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Gingival Rebound and Healing Following Gingivectomy Using Diode Laser and Conventional Surgery: A Prospective Observational Comparative Study

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ABSTRACT

Background and aim: The healing process after Gingivectomy can vary depending on the technique used, with both diode laser and conventional scalpel methods providing satisfactory results but differing regarding postoperative recovery. Coronal displacement of the gingival margin is a possible and unwanted sequel of the gingivectomy procedure. This study aims to compare the laser and scalpel gingivectomy and determine differences in tissue rebound, healing, postoperative pain, and the need for analgesics post-gingivectomy in these patients.

Material and methods: Thirty-two patients were consecutively recruited into the two groups. The parameters evaluated included pain perceived postoperatively after 30 minutes on the 7th and 14th Day, healing on the 7th, 14th, and 30th Day, gingival tissue rebound on the 14th and 30th Day, and analgesics required in the postoperative period.

Results: There was a significant difference in gingival index and gingival relapse on the 14th Day and 30th Day between the groups, with a lesser amount of relapse in the laser group. Groups I and II showed statistically significant differences in healing, with the scalpel group recording better healing in all follow-up appointments. There was no significant difference in pain scores and postoperative analgesic intake.

Conclusions: The study demonstrated that coronal displacement of the gingival margin was comparatively lesser in the laser group, even though it had delayed healing. Combining both techniques might enhance clinical outcomes, particularly in managing gingival inflammation and migration in the initial months following surgery.

1. Introduction

For any dental surgeon, improving clinical practice by rendering effective pain relief and improved patient comfort following surgery is a key objective. Conventional methods of surgery using scalpels and blades have been extensively used to deal with various soft tissue surgical procedures, to correct mucogingival anomalies, or to enhance facial aesthetics. With the emergence of techniques like lasers, clinicians around the globe have been able to achieve the objective of painless surgery and improved patient comfort to a considerable extent. The dental application of lasers is now an established field with great promise.[1] Gingivectomy is the most commonly performed procedure for treating gingival enlargement. It is defined as the surgical excision of unsupported gingival tissue to the level where it is attached, creating a new gingival margin apical in position to the old.[2] A gingivectomy may be indicated to remove diseased tissue for prosthetic reasons, improve aesthetics and/or establish normal gingival architecture, and reduce the periodontal pocket's probing depth.[3] Diode laser systems are proposed as an alternative to scalpel surgery on oral soft tissue surgeries. However, further research is required on the parameters for clinical efficacy and the biological basis for laser therapy. Case reports and case series largely dominate the quality of the literature. The lack of consistency from one study to another has left the profession with no lasers that have been researched extensively enough to provide predictable use parameters.[4] Even though studies have been done comparing laser and scalpel techniques in various soft tissue procedures, fewer studies compare the same in gingivectomy procedures, and an even lesser number of studies assess the gingival rebound. This study aims to compare the laser and scalpel gingivectomy procedures and determine any

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differences in healing assessed using Landry et al.'s healing index postoperative pain using the numerical rating scale and tissue rebound measured from the free gingival margin to a fixed reference point.[5, 6]

2. Material and methods

The study was a prospective observational comparative study. The Institutional Ethics Committee, Government Dental College, Thiruvananthapuram, approved the study.[IEC/E/6/2017/DCT/dtd/27/11/2017] and written informed consent was obtained from the participants. Thirty-two patients with thick gingival biotype who presented with Garde 1 and 2 gingival enlargements of chronic inflammatory nature, treated with gingivectomy procedure in the Department of Periodontics, satisfying the inclusion and exclusion criteria were enrolled in the study after obtaining informed consent. The patients were assigned consecutively into the respective groups until the sample size was attained, and the procedure was done as described below. Both techniques were done under local anesthesia with 1ml of 2% lignocaine with 1:80000 adrenaline. After exploring with a probe, the pockets were marked with a pocket marker. Probing was also performed to determine the bone height, and cases, where adequate biologic width is maintained without osseous recontouring after surgery, were included in the study. In Group I, conventional scalpel gingivectomy was performed, using Periodontal knives and Bard-Parker blades as well as scissors as auxiliary instruments for incisions (Fig. 1). In contrast, in Group II, laser gingivectomy using a diode laser (DenLase-980/7,980nm wavelength) with a 320-quartz optical fiber working at 4W continuous mode was done. The laser fiber tip was used in a light contact mode and moved with the tissue in gentle, sweeping strokes. The area was covered with a surgical pack in both groups. (Fig. 2).

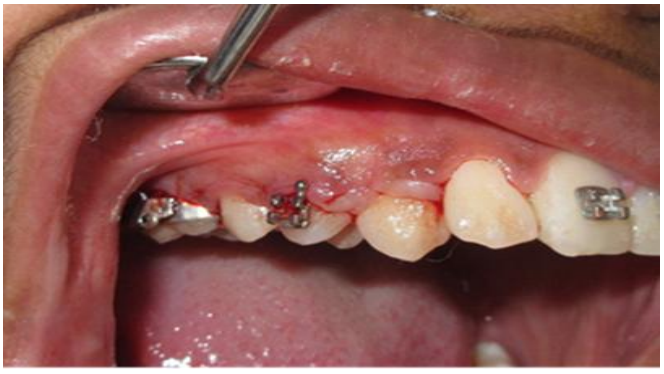

Fig. 1. Scalpel gingivectomy.

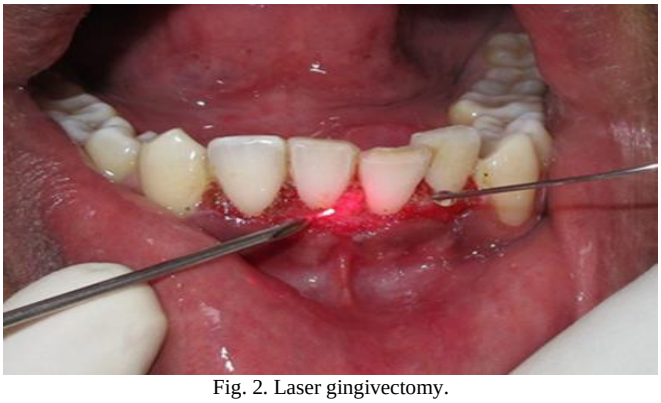

Fig. 2. Laser gingivectomy.

Postoperative evaluation of the patient

Immediate postoperatively, crown heights were measured using a UNC 15 probe from the zenith of the gingival margin to the incisal edge of the incisors' cusp tip of the canines and premolars. Postoperative instructions were given, and the patient was advised to use analgesics if needed for pain. All patients were instructed to use the same analgesic containing Ibuprofen 400mg if needed and were compared for their need for analgesics between the two techniques. Patients were given follow-up appointments at 1 week, 2 weeks, and 1 month. Crown heights were measured immediately postoperatively, at the end of 1 month postoperatively. At the 2-week and 1-month follow-up, the gingival margin position was analyzed, and these crown heights were compared with the immediate postoperative crown heights to determine the gingival relapse. A positive crown height change indicated an apical migration of the gingival margin postoperatively, and a negative crown height change indicated a coronal gingival migration during the postoperative period. The patients were recalled after the 7th, 14th, and 30th Day following the procedure, and during every follow-up, they were evaluated for pain and healing. Healing was assessed using Landry et al. 's healing index. On recall on the 7th Day, the number of analgesics the patient took postoperatively until then was recorded. The results were compared.

In addition, to assess the soft tissue inflammation/healing postoperatively, the Gingival Index (GI) for each tooth receiving either procedure was recorded at the baseline and 1-month postoperative appointments using the criteria described by Loë. The patient's pain perception was assessed using a Numerical rating scale and recorded postoperatively after 30 minutes on the 7th Day and 14th Day. A single operator recorded these scores at 30 minutes postoperatively on the 7th and 14th Day. Photographs of the intra-oral surgical site were taken and documented. The same operator recorded all measurements. In addition, to assess the soft tissue inflammation/healing postoperatively, the Gingival Index (GI) for each tooth receiving either procedure was recorded at the baseline and 1-month postoperative appointments using the criteria described by Loë. The patient's pain perception was assessed using a Numerical rating scale and recorded postoperatively after 30 minutes on the 7th Day and 14th Day. A single operator recorded these scores at 30 minutes postoperatively on the 7th and 14th Day. Photographs of the intra-oral surgical site were taken and documented. The same operator recorded all measurements.

3. Results

Intergroup comparisons of clinical parameters at different time intervals were made by the Whitney U Test, except for gingival tissue rebound, in which an independent t-test was done. For significance, the p-value was set at 5%. The present study assessed Gingival tissue rebound on the second week and the 30th postoperative Day. The difference between both was statistically significant, with a lesser relapse in the laser group. (Table 1). Groups I and II showed statistically significant differences in postoperative healing assessed using the Mann-Whitney U test on the 7th Day ($p = 0.026$),14th Day ($p = 0.002$), and 30th Day. ($p = 0.024$), with scalpel group recording better healing. (Table 2). No significant difference in pain scores was assessed by NRS between the groups at 30 mins on the 7th Day and 14th Day (Table 3) and post-op analgesic intake. (Table 4). Differences in gingival index values at 1 month between the groups were also significant ($p = 0.033$)(Table 5).

Table 1. Comparison of Gingival relapse.

Postoperative Gingival Relapse	Group I	Group II	Statistical Significance
Mean ± SD (14th Day)	0.594 ± 0.37	0.25± 0.36	t – 2.62 p - 0.013*
Mean ± SD (30th Day)	1.25 ± 0.48	0.469± 0.34	t – 5.29 p - 0.000*

Table 2. Comparison of Postoperative Healing Index Scores.

Postoperative Healing	Group I	Group II	Statistical Significance
Mean ± SD (7th day)	3.38 ± .619	2.94± .443	p - 0.026*
Mean ± SD (14th day)	4.44 ± .629	3.62± .619	p - 0.002*
Mean ± SD (30th Day)	4.87 ± .341	4.50± .516	p - 0.024*

Table 3. Comparison of Postoperative pain.

Postoperative Pain at 7th Day	Group I	Group II	Statistical Significance
Median pain at 30 minutes	1	1	0.338
Median pain on the 7th Day	1	1	p - 0.116
Median pain on the 14th Day	0	0	p - 0.934

Table 4. Comparison of Postoperative analgesic intake.

Total no of Analgesics Taken Postoperatively	Group I	Group II	Statistical Significance
Mean ± SD	3.69 ± 1.6	2.94± 1.73	p - 0.206

Table 5. Comparison of gingival index values on the 30th Day.

Gingival Index Scores on 30th Day	Group I	Group II	Statistical Significance
Mean ± SD	.444 ± 0.171	0.319 ± 0.116	p - 0.033* (S)

* P-value < 0.05 is considered significant.

4. Discussion

The study recorded no significant difference in postoperative pain between the groups at 30 minutes on the 7th and 14th Days. There may be no significant difference in pain at 30 minutes because a local anesthetic infiltration was delivered to both groups to provide adequate operative anesthesia, while most studies have used topical anesthetics in the laser group. Also, the diode laser used in this study was operated in continuous mode rather than pulsed mode. Coluzzi et al. suggested that if the laser is in a pulsed mode, the targeted tissue has time to cool before the next pulse of laser energy is emitted. This allows for thermal relaxation of the tissue and, thus, less collateral tissue damage and, consequently, less postoperative pain.[7, 8] Similar results were obtained in a recent systematic review by Maboudi et al. in which diode laser gingivectomy was compared with the conventional scalpel surgery for orthodontic treatment-induced GE.[9] In the present study, the healing of gingivectomy wounds in both the groups following the two techniques was assessed using the Landry et al. healing index on the 7th, 14th, and 30th Day; moreover, the results were compared. There was a significant difference in the postoperative healing recorded, indicating better initial healing of gingivectomy wounds in conventional scalpel gingivectomy, which may be because the diode laser used in this study was operated in continuous mode rather than in a pulsed mode. Similar results were reported in studies by Amaral et al.[10] and Cayan et al.[11] Coronal displacement of the gingival margin, a certain amount of tissue rebound, is a possible sequel of the gingivectomy procedure. Smukler and Chaibi described how a predetermined entity called supra crystal gingival tissue differs from site to site, will reform after surgical excision, and how the "regrowth" will be dictated by the underlying anatomy of the dental and osseous units.[12] The amount of tissue rebound was not influenced by the type of tooth treated, the anatomical anteroposterior position, and individual or group treatment.[13] In the present study, a lesser gingival relapse was observed in the laser group. Similar results were obtained in studies by Altayeb et al.[14] and Tianmitrapap et al.[15] Laser treatment on oral soft tissues results in a thin layer of carbonized tissue and a collagen slough that protects the underlying tissue. Cellular mitotic activity starts from within the connective tissue following laser gingivectomy, and therefore, more time may be required for gingival enlargement to manifest itself clinically than with scalpel gingivectomy. As opposed to this, soft tissue regrowth was seen with a higher tendency in laser gingivectomy and electrocautery gingivectomy groups in a study by Narayan et al. compared to surgical crown lengthening using modified Widman flap and apically repositioned flap with osseous recontouring.[16] A recent systematic review by Smith et al. concluded that crown lengthening Surgery [CLS] using Apically Positioned Flap [APF] with osseous reduction offers periodontal tissue stability over time.[17] Osseous recontouring may have resulted in a lesser rebound in the scalpel group. However, in our study, osseous recontouring was not done in both groups and did not influence the study outcomes. Similar to studies by Junior et al.[18] a comparison of the number of analgesics taken during the postoperative period by patients in both groups showed no statistically significant difference, even though a lesser number of analgesics

were taken in Group II, i.e., the laser group (mean =2.94, SD=1.73), as compared to Group I, the conventional surgery group (mean =3.69, SD=1.06). In the present study, a comparison of mean gingival index values after 30 days showed a statistically significant difference between the groups. A lower gingival index score was recorded on the 30th Day in the laser group, with a lower degree of inflammation seen in patients treated with diode laser 980nm, similar to studies by Evans et al.[19] and Elanchezhiyan et al.[20]

4. Conclusion

The present comparative observational study demonstrated diode laser to be effective in the surgical management of gingival enlargement, thus proving to be a feasible alternative to conventional scalpel gingivectomy, with lesser gingival relapse, postoperative pain, and the need for analgesic medication. Also, gingival inflammation, measured with the gingival index, significantly improved post-surgically with the diode laser compared to the scalpel, and healing of the gingival tissue after laser gingivectomy is delayed than with the scalpel. However, the present study was done with a short follow-up period of 1 month, which is short to evaluate the stability and maturation of the gingival tissues after Gingivectomy. The periodontal phenotype is the key determinant affecting both gingival margin rebound and the healing time. The choice of surgical technique may affect the short-term outcomes and procedure-related morbidity. More significant bone reduction is required with less apical flap positions to achieve stable and predictable results after CLS. The required amount of osseous resection is determined based on the individual baseline supracrestal gingival tissue dimension rather than a fixed dimension. They also recommended that clinicians should respect periodontal tissues' need for an adequate healing time (⩾3 months) before they place permanent restorations. The assessment of healing and pain perception in the present study was purely subjective, and no histological analysis was done in the case of healing. The use of potential periodontal biomarkers of healing, such as fibroblast growth factor 2 levels, cathepsin levels, and endothelin 1 level, could have been correlated to the obtained findings. Also, the individual pain threshold may have influenced the number of analgesics taken by the patient in the postoperative period. The healing process after Gingivectomy can vary depending on the technique used, with both diode laser and conventional scalpel methods providing satisfactory results but differing in postoperative recovery. Although both techniques result in similar healing times, meticulously managing gingival tissue is essential to prevent complications like gingival rebound and recession. Combining these techniques might enhance clinical outcomes, particularly in managing gingival inflammation in the initial months following surgery. Ultimately, while both methods are effective, choosing between them can significantly impact patient experiences, underscoring the importance of careful surgical and postoperative management.

Conflict of Interest

The authors declared that there is no conflict of interest.

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References

[1] Agrawal AA. Gingival enlargements: Differential diagnosis and review of literature. World Journal of Clinical Cases: WJCC. 2015;3(9):779-88. https://doi.org/10.12998/wjcc.v3.i9.779.

[2] Akram HM, Ali OH, Omran NK, Ali AO. Diode laser versus scalpel gingivectomy. Biomedical and Pharmacology Journal. 2017;10(4):1799-804. https://dx.doi.org/10.13005/bpj/1295.

[3] Kohale BR, Agrawal AA, Raut CP. Effect of low-level laser therapy on wound healing and patients' response after scalpel gingivectomy: A randomized clinical split-mouth study. Journal of Indian Society of Periodontology. 2018;22(5):419-26. https://doi.org/10.4103/jisp.jisp_239_18.

[4] Newman MG, Takei H, Klokkevold PR, Carranza FA. Newman and Carranza's Clinical Periodontology E-Book: Newman and Carranza's Clinical Periodontology E-Book. Elsevier Health Sciences; 2018.

[5] LandryRG, TurnbullRS, Howley T. Effectiveness of benzydamine HCl in the treatment of periodontal post-surgical patients. Res Clin Forums 1988;10:105-18.

[6] Rodriguez AB, Alhachache S, Velasquez D, Chan HL. A systematic review of oral wound healing indices. Plos one. 2024;19(2):e0290050. https://doi.org/10.1371/journal.pone.0290050.

[7] Coluzzi DJ, Parker SP, editors. Lasers in Dentistry--Current Concepts. Springer Cham. 2024. https://doi.org/10.1007/978-3-031-43338-2.

[8] Sachelarie L, Cristea R, Burlui E, Hurjui LL. Laser Technology in Dentistry: From Clinical Applications to Future Innovations. Dentistry Journal. 2024;12(12):420. https://doi.org/10.3390/dj12120420.

[9] Maboudi A, Fekrazad R, Shiva A, Salehabadi N, Moosazadeh M, Ehsani H, et al. Gingivectomy with diode laser versus the conventional scalpel surgery and nonsurgical periodontal therapy in treatment of orthodontic treatment-induced gingival enlargement: a systematic review. Photobiomodulation, Photomedicine, and Laser Surgery. 2023;41(9):449-59. https://doi.org/10.1089/photob.2023.0060.

[10] Amaral MB, De Ávila JM, Abreu MH, Mesquita RA. Diode laser surgery versus scalpel surgery in the treatment of fibrous hyperplasia: a randomized clinical trial. International journal of oral and maxillofacial surgery. 2015;44(11):1383-9. https://doi.org/10.1016/j.ijom.2015.05.015.

[11] Çayan T, Hasanoğlu Erbaşar GN, Akca G, Kahraman S. Comparative evaluation of diode laser and scalpel surgery in the treatment of inflammatory fibrous hyperplasia: a split-mouth study. Photobiomodulation, photomedicine, and laser surgery. 2019;37(2):91-8. https://doi.org/10.1089/photob.2018.4522.

[12] Ganji KK, Patil VA, John J. A comparative evaluation for biologic width following surgical crown lengthening using gingivectomy and ostectomy procedure. International journal of dentistry. 2012;2012(1):479241. https://doi.org/10.1155/2012/479241.

[13] Arora R, Narula SC, Sharma RK, Tewari S. Evaluation of supracrestal gingival tissue after surgical crown lengthening: a 6 - month clinical study. Journal of periodontology. 2013;84(7):934-40. https://doi.org/10.1902/jop.2012.120162.

[14] Abdullah A, Romanos PG, Dent M. Laser-assisted esthetic crown lengthening: open-flap versus flapless. Int J Periodontics Restorative Dent. 2022;42(1):53-62. https://doi.org/10.11607/prd.5335.

[15] Tianmitrapap P, Srisuwantha R, Laosrisin N. Flapless Er, Cr: YSGG laser versus traditional flap in crown lengthening procedure. Journal of Dental Sciences. 2022;17(1):89-95. https://doi.org/10.1016/j.jds.2021.05.004.

[16] Narayan S, Rajasekar A. Soft tissue re-growth after different crown lengthening techniques among Indian patients. Bioinformation. 2021;17(12):1130-3. https://doi.org/10.6026/973206300171130.

[17] Smith SC, Goh R, Ma S, Nogueira GR, Atieh M, Tawse-Smith A. Periodontal tissue changes after crown lengthening surgery: A systematic

review and meta-analysis. The Saudi dental journal. 2023;35(4):294-304. https://doi.org/10.1016/j.sdentj.2023.03.004.

[18] Júnior RM, Gueiros LA, Silva IH, de Albuquerque Carvalho A, Leão JC. Labial frenectomy with Nd: YAG laser and conventional surgery: a comparative study. Lasers in medical science. 2015;30:851-6. https://doi.org/10.1007/s10103-013-1461-8.

[19] Evans DH, Abrahamse H. Efficacy of three different laser wavelengths for in vitro wound healing. Photodermatology, photoimmunology & photomedicine. 2008;24(4):199-210. https://doi.org/10.1111/j.1600-0781.2008.00362.x.

[20] Elanchezhiyan S, Renukadevi R, Vennila K. Comparison of diode laser-assisted surgery and conventional surgery in the management of hereditary ankyloglossia in siblings: a case report with scientific review. Lasers in medical science. 2013;28(1):7-12. https://doi.org/10.1007/s10103-011-1047-2.

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