconstr Surg 2009;124(6):1849-59.
8. Shalawe WS, Ibrahim ZA, Sulaiman AD. Clinical Comparison between Diode Laser and Scalpel Incisions in Oral Soft Tissue Biopsy. Al–Rafidain Dent J. 2012;12(2):337-43.
9. Funde S, Baburaj MD, Pimpale SK. Comparison between Laser, Electrocautery and Scalpel in the Treatment of Drug-Induced Gingival Overgrowth: A Case Report. IJSS Case Reports and Reviews 2015;1(10):27-30.
10. Landry RG, Turnbull RS, Howley T. Effectiveness of benzydamine HCl in the treatment of periodontal post-surgical patients. Res Clinic Forums 1988;10:105-18.
11. Butchibabu K, Koppolu P, Mishra A, Pandey R, Swapna LA, Uppada UK. Evaluation of patient perceptions after labial frenectomy procedure: A comparison of diode laser and scalpel techniques. Eur J Gen Dent 2014;3(2):129-33.
12. Awooda EM, Osman B, Yahia NA. Use of Diode Laser (810) nm in Frenectomy. Sudan JMS 2007;2(1):45-7.
13. Gandhi D, Gandhi P. Comparison of Healing Period after Frenectomy Using Scaplel, Electrocautery and Diode Laser. BJMMR 2017;21(12):1-9.
14. Kaur P, Dev YP, Kaushal S, Bhatia A, Vaid R, Sharma R. Management of the upper labial frenum: a comparison of conventional surgical and lasers on the basis of visual analogue scale on patients perception. J Periodontal Med Clin Pract 2014;1(1):38-46.
15. Kafas P, Stavrianos C, Jerjes W, Upile T, Vourvachis M, Theodoridis M, Stavrianou I. Upper-lip laser frenectomy without infiltrated anaesthesia in a paediatric patient: a case report. Cases J 2009;2:7138. doi: 10.1186/1757-1626-2-7138.