Low level laser therapy in the treatment of aphthous ulcer

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ABSTRACT

Recurrent aphthous stomatitis (RAS) is one of the most common and painful ulcerative lesions of the oral cavity, but until now no cure has been recognized for it. Two patients diagnosed with minor RAS were treated in a single sitting with low level laser therapy using 940-nm diode laser. The lesions healed completely within 3-4 days and a follow-up for 1 showed no recurrence in these patients. According to the results of this study, low level laser therapy can decrease the healing time, pain intensity, size, and recurrence of the lesion in patients with minor RAS, and hence can be considered the most appropriate treatment modality for minor RAS, with greatest clinical effectiveness.

Key words: Aphthous ulcer, diode laser, healing, low level laser therapy, pain

Ulceration is a breach in the oral epithelium, which typically exposes nerve endings in the underlying lamina propria, resulting in pain or soreness. Aphthous ulcerations, commonly referred to as "canker sores," are the most prevalent oral mucosal lesions affecting more than 20% of population. The term "aphthous" is derived from a Greek word "aphtha" which means ulceration. Recurrent bouts of solitary or multiple shallow, small, round, or ovoid painful ulcers, with circumscribed margins, having yellow or gray floors surrounded by erythematous halo in patients who are otherwise well characterize recurrent aphthous stomatitis (RAS). RAS has been described under three different clinical variants as classified by Stanley in 1972.[1] Minor RAS also known as Miculiz's aphthae or mild aphthous ulcers, major RAS also known as periadenitis mucosa necrotica recurrens or Sutton's disease, and Herpeti form ulceration characterized by recurrent crops of multiple ulcers which may be up to 100 in number.[1] Various treatment options are available which should be guided by the severity of the disease (the amount of pain), the frequency of ulceration, and the potential adverse effects of the medications. If an underlying disorder is present, effective treatment of the condition may result in the remission of the ulcers. However, in the absence of a clearly defined cause, the treatment for RAS is symptomatic, the goals being to decrease pain, healing time, number and size of the ulcer, and to increase disease-free periods which include topical agents, systemic and topical steroids, corticosteroids, cauterization, antibiotics, mouth rinses containing active enzymes, etc.[2] Currently, low level laser therapy (LLLT) has been employed for the treatment of RAS because of its biomodulation and analgesic effect by stimulation of the healing process and promoting immediate relief of pain without an overdose of medication or side effects. Hence, in the current case series, patients diagnosed with RAS were treated with LLLT using diode laser.

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CASE REPORTS

Two patients with the chief complaint of recurrent painful ulcers in the oral cavity came to the Department of BBDCODS. On intraoral examination, small round ulcers with erythematous halo were seen on the tongue, labial and buccal mucosa. The diagnosis of minor RAS was made on the basis of history and clinical criteria proposed by Natah *et al.* in 2004.[2] A detailed medical history was taken to rule out other ulcerative disorders and conditions such as Crohn's disease, celiac disease, neutropenia, HIV infection, and Behcet's syndrome. A written informed consent was taken from the patient. One of the patients gave a history of recurrence of these extremely painful ulcers since 8 years. The patient had been undergoing treatment for the same since 7 years and had used various chemotherapeutic agents like topical anaesthetics, steroids, etc., which took around 7-10 days for the lesions to heal but still the lesion recurred every 2-3 months [Figures 1 and 2]. The patients were treated for minor RAS with only LLLT using 940-nm

diode laser (Ezlase, Biolase, Irvine, California). The laser was started using a bleaching tip in a defocussed mode 5-8 mm from the lesion and advanced slowly toward the area ending up 2-3 mm away from the lesion, moving continuously from the periphery of the lesion to the center, "painting" the entire area, and moving away from the lesion if the patient felt warmth [Figures 3 and 4]. The setting was initially put at 0.6 W CW (1.2 W pulsed) for 30-45 seconds. A refractory period of 15-20 seconds between laser "passes" was given to allow the tissue to cool down. The area was rubbed with a wet gloved finger to determine if a decrease in pain was felt by the patient. A second and third pass with the laser was further applied to decrease the pain of the area on palpation. A second pass was done with the setting of 0.7 W CW (1.4 W pulsed) for 30-45 seconds, and a third and final pass was completed with 0.8 W CW (1.6 W pulsed) for a similar period of time. After each pass, the area was checked with palpation, but a maximum time of 2 min of total laser energy was employed. Only a single sitting treatment was given. Patients were given log diaries and instructed to record the details of ulcers (the number of ulcers, intensity of pain, the period of healing, and the frequency of recurrence). Pain was assessed using Visual Analogue Scale (VAS). The recordings were made just before the treatment, immediately after treatment, and every 2 days thereafter for a period of 2 weeks. The patients reported that ulcers started healing earlier than in previous attacks; there was also early reduction in pain. Healing was uneventful and all the patients experienced spontaneous reduction in pain as recorded on VAS immediately after treatment. The lesions healed completely within 3-4 days [Figure 5]. A follow-up for 1 year showed no recurrence in these patients.

Figure 1: A cluster of aphthous ulcers

Figure 2: Aphthous ulcer on tongue

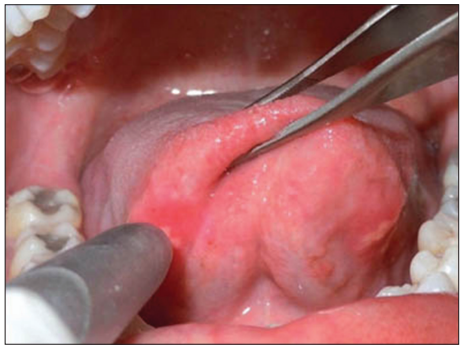

Figure 3: Lesion treated with 940-nm diode laser

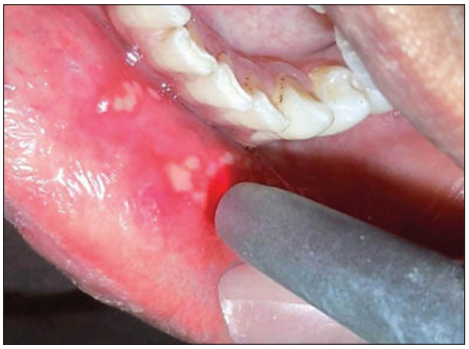

Figure 4: Lesion treated with 940-nm diode laser

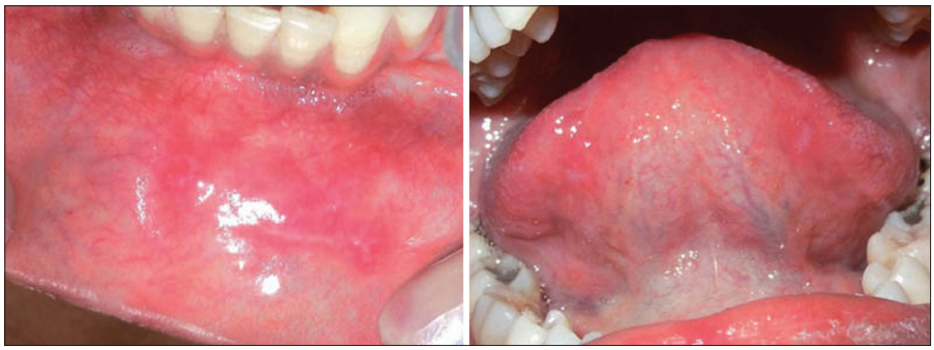

Figure 5: Postoperative on third day

DISCUSSION

RAS is one of the most painful oral mucosal inflammatory ulcerative conditions causing pain on eating, swallowing, and speaking. Various treatment modalities like steroids, mouthwashes, etc., have numerous side effects, require patient compliance, and are relatively expensive. On the contrary, LLLT not only provided instant pain relief but was also cost-effective and provided time benefit as single sitting was sufficient. Though in the cases described here semiconductor diode laser, which is sometimes referred to as "cold" or "soft" laser, was used, some of the "hard" or "hot" surgical lasers (such as CO_2, Nd: YAG) have also been used for providing LLLT. Zand *et al.* in 2009 employed a low-intensity, non-thermal, single session of CO_2 laser for the treatment of minor RAS and reported dramatic and immediate pain reduction in the patients after irradiation.[3] Similar results were also demonstrated by Iris Brader (2008) when Nd: YAG laser was used in a noncontact mode for the treatment of minor RAS.[4] Yet, diode lasers have an edge over their high-powered "hard" surgical laser counterparts, as they do not cause thermal injury to hard tissues, are compact, low-cost devices, and have very high electrical and optical efficiencies.[5] Apart from treating apthous ulcers, LLLT has also been successfully employed in dentistry for the promotion of wound healing, neuronal regeneration, and for the management and treatment of mucositis, pulpotomy, post-herpetic neuralgia, Temporo-mandibular joint pain, oral lichen planus, pemphigus vulgaris, and multiple chronic ulcers such as mucus membrane pemphigoid, epidermolysis bullosa, etc.[5,6] Healing, highlighted as one of the main effects of LLLT, is characterized by three main factors.[7] First, there is an increment of adenosine triphosphate (ATP) production, as laser is considered to raise the production of ATP, leading to a boost in mitotic activity and to an increase in protein synthesis by mitochondria, resulting in greater tissue regeneration in the repair process. Second, there is a stimulus to microcirculation, which increases the delivery of nutritional elements associated with increased speed of mitosis, facilitating cell multiplication. Finally, new vessels are formed from pre-existing vessels.[7] Table 1 reveals various possible mechanisms involved in the acceleration of wound healing by LLLT, as given by Walsh.[5] Furthermore, in the cases presented here, the time required for complete healing of lesions was 3-4 days, which is significantly quicker as compared to the longer healing periods with pharmaceutical methods, also demonstrated by Bladowski *et al.* in 2010.[8] It is also in agreement with the results from the study performed by De Souza *et al.* in 2010 who revealed that 75% of the patients reported a reduction in pain in the same session after laser treatment and total regression of the lesion occurred after 4 days, whereas total regression in the corticoid group took 5-7 days.[9] Khademi *et al.* also found similar benefits of quicker healing and reduced pain after using low levels of laser treatment on RAS.[10] Hence, it can be concluded and validated that LLLT is the most appropriate treatment modality for minor RAS. However, long-term comparative studies are needed to further substantiate the advantages of LLLT in the treatment of oral lesions.

Table 1: Possible mechanisms involved in the acceleration of wound healing by LLLT

Fibroblast	Proliferation
	Maturation
	Locomotion
	Transformation into myofibroblasts
	Reduced secretion of PGE2 and IL-1
	Enhanced secretion of bFGF
Macrophages	Phagocytosis
	Secretion of fibroblast growth factors
	Fibrin resorption
Lymphocytes	Activation
	Enhanced proliferation
Epithelial cells	Motility
Endothelium	Increased granulation tissue
	Relaxation of vascular smooth muscle
Neural tissue	Reduced synthesis of inflammatory mediators
	Maturation and regeneration
	Axonal growth

PGE2: Prostaglandin E2, IL-1= Interleukin 1, bFGF=Basic fibroblast growth factor, LLLT=Low level laser therapy

CONCLUSION

LLLT employed as a treatment modality for the management of minor recurrent apthous ulcers in the current case report not only provided instant pain relief with a rapid decrease in the size of the lesion but also no recurrence was seen even after 1 year of follow-up. Since no medications were required, their side effects and risk of overdosage could also be prevented. Hence, it can be concluded that LLLT is a safe and clinically effective therapy for treating minor RAS, which also provides time and cost benefit to the patients.

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