

Preventive aspects and patient satisfaction with laser aided gingivectomy versus conventional method.

An in-vivo comparative study

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Background and Objectives: Nowadays, the field of dentistry has undergone an outstanding remarkable advances in both scientific and technological aspects, dentists are obligated to synchronize the progressive demands of the patients. Gingival diseases are among the most common health problems of human being. Gingivectomy, as a surgical interference can be performed with either scalpel or soft tissue Laser The objective of this study was to evaluate the preventive extent of Diode Laser in regards to gingivectomy associated complications beside the patient's satisfaction.

Methods: This in vivo comparative study was designed to include 64 patients, divided into 2 groups of patients treated with either Laser therapy (34 Patients) or conventional method (30 Patients) of gingivectomy. The outcomes of the study plus patients' satisfaction with each procedure were analyzed using IBM SPSS V. 22 program.

Results: The mean age of the sample was 25.01 + 6.56 years, more than half (57.8%) of the sample were females. All the patients in the surgery group needed local anesthesia and periodontal pack compared to 23.5% and 0% of patients in the laser group respectively. The bleeding was significantly more severe in the first group than second group. The mean ranks of the post-operative pain scores among patients of the surgery group were significantly higher than laser group ($p < 0.001$). More than forty percent of the patients in the laser group were strongly satisfied with the procedure compared to 10% of patients in the surgery group.

Conclusions: Diode laser can be used as a preventive tool for undesired Gingivectomy-associated pain, bleeding, and needs for anaesthesia which subsequently leads to more patient satisfaction compared to conventional methods.

Keywords: Diode laser, gingivectomy, comparative study, preventive tool.

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Introduction

Gingival enlargement, which is an inflammatory response of gingival tissue secondary to the exposure with pathogenic microorganisms especially bacteria of different species. This is a result of non-accomplishing effective oral hygiene by the patient The enlargement could be localized or generalized. When this condition occurs and left without treatment, the condition will

be more progressive and involve the periodontal tissue.¹ The primary onset of this condition usually resolves with initial periodontal treatment and effective oral hygiene practices. Sometimes, more advanced treatments may be needed for a good aesthetic appearance.²

Gingivectomy procedures usually performed in such circumstances for recontouring the

gingival margin.³ Gingivectomy can be performed by different methods such as scalpels, electrosurgery, chemosurgery, and laser. In the past, conventional surgery performed by a scalpel, it was the most common method of gingivectomy despite the concurrent and post-operative complications and undesired sensation. Excessive bleeding during the operation, posts-operative high level pain plus long healing time of this treatment may cause patient discomfort with conventional gingivectomy procedures.⁴⁻⁵ All of these factors prevent the convenience of the physician and success of operation.⁶ On the other hand, Gingivectomy can be performed easily with or without anesthesia using diode laser.⁶⁻⁷ Diode lasers can provide hemostasis, less postoperative pain and swelling reduce the infection risk, and may improve aesthetics and accelerate recovery time while soft tissue healing.⁸⁻¹⁰ The most suitable wavelength used for treatment of inflamed gingiva or hyperplastic soft tissues with a very high vascular component is near or far infrared laser.¹¹ Diode laser is a near-infrared type laser with a wavelength ranging from 800 nm to 980 nm. The laser wavelengths are selected according to each specific tissue biotype; it is always important to use the correct wavelength. diode lasers have a very gentle incision procedure in soft tissue with cutting depth ranges from 2 to 6 mm. This type of laser has a very good surgical and hemostatic action on soft tissues following numerous soft tissue surgical procedure within the oral cavity.¹²⁻¹⁴ As Long as, a few number of articles with relatively small sized sample were found in the literature concerning gingivectomy in pediatric and teenager patients receiving orthodontic treatment and no much studies compared diode laser with conventional surgery procedure in adult patient.¹⁵⁻¹⁷ In the present study, 940 nm diode laser was compared with conventional scalpel surgery on postoperative bleeding, pain, needs for local anesthesia (LA), especially injection type and patient satisfaction.

Patients and Methods

This comparative study was carried out at Sulaimani City throughout 2 calendar years from 2016 till 2018 at two different clinics of dental specialties.

Study design. An in vivo comparative study.

Ethical consideration. This clinical trial was done in accordance with declaration of Helsinki – Ethical principles for medical research involving human subjects by World Medical Association (WMA-2013). Moreover, Ethical approval was obtained from the ethical committee of the medical colleges at University of Sulaimani. Every patient or care giver of underage patients (less than 18 years old) was informed about the clinical procedures and the purpose of the study before he/she signed on a consent form (written in his/her language). Non Smoker patients with no Systemic and/or continuous medication which induces gingival enlargement were included in the study.

Inclusion criteria. The patients were included in the study when they agreed to participate willingly, free of any systemic disease which might be contributed to the development of gingival enlargement such as Diabetes mellitus, non-smoker, and no pregnancy for female patients.

The procedure. Sixty-four patients (27 males, 37 females) of different age groups that ranged from 20 years up to 30 years, were treated from gingival enlargement with gingivectomy procedure at the dental clinics of both B&R dental center and Faruk Medical City (FMC). The patients were randomly divided into two groups named: laser group (34 patients, treated with diode laser) and conventional group (30 patients, treated with the conventional surgical method), the patients of each group was treated by a single operator as a matter of standardization.

All the patients received oral hygiene instructions, motivation, and a thorough gingival scaling and polishing in advance to the operations. In the conventional surgical method group, topical anesthetic was applied before surgery followed by local infiltration anesthesia (2% lignocaine with 1: 80,000 epinephrine) to achieve deep anesthesia for patients. The

conventional surgical method performed by a standard surgical scalpel (No.15) with scalloped external bevel incision and then, a sulcular incision was performed with an Orban knife. Following excision of the enlarged tissue with curettes, gingivoplasty was performed by Kirkland knife for all patients. Finally, the operated gingiva was covered with periodontal pack.

For the laser group patients, LA was achieved by only topical gel of Lidocaine 5% unless the patient asked for deep anesthesia in case of intolerable pain during the operation. The patients were treated for 30 second per tooth by a 940 nm diode laser (EpicX, Biolase, California, USA) with a 400 μ m fiber at 1W power, the laser tip moved horizontally with a continuous laser beam, the gingival tissue was removed and shaped for gingivoplasty. No periodontal packs were used.

Acetaminophen tablets (500mg) were prescribed for the patients of both groups for analgesia and the patients were advised to take a tablet as needed post-operatively.

Bleeding and pain scoring. A single operator recorded the severity of bleeding at the day of operation in addition to the first and third post-operative days using scores adopted by other researcher,¹⁸ bleeding was assessed according to the following grades: 1. None, 2. Self-limiting, 3. Requiring light pressure, 4. Requiring coagulation, 5. Requiring ligation. Pain scores were recorded during the procedure and at the first post-operative day till seventh day.

The patients were asked to rate the degree of pain during their usual day life activities, especially eating or speech, on a 10 cm horizontal visual analog scale (VAS) by placing a vertical mark to assess position between the two endpoints. The left end point was nominated as “no pain,” and the right end point was nominated as “worst pain possible.”

Finally, the patients of both the groups were asked to declare their satisfaction rate with the procedure of treatment for (0: Not satisfied, 1: Satisfied, 2: Strongly satisfied).

Statistical analysis. Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 22). Chi square test of association was used to compare

proportions. Fisher’s exact test was used when the expected count of more than 20% of the cells of the table was less than 5. Mann Whitney test (a non-parametric test) was used to compare the mean ranks of the two study groups. A p value of ≤ 0.05 was considered statistically significant.

Results

Sixty-four patients underwent gingivectomy, laser was used for 34 patients, and scalpel surgery for the rest 30 patients. The mean age \pm SD of the sample were 25.01 ± 6.56 years, ranging from 18 to 44 years. The median was 23 years. Table 1 shows that 43.3% of patients in the surgery group aged ≥ 30 years, compared with 0% in the laser group ($p < 0.001$). More than half (57.8%) of the sample were females, but there was no significant difference between the two groups regarding the gender distribution ($p = 0.401$) this result can be seen in table 1.

All the patients in the conventional surgery group needed local anesthesia compared with 23.5% of patients in the laser group ($p < 0.001$) as presented in Table 2. All the patients in the surgery group needed periodontal pack while none of the patients in the laser group needed such a pack ($p < 0.001$). The table shows that 41.2% of the patients in the laser group were strongly satisfied with the outcome compared with 10% of patients in the surgery group ($p = 0.001$). All the patients in the conventional surgery group developed severe bleeding during surgery compared with 0% in the laser group ($p = 0.001$). Regarding the postoperative bleeding, 1 and 3 days after surgery, the table shows that, in general, the bleeding was significantly more severe in the surgery group than the laser group ($p < 0.001$).

It is evident in Table 3 that, all the medians of pain scores of the first seven days after surgery among patients of the surgery group were higher than the medians of the laser group. The mean ranks of the pain scores among patients of the surgery group were significantly higher than the mean ranks of the laser group ($p < 0.001$).

Table 1: Age and gender distribution.

Age groups	Laser		Conventional Surgical method		Total	
	No.	(%)	No.	(%)	No.	(%)
< 20	10	(29.4)	3	(10.0)	13	(20.3)
20-24	18	(52.9)	5	(16.7)	23	(35.9)
25-29	6	(17.6)	9	(30.0)	15	(23.4)
≥ 30	0	(0.0)	13	(43.3)	13	(20.3)
Gender						
Male	16	(47.1)	11	(36.7)	27	(42.2)
Female	18	(52.9)	19	(63.3)	37	(57.8)
Total	34	(100.0)	30	(100.0)	64	(100.0)

Table 2: Needs of local anesthesia, Periodontal pack. patients' satisfaction, and incidence of complications in the two study groups.

		Laser group patients		Conventional surgical method		Total		P Value
		No.	(%)	No.	(%)	No.	(%)	
Need for local anesthesia	No	26	(76.5)	0	(0.0)	26	(40.6)	< 0.001
	Yes	8	(23.5)	30	(100.0)	38	(59.4)	
Need for periodontal pack	No	34	(100.0)	0	(0.0)	34	(53.1)	< 0.001
	Yes	0	(0.0)	30	(100.0)	30	(46.9)	
Patient satisfaction	Not satisfied	0	(0.0)	6	(20.0)	6	(9.4)	0.001*
	Satisfied	20	(58.8)	21	(70.0)	41	(64.1)	
	Strongly satisfied	14	(41.2)	3	(10.0)	17	(26.6)	
Bleeding during surgery	Self-limiting	34	(100.0)	0	(0.0)	34	(53.1)	< 0.001
	Require light pressure	0	(0.0)	30	(100.0)	30	(46.9)	
Post-operative bleeding 1 st day	Self-limiting	34	(100.0)	0	(0.0)	34	(53.1)	< 0.001*
	Require light pressure	0	(0.0)	27	(90.0)	27	(42.2)	
	Requiring coagulation	0	(0.0)	3	(10.0)	3	(4.7)	
Post-operative bleeding after 3 days	Self-limiting	34	(100.0)	14	(46.7)	48	(75.0)	< 0.001
	Require light pressure	0	(0.0)	16	(53.3)	16	(25.0)	
	Total	34	(100.0)	30	(100.0)	64	(100.0)	

*By Fisher's exact test.

Table 3. Mean ranks of the pain scores of the two study groups.

Days after the operation	Laser pain scores		Surgery pain scores		P Value
	Mean rank	Median	Mean rank	Median	
Day 1	18.12	3.0	48.80	6.0	< 0.001
Day 2	19.26	2.0	47.50	3.5	< 0.001
Day 3	18.74	1.0	48.10	3.0	< 0.001
Day 4	18.38	0.0	48.50	2.0	< 0.001
Day 5	17.50	0.0	49.50	2.0	< 0.001
day 6	17.50	0.0	49.50	1.0	< 0.001
Day 7	19.50	0.0	47.23	1.0	< 0.001

*By Mann Whitney test.

Discussions

In the present study, Diode laser surgery been compared to the conventional surgical method with scalpel in regards to necessity to infiltration type of LA, periodontal dressing with a pack, post-operative pain, bleeding in 3 different occasions, and patients' satisfaction with each procedure. Sixty-four patients underwent gingivectomy, laser was used for 34 cases, and surgery for the rest of the patients (30 patients). About one quarter of the laser group patients asked for LA while, all the patients in the other group anesthetized with 2% lignocaine, which explains that, diode laser initiate minimum pain and harmful effect during surgical procedures of oral soft.¹⁹⁻²⁰ The bleeding rate within the diode laser group were found at the minimum rate in contrast to the second group, these results were an agreement with other studies.^{15,18,22} Reduced bleeding during surgery, rapid postoperative hemostasis and clear vision of the surgical field were observed in the laser group, which showed compatibility with other study.^{19,23-24} The irradiated tissue constricts against the proximal vasculature and the shrinkage of the collagen in the walls of blood vessels will improve hemostasis. Laser damage to erythrocytes enhanced aggregation of platelets which encourage intraluminal thrombosis and further decrease in the blood loss and this explains why the laser group had minimal blood loss in comparison to the scalpel group.²⁵ Generally, it was noticed that, conventional surgical approach has

caused some problems like: surgical trauma, bleeding during surgery, postoperative pain and swelling, these problems can handle more easily with lasers.²⁶ No extensive bleeding and tissue damage at the operated sites of the laser group made the application of periodontal pack unnecessary. There was a significant difference between the two groups in regard to post-operative bleeding at two subsequent occasions (1st day and 3rd day after the operation) when the laser surgery showed less bleeding, this can be clarified by the fact that, diode lasers are highly absorbed by hemoglobin and melanin, this allow precise cutting of soft tissue with excellent homeostasis and deep penetration which consequently reduce the operation time and postoperative bleeding without the need to surgical pack or suture.^{8,14,17,23} It has the ability to be absorbed by gingival tissue rather than the adjacent structures which makes this device of choice for gingival surgery. 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.²⁷⁻²⁹ The recorded postoperative pain scores were significantly more in the patients treated with diode laser as compared to surgical procedure, no patients asked for analgesia except for some surgical method patients within the next the days of post-operative treatment. The pain

was controlled with Acetaminophen tablets with the dose of 500 mg, as required with no more than 3 times a day after treatment. The decontamination ability of lasers allows the surgeon to work in almost sterilized surgical field that reduced the possibility of postoperative infection and subsequently reduces pain sensation.³⁰

All the patients were satisfied with Laser surgery, on the other hand, not all the patients were happy with the conventional type of gingivectomy with a significant difference between the two groups, this proves that, laser aided operations are less frightening and more acceptable by the patients, this result was in accordance with other studies.³¹

The subjective quality of pain threshold may be limitation of this clinical study, for this reason, VAS as a reliable and reproducible tool was used for patients.

Conclusion

It was concluded from the results of the present study that, Undesired Gingivectomy-associated pain, bleeding, and needs for anaesthesia that associated with conventional procedure can be diminished to the lowest level with soft tissue laser and subsequently leads to more patient satisfaction, so diode lasers can be used as a suitable preventive tool for most of the complications, discomforts, and difficulties that associated with conventional method of gingivectomy procedure.

Conflict of interest

The authors reported no conflict of interests.

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