

A Comparison between Mechanical Sulcular Debridement and Debridement by Diode Laser in Modified Widman Flap for Treatment of Periodontitis

Aseel Ghithal Hayder¹, Samar Khalid Al-Adel², Basma Raad Omar³

¹High Diploma, Department of Periodontics, College of Dentistry, University of Baghdad, Iraq
Corresponding Author Email: [aseelhayder30\[at\]gmail.com](mailto:aseelhayder30[at]gmail.com)

²Master, Department of Conservative, College of Dentistry, University of Baghdad, Iraq

³Master, Department of Periodontics, College of Dentistry, University of Baghdad, Iraq

Abstract: *Periodontitis is an inflammatory disease caused by a group of microorganisms attached to tooth surfaces as a biofilm. Therapeutic modalities aim to elimination or suppression of microorganisms, open flap debridement such as Modified Widman Flap is one of these modalities. Diode laser due to antibacterial effect had become popular in periodontology, however limited study was done on it's application in periodontal flap surgery.*

Keywords: Diode Laser, Periodontitis, Debridement

1. Introduction

Periodontitis is a chronic multifactorial inflammatory disease associated with plaque biofilms and characterized by progressive destruction of the tooth-supporting apparatus. Its primary features include the loss of periodontal tissue support, manifested through clinical attachment loss (CAL) and radiographically assessed alveolar bone loss, presence of periodontal pocketing and gingival bleeding.^[1]

Treatment of chronic periodontitis

Most conventional methods used to treat the disease involve disruption of the biofilm by mechanical removal of subgingival plaque and sometimes, the adjuvant use of antimicrobial agents and mechanical surgical debridement of pockets and root surfaces damaged as a result of periodontal disease.^[2]

The nonsurgical therapy leads to resolution of inflammation, reduction in bacterial load, and reduction in probing pocket depth. However, the complete removal of the bacterial toxins from the root surfaces.^[3]

Also, sonic and ultrasonic instrumentation does not lead to killing of periopathogenes. These instruments help to reduce the bacterial load by mechanical removal of plaque and calculus.^[4]

The surgical treatment by modified widman flap performed in cases with persistent inflammation, deeper pockets, class II, III furcation defects and infrabony pockets provide better accessibility to root surfaces as well as osseous defects.^[5] Modified Widman flap remains the standard procedure for open periodontitis therapy^[6, 7, 8]. It is classified with the "access flap operations" because the goal of the flap reflection is primarily to provide improved visual access to

the periodontally involved tissues. The method is characterized by precise incisions, partial flap reflection and an atraumatic procedure, whose goal is not necessarily pocket elimination but "healing" (regeneration or a long junctional epithelium) of the periodontal pocket with minimum tissue loss. The main goals of the procedure include optimum mechanical subgingival root planing, as well as healing by primary intention following close interdental flap adaptation. No ostectomy is performed. However, minor contouring osteoplasty can be performed to improve the facial or oral osseous morphology, primarily to achieve the desired interdental defect closure.^[6, 7, 8, 9]

Laser mean Light Amplification by Stimulated Emission of Radiation Normally a pulsed diode laser at a wavelength of 812–980 nm is preferred for cosmetic gingival surgery. The laser procedures are not time consuming and cause considerably less discomfort and bleeding than other types of lasers.^[10]

In addition to conventional and contemporary guided tissue regeneration, lasers have also been used to induce regeneration and healing of periodontal tissues.^[11]

In laser sulcular debridement, the fiber tip from diode laser is placed in the periodontal pocket and laser energy is used to remove the necrotic debris and the infected soft tissue pocket lining (epithelium). The bacteriocidal potential of the laser also exploited to destroy pigmented oral pathogens.^[12, 13]

Laser have been used in periodontology to reduce periodontopathogenic bacteria, remove the pocket epithelium and retard epithelial migration into the pocket.^[14, 15, 16]

2. Materials and Methods

Sample selection

Thirty patients were selected from outpatient in periodontics department in Al-mammon specialized dental center, the following selection criteria: systemically healthy (with special regard to disease affecting tissue repair) the age of group was range (25-60) with chronic periodontitis and probing depth of a minimum ≥ 5 mm, the selected patients were randomly distributed into two groups each group include 15 sample (Test group $n=15$) & (Control group $n=15$), control group treated by modified widman flap surgery, test group treated modified widman flap with assisted of diode laser, all the patients in this study underwent phase I therapy were subjected to initial preparation which consisted of full mouth scaling and root planning as this allows for optimal tissue health and plaque control, thereby enhancing treatment outcomes. which include scaling by ultrasonic scaler followed by root planning by gracey curette to obtain smooth and calculus-free root surface and at the end of this phase four baseline measured.

- 1) Gingival index (GI) by Loe and Sillness (1963)
- 2) Plaque index (PI) by Loe and Sillness (1963)
- 3) Probing pocket depth (PPD)
- 4) Bleeding on probing (BOP)

Surgical procedure

The surgical areas were anesthetized using local anesthetic 2% lignocaine with adrenaline 1:80,000 then Intracrevicular incisions were made and full-thickness mucoperiosteal flaps

were elevated, following flap reflection, the hard tissue deposits were debrided using ultrasonic scalar and universal curettes, In the test group, granulation tissue debridement using soft tissue diode laser In the test sites, granulation tissue debridement using soft tissue diode laser with wave length (980nm) following all debridement surgical flaps were repositioned to the presurgical level and sutured with 3-0 silk suture, direct suturing technique achieving primary closure. periodontal dressing was placed, Patients after surgery were asked to use chlorhexidine gluconate (0.2%) rinse twice a day for 15 days. Patients were recalled after a period of 1 week for suture removal then they were recalled every month for the reinforcement of oral hygiene instructions. After 3 months of the procedure three baseline Gingival index (GI), Plaque index (PI), probing depth (PD) and bleeding on probing (BOP) were measured.

3. Results

The clinical parameters in both the groups (control and test group) were statistically analyzed by using Student's 't' test using Statistical Package for the Social Sciences SPSS version 19, Paired 't' tests were used to compare intergroup and intragroup variations. A 'p' value of 0.05 or less was considered significant.

T test showed A significant difference improvement in clinical parameters Gingival index, Plaque index, Pocket depth within both groups ($p < 0.01$) as shown in table (1)

Table 1: t-test for comparison of significance of the plaque index, gingival index, and pocket depth of control group and test group after three months of procedures

Parameter	Group	Mean	SD	t-test	P- value	Significant
Plaque index	Surgical group	1.27000	.34006	14.464	.000	HS
	laser group	.66000	.27980	9.136	.000	HS
Gingival index	Surgical group	1.00000	.26458	14.639	.000	HS
	laser group	1.34667	.50831	10.261	.000	HS
Pocket depth	Surgical group	3.23333	.62754	19.955	.000	HS
	laser group	4.31333	.94632	17.653	.000	HS

While Comparison of Pocket depth, Gingival index between two groups by using t test revealed a statistically significant difference ($0.05 > p > 0.01$) but Plaque index between two groups revealed no statistically significant difference ($p > 0.05$) as shown in table (2)

Table 2: t-test for comparison of significance of the plaque index, Gingival index, and pocket depth of control group versus plaque index, Gingival index, and pocket depth of test group.

Parameter	Group	Mean	SD	t-test	P- value	Significant
Plaque index	Surgical group	.04000	.20633	.751	.465	NS
	laser group					
Gingival index	Surgical group	.45333	.40509	4.334	.001	S
	laser group					
Pocket depth	Surgical group	.55333	.56425	3.798	.002	S
	laser group					

4. Discussion

Successful periodontal therapy depends on anti-infective procedures aimed to eliminating or suppressing pathogenic organisms^[17].

In this study all patients were subjected to initial preparation which consisted of full mouth scaling and root planing as this allows for optimal tissue health and plaque control, thereby enhancing treatment outcomes^[18].

surgical mechanical therapy alone may not effectively eliminate the periodontal disease completely, particularly in deep pockets. Hence, surgical therapy is performed, which provides improved visualization of the root surface and defects. Soft tissue lasers such as diode and Nd:YAG have the potential for curettage of pocket wall and disinfection of periodontal pockets^[19, 20].

In this study plaque index was used to monitor the oral hygiene status of the patients, The results demonstrate that there was no statistically significant difference in the PI at base line and at 3 months in the control and test group this

suggesting maintenance of fair oral hygiene by the patients throughout the study, on the other hand after 3 months, both treatment groups test and control group, the PI, GI, PPD decreased significantly compared to baseline ($p < 0.01$) This suggests the effectiveness of access flap surgery in reducing the signs of inflammation caused by effective removal of calculus and infected granulation tissue.^[21]

The result of this study showed statistically significant in the laser-treated group as compared with the control group ($0.05 > p > 0.01$).

Because Diode laser is an excellent soft tissue laser show greater absorption and less penetration especially in blood-rich tissue because of its tissue coagulation and hemostatic effect^[22].

5. Conclusion

During periodontal surgical procedure in treatment of deep periodontal pockets, such as Modified Widman Flap, laser application for removal of granulation tissue seems to be safe and effective with results superior than those conventional mechanical methods.

Diode laser was well tolerated by the patients and it demonstrated significant effect.

Laser assisted flap procedure have potentially better therapeutic outcomes when compared to the conventional modified widman flap surgery and conventional debridement, which is evident from the enhanced reduction in periodontal plaque, gingival index, probing pocket depth.

References

- [1] Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, Flemmig TF, Garcia R, Giannobile WV, Graziani F, Greenwell H. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *Journal of periodontology*. 2018 Jun;89:S173-82.
- [2] Marsh PD. Sugar, fluoride, pH and microbial homeostasis in dental plaque. *Proceedings of the Finnish Dental Society, Suomen Hammaslaakariseurotoimitus*. 1991 Jan 1;87(4):515-25.
- [3] Ishikawa I, Baehni P. Nonsurgical periodontal therapy—where do we stand now?. *Periodontology* 2000. 2004 Oct;36(1):9-13.
- [4] Schenk G, Flemmig TF, Lob S, Ruckdeschel G, Hickel R. Lack of antimicrobial effect on periodontopathic bacteria by ultrasonic and sonic scalers in vitro. *Journal of clinical periodontology*. 2000 Feb;27(2):116-9.
- [5] Sandros J, Papapanou P, Dahlén G. *Porphyromonas gingivalis* invades oral epithelial cells in vitro. *Journal of periodontal research*. 1993 May;28(3):219-27.
- [6] Widman, L.: The operative treatment of pyorrhea alveolaris. A new surgical method. *Sven TandlakTidskr* (special issue) Dec. 1918.

- [7] Ramfjord SP, Nissle RR. The modified Widman flap. *Journal of Periodontology*. 1974 Aug;45(8P2):601-7.
- [8] Ramfjord SP. Surgical pocket therapy. *International dental journal*. 1977 Sep 1;27(3):263-9.
- [9] Herbert F. Wolf, Edith M. Klaus H. Rateitschak, Thomas M. Hassell. *Color Atlas Of Dental Medicine, Periodontology*, 3rd revised expanded edition. 2011, P 309.
- [10] Sarver DM, Yanosky M. Principles of cosmetic dentistry in orthodontics: part 2. Soft tissue laser technology and cosmetic gingival contouring. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2005 Jan 1;127(1):85-90.
- [11] Belal MH, Watanabe H. Comparative study on morphologic changes and cell attachment of periodontitis-affected root surfaces following conditioning with CO₂ and Er: YAG laser irradiations. *Photomedicine and laser surgery*. 2014 Oct 1;32(10):553-60.
- [12] White JM, Goodis HE, Rose CL. Use of the pulsed Nd: YAG laser for intraoral soft tissue surgery. *Lasers in surgery and medicine*. 1991;11(5):455-61.
- [13] Harris DM, Loomer PM. Ablation of *Porphyromonas gingivalis* in vitro with dental lasers. *IADR, San Antonio*. 2003 Mar;855.
- [14] Katuri KK, Bollepalli AC, Sunkireddy HK, Chilakalapudi HC, Kurapati S, Vinnakota NR. Clinical effectiveness of laser assisted new attachment procedure as an adjunct to nonsurgical periodontal treatment: a randomized clinical study. *Journal of International Oral Health*. 2015 Nov 1;7(11):57.
- [15] Rao N, More C. Application of Lasers in Periodontal Therapy: A Review of Literature with Proposed Classification. 2016; 8(09): 38985-94
- [16] Jha A, Gupta V, Adinarayan R. LANAP, periodontics and beyond: A review. *Journal of lasers in medical sciences*. 2018;9(2):76.
- [17] Drisko CH. Nonsurgical periodontal therapy. *Periodontology* 2000. 2001 Jan 1;25:77-88.
- [18] Miyazaki A, Yamaguchi T, Nishikata J, Okuda K, Suda S, Orima K, Kobayashi T, Yamazaki K, Yoshikawa E, Yoshie H. Effects of Nd: YAG and CO₂ laser treatment and ultrasonic scaling on periodontal pockets of chronic periodontitis patients. *Journal of periodontology*. 2003 Feb;74(2):175-80.
- [19] Kerry G. Tetracycline-loaded fibers as adjunctive treatment in periodontal disease. *Journal of the American Dental Association* (1939). 1994 Sep 1;125(9):1199-203.
- [20] Ribeiro IW, Sbrana MC, Esper LA, Almeida AL. Evaluation of the effect of the GaAlAs laser on subgingival scaling and root planing. *Photomedicine and laser Surgery*. 2008 Aug 1;26(4):387-91.
- [21] Lindhe J, Nyman S. Scaling and granulation tissue removal in periodontal therapy. *Journal of clinical periodontology*. 1985 May;12(5):374-88.
- [22] Gaspirc B, Skaleric U. Clinical evaluation of periodontal surgical treatment with an Er: YAG laser: 5-year results. *Journal of periodontology*. 2007 Oct;78(10):1864-71.