Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Effectiveness of low level laser therapy in pain management of Recurrent Apthous Stomatitis using diode laser

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***ABSTRACT*:**
Aim: The present study was conducted with the aim of assessing the efficacy of LLLT (Low level Laser Therapy) in treating apthous stomatitis. **Materials and Methods:** A total number of 100 patients diagnosed as recurrent apthous stomatitis were enrolled in the study. They were divided in two equal groups as follows: Group 1: Comprised of randomly selected 50 patients of either gender in whom minor apthous ulcer was treated by local application of anaesthetic Benzocaine gel 20%. Group 2: Comprised of randomly selected 50 patients of either gender in whom minor apthous ulcer was treated by giving LLLT using Diode Laser. **Results:** The mean value of pain VAS score with standard deviation on day 0 before treatment, after treatment, on day 3 and day 6 in group 1 was 6.54±1.15, 5.64±1.01, 3.16±0.91and 1.4±0.49 respectively. In group 2 the mean value of pain VAS score with standard deviation on day 0 before treatment, after treatment, on day 3 and day 6 was 6.44±1.15, 3.9±0.93, 1.36±0.56 and 0.02±0.14 respectively. P value in group 1 and group 2 on day 0 before and after treatment was statistically significant. ($P < 0.00001$) P value between group 1 and group 2 on day 0 after treatments, on day 3 and day 6 was statistically significant. ($P < 0.00001$). **Conclusion:** Many treatment modalities have been tried in the past for the management of RAS with varied success. The topics pertaining to the appropriate treatment modality for the management of RAS still remain as a never ending debate in the field of dentistry. LLLT gains an edge over the other existing treatment modalities due to its localized effects resulting in no harm to the adjacent tissues and no systemic toxicity. It is noninvasive with good patient compliance having no mutagenic effects and can repeatedly be used without risk.
Keywords: RAS, LLLT, Diode Laser, Apthous ulcer, Biostimulation

Received: 4 December, 2020 Accepted: 8 December, 2020

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This article may be cited as: Rupapara RK, Rajyaguru JM, Damor DK, Solanki DA, Kaneria RV, Chavda RM. Effectiveness of low level laser therapy in pain management of Recurrent Apthous Stomatitis using diode laser. J Adv Med Dent Scie Res 2021;9(5):5-8.

INTRODUCTION

Recurrent apthous stomatitis (RAS), commonly referred to as canker sores, are inflammatory lesions of the mucosal lining of the mouth. The prevalence of RAS in the general population is between 2% and 50%; most estimates fall between 5% and 25%.[1,2,3] They are characterized by painful, recurrent, small, round or ovoid ulcers with circumscribed margins, erythematous haloes and yellow or gray floors, typically first presenting in childhood or adolescence.[4]

RAS can be classified into minor (MiRAS), major (MjRAS) and herpetiformis ulcers (HUs). MiRAS,

which comprises more than 80% -90% of RAS cases, presents lesions of less than 1 cm in diameter and heals within 7-14 days without scar formation. MjRAS lesions exceed 1 cm in diameter and heal within 20-30 days with scarring. HUs are characterized by 1-3 mm multiple and clustered lesions, which may coalesce into larger ulcers and heal within 15 days. [5]

In most cases, a symptomatic treatment is necessary against pain to permit nutrition, hydration and for speech. Recently LASER therapy has been used for treatment of oral ulcers. Low- level laser therapy (LLLT) is also known as 'soft laser therapy', 'laser photo therapy' and 'cold laser therapy'. [6]

LLLT does not effect through emitting heat, sound or vibration, but it can act via photobiologic or biostimulation which are nonthermal and photochemical reactions in the cells. Laser induces powerful analgesic and anti-inflammatory effects. Healing of the ulcerations is mainly achieved by stimulating epithelial growth and angiogenesis. [7] Based on this rationale, the present study was conducted with the aim of assessing the efficacy of LLLT in treating apthous stomatitis.

MATERIAL AND METHODS

Subjects included in the present study were selected from the dental department of P.D.U. Govt. Medical College, Rajkot. A total number of 100 patients both males and females in the age range of 16-45 years, diagnosed as recurrent apthous stomatitis were enrolled in the study after explaining the procedures and taking informed consent of the patients. They were divided in two equal groups as follows:

Group 1: Comprised of randomly selected 50 patients of either gender in whom minor apthous ulcer was treated by local application of anaesthetic Benzocaine gel 20%.

Group 2: Comprised of randomly selected 50 patients of either gender in whom minor apthous ulcer was treated by giving LLLT using Diode Laser

The patients with systemic disorders and /or less than 16 years old, smokers and the patients who used local or systemic medication were excluded from the study. For the Benzocaine group, benzocaine gel 20% was applied over the ulcer for 1 minute and patients were advised to apply it over the ulcer three times daily over next one week.

For LLLT group the treatment consisted of only one sitting of laser irradiation. Each sitting consisted of 3 sessions of laser irradiation lasting about 20 seconds each. A resting interval time of about 10 seconds was given between each cycle. The Laser unit was set at an output power of 1W, wavelength of 980 nm, applied in Non-Contact, Continuous (NCC) mode. Laser irradiation of ulcers was done from a distance of 10mm from ulcer and slowly approaching within 2 mm in a circumferential manner (moving laser tip from the periphery of the lesion toward the center).

Pain score was recorded using VAS score in both groups for the following times. (1)Immediately before and 20 min. after treatment (2) At third follow up day and (3) At sixth follow up day.

RESULTS

The mean value of pain VAS score with standard deviation on day 0 before treatment, after treatment, on day 3 and day 6 in group 1 was 6.54±1.15, 5.64±1.01, 3.16±0.91and 1.4±0.49 respectively. In group 2 the mean value of pain VAS score with standard deviation on day 0 before treatment, after treatment, on day 3 and day 6 was 6.44±1.15, 3.9±0.93, 1.36±0.56 and 0.02±0.14 respectively.

Table 1 shows Intra-Group comparison of Pain VAS score at Day 0 - Before and after treatment. P value in group 1 and group 2 on day 0 before and after treatment was statistically significant. ($P < 0.00001$) Test of significance: Wilcoxon matched pair test

Table 2 Shows Inter-Group comparison of Pain VAS score. P value between group 1 and group 2 on day 0 after treatments, on day 3 and day 6 was statistically significant. ($P < 0.00001$) Test of significance: Mann-Whitney U Test Calculator

Table 1: Shows Intra-Group comparison of Pain VAS score at Day 0 - Before and After treatment is given

Groups	Day 0 Before Treatment	Day 0 After Treatment	p value
Group 1 (Mean ± SD)	6.54±1.15	5.64±1.01	< 0.00001
Group 2(Mean ± SD)	6.44±1.15	3.9±0.93	< 0.00001

Table 2: Shows Inter-Group comparison of Pain VAS score			
Groups	**Day 0 After Treatment**	**Day 3**	**Day 6**
Group 1	5.64±1.01	3.16±0.91	1.4±0.49
Group 2	3.9±0.93	1.36±0.56	0.02±0.14
p value between Group 1 & 2	< 0.00001	< 0.00001	< 0.00001

Test of Significance: Mann-Whitney U Test Calculator

DISCUSSION

A large spectrum of options is available for the management of apthous stomatitis. The main goal of treatment is to decrease pain, healing time, number and size of the ulcers. [8] Laser therapy is currently widely used in medical field due to its beneficial therapeutic effects such as analgesic, anti inflammatory and promotes wound healing. Laser therapy can also improve microcirculation and oxygenation of the tissue and stimulate epithelial, endothelial and mesenchymal cell growth. [9]

In the present study, reduction in the pain intensity, VAS score was evaluated in both the Groups Immediately before and 20 min. after treatment, at third follow up day and at sixth follow up day.

Group 2 revealed significant (p value < 0.00001) reduction in pain VAS score after laser application. The results are in accordance with study conducted by Muhannad A. Kashmoola(2005), Hadeel Salman et al (2008), Khademi H et al (2009), De Souza TO et al(2010) who have concluded that 75% of the patients reported a reduction in pain in the same session after laser treatment.[10,11,12,13]

Group 1 revealed significant (p value < 0.00001) reduction in pain VAS score before and after application of Benzocaine gel. Also duration of action was noted, both after Diode Laser at 1W in NCC mode application and Benzocaine 20% gel application. It was observed that Diode Laser at 1W in NCC mode application had rapid onset of 1-2 minutes and duration of pain free period after Diode Laser at 1W in NCC mode application was 40-50 minutes. After recurrence, pain intensity was much lesser as compared to the intensity before treatment was given. Topical application of Benzocaine 20% gel too had a rapid onset of 1-2 minutes but duration of pain free period was only 15-20 minutes. And after recurrence, pain intensity was less as compared to the intensity before treatment was given but results were better after Diode Laser at 1W in NCC mode application. Thus, it can be said that the reduction in pain intensity after the application of LLLT was more in comparison to Benzocaine 20% gel.

Similar studies by Muhamed et al revealed that reduction of pain immediately after a single session of laser treatment and the lesion duration were significantly reduced to about 40% from that of control lesion. [14] Low level laser therapy stimulates the production of β-endorphins, thereby relieving pain. Low level laser therapy enhances ATP synthesis leading to a state of hyperpolarization and blocks the conduction of pain stimuli, thus aiding in a decrease of pain sensation. [15]

These effects include lymphocyte stimulation, activation of mast cells, and also the proliferation of various types of cells such as fibroblasts and macrophages. All these factors synergistically promote anti-inflammatory effects and bio stimulatory effects, thus enhancing wound healing. [16] Low-level laser therapy tends to increase fibroblast proliferation and differentiation by stimulating the production of basic fibroblast growth factor. [17] In addition, LLLT aids in the transformation of fibroblasts into myofibroblasts, which are responsible for wound contraction thus helping in the rapid healing of the ulcer. [18] Secondary clinical effects associated with LLLT are a decrease in the levels of histamine, bradykinins, and substance *P*, which reduces the inflammation. [1]

This effect was clearly evident as the erythematous halo surrounding the ulcers had completely resolved by third day post LLLT. It can be concluded based on the results of the present study and thorough review of the existing literature that LLLT can decrease the healing time and pain intensity in RAS and hence can be considered the most appropriate treatment modality for RAS, with the greatest clinical effectiveness

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