

Assessment of Healing Following Frenectomy Using Diode Laser and Conventional Scalpel: A Randomized Clinical Study

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Abstract

Aim: To assess healing following diode LASER for Frenectomy procedure and to compare it with the conventional scalpel procedure.

Materials and methods: A total of 20 patients for whom Frenectomy was indicated were randomly assigned to two treatment groups; Group A (10 patients) treated with diode LASER and Group B (10 patients) treated with a scalpel. The postoperative healing was assessed for each patient using early wound healing index 7th day post-operatively and at the end of 21st day.

Results: Analysis of intergroup results for healing index between LASER and conventional scalpel group showed statistically significant difference ($p < 0.004$) after 1 week but did not show any statistically significant difference at the end of 21st day ($p < 0.081$).

Conclusion: Within the limitations of present study, diode LASERS provide efficient and satisfactory healing following Frenectomy procedure. Further longitudinal studies with larger sample size are required to confirm the results of present study.

Keywords: Frenectomy, Scalpel, Diode LASER, Healing

Introduction

A frenum is a fold of mucous membrane enclosing the muscle fiber that attaches the lips and cheeks to the

alveolar mucosa and / or gingiva and underlying periosteum. Its primary function is to provide stability of the upper and lower lip and the tongue. Contents of frenum are variable amount of loose connective tissue with elastic and dense collagen fibres, fat cells, occasionally acini of mucous producing salivary glands and muscle fibres.

The frenum is shielded by means of stratified layered epithelium which contains vascular structures with thin peripheral nervous ramifications. Papillary and papilla penetrating frena are considered as pathological as they have been found to be associated with loss of papilla, recession, diastema, difficulty in brushing, malalignment of teeth, compromising the denture fit or retention leading to psychological disturbances to the individual. In order to facilitate maintenance of proper oral hygiene and to prevent gingival recession, Frenectomy can be carried out either by conventional scalpel technique, electro surgery or by using LASERS [1]. The conventional technique comprises excision of the frenum by using a scalpel. Conversely, it carries the routine risks of surgery like bleeding and patient compliance with favorable healing.

The role of LASERS in dentistry is well-established in traditional management of oral diseases. The leading LASER demonstrated by Robert N. Hall in 1962 stayed a

diode laser, which is a solid-state semiconductor LASER that classically uses a combination of Gallium (Ga), Arsenide (Ar), and supplementary elements, such as Aluminum (Al) and Indium (In), to change electromagnetic energy into heat. The diode LASER is being one of the most employed, as it provides numerous advantages compared to the conventional scalpel or other types of LASERs. It is usually operated in contact mode by means of a flexible fiber optic delivery system that emits in continuous- wave or gated- chopped modes. Diode LASERs allows soft-tissue manipulations such as gingival recon touring, operculectomy, or Frenectomy accompanied by improved epithelization and wound healing.

So the aim of the study was to assess the healing following diode LASER for Frenectomy procedure and to compare it with the conventional scalpel procedure.

Materials and Methodology

A comparative clinical study was conducted in the Department of Periodontology, FDS, Ramaiah University of Applied Sciences, Bangalore from August to November, 2018 with a sample size of 20 patients (Group A-10 patients; Group B-10 patients). 20 patients who were indicated for Frenectomy were randomly divided into 2 groups by toss of coin method. Ethical clearance and written informed consent from the patients were obtained.

Inclusion & Exclusion criteria

Inclusion criteria

- Patients indicated for Frenectomy
- Good oral hygiene at the time of the surgery
- Systemically healthy subjects

Exclusion criteria

- History of smoking
- Pregnancy or lactation
- Use of antibiotics in the past 6 months

Clinical procedure for LASER and Scalpel Frenectomy

Scaling and root planning was carried out for all the patients and were recalled and evaluated for frenectomy procedure after a week. A complete blood picture was advised for all the patients prior to the procedure.

Group A (LASER Group) - Diode LASER emitting 980 nm was used where preset value was adjusted: Power of 2.00 watt, pulsed contact mode, continuous pulse duration, and pulse interval of 1.00ms. Safety measures were taken for operator, patient and assistant by wearing the recommended LASER protective eyewear. High speed suction and clinical masks was used to prevent infection from the LASER plume. For Frenectomy, local anesthetic infiltration using 2% Lignocaine with adrenaline 1:200,000 was administered adjacent to the frenum attachment. Blunt end of the probe was used to check for the objective symptoms. After the area was anesthetized, the incision was carried out using LASER tip. The intervening labial frenum was released from its apex to the base by giving brush strokes. After excision, the surgical site was wiped off with cotton pellet soaked in normal saline. The entire procedure was painless with no bleeding and lesser intra-operative time. Thus, there was no need for sutures (Fig 1a to 1e).

Group B (Scalpel group) - Conventional scalpel technique was used for Frenectomy. Under local infiltration, the aberrant frenum was held with a pair of hemostats, and the whole band of tissue together with its alveolar attachment was excised with a no.15 blade. The remaining fibrous adhesions to the underlying periosteum were removed. After the bleeding was controlled, the wound was closed with 3-0 silk sutures and periodontal dressing (COE-PAK™) was given (Fig 2a to 2e). Both groups received postoperative instructions and analgesics were prescribed

to be taken as needed. On 7th and 21st day postoperatively, the healing was assessed using early wound healing index (Table 1).

Statistical Analysis

Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 released 2013. Armon, NY: IBM Corp was used to perform statistical analysis. Intergroup comparisons for healing scores were done using Mann-Whitney U test. The frequency distribution for categorical data was expressed in terms of number & percentage, whereas for continuous data, it was expressed in frequency, mean, and standard deviation (SD). The level of significance was set at $p < 0.05$.

Results

20 patients completed the follow up who had enrolled for the study. Patients were recalled on the 7th day post-operatively and at the end of 21st day for evaluation of healing using early wound healing index scores. Table 1 represents the early wound healing index scores by Landry et al and Table 2 depicts the interpretation of percentage of Early Wound Healing Index Scores between LASER and scalpel groups which indicated that 50% of Group A patients (LASER) showed very good early healing results and 60% of Group B patients (Scalpel) showed good healing results. Intergroup comparison of early healing index scores between diode LASER and conventional scalpel group 7th day post-operatively and 21st day post operatively is summarized in Table 3. Comparison of mean scores of early wound healing index between the 2 groups after diode LASER and conventional scalpel techniques were analysed using Mann Whitney U test as summarized in Graph 1.

Analysis of the intergroup results for healing index between LASER and scalpel group showed statistically significant difference ($p < 0.004$) after 1 week but did not

show any statistically significant difference after 21st day of evaluation ($p < 0.081$).

Discussion

In the era of periodontal plastic surgery, techniques should be more conservative and precise to create more functional and aesthetic results. Frenectomy can be performed using various techniques like conventional scalpel technique, with electrocautery or with lasers. The soft tissue LASER and electrocautery is now a viable alternative to the scalpel in soft tissue surgery.

LASERs such as Diode, Nd: YAG, Co2 and Er: YAG had been used for Frenectomy procedures. In our study, Diode LASER has been used. Advantages of LASER for soft tissue cutting are as follows:

- Requires minimal tissue cutting
- No harm to dental hard tissues
- No injury to the dental pulp
- Can be used around dental implants
- Antimicrobial properties
- Removal of endotoxins from root surfaces
- Laser technology is considered state of the art by the lay public, so patients are more accepting its use in their treatment.

Frenectomy using Diode LASER (810nm) resulted in dry and bloodless field during operation, no post-operative swelling, no pain or discomfort with normal healing process [2]. A study by Gandhi et al in 2017 concluded that diode LASERs provide better patient perception and an efficient and satisfactory option for procedures such as Frenectomy. Diode LASERs provided better patient perception and wound healing at 7th day and after 1 month for both the groups which showed statistically significant difference with better outcomes in the Diode LASER group [3]. The clinical application of the diode LASER (980 nm) in Frenectomy procedure proved that it can be considered practical and easily acceptable by the

patients and can be used as an impressive alternative for conventional scalpel techniques^[4].

All the patients experienced normal healing process with no postoperative complications^[5]. Nd:YAG laser frenectomies resulted in reduced transoperative bleeding, avoiding the need for suturing, and promotes a significant reduction of surgical time in comparison with conventional surgery^[6]. Favorable outcomes of LASER surgery were observed on follow-up sessions. In our study, the healing was assessed by the early wound healing index given by Landry, Turnbull and Howley. 10% of Group A (LASER) patients showed excellent early wound healing, 50% showed very good healing whereas 10% patients showed poor results. 60% of Group B (Scalpel) patients showed good healing results whereas only 20% of the patients showed poor healing results. Analysis of the intergroup results for healing index between LASER and scalpel groups showed statistically significant difference ($p < 0.004$) after 1 week but did not show any statistically significant difference after 21st day of evaluation. Both the techniques showed effective post-operative healing with better outcomes in the LASER group after 1 week ($p < 0.081$).

A study using Nd-YAG LASER and scalpel concluded that the use of blade is preferable than Nd-YAG LASER as it is cost effective and both the techniques show same patient safety, comfort and similar outcomes which was in contrast to our study which showed that LASER group has better healing outcome when compared to conventional scalpel group^[7].

Conclusion

Within the limitations of the present study, it can be concluded that Diode LASER provides better patient comfort in terms of minimal intra-operative bleeding, pain, swelling, epithelization, infection, reduced operative time and better healing. Based on current findings and

clinical outcome, Diode LASERs provide efficient and satisfactory option for procedures Frenectomy.

Limitations and Future Recommendations

There is a need for further longitudinal studies with larger sample size to establish the exact efficacy of LASER technique over the conventional scalpel technique for Frenectomy procedure.

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Legends Figure and Table

Table 1: Early Wound Healing Index Scores By Landry Rg, Turnbull Rs, Howley T

Early wound healing index scores	Tissue Color	Response to palpation	Granulation tissue	Incision Margin	Suppuration
1-Very poor	>= 50% of gingiva red	Bleeding	Present	Not epithelialized, with loss of epithelium beyond incision margin	Present
2-Poor	>= 50% of gingiva red	Bleeding	Present	Not epithelialized, with connective tissue exposed	Absent
3-Good	>= 25% and < 50% of gingiva red	No Bleeding	None	No connective tissue exposed	Absent
4-Very good	< 25% of gingiva red	No Bleeding	None	No connective tissue exposed	Absent
5-Excellent	All tissues pink	No Bleeding	None	No connective tissue exposed	Absent

Table 2: Interpretation of Percentage Of Early Wound Healing Index Scores Between Laser And Scalpel Groups

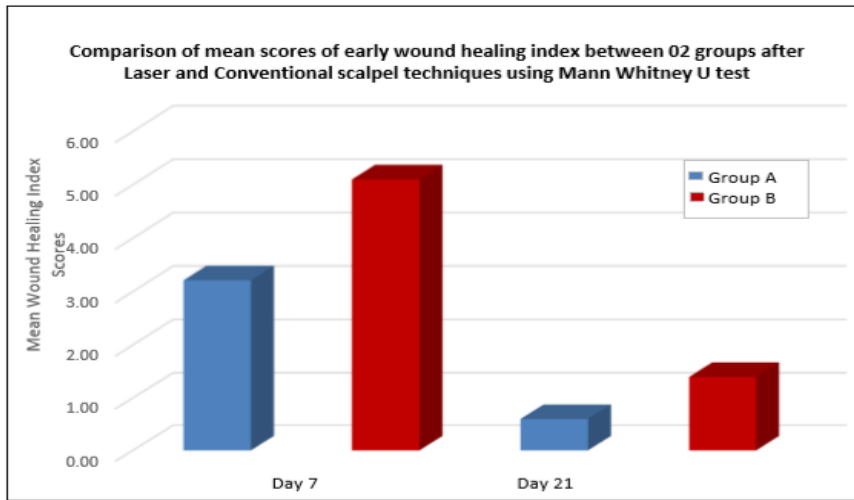
Early wound healing index scores	Group A (LASER)	Group B (Scalpel)
1-Very poor	0	0
2-Poor	10%	20%
3-Good	30%	60%
4-Very good	50%	20%
5-Excellent	10%	0

Table 3: Intergroup Comparison of Early Healing Index Scores between Laser and Conventional Scalpel Group 7 Days and 21 Days Post Operatively

Comparison of mean scores of early wound healing index between 02 groups after LASER and conventional scalpel techniques using Mann Whitney U test							
Time	Groups	N	Mean	SD	Standard Error Mean	p-Value	
Day 7	Group A	10	3.21	0.93	0.29072	0.004*	
	Group B	10	5.10	1.51	0.47132		
Day 21	Group A	10	0.60	0.41	0.16495	0.081	
	Group B	10	1.40	0.62	0.13373		

Note: Group A: LASER Group B: Conventional scalpel *- Statistically significant

Graph 1: Comparison Of Mean Scores Of Early Wound Healing Index Between 02 Groups After Laser And Conventional Scalpel Techniques Using Mann Whitney U Test



Figures



Fig 1a: Pre-op High maxillary labial frenal attachment Fig 1b: LASER application



Fig 1c: Immediate post-op Fig 1d: 7th day post-op



Fig 1e: 21st day post-op



Fig 2a: Pre-op High maxillary labial frenal attachment **Fig 2b: Immediate post-op**



Fig 2c: Interrupted sutures placed

Fig 2d: 7th day post-op



Fig 2e: 21st day post-op