

# Pain reduction of recurrent aphthous stomatitis

## Evaluation of class 2M diode laser as a home care device

**Authors** Dr Maziar Mir, MSc, Dr Masoud Mojahedi, MSc, Dr Jan Tunér DDS, Dr Hassan Adalatkhah, MSc, Dr Amir Mansour Shirani, MSc & Dr Masoud Shabani, Germany & Iran

### Introduction

Recurrent aphthous stomatitis (RAS) is a common condition, restricted to the mouth, and typically starts in childhood or adolescence as recurrent small, round or ovoid ulcers with circumscribed margins, erythematous haloes, and yellow or gray floors. RAS has three clinical types: minor, major and herpetiform ulcers. Ulcers with similar clinical features (aphthous-like ulcers) may be associated with systemic conditions such as Behçet syndrome, auto-inflammatory syndromes, gastrointestinal disease or immune defects such as HIV/AIDS. The etiology of recurrent aphthous stomatitis (RAS) is not entirely clear. A genetic basis exists for some RAS.

This is shown by a positive family history in about one third of patients with RAS, an increased frequency of HLA types A2, A11, B12, and DR2, and susceptibility to RAS which segregates in families in association with HLA haplotypes. RAS probably involves cell-mediated mechanisms but the precise immunopathogenesis remains unclear. Phagocytic and cytotoxic T cells probably aid in destruction of oral epithelium that is directed and sustained by local cytokine release. Patients with active RAS have an increased proportion of gamma-delta T cells compared

with control subjects and patients with inactive RAS. Gamma-delta T cells may be involved in antibody-dependent cell-mediated cytotoxicity (ADCC). Compared with control subjects, individuals with RAS have raised serum levels of cytokines such as interleukin (IL)-6 and IL-2R, soluble intercellular adhesion modules (ICAM), vascular cell adhesion modules (VCAM), and E-selectin. However, some of these do not correlate with disease activity.<sup>1-4</sup>

LLLT has been reported as a useful treatment for several conditions, such as reduction of the destructive interleukins and TNF-production, improvement of the immune system function, reduction of pain and the healing time period.<sup>5-12</sup>

Lasers (high power and low power) have been used in some case reports and studies for pain reduction and shortening healing time of RAS.<sup>13-32</sup> Most of these reports focussed on office treatment, but many patients have recurrent lesions and there were no known home care devices for laser treatment of RAS. Therefore, to assist patients in using lasers at home by themselves, a class 2M low level laser was inserted in a pen-like device. This laser is called LLLAP (Low Level Laser Aphthous Pen) and it seems that it was the first time that such a device is introduced to dental professionals. Therefore, the aim of this pilot study was to evaluate the pain reduction efficiency of this particular instrument.

### Material and method

A prospective randomised trial was conducted with 30 patients. Inclusion criteria were: having at least one minor aphthous ulcer smaller than 5 mm, satisfaction and ability to take part in the study, fulfilment of the patient consent form according to the Code of Ethics and having new lesions in the first two

**Fig. 1** Low Level Laser Aphthous Pen.

**Fig. 2** Minor aphthous ulcer.

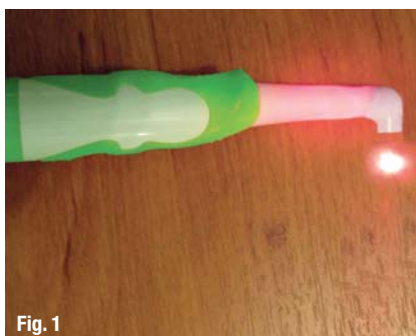


Fig. 1



Fig. 2

days. Exclusion criteria were: pregnancy, carcinoma, taking steroids or anticoagulant and anti-inflammatory agents, eye problems or mental retardation or impairment and patients with aphthous-like ulcers with signs and symptoms of systemic diseases like Behçet syndrome, auto-inflammatory syndromes, gastrointestinal disease, or immune defects such as HIV/AIDS and severe anaemia. Ethically, all these patients were treated as well but were not counted as study cases.

The samples were allocated into three groups: Group 1 received laser therapy (low-level laser aphthous pen, registration number in Iran: 72619). The device was prepared by insertion of the diode laser in the tooth brush, then it was calibrated and tested (Fig.1). Group 2 received topical triamcinolone acetone 0.1% in orabase (gelatin, pectin, and carbonylmethyl cellulose sodium in Plastibase® (Plasticized Hydrocarbon Gel), a polyethylene and mineral oil gel base, Adcortyl in orabase, Bristol-Myers Squibb Company). Group 3 received placebo (red LED light).

Laser parameters were: InGaAlP diode class 2M laser, wavelength 660 nm, continuous, 40 mW, irradiation diameter 3 mm, spot size 0.19625 cm<sup>2</sup>, 30 seconds, 1.2 J, 6 J/cm<sup>2</sup> twice per day for five consecutive days, near non-contact mode and near at a perpendicular angle (Figs. 2-4). Class 2 laser was used because this laser was used at home and it is necessary to use a relatively safe laser. For this kind of laser, natural reaction of a person like shutting of the eyelid is sufficient for eye protection. But patients were educated in the application of the laser, not to stare into the beam or view it directly with optical instruments and to put it in a place which is not reachable by children. The Research Ethical Committee approval was adopted with number 01391023 for this research from Ardebil University of Medical Sciences.

The VAS scale was used for the evaluation of pain, in the range of 0 to 10 so that 0 is no pain and 10 is very severe pain. Evaluations were performed before treatment, immediately after irradiation and every day during the first five days. The data were analysed by one way ANOVA and PostHoc tests.

## Results

Thirty patients took part in the study, 16 were men and 14 were women. The location of minor RAS was the upper lip in 20 patients and the lower lip in 10 patients.

In ANOVA data analysing, there was no significant VAS difference between the groups before treatment ( $p=0.500$ ). After treatment, there was significant difference between the LLLT/Adcortyl groups and the placebo group immediately after the first session and



Fig. 3

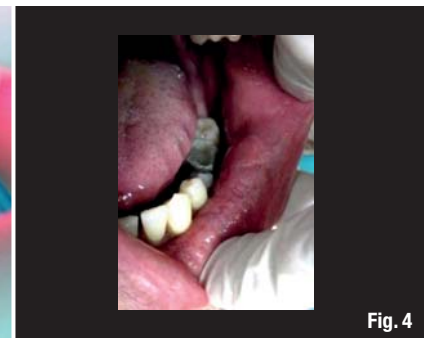


Fig. 4

during the first five days ( $p=0.001$ ). The data for Mean, Standard deviation and PostHoc test results are presented in table 1. There was no significant difference between laser and Adcortyl groups but both were significantly better than the red light pen. Chart 1 shows the pain reduction during five consecutive days among the groups.

## Discussion

Many different treatments are considered for RAS. Relief of pain and reduction of ulcer duration are the main goals of therapy. Topical corticosteroids remain the mainstays of treatment.<sup>4</sup> Thus, in this study, one group received topical Adcortyl™ in Orabase™ for better comparison.

Different kinds of laser were successfully used in studies for treatment of RAS. The GaAlAs diode laser,<sup>15</sup> He-Ne laser,<sup>16,17</sup> argon laser,<sup>20</sup> InGaAlP laser,<sup>14,21</sup> Nd:YAG laser,<sup>22,29</sup> diode 830 nm,<sup>29</sup> GaAs (904 nm),<sup>24</sup> CO<sub>2</sub>,<sup>26,30,31</sup> diode laser<sup>32</sup> were used in case reports and studies. For cases with aphthous-like lesion in Behçet syndrome, CO<sub>2</sub> laser<sup>23</sup> and GaAs (904 nm)<sup>25</sup> have been applied successfully. For cases with aphthous-like ulcer in AIDS (Acquired Immune Deficiency Syndrome) cases, diode 660 nm laser has been used with good result.<sup>27</sup>

Fig. 3\_Laser irradiation with aphthous laser pen.

Fig. 4\_Four days after treatment.

Fig. 5\_Pain reduction during five consecutive days among intervention groups.

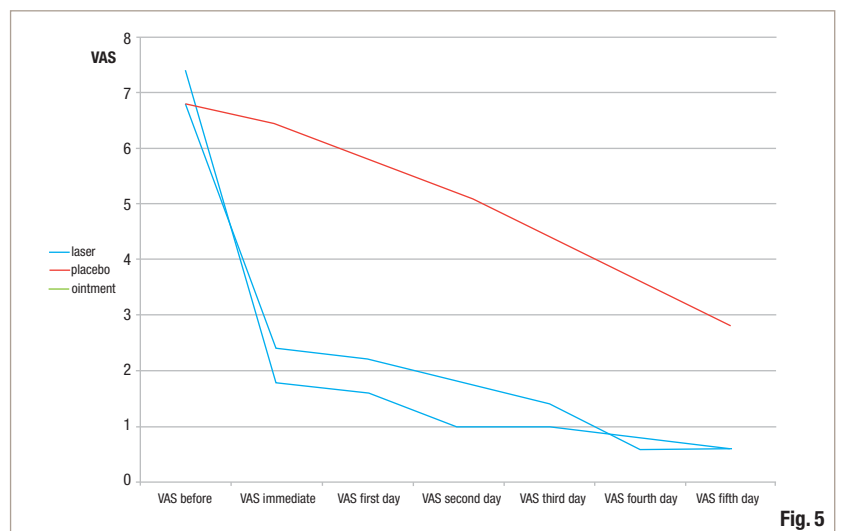


Fig. 5

Variable		N	Mean	Std.D	Groups	Sig	CI95%
VAS before treatment	Laser	10	7.4	1.07	Laser-Ointment	0.56	(-0.8)-(2.04)
	Placebo	10	6.8	1.39	Laser-Placebo	0.56	(-0.8)-(2.04)
	Ointment	10	6.8	1.39	Ointment-Placebo	1	(-1.44)-(1.44)
VAS imm. after treatment	Laser	10	1.8	0.42	Laser-Ointment	0.3	(-1.6)-(0.41)
	Placebo	10	6.4	5.8	Laser-Placebo	0	(-5.61)-(-3.95)
	Ointment	10	2.4	0.51	Ointment-Placebo	0	(-5.01)-(-2.9)
VAS 1 <sup>st</sup> day after treatment	Laser	10	1.6	0.51	Laser-Ointment	0.3	(-1.6)-(0.47)
	Placebo	10	5.8	1.3	Laser-Placebo	0	(-5.2)-(-3.1)
	Ointment	10	2.2	0.78	Ointment-Placebo	0	(-4.6)-(-2.5)
VAS 2 <sup>nd</sup> day after treatment	Laser	10	1	0.6	Laser-Ointment	0.19	(-1.91)-(0.31)
	Placebo	10	5.2	1.3	Laser-Placebo	0	(-5.3)-(-3.08)
	Ointment	10	1.8	0.78	Ointment-Placebo	0	(2.28)-(4.51)
VAS 3 <sup>rd</sup> day after treatment	Laser	10	1	0.6	Laser-Ointment	0.74	(-1.7)-(0.96)
	Placebo	10	4.4	1.7	Laser-Placebo	0	(-4.7)-(-2.03)
	Ointment	10	1.4	1.07	Ointment-Placebo	0	(-4.3)-(-1.63)
VAS 4 <sup>th</sup> day after treatment	Laser	10	0.8	0.42	Laser-Ointment	0.9	(-0.97)-(1.37)
	Placebo	10	3.6	1.71	Laser-Placebo	0	(-3.9)-(-1.6)
	Ointment	10	0.6	0.51	Ointment-Placebo	0	(1.82)-(4.17)
VAS 5 <sup>th</sup> day after treatment	Laser	10	0.6	0.51	Laser-Ointment	1	(-1.01)-(1.01)
	Placebo	10	2.8	1.39	Laser-Placebo	0	(-3.2)-(-1.1)
	Ointment	10	0.6	0.51	Ointment-Placebo	0	(-3.2)-(-1.1)

**Table 1** \_Result of PostHoc test for multiple comparisons between groups.

As the low level laser can modulate inflammatory mediators such as TNF-alpha, IL-6 and others, reduction of pain can be achieved. The healing of the aphthous ulcer can be attributed to increase of the cellular activity, especially fibroblasts, keratinocytes and immune cells. Therefore, wound healing and boosting of the natural function can be achieved.

Most studies focus on in-office treatment. The low level laser therapy often requires additional treatment sessions and there is no known home care device for laser treatment of RAS. Patients with RAS have recurrent ulcers and in-office treatment for each recurrent lesion requires several visits to the dental office and consequent economic problems. Therefore, a class 2M low level laser was inserted in a pen-like device in order to assist patients to use lasers at home.

In this study, laser pen was statistically better than laser placebo in pain reduction. This was similar to another study.<sup>21</sup> The laser pen statistically had an efficiency similar to topical corticosteroids (as a routine treatment) in pain reduction. This finding was consistent with other studies.<sup>24,29</sup> In the present study, only pain reduction was evaluated but in the Salman study<sup>24</sup>: the laser treatment group had a shorter healing time in comparison to Adcortyl™. Laser therapy

reduced healing time in recurrent aphthous stomatitis in comparison to the control group (topical lidocaine) in some studies.<sup>33</sup>

As corticosteroids have several side effects, laser treatment may have some advantages for the treatment of recurrent aphthous stomatitis.

### Conclusion

In this clinical pilot study, the laser pen seems to be useful for the treatment of RAS as a home care device.

*Editorial note: A list of references is available from the publisher.*

<b>_contact</b>	<b>laser</b>
<p><b>Dr Masoud Shabani</b>                  Oral Health Department, Official Complex of Ardebil University of Medical Sciences, Daneshgah Street 5618985991 Ardebil, Iran</p> <p>Tel.: +98 451 5521417                  Fax: +98 451 5522196</p> <p>m.shabani@arums.ac.ir</p>	

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