

THE EFFECT OF LASER DIODE IN TREATMENT OF CHRONIC PERIODONTITIS AT THE ODONTO-STOMATOLOGY DEPARTMENT OF FRIENDSHIP HOSPITAL

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Objectives: The aim was to evaluate the effectiveness of chronic periodontitis treatment using the diode laser method in Odonto - Stomatology Department of Friendship Hospital.

Subjects and methods: Our study was a case-control clinical trial. Sixty patients were randomized into two groups. The group of controls 30 patients with chronic periodontitis who were treated with conventional procedures (cleaning and polishing). The group of cases was 30 patients who were treated with conventional procedure and laser diode. Patients were followed up for 3 periods: pre-treatment, after 2 and 4 weeks of treatment.

Results: Gingival Index (GI) and Gingival Sulcus Bleeding Index (SBI) decreased after treatment in both groups ($p < 0.005$). The depth of periodontal pocket and the loss of attachment in the experimental group after 4 weeks were less than in the control group ($p < 0.05$).

Conclusions: The laser diode should be applied along with cleaning and polishing in the treatment of chronic periodontitis.

Keywords: *chronic periodontitis, laser diode.*

INTRODUCTION

Chronic periodontitis is a common dental disease in our country as well as in the world. In Vietnam, the nationwide survey in 2015 evaluating periodontal conditions and treatment needs in the elderly showed that the prevalence of periodontal disease was as high as 77.3%¹. The invention of the laser is an achievement in modern medicine, lasers are widely used in medicine and dentistry. When a low-power laser is irradiated into a biological system such as the human body, biological effects will occur. These are anti-inflammatory, anti-pain responses, cell damage responses, regenerative responses, and immune system responses^{2,3}.

Diode laser is a type of laser that has been proven to have a biological stimulating effect on living organisms and furthermore eliminates necrotic tissues and bacteria, thus helping the healing process faster⁴. Although scaling and root planing are the gold standard in the treatment of chronic periodontitis, there is increasingly convincing evidence that adjuvant treatment with diode lasers will produce better. Some studies show that, after scaling and root planing, some pathogenic bacteria and bacterial toxins still exist in the periodontal tissue. Results of analyzing the bacterial composition in the periodontal pocket after laser treatment showed a significant reduction in specific types of bacteria that cause periodontal disease⁵. In addition, diode laser has many advantages such as compact structure, simple operation and painless after treatment⁶.

The Department of Odonto-Stomatology, Friendship Hospital firstly used the Diode Laser in January 2017, but there have been no studies reporting on the treatment results of this laser. Therefore, we conducted research on this topic with

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the goal of evaluating the effectiveness of chronic periodontitis treatment using the diode laser method in Odonto - Stomatology Department of Friendship Hospital.

SUBJECTS AND METHODS

Subjects: 60 patients were randomly assigned to two groups according to the order of examination, group of cases was 30 patients with chronic periodontitis treated with conventional procedures (scaling, root planing) combined with diode laser; group of controls was of 30 patients treated with conventional procedures only (removing tartar, root planing).

Selection criteria: Study subjects are patients in Friendship Hospital who were examined and diagnosed as chronic periodontitis with periodontal pockets from 4-6mm at the Odonto - Stomatology Department during the period from October 2022 to March 2023.

Exclusion criteria: Patients with one of the following conditions: 1) Patients with acute

periodontitis. 2) The patient was treated with periodontal surgery. 3) The patient has previously undergone bone graft intervention. 4) The patient has a progressive systemic disease. 5) The patient has used antibiotics to treat periodontal disease in the last 3 months. 6) The patient does not cooperate and does not agree to participate in treatment.

Methods: Case-control clinical trial.

Procedures: Patients who came for examination and were diagnosed with chronic periodontitis were randomly selected into 2 groups, the control group was treated with scaling and root smoothing, and the experimental group received supportive treatment by diode laser. Patients in both groups were monitored before treatment (first time), after 2 weeks of treatment (second time) and after 4 weeks (third time).

Data collection and processing: After collected data is processed using SPSS 16.0 software and a number of statistical algorithms.

RESULTS

The pockets appear in the majority of molars (63.3% in the control group, 96.7% in the experimental group).

The changes of GI, SBI after treatment in the control group

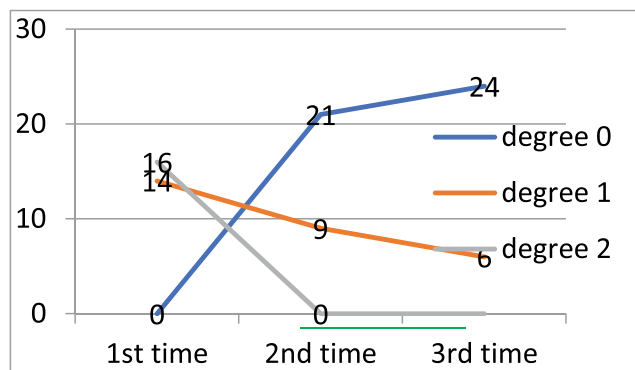


Chart 1. The changes of GI

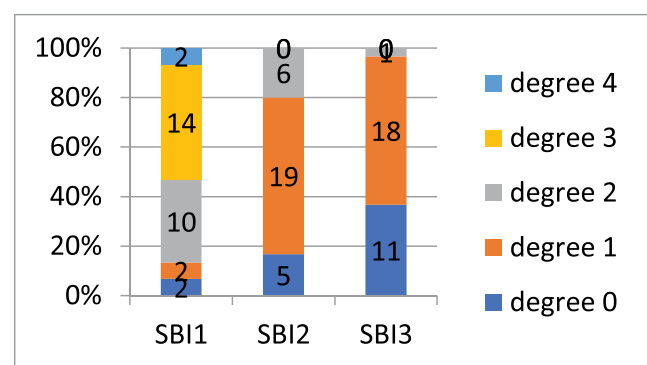


Chart 2. The changes of SBI

Comment:

- Average GI before treatment is 1.53 ± 0.507 , after 2 weeks: 0.30 ± 0.466 and after 4 weeks : 0.20 ± 0.407 .

- The average SBI in the control group before treatment is 2.4 ± 0.968 ; After 2 weeks 1.03 ± 0.615 and after 4 weeks 0.67 ± 0.547 . SBI gradually decreased after treatments ($p_{12} = 0.008$; $p_{23} = 0.004$ and $p_{13} = 0.000$ according to McNemar chi-square test).

The changes of GI, SBI after treatment in the intervention group

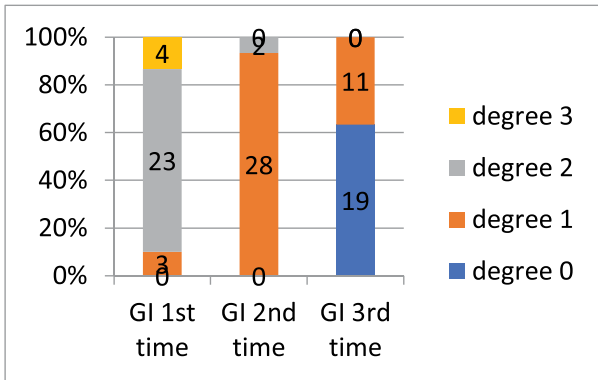


Chart 3. The changes of GI

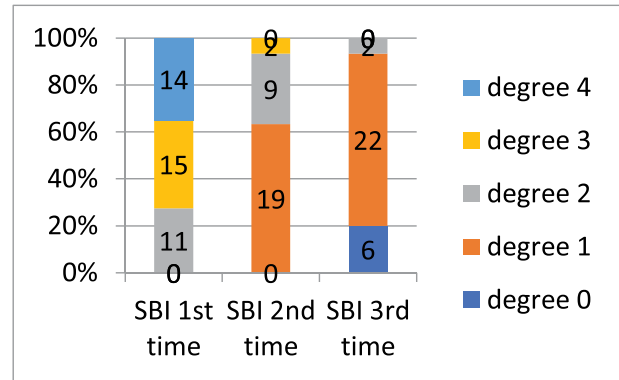


Chart 4. The changes of SBI

Comment:

- GI decreased after treatments ($p_{12} = 0.001$; $p_{23} = 0.043$ and $p_{13} = 0.049$). The average GI in the intervention group before treatment is 2.03 ± 0.490 ; After 2 weeks 1.07 ± 0.254 and after 4 weeks 0.37 ± 0.490 .

- SBI decreased after treatments ($p_{12} = 0.006$; $p_{12} = 0.000$ and $p_{13} = 0.000$). The average SBI in the intervention group before treatment 2.77 ± 0.679 ; After 2 weeks 1.43 ± 0.626 and after 4 weeks 0.87 ± 0.507 .

The changes of periodontal pocket and the loss of attachment in the intervention group

The changes of periodontal pocket: The depth of periodontal pocket in pre-treatment was 4.53 ± 0.629 mm, after 2 weeks was 3.43 ± 0.679 mm, after 4 weeks was 2.97 ± 0.414 mm

Table 1. The changes of periodontal pocket after treatment in intervention group

The changes	Mean \pm SD (mm)	p
Periodontal pocket 1-2	1.100 ± 0.607	0.000
Periodontal pocket 2-3	0.467 ± 0.507	0.000
Periodontal pocket 1-3	1.567 ± 0.656	0.000

Comment: Compare the depth periodontal pocket before and after treatment, it showed that after treatment the depth of periodontal pocket decreased with statistical significance (T-test).

The changes of the loss of attachment

The loss of attachment in pre-treatment was 5.33 ± 1.093 mm, after 2 weeks was 5.23 ± 1.04 mm, after 4 weeks was 3.97 ± 0.765

Table 2. The changes of the loss attachment after treatment in intervention group

The changes of the loss attachment	Mean \pm SD (mm)	p
Loss attachment 1-2	0.100 ± 0.305	0.083
Loss attachment 2-3	1.267 ± 0.521	0.000
Loss attachment 1-3	1.367 ± 0.490	0.000

Comment: After 2 weeks of treatment, loss of attachment did not decrease significantly. After 4 weeks of treatment, loss of attachment decreased ($p = 0.000$)(T-test).



Compare the control group and intervention group

Table 3. Compare the depth of periodontal pocket in 2 groups after treatment

Depth of Pocket	Control group Mean \pm SD	Intervention group Mean \pm SD	p
Frist time	3.50 \pm 0.861	4.53 \pm 0.629	0.000
Second time	3.43 \pm 0.774	4.43 \pm 0.679	0.855
Third time	3.33 \pm 0.717	2.97 \pm 0.414	0.037

Comment: In pre-treatment, the intervention group had a higher depth periodontal pocket, but after intervention, the depth of periodontal pocket decreased ($p < 0.05$).

Table 4. Compare the loss of attachment in 2 groups after treatment

Loss of attachment	Control group Mean \pm SD	Intervention group Mean \pm SD	p
Frist time	5.40 \pm 1.831	5.33 \pm 1.093	0.865
Second time	5.40 \pm 1.831	5.23 \pm 1.104	0.671
Third time	5.40 \pm 1.831	3.97 \pm 0.765	0.000

Comment: The level of attachment loss between the 2 groups before and 2 weeks after treatment was not different. After 4 weeks of treatment, the level in the intervention group decreased. ($p = 0.000$) (T test).

Table 5. Compare GI in 2 groups after treatment

Level of GI	1st time		2nd time		3rd time	
	Control group	Intervention group	Control group	Intervention group	Control group	Intervention group
0	0	0	21	0	24	19
1	14	3	9	28	6	11
2	16	23	0	2	0	0
3	0	4	0	0	0	0
Sum	30	30	30	30	30	30
p	0.002		0.000		0.152	

Comment: There was no difference in GI after treatment between the 2 groups.

Table 6. Compare SBI in 2 groups after treatment

Level of SBI	1st time		2nd time		3rd time	
	Control group	Intervention group	Control group	Intervention group	Control group	Intervention group
0	2	0	5	0	11	6
1	2	0	19	19	18	22
2	10	11	6	9	1	2
3	14	15	0	2	0	0

Level of SBI	1st time		2nd time		3rd time	
	Control group	Intervention group	Control group	Intervention group	Control group	Intervention group
4	2	14	0	0	0	0
Sum	30	30	30	30	30	30
p	0.314		0.055		0.332	

Comment: There was no difference in SBI after treatment between the 2 groups.

DISCUSSIONS

The result showed that molars with periodontal pockets accounted for the highest proportion in both the control group (63.3%) and the intervention group (96.7%). This result is also equivalent to many observations of other authors. This can be explained by the position of the molars in posterior, cleaning more difficultly. On the other hand, the molars have the main function of chewing, so they can withstand stronger forces than the anterior teeth.

In the control group, GI grade 0 gradually increased after treatment. Specifically, after 2 weeks of treatment with conventional dental scaling method, GI level 0 increased from 0 to 21 people, and after 4 weeks of treatment increased to 24 people. The average GI pre-treatment was 1.53 ± 0.507 ; After 2 weeks, it was 0.30 ± 0.466 and after 4 weeks, it was 0.20 ± 0.407 . The results showed a clear reduction in GI after 2 weeks of scaling and root planing from 1.53 to 0.3. After 2 treatments, SBI in the control group also improved, specifically decreasing over 2 and 4 weeks of treatment with statistical significance with $p < 0.05$.

In the case group, GI and SBI gradually decreased over 2 and 4 weeks, the difference being statistically significant. According to Nguyen Ba Khanh (2013), research on the effectiveness of treating gingivitis with He-Ne laser showed clear improvement in GI and SBI after 4 weeks of treatment⁶.

When comparing pairs of periodontal pocket depth pre and post treatment, it showed that after

treatment the depth of periodontal pocket decreased with statistical significance ($p = 0.000$). The loss of attachment after 2 weeks decreased but was not significant ($p > 0.05$), but after 4 weeks of intervention there was a significant decrease ($p = 0.000$). Our research results are similar to the research results of Matthias Kreisler (2005) who studied the clinical effectiveness of applying diode laser to support treatment, resulting in teeth treated with laser. The depth of periodontal pockets and the loss of attachment are both decreased⁷.

The results showed that there was no difference in treatment effectiveness between the 2 groups after treatment as shown by GI and SBI. Explaining this result, we believe that, due to the difference in severity of patients before treatment in the 2 groups, due to the random selection of patients into the 2 groups, there is a situation where patients in the experimental group had a higher GI of 2.03 ± 0.490 while before treatment the GI in the control group was 1.53 ± 0.707 . Pre-treatment SBI in the control group was 2.77 ± 0.679 while pre-treatment SBI in the experimental group was 2.4 ± 0.968 . Therefore, after treatment, GI and SBI in the experimental group decreased more but there was no significant difference compared to the control group. On the other hand, our research subjects were elderly patients with poor oral hygiene and gingivitis mainly caused by tartar and plaque. Therefore, scaling and root planing can significantly control gingivitis.

It can be said that the treatment effectiveness of diode laser is clearly shown through the improvement



the depth of periodontal pocket and the loss of attachment. The results are shown in table 5 and table 6. The average of periodontal pocket depth and average loss of attachment level in the test group pre-treatment were higher than the control group but post-treatment they decreased lower, the difference is significant. Statistical analysis with $p < 0.05$. After 2 weeks of treatment, the effect of reducing periodontal pocket depth and reducing attachment between the 2 groups did not have a statistically significant difference, but after 4 weeks of treatment, there was a clear effect ($p < 0.05$).

CONCLUSIONS

Through research, we have drawn some conclusions as follows: the periodontal pockets appear in the majority of molars (63.3% in the control group, 96.7% in the intervention group). The improvement in GI and SBI changes after treatment was statistically significant ($p < 0.05$). However, there was no difference between the 2 groups. The depth of periodontal pocket and the loss of attachment clearly decreased in the intervention group compared to the control group (significant difference with $p < 0.05$).

Through this, we realize that diode laser treatment should be applied along with scaling and root planing in treating chronic periodontitis, especially cases with deep periodontal pockets.

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