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Comparative study of wound healing following laser Gingivectomy and scalpel Gingivectomy

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Abstract

Background: Various researchers have claimed the superiority of laser surgery over traditional methods. So it has become an important issue to access the advantages of laser surgery over traditional scalpel surgery.

Aim: To test the efficacy of wound healing following laser gingivectomy and scalpel gingivectomy. **Methods:** Thirty patients with a total of forty quadrants of gingival enlargement were selected for external bevel gingivectomy. They were randomly divided into two groups. Group-I (Test Group): enlarged gingiva removed by laser gingivectomy. Group-II (Control Group): gingiva removed by conventional scalpel gingivectomy.

Results: Group I showed no significant differences in plaque and gingival means between the visits, the bacteriological examination showed no growth of bacteria and histological examination revealed less inflammatory cells than Group II. Group II showed significant differences in plaque and gingival indices between the visits.

Conclusion: Postoperative records were almost comparable between two groups. No statistically significant difference found in healing between laser gingivectomy and scalpel gingivectomy. Laser gingivectomy may have some advantages over it.

Keywords: Gingivectomy, laser, scalpel, postoperative

Introduction

Gingivectomy is a procedure of excising the unsupported gingival tissue to a level where it is attached and create a new gingival margin that is apical to the old position [1]. For many years, scalpel were been used in performing gingivectomy in which small surgical blades and other periodontal surgical instruments were used to cut the tissue and place the gingival margin in a more ideal position [2]. Disadvantages of scalpel are need of giving anesthesia, bleeding that result in inadequate visibility and the incision cut is not sterilized [3].

In the modern era of high technological advancement, lots of progress have been made in the field of dentistry. Lasers have emerged as one such most important addition in the advances made so far [4]. Laser treatment is expected to serve as an alternative or adjunctive to conventional mechanical periodontal treatment [5]. The better control of laser, less post-operative inflammation and pain and the improved healing in the surgical site all are the benefits of using laser in surgery [6].

Various researchers have claimed the superiority of laser surgery over traditional methods. So it has become an important issue to access the advantages of laser surgery over traditional scalpel surgery. Thus, this study was planned with an objective to test the efficacy of wound healing following laser gingivectomy and scalpel gingivectomy.

Methods

This investigation was conducted at the Department of Periodontics of a tertiary care dental teaching hospital located in the region of Jammu and Kashmir. Convenient sampling technique was adopted. Study subjects aged 18-45 years; having good general health and oral hygiene habit, not taken any systemic antibiotic since the last six months were included in the study. Patients with moderate to advanced periodontal destruction with suprabony pocket $\geq 5\text{mm}$ in depth or gingival enlargement in which bottom of pockets not apical to mucogingival junction were included in this study.

Thirty patients with a total of forty quadrants of gingival enlargement were selected for external bevel gingivectomy. The surgical areas covering not less than three teeth were included in the study. After selection of study subjects, they were randomly divided into two groups.

Group-I (Test Group): After phase-1 therapy remaining suprabony pocket / enlarged gingiva removed by laser gingivectomy using Er, Cr: YSGG laser.

Group-II (Control Group): After phase-1 therapy remaining suprabony pocket / enlarged gingiva removed by conventional scalpel gingivectomy.

In Group-II gingivectomy performed by using Bard Parker Handles with No. 11 and 15 blades, Crane Kaplan Pocket Marker, Kirkland Knife, Blake's Handle, Orban Knife, Tissue Forceps and Curettes. Following administration of local anaesthetic agent (Lignocain HCl 2% with Adrenalin 1:100000), pocket depth marked with the help of pocket marker facially and lingually.

In Group-I Laser gingivectomy was performed by using Er, Cr: YSGG Laser with Tips (T4, G6). Following administration of topical anaesthetic (Lignocaine aerosol 15% w/w) over surgical area, pocket was explored and marked with pocket marker. Proper eye protection was employed. Laser gingivectomy was performed utilizing the Er, Cr: YSGG laser (2780nm) with a T4 & G6 sapphire tip, 0.5 W, 11% Air, 7% water. Excess gingival tissues were reduced in a motion very similar to festooning of gingiva. The calculi and necrotic cementum were removed, the root surfaces were smoothened using scalers and curettes after which the areas were cleaned and washed with normal saline. Aluminium foil was placed over the surgical area in both test and control group before ZOE periodontal dressing, isolating the surgical area from direct contact of dressing.

Following variables were studied. Healing of Wound: At every post-surgical recall visit healing was evaluated using following parameters: a) Plaque Index: Amount of plaque present were measured using Plaque Indices (PI), b) Gingival index, c) Gingival Crevicular Fluid Flow: Gingival fluid was collected prior to surgery and at 7th, 14th, 28th day postoperatively.

Mouth Preparation and Gingival Crevicular Fluid Collection: The facial and lingual surfaces of the teeth and gingiva were carefully dried with gauze. Whatman No.1 filter paper strip 1.5mm wide \square 10mm long were used to determine fluid index.⁶ A filter strip was gently placed at the entrance to gingival crevice after 30 seconds had elapsed from the time of drying the tissue and left for exactly 3 minutes.⁷ This time (30seconds) interval was used to allow the physiologic reestablishment of sulcular exudate flow. **Staining:** An alcoholic solution of 0.2% Ninhydrin was used for staining. Ninhydrin is chemically a triketohydrindene hydrate that react with amino acid specifically with alpha-amino acid, an important protein component of gingival fluid to yield a blue or purple colour. **d. Wound Evaluation (Clinical)-**The operated areas were inspected at every recall visit after removing dressing for any excess granulation tissue, denuded bone, extent of epithelialization and sloughing only by the look of operated area. **Wound Evaluation Scoring (On Visual Inspection of Wound)** 1) **Epithelization:** 0-Satisfactory, 1-Unsatisfactory, 2) **Slough (Amount of slough on surgical area):** 0- Absent, 1- Slight, 2 - Slight to Moderate, 3-Moderate. **Histological wound evaluation:** In one patient gingivectomy sites were biopsied

from the test and control group on 28th day after gingivectomy. Biopsy were performed by incising a gingival strip of about 2*10 mm in dimension.

Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The results were expressed using appropriate statistical variables.

Results

Evaluation of wound: Plaque Index on baseline and postoperative days were seen to be almost comparable in both Group-I and Group-II. Gingival Index scores were equal in both Group-I and Group-II on 7th, 14th & 28th postoperative day ($p>0.05$). **Gingival Crevicular Fluid:** Gcf flow was greater on 7th, 14th, 28th postoperative day in Group-I as compared to Group-II.

Epithelization: While evaluating wound considering epithelization shows comparatively more epithelization on 7th postoperative day with Group-II. In Group-I 22% cases showed complete epithelization while in scalpel group 64% cases presented with complete epithelization on 7th day after gingivectomy.

Regarding slough accumulation, the distribution of slough accumulation over tissues were observed to be statistically significant at on 1st day after gingivectomy. Slough was also seen to be more with laser gingivectomy on 2nd, 3rd and 7th postoperative days but the results were statistically not significant.

Histological evaluation at 28th postoperative day revealed normal looking stratified epithelium in the gingival specimen of both test and control group. In scalpel gingivectomy group edematous connective tissue with slightly increased amount of vascular channels was observed. Overall no significant difference in the inflammatory status found between Group-I and Group-II.

Discussion

Various studies have demonstrated the benefits of diode laser in various oral soft tissue procedures. Precise cutting abilities, good coagulation effect and the extremely small zone of thermal necrosis to surrounding tissues are the advantages of using laser^[7]. Diode laser are more precise as compared with other systems, including carbon dioxide and Nd: YAG lasers^[8]. They are optimal for gingival surgery due to their ability to be absorbed by gingival tissue and not by the adjacent structures. The interaction of laser wavelength and energy density with tissues at the tip of fiberoptic contact delivery system allows simultaneous cutting and coagulation of tissue^[9].

Deciding whether to do a conventional gingivectomy by scalpel or to use laser depends on many factors, in our study we compared between the two methods. First of all the surgery was easier and quicker in Laser than conventional gingivectomy. Bleeding was observed in the conventional gingivectomy while relatively blood-less in laser. Less anesthesia is needed in laser gingivectomy^[10].

In Laser gingivectomy, we found that the pain post-operatively was less compared to the pain in conventional gingivectomy this could be attributed to the heat generated

by laser that inhibit the pain receptors and the coagulation which provided a dry and isolated environment and less infection to the wound^[11].

In thus study, Histological evaluation at 28th postoperative day revealed normal looking stratified epithelium in the gingival specimen of both test and control group. In scalpel gingivectomy group edematous connective tissue with slightly increased amount of vascular channels was observed. Overall no significant difference in the inflammatory status found between Group-I and Group-II. Similar findings were also reported by Camillo *et al.*^[12] in 2007. Considering the inflammatory status at 28th day after gingivectomy there was no significant difference observed between the test and control group. The reason behind this may be because healing was almost completed in both test & control groups by the end of 28th day of gingivectomy^[13]. We observed in this study that distribution of slough accumulation over tissues were observed on 1st postoperative day with the laser group. On 2nd, 3rd and 7th postoperative days slough accumulation were also comparatively greater with the test group. Moreno *et al.*^[14] in 1984 indicated that scalpel cuts are superior in terms of reducing slough accumulation compared to laser.

Fisher *et al.*^[15] in 1983 studied the wound healing after CO₂ laser irradiation observed that laser wound tend to show less collagen formation, little wound contraction and slower epithelial regeneration compared with conventional surgical wounds. It was opined that delayed epithelialization of laser wound may be due to inhibitory substances produced by necrotic tissue, physical hindrance caused by the presence of eschar or heat fixation of adjacent epithelial cells^[16].

Conclusion

This study observed that Group I showed no significant differences in plaque and gingival means between the visits, the bacteriological examination showed no growth of bacteria and histological examination revealed less inflammatory cells than Group II. Postoperative records were almost comparable between two groups. No statistically significant difference found in healing between laser gingivectomy and scalpel gingivectomy. Laser gingivectomy may have some advantages over it.

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