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A Study of the Effects of CO_2 Laser Therapy on Oral Lichen Planus (OLP)

Hamidreza Mozafari[1], Kianoush Farhadzadeh[2] and Fatemeh Rezaei*[3]

[1]Oral Medicine Department, School of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, Iran
[2]PhD. Student, School of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, Iran
[3]Oral Medicine Department, School of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, Iran

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ABSTRACT

Background and Objectives: Some patients with oral lichen planus (OLP) are resistant to the typical therapy with corticosteroids. Therefore, a variety of therapies such as laser radiation has been suggested in treating such patients. The present study was aimed at evaluating the therapeutic effects of CO_2 laser therapy on OLP.
Materials and Methods: In the present clinical experiment, 50 patients who were diagnosed with histopathologic OLP and had not responded to local corticosteroid were studied. Based on the type of treatment, the patients were divided into two groups of 25: the control group (retreatment with local corticosteroid) and the experimental group (treatment with CO_2 laser). Before the study and 15 days, one, three, and six months after it, pain level was measured with a visual analogous scale (VAS) and the size of the lesion based on centimeter was specified. Efficiency index (EI) was utilized to evaluate the changes of lesion size. The collected data were analyzed using Freedman and Mann-Whitney tests through SPSS 18.0 ($p<0.05$).
Results: In the beginning of the study, there was no significant difference between the two groups in regard with their mean VAS (5.84±2.44 vs. 6.2±2.47, p=0.823), lesion diameter (2.48±1.47 vs. 2.34±1.15, p=0.944). After the study, pain level in the experimental group compared to the control group was 1.84±3.24 versus 5.12±3.02 ($p<0.001$) and the size of the lesion was 0.73±1.19 versus 2.02±1.27 ($p<0.001$), which showed a remarkable reduction in the experimental group. The efficiency index of laser therapy was outstandingly higher than that of local treatment with corticosteroid ($p<0.001$).
Conclusion: Radiation of CO_2 laser on OLP lesions that are resistant to local corticosteroid can reduce pain level and lesion size more than therapy with corticosteroid.
KEYWORDS: oral lichen planus; local corticosteroid; CO_2 laser.

1. INTRODUCTION

Oral Lichen Planus (OLP) is a chronic mucocutaneous disease whose etiology and pathogens are not exactly specified. Different causes are involved with its incidence including stress, genetics, systemic diseases, medicines, dental restorative materials and viruses through activating mechanisms of T cytotoxic cells, degranulation of mast cell, and activation of metalloproteinase matrix that disturbs the base membrane and basal cell apoptosis will be epithelial [1].

Half of those who are infected with OLP have no symptoms. However, oral pain or burning sensation is the commonest complaint expressed by the patients (43.3%). Mucosa roughness, dry mouth, bleeding gums, and change in taste are other complaints [2]. To treat the lesion and reduce the disease complications, different methods and factors like corticosteroids (local, inter-lesion injection, and systemic consumption), griseofulvin, curcuminoid, sulodoxide, oxypentifylline, retinoids, phototherapy, surgery, PUVA, and laser radiation have been proposed [3, 4].

2. MATERIALS AND METHODS

In the present clinical experiment, 50 patients who were diagnosed with histopathologic OLP and had not responded to local corticosteroid were investigated. OLP diagnosis was conducted using histopathologic findings by WHO. This clinical experiment was approved by the Moral Committee of Kermanshah University of Medical Sciences. Letter of consent was taken from all participating patients.

Criteria to enter the study were infection with OLP resistant to local corticosteroid during the last two years to six months. History of systemic disease, pregnancy, presence of amalgam restorations around the lesion, consumption of specific medicines, or identification of dysplasia according to pathology report were among exclusion criteria.

Based on the therapy method, the participating patients were divided into two groups:

Control Group: Retreatment with local corticosteroid

Experimental Group: One month after they had stopped using local corticosteroid, the patients of this group were treated with laser therapy. Before and after laser radiation, photography was taken from the lesion. The lesion place was completely anesthetized using lidocaine 2%, then it was exposed to CO_2 laser radiation using Spectra Dental Korea 2007 with wavelength of 10600 nm and with maximum power of once 2 W, and finally it was exposed to laser in a defocused rubbing method for 3 minutes at a more distance (1 cm) than necessary and with healthy edge. During applying laser, the

Corresponding author: Fatemeh Rezaei, Oral Medicine Department, School of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, Iran. Email: f.rezaei@kums.ac.ir

patients and the practitioner were protected using eye glasses. After CO_2 laser, the laser place was photographed and the patents were prescribed hydrochloride Benzydamine mouthwash for 5 days.

The size of the lesion was measured using a caliper in the largest diameter of the lesion. Pain/burning level was specified through a VAS scale graded from 0 to 10. The pain acuity was graded as follow:

Without pain: VAS=0
Slight pain: VAS=1-3
Moderate pain: VAS=4-6
Acute pain: VAS=7-10

Clinical assessments included determining the size of the lesion and pain acuity in the beginning of the study (t_0), and 15 days (t_1), one month (t_2), three months (t_3), and six months (t_4) after the study. To measure the changes in the lesion size, efficiency index (EI) was applied:

$$EI = \frac{\text{final size of lesion - initial size of lesion}}{\text{initial size of lesion}}$$

The observed changes were ranked as follow:

Without improvement: EI=0
Slight improvement: 0<EI<25%
Average improvement: 25 %< EI<75%
Remarkable improvement: 75 %< EI<100%
Complete improvement: EI=100%

The results of the therapeutic changes in each period were recorded. The collected data were analyzed using Freedman and Mann-Whitney tests through SPSS 18.0. Significance level was set at 0.05 ($p<0.05$).

3. Results

Fifty patients divided into an experimental group and a control one (each including 25 patients) were investigated. The control group contained 7 men (28%) and 18 women (72%) with an average age of 48.88 years. The experimental group included 9 men (36%) and 16 women (64%) with an average age of 51.56 years.

Table 1 presents mean pain level (VAS) for the two groups. In the beginning of the study (t0), there was no significant difference between the two groups in regard with their pain level ($p=0.823$). There was a significant difference between the pain level of the two groups in different follow-up periods ($p<0.001$). After the experiment (t4), pain level in the experimental group was significantly lower than that of the control group ($p<0.001$).

In Table 2, the mean size of the lesion of the two groups is presented. In the beginning of the study (t0), there was no significant difference between the two groups in terms of their lesion size ($p=0.944$). There was a significant difference between the lesion size of the two groups in different follow-up periods ($p<0.001$). After the experiment (t4), lesion size in the experimental group was significantly smaller than that of the control group ($p<0.001$).

Frequency distribution of efficiency index (IE) is presented in Table 3. IE of laser therapy was significantly higher than that of therapy with local corticosteroid (($p<0.001$).

4. Discussion

In recent years, utilization of laser in treating mucocutaneous lesions has been associated with positive results [11-13]. In cases where local corticosteroid is not effective for patients with OLP, CO_2 laser as a harmless therapy can reduce the long-term complications of the disease. The present study evaluated the effects of CO_2 laser therapy among OLP patients that were resistant to local corticosteroid.

The present study indicated that laser therapy resulted in a significant reduction of pain level reported by the patients during the first six months after the study. Similar findings of significant reduction of pain and burning among patients with OLP treated with CO_2 laser are reported by Pakfetrat [6] and Agha-Hosseini [10]. In a case study conducted by de Magalhaes-Junior et al, it was observed that OLP lesion in a 46-year woman with oral pain and burning symptoms had not responded to local corticosteroid for 3 months; however, she recovered after being treated with laser, and no sign of reoccurrence of the lesion was observed during a one-year follow-up [14]. Sattayut et al observed that treating aphthous stomatitis patients with CO_2 laser resulted in reduction of pain level [15].

The present study showed that laser therapy caused reduction in lesion size observed during the 6-month period. Similar to this finding was reported by Pakfetrat et al who reported significant reduction of pain and burning following CO_2 therapy during a period of 3 months [6]. Loh utilized CO_2 laser to remove lesion of 10 patients and figured out that there was no reoccurrence of LOP lesions in areas exposed to laser radiation [16].

In explaining the mechanism of the lesion improvement, it should be noted that the improving factor depends on the laser power. Lasers with low power involve primary and secondary physiological effects. Primary effects are vasodilatation, increased blood circulation, lymphatic drainage, cellular metabolism, activity of neutrophils and fibroblasts, and the effect on pain threshold. And secondary effects include accumulation of prostaglandins such as PGE2, and immunoglobulin, lymphokines, and beta-endorphin, encephalitis in the tissues, and reduction of inflammation, immune response, and pain. [17]. However, the effects of lasers with high power depend on their thermal effects.

In previously conducted studies, low-power lasers with low range and different powers were reported with an improvement level of 25-85% while in the present study power of 2 W and improvement of 84% were recorded. In previous studies, low-power laser of 308 nm in the range of ultraviolet waves (UV-B) with penetration depth of 0.3 mm was used while in the present study 10600 nm laser in the range of infrared with depth of a few mm was used, which indicated favorable efficiency in improving injury and decreasing pain and inflammation in previous studies. Another

advantage of the present study was utilization of CO_2 laser with wavelength of 10600 nm while in some studies excimer laser was utilized which is can create waves in the range of ultraviolent (UV-B) that are associated with carcinogenic risks and with an increase in the energy of the laser the patients will experience erythema and burning in the laser place [18]. In the present study, none of the patients reported hurt or discomfort after laser therapy. The sample size in previous studies was smaller than the present one; therefore, improvement chance has a higher level of confidence.

Limitations: Since utilization of laser in treating jaw, face, and mouth is new and patients are not familiar enough with laser therapy, few patients are willing to conduct laser therapy for their oral diseases. Moreover, the problem of distance due to follow-up sessions was another limitation of the present study.

The present study indicated that retreatment with corticosteroid and utilization of CO_2 laser for OLP patients who are resistant to local corticosteroid resulted in remarkable reduction of lesion size and pain acuity during a period of six months. However, efficiency of treatment with laser was remarkably higher than corticosteroid.

Table 1. Pain level in experimental and control groups during follow-up periods

VAS	Corticosteroid		Laser	
	Mean	SD	Mean	SD
t0	6.2	2.47	5.84	2.44
t1	6.08	2.41	4.92	2.27
t2	5.64	2.51	3.76	2.77
t3	5.56	2.63	2.6	3.08
t4	5.12	3.02	1.84	3.24

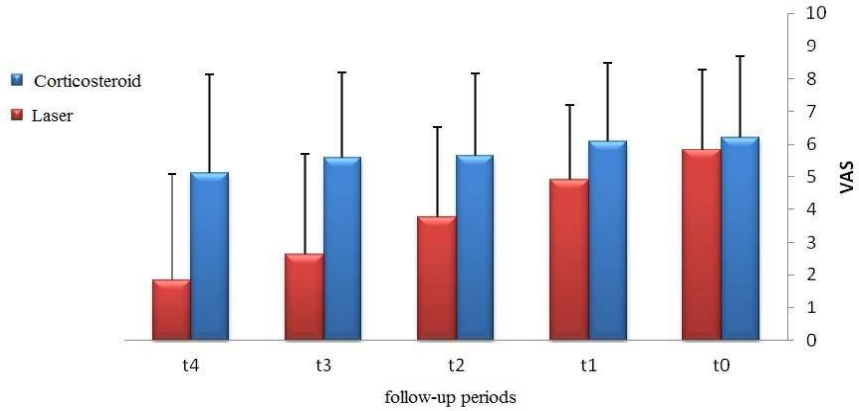

Fig. 1. Pain level in experimental and control groups during follow-up periods

Table 2. Lesion size in experimental and control groups during follow-up periods

VAS	Corticosteroid		Laser	
	Mean	SD	Mean	SD
t0	2.34	1.15	2.48	1.47
t1	2.34	1.15	2.4	1.32
t2	2.22	1.12	1.65	1.14
t3	2.1	1.18	1.14	1.12
t4	2.02	1.27	0.73	1.19

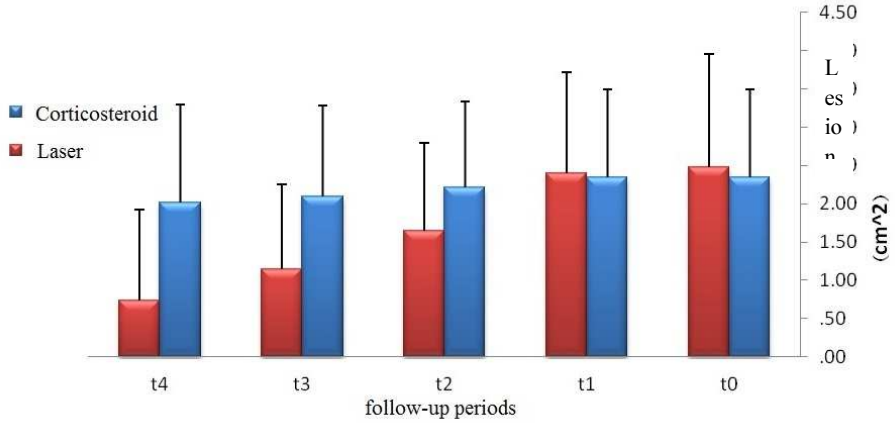

Fig. 2. Lesion size in experimental and control groups during follow-up periods

Table 3. EI in experimental and control groups in the end of the study

	Without Treatment	Slight Treatment	Moderate Treatment	Remarkable Treatment	Complete Treatment
Local Corticosteroid	19	0	4	0	2
Laser	4	0	5	3	13

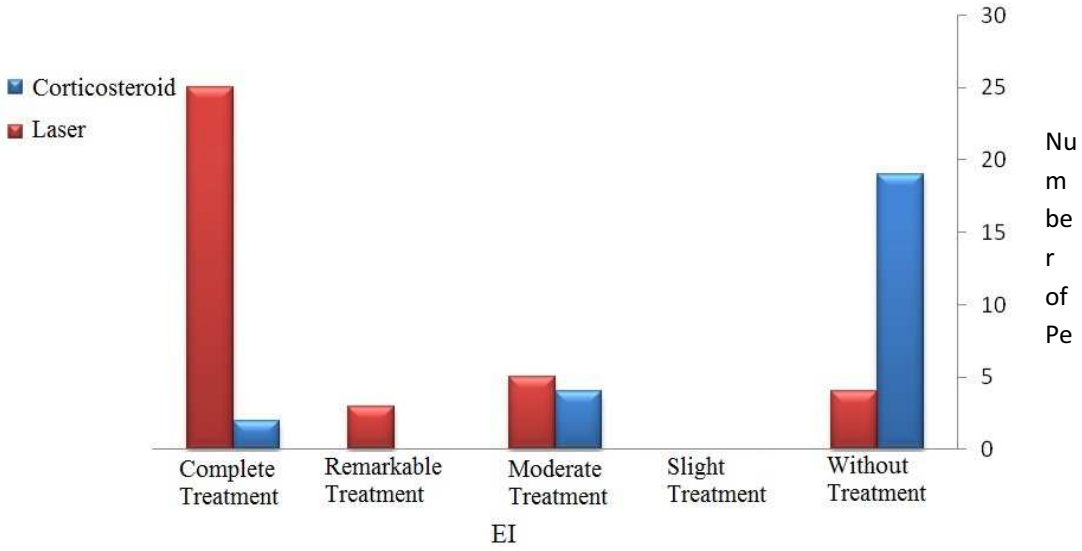

Fig. 3. EI in experimental and control groups in the end of the study

Fig. 4. Before laser

Fig. 5. After Laser

Fig. 6. Six Month after laser

REFERENCES

1. Suma G. N., Arora M. P., Lakhanpal M., Stem cell therapy: A novel treatment approach for oral mucosal lesions,2015, J Pharm Bioallied Sci, 7(1), pp. 2-8.
2. Budimir V., Richter I., Andabak-Rogulj A., Vučićević-Boras V, Budimir J, Brailo V. Oral lichen planus - retrospective study of 563 Croatian patients,2014, Med Oral Patol Oral Cir Bucal, 19(3), e255-60.
3. Greenberg M., Glick M., Burket's oral medicine diagnosis and treatment,2008, 11th ed. BC Decker Inc, pp. 89-96.
4. Sahebjamee M., Arbabi-Kalati A., Manangment of oral lichin planus,2005, Archives of Iranian Medicine, 8(4), pp. 252-266.
5. Usatine R. P., Tinitigan M., Diagnosis and treatment of lichen planus, 2011, Am Fam Physician, 84(1) pp. 53-60.
6. Pakfetrat A., Falaki F., Ahrari F., Bidad S., Removal of refractory erosive-atrophic lichen planus by the CO2 laser, 2014, Oral Health Dent Manag, 13(3), pp. 595-9.
7. Vente C., Reich K., Rupprecht R., Neumann C., Erosive mucosal lichen planus: response to topical treatment with tacrolimus, 1999, Br J Dermatol, 140(2), pp. 338-42.
8. Jerjes W., Hamdoon Z., Hopper C., CO2 lasers in the management of potentially malignant and malignant oral disorders, 2012, Head Neck Oncol, 4(17).
9. de Magalhaes-Junior E. B., Aciole G.T., Santos N.R., dos Santos J.N., Pinheiro A.L., Removal of oral lichen planus by CO2 laser, 2011, Braz Dent J, 22(6), pp. 522-6.
10. Agha-Hosseini F., Moslemi E., Mirzaii-Dizgah I., Comparative evaluation of low-level laser and CO_2 laser in treatment of patients with oral lichen planus,2012, Int J Oral Maxillofac Surg, 41(10),pp. 1265-9.
11. Medrado A.R., Pugliese L.S., Reis S.R., Andrade Z.A., Influence of low level laser therapy on wound healing and its biological action upon myofibroblasts, 2003, Lasers Surg Med, 32(3), pp. 239-44.
12. Walker M.D., Rumpf S., Baxter G.D., Hirst D.G., Lowe A.S., Effect of low-intensity laser irradiation (660 nm) on a radiation-impaired wound-healing model in murine skin,2000, Lasers Surg Med, 26(1),pp. 41-7.
13. Lagan KM, Clements BA, McDonough S, Baxter GD. Low intensity laser therapy (830nm) in the management of minor postsurgical wounds: a controlled clinical study. Lasers Surg Med 2001; 28(1): 27-32.
14. de Magalhaes-Junior E.B., Aciole G.T., Santos N.R., dos Santos J.N., Pinheiro A.L., Removal of oral lichen planus by CO2 laser,2011, Braz Dent J, 22(6), pp. 522-6.
15. Sattayut S., Trivibulwanich J., Pipithirunkarn N., Danvirutai N., A clinical efficacy of using CO2 laser irradiating to transparent gel on aphthous stomatitis patients, 2013, Laser Ther, 22(4), pp. 283-9.
16. Loh H.S., A clinical investigation of the management of oral lichen planus with CO2 laser surgery, 1992, J Clin Laser Med Surg, 10, pp. 445-9.
17. Mahdavi O., Boostani N., Jajarm H., Falaki F., Tabesh A., Use of low level laser therapy for oral lichen planus, 2013, report of two cases. J Dent (Shiraz), 14(4), pp. 201-4.
18. Köllner K., Wimmershoff M., Landthaler M., Hohenleutner U., Treatment of oral lichen planus with the 308-nm UVB excimer laser--early preliminary results in eight patients,2003, Lasers Surg Med, 33(3), pp. 158-60.