EGYPTIAN DENTAL JOURNAL
www.eda-egypt.org
VOL. 69, 2821:2828, OCTOBER, 2023
PRINT ISSN 0070-9484 • ONLINE ISSN 2090-2360
ORAL MEDICINE, X-RAY, ORAL BIOLOGY AND ORAL PATHOLOGY
Submit Date : 7-08-2023 • Accept Date : 31-08-2023 • Available online: 10-10-2023 • DOI : 10.21608/EDJ.2023.229728.2683

CLINICAL COMPARISON BETWEEN SOFT TISSUE LESIONS REMOVAL USING SCALPEL VERSUS LOW-LEVEL LASER TECHNIQUE

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ABSTRACT

Objective: To compare between soft tissue lesions removal using scalpel incision versus Low-Level Laser Technique (LLLT) in the removal of oral soft tissue lesions.

Patients and Methods: 12 patients (6 females and 6 males) aging 40-70 requiring soft tissue lesions removal. patients indicated for fibroma (2), epulis fissuratum (EF) (3), peripheral giant cell granuloma (PGCG) (3), pyogenic granuloma (PG) (2), and hemangioma (2). Patients were treated either with conventional surgery using a scalpel or with a LLLT. Pain scores were evaluated using the visual analogue scale (VAS), postoperative healing, wound dehiscence. Patients were followed up in the following schedule, Day 1, 3, 7 then once per week for the first month then once monthly in the second month.

Results: Group (I) had VAS values that were substantially higher than Group (II) (p 0.05) and within both two groups there was a significant reduction in VAS values with values measured after 7 days being significantly lower than day 1 values ($p<0.05$). Wound dehiscence was present only in two cases in group (I) and the difference between both groups was not statistically significant ($p=0.121$).

Conclusions: LLLT was considered an effective method for removal of soft tissue lesions with effective hemostasis intra-operative and less postoperative complications such as pain and wound dehiscence. Oral soft tissue surgery can be performed using the diode laser as a modality.

KEYWORDS: Diode laser; scalpel; soft tissue lesion, LLLT.

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INTRODUCTION

Surgeons and physicians frequently observe soft tissue tumors or lesions as part of routine patient treatment. All soft tissue growths, both benign and malignant, are included. Soft tissue lumps may be linked to trauma, infection, or cancer. A combination of clinical data (a thorough medical history and physical examination), imaging results, and histology, where warranted, is used to make the diagnosis of soft tissue masses. [1,2]

Soft tissue masses' clinical characteristics, such as how long they have been present, their size, depth, mobility, consistency, changes in dimension and development rate, the kinds of related symptoms, and any previous histories of trauma, inflammation/infection, or cancer, can provide crucial information about how they developed. [1,2]

The three methods that are most frequently employed to remove tissues overgrowth are the electrocautery, scalpel and laser. The carbon dioxide laser (CO_2), the neodymium-doped yttrium aluminum garnet (Nd:YAG) laser, and the erbium, chromium: scandium, yttrium, gallium, garnet (Er, Cr: YSGG) laser have all been used for this aim. Despite the fact that CO_2 and Nd:YAG lasers are widely known for their ability to remove soft tissue, they can also significantly increase the temperature of the tissues they are meant to target. A diode laser was used to treat a patient with epulis fissuratum. This laser has been proven to be useful for treating gum lesions and getting rid of soft tissue growths inside the mouth. Reduced bleeding during surgery. [3,4,5]

The safety of using diode laser in soft tissue oral surgeries including frenectomy, epulis fissuratum, and fibroma excisions, face pigmentation and vascular lesions has been examined. The use of lasers has the benefit of offering surgical and postoperative procedures with little bleeding and less edema and scarring. For excisional biopsy of gingival pigmentation and pyogenic granuloma, we employed a diode laser.[6]

Based on the surface texture the peripheral oral exophytic lesions are classified as: smooth (originating from the mesenchyme or nonsquamous epithelium) and rough (originating from the squamous epithelium). Reactive hyperplastic lesions/inflammatory hyperplasia, mesenchymal lesions (benign and malignant neoplasms), and salivary gland lesions (nonneoplastic and neoplastic) were the three groupings that were created from the lesions with smooth surfaces based on their general frequency. Figure (1) [7]

Reactive hyperplasia is the most common disorder that results in exophytic lesions in the oral cavity which are a result of low-grade or persistent trauma, such as tooth fractures, calculus accumulation from chewing, and iatrogenic factors such an extended denture flange and overhanging dental restorations. The floor of mouth, tongue and buccal mucosa are the next most typical areas for reactive lesions to manifest. Clinically, they resemble pedunculated or sessile masses with a smooth surface. Lesions can be soft or hard, and they can range in color from pink to scarlet. However, there are also instances where the clinical signs resemble malignant tumors, which poses a diagnostic challenge. Giant cell fibroma, pregnant epulis, peripheral giant cell granuloma, peripheral ossifying fibroma, irritational fibroma, leaf-like fibroma/fibroepithelial polyp, epulis fissuratum, parulis, palatal papillomatosis, inflamed papillary hyperplasia. [8,9] This study was conducted to evaluate the use of scalpel incision in soft tissue lesions removal versus LLLT in the removal of oral soft tissue lesions.

MATERIAL AND METHODS

Ethic approval

The ethical aspects of this clinical trial were reviewed by Research Ethics committee at Faculty of Dentistry, October 6 University, Giza, Egypt, (Approval Number: ***RECO6U/12-2023*** – Approval date: January 9, 2023).

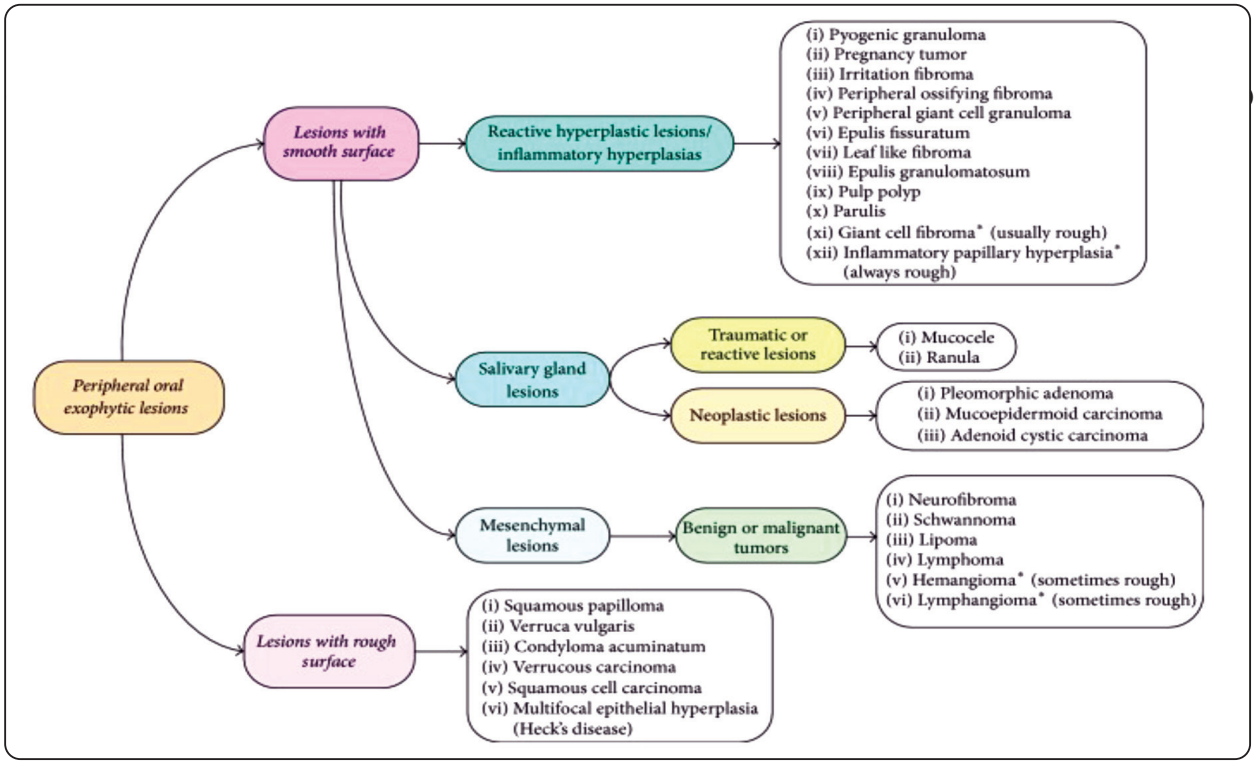

Fig. (1) Decision tree for peripheral oral exophytic lesions as shown in Mortazavi et al, 2017[7]

Patients' examination Pre-operative full examination was done for all patients included: patient's medical history, past dental history, history of their chief complaint and any medications were taken. Visual Analog Scale (VAS) for assessment of pain severity preoperative (Fig. 2).[10]

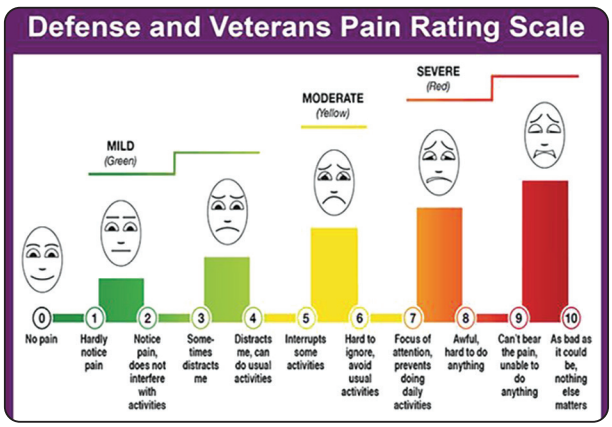

Fig. (2) Diagram showing the VAS score for assessment of pain severity. [10]

Eligibity criteria

Patients diagnosed with soft tissue lesion, with age range 40 to 70 years were recruited. Patients with suspicious malignant tumors or systemic diseases that could interfere with wound healing e.g diabetes were excluded.

Consent was obtained from all patients. A full extraoral and intraoral examination, medical and dental histories, as well as any necessary radiographic imaging, were all done on the individuals. The use of systemic drugs, the kind of anesthesia technique, the requirement for analgesics, postoperative discomfort, and postoperative complications were also noted.

Patients Grouping:

Twelve patients with soft tissue lesions with age range of 40 to 70 years. They were diagnosed and randomly assigned to 2 groups (n=6), one of the contributing authors was responsible for making patient files and each file took number, then all numbers were divided randomly into **Group I/II**. LLLT In GaAsP diode laser (Biolase)©** (Figure 3) have been used in this study with a wavelength of 1080 J with 4.0 W and 940 nm. All patients were suffering from soft tissue lesions. The patients and the clinician used protective eyewear. **Group I** included six patients (4 females and 2 males) who received scalpel incision (Figure 4). However, in **Group II** six patients (2 females and 4 males) who received Diode laser technique (Figure 5).

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* BIOLASE, EPIC, USA

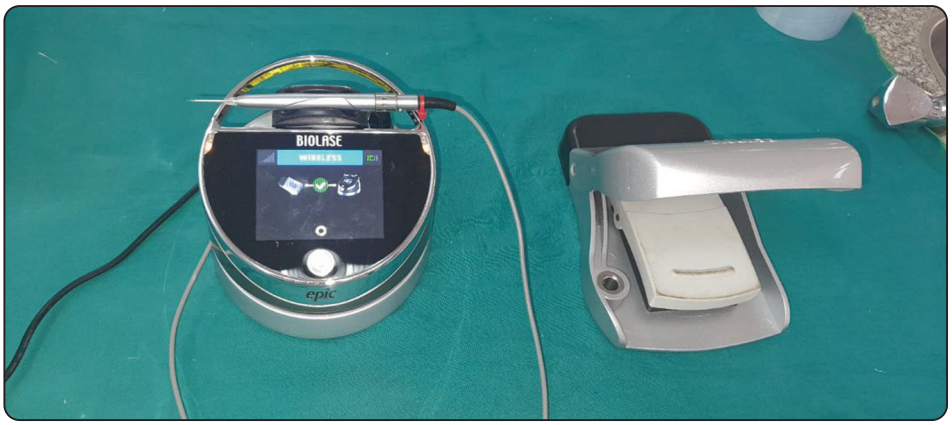

Fig. (3) Photograph showing the ''BIOLASE'' equipment.

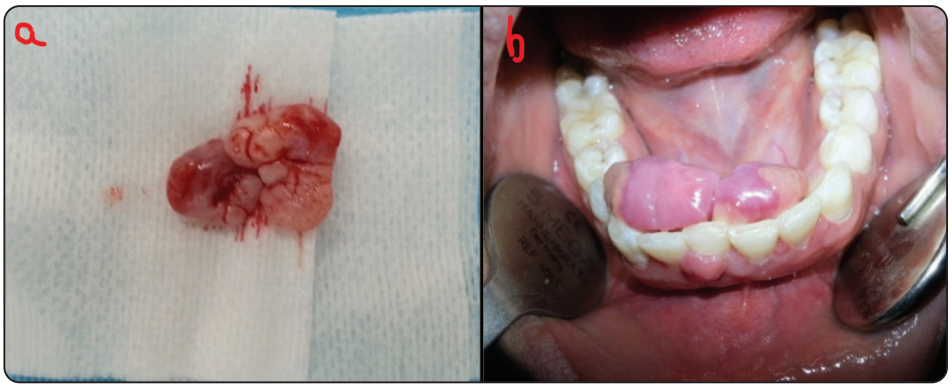

Fig. (4) a. pregnant tumor before treatment with scalpel. b, pregnancy tumor. excised with scalpel.

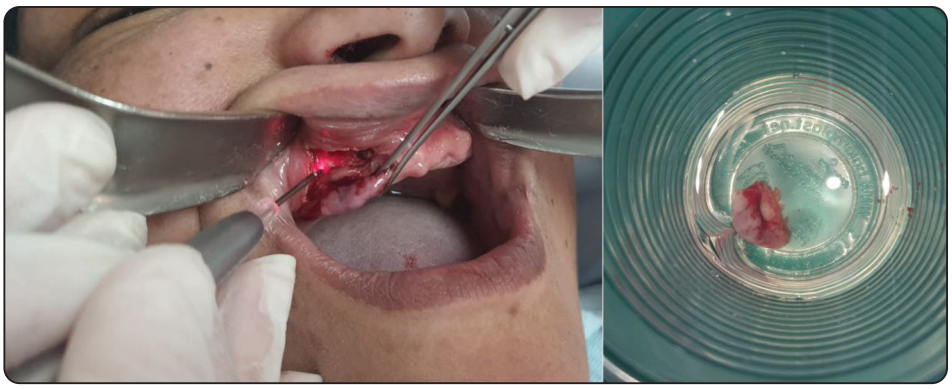

Fig. (5) a, b Diode laser device used in excision and biopsy.

Follow up

Pain score was assessed by the visual analogue scale (VAS), Healing postoperative and wound dehiscence. 6 females and 6 male patients with age 40-70 years were distributed randomly among both groups. Patients were followed up in the following schedule, Day 1, 3, 7 then once per week then weekly for the first month then once monthly in the second month.

Statistical analysis

Categorical data were presented as frequency and percentage values and were analyzed using chi-square test. Numerical data were presented as mean and standard deviation (SD) values and were tested for normality using Shapiro-Wilk's test. Age data were normally distributed and were analyzed using independent t-test. VAS data were non parametric

and were analyzed using Kruskal-Wallis test followed by Dunn's post hoc test with Bonferroni correction test for intergroup comparisons and Freidman's test followed by Nemenyi post hoc test for intragroup comparisons. The significance level was set at $p<0.05$ within all tests. Statistical analysis was performed with R statistical analysis software version 4.3.1 for Windows. [11]

RESULTS

12 cases were included (i.e., 6 cases each) in tested groups. In group (I), there were 2(33.3%) males and 4(66.7%) females while in group (II) there were 4(66.7%) males and 2(33.3%) females. The mean age of cases in group (I) was (58.17±5.08) years and in group (II) it was (54.00±10.68). There was no significant difference between both groups regarding gender (p=0.248) and age (p=0.408). Results of intergroup comparisons of demographic data are presented in table (1).

TABLE (1) Intergroup comparisons of demographic data

Parameter		n (%)/ Mean±SD		Test statistic	p-value
		Group (I)	Group (II)		
Sex	**Male**	2 (33.3%)	4 (66.7%)	**1.33**	**0.248**
	Female	4 (66.7%)	2 (33.3%)		
Age (years)		58.17±5.08	54.00±10.68	**0.86**	**0.408**

Within all intervals, VAS values measured in group (I) were significantly higher than group (II) ($p<0.05$) and within both groups there was a significant reduction in VAS values with values measured after 7 days being significantly lower than day 1 values ($p<0.05$). Results of inter and intragroup comparisons of VAS values are presented in table (2) and in (Figs. 6, 7).

Wound dehiscence was present only in two cases in group (I) and the difference between both groups was not statistically significant (p=0.121). (fig.8)

TABLE (2) Inter and intragroup comparisons of post-operative pain (VAS)

Interval	VAS (Mean±SD)		u-value	p-value
	Group (I)	Group (II)		
Day 1	9.67 ± 0.52^{A}	3.83 ± 2.14^{A}	36.00	0.004*
Day 3	8.33 ± 0.52^{AB}	2.50 ± 1.22^{AB}	36.00	0.003*
Day 7	6.67 ± 1.97^{B}	0.67 ± 1.21^{B}	36.00	0.004*
q-value	9.36	9.00		
p-value	0.009*	0.011*		

Different superscript letters indicate a statistically significant difference within the same vertical column; *significant (p<0.05)

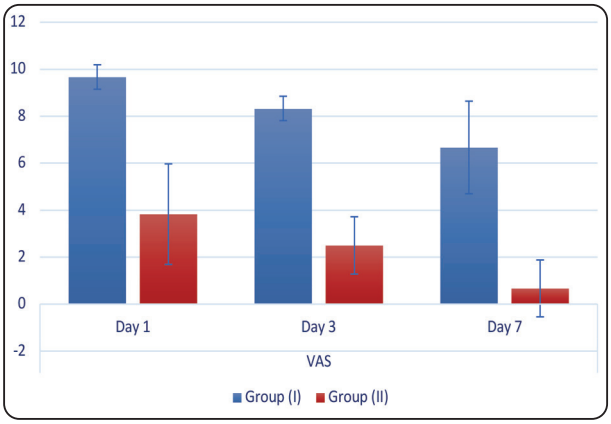

Fig. (6) Bar chart showing mean and standard deviation (error bars) values for VAS

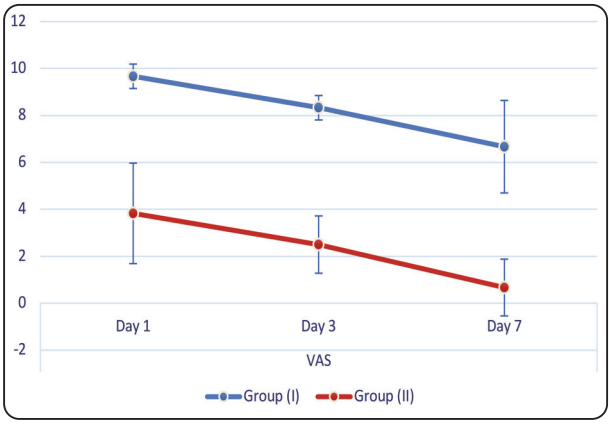

Fig. (7) Line chart showing mean and standard deviation (error bars) values for VAS

TABLE (3) Intergroup comparison of presence of wound dehiscence

Wound dehiscence	n (%)		χ^2	p-value
	Group (I)	Group (II)		
Present	2 (33.3%)	0 (0.0%)	**2.40**	**0.121**
Absent	4 (66.7%)	6 (100.0%)		

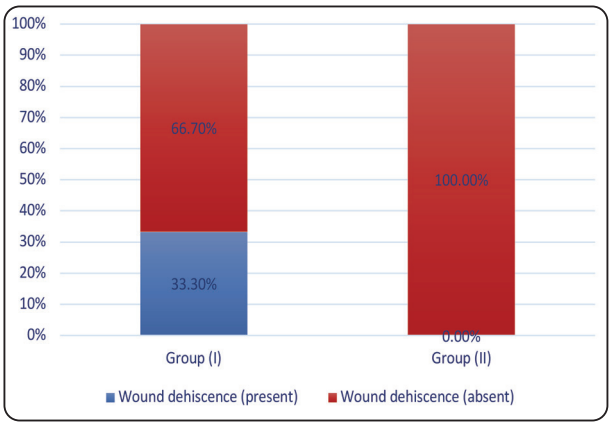

Fig. (8) Stacked bar chart showing occurrence of wound dehiscence

Different superscript letters indicate a statistically significant difference within the same vertical column; *significant ($p<0.05$)

DISCUSSION

There are two types of oral peripheral exophytic lesions: lesions with smooth surfaces and lesions with rough surfaces. For instance, a pyogenic granuloma, often known as a pregnancy tumour in a pregnant woman, is suggested by a brilliant red color in a soft, readily bleedable mass. A peripheral giant cell granuloma, on the other hand, manifests as a firmer, more blue mass that is positioned buccolingually only on the gingiva or alveolar ridge. In the meanwhile, it could result in bone and root resorption. Similar to tooth mobility, peripheral ossifying fibroma also tends to cause bone deterioration, although it is firm to hard to the touch and light pink in color. [12,13]

Additionally, certain lesions can be recognized primarily based on where they are located, such as those connected to ill-fitting dentures. Epulis fissuratum manifests as one or more folds along denture flanges, inflammatory papillary hyperplasia mostly affects the hard palate and resembles cobblestones, and leaf-like fibromas are seen at the base of maxillary dentures and have a thin stem and serrated edges. [7]

Oral soft tissue surgery especially for minor visible lesions can be removed using diode lasers, because of their simplicity of usage, no need for sutures, enhanced coagulation, decreased swelling and pain, and ability to cure physiologic gingival pigmentation from an aesthetic standpoint. It might be considered a first option in place of periodontal surgery because of its speedier reaction, better de-epithelialization, lack of bleeding, and improved recovery. [14]

The energy from the laser is transmitted to the cells, where it causes drying, coagulation, protein denaturation, warming, welding, vaporisation, and carbonization. In the mid-90sec, the diode laser was first used in oral surgery and dentistry. [15]

Three different diode laser wavelengths—810, 940, and 980 nm—have been applied in surgical procedures. Diode lasers are safe and effective for soft tissue oral surgery procedures such frenectomy, fibroma, epulis fissuratum, face pigmentation, and vascular lesions when used properly. [16]

Diode lasers have clear advantages over other laser types, such as CO2 and erbium Lasers, including sharp and precise cutting edges, hemostasis and coagulation after surgery, as well as small size and better manoeuvrability during application. Nearly all research papers underlined these benefits. Diode lasers have some drawbacks that are somewhat comparable to those of other lasers, including delayed repair that is prominent in larger lesions and charring tissue in smaller lesions when compared to using traditional surgical techniques with scalpels, and laser plume in excision of exophytic lesions. [17]

Scientists have shown that the virus and perhaps related pathogens cause comparable lesions in practically all studies. For many therapies, the clinical and histological findings evolve over time. Due to tissue thermal injury, diode laser surgery tends to result in more significant alterations than traditional scalpel surgery, with a correspondingly more inflammation and initial delay in tissue organization. Histological analysis is essential for predicting treatment outcomes. Because, it appears to be a viable substitute for suture and scalpel repair.[18]

According to Jin et al, a diode laser is an excellent device for cutting oral mucosa, however it causes more tissue damage than a scalpel or an Er, Cr:YSGG laser. When compared to a scalpel, laser tends to create more noticeable tissue alteration as a result of thermal-induced damage. Such alterations are related to a heightened inflammatory response and a delayed healing response at first.[19]

Romanos and Nentwig reported that treatment of soft tissue tumors, gingival hyperplasia, frenectomies, elimination of haemangiomas, periimplant tissue surgery, and vestibuloplasty using diode laser 980 nm was successful in 22 patients. The same authors concluded that diode laser had postoperative benefits, including reduced pain, edoema, bleeding, and scarring as well as faster wound healing.[19]

Additionally, Stubinger et al.'s study on the efficacy of diode laser. Satisfactory cutting capabilities, coagulation and incredibly little zone of thermal necrosis to the neighboring tissues, the same authors came to the conclusion that postoperative clinical data were outstanding.[20] Results of that study are consistent with the results of present study.

CONCLUSION

Because of its ease of use, improved coagulation, lack of need for sutures, decreased swelling and discomfort, and capacity to treat physiologic gingival pigmentation from an aesthetic perspective, diode lasers can be utilized in oral soft tissue surgery, particularly for tiny conspicuous lesions. Due to its quicker response, greater de-epithelialization, lack of bleeding, and superior healing, it might be regarded as a first alternative in place of periodontal surgery.

Conflict of Interest

Nil

Source of Funding

Self

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