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A COMPARATIVE EVALUATION: FRENECTOMY WITH CONVENTIONAL SCALPEL AND DIODE LASER TECHNIQUE

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ABSTRACT

Frenectomy is complete excision of the frenum attachment to the underlying bone. Conventional frenectomy with blade has been widely used; however, laser-assisted frenectomy is the most recent alternative. **Aim:-** The present study aims to compare two methods of frenectomy for the pain experienced, intraoperative bleeding, healing outcome, and need for analgesics. **Materials and Method:** Twenty patients with high labial frenum attachment requiring frenectomy were included in this study. Patients were randomly divided into Group A: scalpel group and Group B: Diode laser group. Visual Analog pain score, intraoperative bleeding, number of analgesics used, and healing outcome 3 months postoperatively were recorded. **Results:** Group B patients experienced less pain (P = 0.016), less bleeding (P = 0.016), and required fewer number of analgesics (P = 0.008). Healing outcome at 3 months showed no significant difference between the two groups (P = 0.095). **Conclusion:** Based on the results of this study, it can be concluded that Nd:YAG laser is an efficient and a more comfortable alternative to scalpel for frenectomy.

KEYWORDS: Frenectomy, Neodymium-doped yttrium aluminum garnet laser, Scalpel.

INTRODUCTION

Frenectomy involves the complete removal of the frenulum, including its attachments to the underlying alveolar process. Any abnormalities in the size and location of the frenulum can cause functional and esthetic problems which requires surgical excision.[1] The most common location for the development of frenum abnormalities are maxillary and mandibular central incisors and canine and premolar areas.[2]

These abnormalities can result in gingival recession, development of midline diastema, and speech difficulties. Blanch test is the most commonly used method for the diagnosis of high frenum attachment.[3] It involves application of tension over the frenum by pulling it and visually detecting the movement of papillary tip or any blanching produced. Various methods have been used for surgical excision of frenum including scalpel, electro cautery, and most recently lasers such as, Diode LASER CO_2, erbium (Er):yttrium aluminum garnet (YAG), and neodymium-doped YAG (Nd:YAG)[4] Choice of the method depends on the efficiency, effectiveness, and affordability. Diode laser with the wavelength of 980 nm has been used for the surgical management of soft tissues, such as incisional and excisional biopsies, ulcer treatment, gingivectomies, and frenectomy. It provides the advantage of good hemostasis and postoperative comfort. These advantages of Diode laser are well documented in literature, but there are a very few studies which compared this laser

technique with the conventional method for frenectomy. Hence, this study was conducted with the aim to compare scalpel and Diode laser-assisted frenectomy for the amount of intraoperative bleeding, pain during the procedure, healing outcome, and need for analgesics. These clinical parameters were studied as they determine the ease for the patient during the procedure and their acceptance for the method.

Twenty patients scheduled for frenectomy due to high frenum in the maxillary anterior region were selected for this study [Figures 1&2]. Patients were randomly divided into two groups by the flip of the coin technique, and written consent was obtained from each patient/guardian

1. Group A: Ten patients selected for the conventional scalpel technique
2. Group B: Ten patients selected for the Diode laser technique.

The entire procedure was explained to the patients and informed consent was obtained. A single operator performed all the frenectomies.

After proper clinical and hematological examinations, frenectomy was performed according to the conventional approach.[5] The frenum was engaged with a hemostat which was inserted into the depth of vestibule and incision were placed on the upper and under surface of the hemostat. A blunt dissection was done on the bone to relieve the fibrous attachment [figure 2]. The edges of diamond-shaped wound were sutured with interrupted sutures (nonresorbable 4-0 braided silk [Ethicon, Johnson & Johnson limited, USA]) [figure 3]. The area was covered with a periodontal pack. After surgery, the patients were advised to be on soft/liquid diet for 1 week. Post 1 week, sutures and Coe-pak were removed. Tablet Ibuprofen 400 mg + paracetamol TID and tablet amoxicillin 500 mg TID for 5 days were prescribed.

Conventional frenectomy

Fig 1: Pre operative.

Figure 2: Interoperative.

Figure 3: Suturing done.

Figure 4: Post operative.

For the laser group, DIODE LASER with 980 nm wavelength was used. Topical spray (Nummit spray, lidocaine USP 15% w/w) was used to obtain surface anesthesia. A 300-µm fiber tip was used at power setting of 4 W in contact mode and moved with a paint brush stroke, from the base to the apex of the frenum, thereby excising it [Figures 5]Sutures were not used in this group. Similar postoperative instructions were delivered to the patients of both the groups. The use of analgesic containing Ibuprofen 400 mg + paracetamol was left to the patient's discretion and to be taken as and when needed. Each of the patients was recalled 3 months after the surgery to determine the healing outcome [FIGURE 6]

Laser frenectomy

Scoring of pain

Visual Analog Scale (VAS) was used to rate the pain experienced by each patient. Immediately after the procedure, each patient was asked to make a vertical mark on a 10-cm VAS. On the pain scale, the left end point indicated "no pain," whereas the right end point indicated "worst pain imaginable."[6]

Sevaerity of bleeding

The severity of bleeding was recorded by the operator by scoring the amount of bleeding during the procedure for each patient (1: none, 2: mild, 3: moderate, and 4: severe).[7]

Wound healing

Three months postoperatively, each patient was recalled to determine the wound healing. For each patient, the healing was scored as 1: complete epithelialization, 2: incomplete epithelialization, 3: ulcer, and 4: tissue defect or necrosis.[8]

Number of analgesics

Each of the patients during the recall appointment was questioned about the number of analgesics used during the healing phase. The entire scoring process was done by a single operator trained for the purpose.[9]

Statistical analysis

A statistical analysis was performed using the Statistical Package for the Social Sciences software version 19 (IBM Corporation, Armonk, New York, USA). Since the data were not distributed normally, nonparametric tests were chosen. For intergroup comparisons, Mann–Whitney U-test was used. Results were represented as median and range, $P < 0.05$ was considered statistically significant.

RESULTS

Median and range for each parameter were used to compare both the groups. Comparison of the median and range for VAS score, intraoperative bleeding, healing outcome, and number of analgesics used is summarized in Table 1. The analysis showed that VAS score for pain was significantly lower in the laser group as compared to the scalpel group ($P = 0.016$). Intraoperative bleeding scores were found to be significantly higher for Group A than Group B ($P = 0.016$). Furthermore, the number of analgesics used by patients in Group A was significantly higher ($P = 0.008$) than by patients in Group B. The comparison of healing outcomes 3 months postoperatively showed no significant difference between the two groups ($P = 0.095$).

Parameter	Group	Median	Range	Significant P (Probability value)
Vas scale	A	2	2-3	0.016
	B	1	1-2	
Bleeding	A	2	2-3	0.016
	B	1	1-2	
Healing Outcome	A	2	1-2	0.093
	B	2	2-3	
No. of analgesics used	A	2	2-3	0.008
	B	1	0-1	

DISCUSSION

Abnormalities in the size and location of frenum lead to the development and persistence of midline diastema, gingival recession, and speech problems. Such conditions require complete excision of the frenum attachment to the underlying alveolar process. Surgical scalpel is the most commonly used method for frenectomy. Scalpel-assisted frenectomies are associated with postoperative pain and discomfort. This procedure also requires sutures which may lead to greater complications when sutures come in contact with the food. Soft tissue laser is a viable alternative to scalpel for such surgeries because laser treatment does not require sutures in most cases, reduction in surgical time, less postsurgical pain and discomfort leading to increased patient acceptance.[10]

This study was conducted with an aim to compare laser and scalpel technique for frenectomy procedure for the amount of intraoperative bleeding, pain during the procedure, wound healing, and number of analgesics used. These clinical parameters were selected and compared as they determine the ease of the procedure and the patient acceptance for the technique.

Various lasers such as DIODE, Nd:YAG, CO_2, and Er: YAG had been used for frenectomy procedures. In this study, DIODE laser has been used because of its ability to penetrate deep into the tissue which makes this laser ideal for soft-tissue procedures such as frenectomy, gingival curettage, and depigmentation.[11,12] Other benefits of using this laser include reduction in postoperative pain and infection, reduced postoperative inflammation, sutures are not required, resulting contraction and scarring is minimal, and there is no need for local anesthesia.[13]

In this study, laser group patients recorded significantly lower VAS score and used lesser number of analgesics than the scalpel group, indicating that laser group patients experienced less pain during the procedure and post-operative time. This result was found to be consistent with the results of study by Butchibabu *et al*. who suggested that laser-assisted frenectomies result in greater patient acceptance due to reduced pain perception during the procedure and during the postoperative periods.[12]

Decreased pain perception may be attributed to coagulation of protein at the wound surface which acts as a biological dressing, thus sealing the ends of the sensory nerves.[14,15] In addition, the postoperative periods were more comfortable for the laser group with minimal or no pain indicated by the minimal use of analgesics. This is because laser causes minimal collateral damage, and also brings about sealing of lymphatics. Furthermore, a fibrin clot forms over the surgical site which protects it from external irritation.[16]

Increased pain was experienced with the use of scalpel, which can be a result of involvement of extensive surgical site causing greater loss of blood, wider wound, and need for suturing. Sutures can cause postoperative discomfort due to accumulation of food and plaque. Thus, greater number of analgesics are required in the scalpel group.[17,18]

Intraoperative bleeding encountered in the laser group was lesser than that of the scalpel group. This is found to be consistent with the study by Patel *et al*. who recorded significantly less intraoperative bleeding with laser-assisted frenectomy.[9] This can be attributed to the coagulation of soft-tissue proteins at high temperature of tissue ablation resulting in reduced bleeding at the ablated tissue margins. Furthermore, at high temperature, the walls of blood vessels shrink causing photothermal coagulation.[19]

Healing outcome 3 months postoperatively was not found to be significantly different between the two groups. However, Fisher *et al*. reported that the laser wound differed from the conventional wound and showed delayed healing. This was because with the laser there is minimal damage to the adjacent tissue; initially, a coagulum of denatured protein forms on the surface; the inflammatory reaction is less; fewer myofibroblasts are present and there is little wound contraction; less collagen is formed; and epithelial regeneration is delayed and more irregular.[14] However, some other studies suggested that wound healing occurs more quickly and produces less scar tissue in laser technique than scalpel technique.[8,20] Neev *et al*. discovered that there is less collagen remodeling and in turn, faster healing with minimal scar tissue presenting after laser soft-tissue surgeries.[21]

CONCLUSION

This clinical study indicates that Diode lasers can be considered a viable alternative to scalpel for frenectomy. Lasers have the advantage of better patient acceptance due to reduced pain perception and postoperative discomfort. Furthermore, reduced intraoperative bleeding is encountered compared to scalpel. However, higher cost and need for operator skill are the associated limitations. Further long-term studies with larger sample size are required to establish the greater efficacy of laser technique over the conventional scalpel technique for frenectomy procedure.

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