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Original Article

Comparative evaluation of healing after gingivectomy with electrocautery and laser

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ABSTRACT

Purpose of the study: To evaluate whether laser has got any advantage over electrocautery in performing gingivectomy procedure.

Method: This was randomized split mouth prospective study where 17 patients having symmetrical gingival hyperplasia were treated with electrocautery and laser on each side. Intra- and postoperative parameters assessed were duration of surgery, bleeding, tissue sticking, postoperative pain and healing. The results were statistically analyzed and compared.

Result: There were 7 Females and 10 Males with a mean age of 28.2 ± 11.6 years. The mean time taken on the laser and electrocautery was $16 (\pm 8.05)$ and $16.7 \text{ min } (\pm 9.86)$ respectively and the difference was not significant. On laser side, there was no bleeding in 3 (17.6%) and self limiting in 14 patients (82.4%) whereas electrocautery side, there was no bleeding in 2 (11.8%) and self limiting in 15 patients (88.2%). Both electrocautery and laser were comparable regarding ease of use during gingivectomy procedure. Charring was observed on both sides although there was more charring on the laser side. Fibrinous slough was present on both sides at 24 h. Difference in healing was not significant at various time intervals. There were no significant difference in postoperative pain experienced by the patients among the laser and cautery group at different time intervals.

Conclusion: Both techniques with proper adhesion to safeguards, can be used to remove gingival overgrowth with equal efficiency and wound healing capacity. There is no advantage of diode laser over electrocautery in performing gingivectomy.

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Introduction

Electrocautery and lasers are being used routinely for oral surgical procedures. Excision of growth, excisional or incisional biopsy, ablation of white lesions, removal of mucocoele and gingivectomy are commonly performed intraoral procedures. With an advantage of an excellent haemostasis and clear visual field, electrocautery and lasers are now part of standard oral surgery. Electrocautery provides excellent haemostasis during surgery but can lead to generation of excess heat leading to a thermal damage. There are numerous claims made by the manufacturers about laser. These include efficient and effective soft tissue removal, excellent haemostasis, safety around implants, reduced postoperative pain, no gingival recession, reduced swelling and discomfort and better wound healing.¹ There are studies regarding its clinical applications in oral surgery but till date there is no human study comparing healing of oral wounds after treatment with electrocautery and laser.² The present study was designed to compare and evaluate whether the diode laser has got any advantage over electrocautery in performing gingivectomy procedure.

Methodology

The study was prospective, randomized with split mouth design. Ethical clearance was taken from the institutional ethical committee and written informed consent was obtained from all the patients. Patients of age 12 years and above, having bilaterally symmetrical gingival hyperplasia were selected from the Outpatient Unit (Fig. 1). A standard oral hygiene regimen was done for all the patients to remove any irritant factors prior to surgery. In each patient, electrocautery and the diode laser were used for gingivectomy in each half of mouth in a symmetrical manner. The side treated with electrocautery was considered as cautery group and the side treated with diode laser as the laser group. The side of surgery (right or left) for diode laser or electrocautery was randomly assigned.

The surgical procedures were performed under local anaesthesia. The gingival hyperplastic tissue was excised on one half with Class IV diode laser (manufactured by BIOLITEC,

Fig. 1 – Pre-operative photograph showing symmetrical gingival hyperplasia in the mandibular arch.

Germany) with a wavelength of 980 nm and fibre diameter of 200 micrometre in contact type treatment mode. Power settings for the diode laser was adjusted according to the ease of use but on an average 5 W was used.

On the other half the gingival overgrowth was excised with monopolar electrocautery (Martin MD 70, Medizin-Technik, Germany) having power 50 W and 1000 Ω resistance in the cutting mode on the same appointment. The power of cautery was also adjusted according to the ease of use. Post-operatively, analgesics were prescribed as and when required in the form of paracetamol 500 mg and a chlorhexidine mouthwash for oral rinse twice daily to maintain oral hygiene. In case of pain not controlled by the above-mentioned drug, Ibuprofen 400 mg was reserved as the rescue medication. The patients were advised to have soft diet preferably semi-solid on the day of procedure and to rinse with water after each meal.

Evaluation of parameters

Parameters were broadly categorized into intraoperative and postoperative groups. Evaluation of haemostasis, tissue sticking and time taken to complete the procedure with each instrument was done during and immediately after the procedure. Duration of surgical procedure with both diode laser and electrocautery was measured separately and was recorded in minutes by using a Stop Watch. The duration was measured from the first application of the instrument (Laser/Electrocautery) till the last application.

Intraoperatively bleeding was assessed to determine the instrument performance for haemostasis and it was graded as None: 1, Self-limiting: 2, Requiring light pressure: 3, Requiring coagulation: 4, Requiring ligation or Hemoclips: 5.

Intraoperatively the instrument performance was also assessed by the surgeon in terms of tissue sticking to the instrument during the procedure and was graded as None: 1, Requiring activation of instrument to release tissue: 2, Requiring gentle grasping and removal of tissue from the instrument: 3, Requiring extensive force for removal of tissue from the instrument: 4, Tearing tissue when instrument tip is released from application site: 5.

Postoperative pain was evaluated at 24 h, 72 h and 1 week. To assess the severity of postoperative pain, the patients were asked to correlate it to a 10-point Visual Analog Scale (VAS) on these days. The anchor words were “no pain at all” equivalent to 0 and “the most intense pain you can imagine” equivalent to 10. The patients were not shown the previous pain score recording. The patients were asked to score pain for left and right side. The difference in pain score was calculated.

Comparative evaluation of healing on each side was done after 24 h, 72 h and at the end of 1st, 2nd, 4th and 6th week in terms of Tissue colour (Pink, Red, Bluish, Purple, or Charred), Tissue contour (Normal, Hyperplastic or Atrophic), Appearance of wound (Granulated, Slough, Necrotic), Re-epithelialization at the end of three months.

Statistical analysis

All the data was expressed as mean $\pm$ SD, percentage wherever necessary. Student t-test was used for comparing

postoperative pain, time taken to complete the procedure between the two groups as appropriate. For qualitative variables like healing between the two groups, Chi-square test was performed. For haemostasis and tissue sticking Fisher's Exact Test (non parametric test) was used. Statistical analysis was performed with SPSS software for windows, version 17.0 (SPSS Inc., Chicago, IL, USA). In all the cases, a probability value (p) of <0.005 was considered significant.

Results

A total of 17 patients (7 Females and 10 Males) were treated for gingival hyperplasia. The age ranges of the patients were 14–48 years with mean age 28.2 ± 11.6 years. Results of various intraoperative and postoperative parameters studied were as follows:

Duration of surgery

The mean time taken on the laser side was 16.08 min (± 8.05) while on electrocautery side it was 16.76 min (± 9.86). The difference was found to be statistically insignificant.

Haemostasis

On laser side, there was no bleeding in 3 patients (17.6%) and the bleeding was self limiting in 14 patients (82.4%). On electrocautery side, there was no bleeding in 2 patients (11.8%) and bleeding was self limiting in 15 patients (88.2%). In conclusion, there was no difference between laser and electrocautery regarding haemostasis.

Tissue sticking

On laser side during the procedure, there was no tissue sticking in 2 patients (11.8%) and in 15 patients (88.2%)

removal of tissue required gentle grasping from the tip of the instrument. On electrocautery side also, there was no tissue sticking in 2 patients (11.8%) and in 15 patients (88.2%) removal of tissue required gentle grasping from the tip of the instrument. Therefore, both electrocautery and laser were comparable regarding ease of use during gingivectomy procedure.

Healing (Table 1, Graph I)

At 24 h, no statistical difference was found between the laser and the cautery group ($p = 1.00$). Charring was observed on both sides although in 3 patients, there was relatively more charring on the side treated with laser as compared to the side treated with electrocautery. The reason for more charring or carbonisation may be that electrocautery achieves much lower temperatures compared with laser therapy; therefore, it does not cause carbonization of all the tissues removed, which causes cell disruption at the lesion margins, promoting new cell contamination.¹ Regarding appearance of wound, fibrinous slough was present on both sides at 24 h (Fig. 2).

At 72 h, no statistical difference was found between the laser and the cautery group ($p = 1.00$). Compared to Electrocautery, healing was better in 3 patients on the Laser side while it was inferior in 3 patients. (Fig. 3) Charring and fibrinous slough was still evident on both sides.

At 1 week and 2 weeks postoperatively, equivalent healing was observed on both laser side and electrocautery side in 16 patients. (Figs. 4 and 5) In 1 patient healing was inferior on the laser side. This could be attributed to the fact that there was erythema at the margins at the laser side while the gingival margin was pink at the electrocautery side. Again the difference was statistically insignificant with p value >0.005.

At 4 weeks and 6 weeks, healing was equivalent on both laser and electrocautery side (Figs. 6 and 7) in all 17 patients (p -value = 1.00). Healing was also evaluated at 3 months

Table 1, Graph I – Frequency table showing comparative healing. Difference in healing was insignificant as shown by p-value using chi-square test.

Healing	24 Hr	72 Hr	1 Week	2 Weeks	4 Weeks	6 Weeks
Equivalent	11 (64.7%)	11 (64.7%)	16 (94.1%)	16 (94.1%)	17(100%)	17 (100%)
Better on laser side	3 (17.6%)	3 (17.6%)	0	0	0	0
Inferior on laser side	3 (17.6%)	3 (17.6%)	1 (5.9%)	1 (5.9%)	0	0
p-value	1.00	1.00	0.99	0.99	1.00	1.00

Time Point	Equivalent	Better on Laser side	Inferior on LASER side
24 Hrs	11	3	3
72 Hrs	11	3	3
1 Week	16	0	1
2 Week	16	0	1
4 Weeks	17	0	0
6 Weeks	17	0	0

Fig. 2 – 24 h post-operative photographs.

postoperatively and both laser and electrocautery sides showed equivalent epithelisation.

Pain scores (Table 2, Graph II)

At both 24 h and 72 h, pain was slightly more on the laser side in majority of patients although, the difference was statistically insignificant with p value of 0.069 and 0.252 respectively. There was a marked reduction in pain scores at 1 week on both laser and electrocautery sides, with a mean pain score of 0.406 on laser side and 0.171 on electrocautery side. The difference was statistically insignificant with p value of 0.149. There were no significant difference in postoperative pain experienced by the patients among the laser and cautery group.

Discussion

Split mouth design was chosen for the present study because it minimizes the influence of numerous inter-subject factors,

Fig. 4 – 1 week post-operative photographs.

such as age, sex, anatomic factors, and bone metabolism, on any differences that may be present.³ Sample size requirement of split mouth design are much less as compared to other methods. The present study showed that there was no significant difference in the post-operative healing and outcome after gingivectomy with laser or electrocautery. All the intra-operative and post-operative parameters showed minor differences in the two groups which are not statistically significant.

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.⁴ Diode laser are more precise as compared with other systems, including carbon dioxide and Nd:YAG lasers.⁵ 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.⁶

Duration of surgical procedure and haemostasis with both Diode Laser and Electrocautery was measured separately and

Fig. 3 – 72 h post-operative photographs.

Fig. 5 – 2 weeks post-operative photographs.

Fig. 6 – 4 weeks post-operative photographs.

the difference was statistically insignificant. Both laser and cautery are equivalent in this regard and good haemostasis is achieved with both devices. There was sticking of tissue to the tips of both instruments during application and in majority of patients gentle grasping was required to remove the tissue. Tissue sticking was more on the laser side where the overgrown tissue was deep or thick and in those cases tip of the fibre required cutting and removal of sheath. In those cases, cutting with electrocautery was a little bit easier as there was less tissue sticking. Where the tissue was less thick, or where superficial ablation was required, laser was much easier to use, as in those cases there was less sticking on the laser tip. We concluded that for bulky and deep gingival overgrowth, laser is an inappropriate tool for excision. Electrocautery is useful in such cases.

In the present study, no significant difference in healing was found between laser and electrocautery group at 24 h, 72 h, 1, 2, and 4 weeks. Regarding appearance of wound, fibrinous slough was present on both sides at 24 h. After 6 weeks, no difference in healing was observed in any of the patient between laser and cautery group. We could not study swelling and scarring as our study was based on gingivectomy wounds on attached mucosa. Studies evaluating the thermal tissue effects of diode lasers are not conclusive. In a histological comparison of four different common medical laser

Fig. 7 – 6 weeks post-operative photographs.

Table 2, Graph II – Postoperative pain scores at various intervals.

systems (Ho:YAG, Nd:YAG, and two diode lasers with wavelengths of 830 and 940 nm), Nd:YAG and diode lasers in contact application showed low thermal tissue effects in depth, resulting from a high power loss caused by the development of large carbonization zones at the surface of the tissue.⁷

Charring was observed on both sides although in 3 patients, there was relatively more charring on the side treated with Laser as compared to the side treated with Electrocautery. The reason for more charring or carbonisation may be that the electrocautery achieves much lower temperatures compared with laser therapy; therefore, it does not cause carbonization of all the tissues removed, which causes cell disruption at the lesion margins, promoting new cell contamination.¹

Postoperative pain score was slightly more on the side treated with diode laser as compared to cautery side but the difference between the two groups was statistically insignificant. In all except 1 patient, this pain was controlled with the Paracetamol 500 mg (standard drug) prescribed as and when required. In 1 patient, the pain was severe and in that case the rescue drug was given (Ibuprofen 400 mg thrice a day) to control the pain. So it can be concluded that the postoperative pain was of equal magnitude between both groups and the diode laser has got no advantage over electrocautery as far as postoperative pain is considered. Pain is a generalised phenomenon and affects whole body. There may be overlap of pain from one side to other side and patient may not be able to differentiate pain from left and right side.

To conclude, with proper adhesion to safeguards, both techniques can be used to remove gingival overgrowth with equal efficiency and wound healing capacity. There is no advantage of diode laser over electrocautery in performing gingivectomy. We are aware of the limitations of this study. A small sample size is also not sufficient to fully understand the pros and cons of any device or to compare superiority or inferiority of one machine over another. We studied wound healing for gingivectomy wounds. There may be differences in wound healing at other sites.

Conflicts of interest

All authors have none to declare.

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