

Use and Efficacy of 810nm Diode LASER in Oral Aphthous Ulcers

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Abstract

Background and Objectives: To evaluate the safety and efficacy of an 810-nm diode laser for treatment of oral aphthous ulcers.

Methods: Treatment with the 810-nm diode laser was applied to hundred patients of oral aphthous ulcers.

Results: The results of the study depended mainly on the clinical observation during the procedure and in the follow up period. The results showed that there was quicker pain relief with shorter and normal healing process with high acceptance by the patients.

Conclusion: Patient acceptance and satisfaction, without compromising health and function, have been found to be of a high degree in this present study. Thus, we can say that the use of the 810-nm diode laser may indeed be the best choice in oral aphthous ulcers.

Keywords: 810 nm diode laser, oral medicine, lasers in dentistry, aphthous ulcers.

INTRODUCTION

Dentistry has changed tremendously over the last few decades for the benefit of both the clinician and the patient. Newer materials and technologies have

improved the efficiency and predictability of treatment. LASERS are one of these new technologies which have revolutionized the fields of medicine and dentistry.

The concept of lasers dates back to 1917 with Einstein's theory of stimulated emission. The first laser was introduced into the fields of medicine and dentistry during the 1960s. Since then, this science has progressed rapidly¹.

Unlike in many fields of medicine and surgery, where laser treatment represents a sole source of remedy, in dentistry the use of laser is considered adjunctive in delivering a stage of tissue management conducive to achieving a completed hard or soft tissue procedure.²

Laser light is monochromatic and is of one specific wavelength. Laser light is coherent, organized, unidirectional, strong and concentrated. It is not like a typical flashlight, which releases light in many directions.^{2, 3}

Although the lasers offer many advantages over other modalities of treatment, probably the greatest impact it has made is because of its ability to be used for both hard and soft tissues, often without the need for anesthesia. When used efficaciously and ethically lasers are an exceptional modality of treatment for many conditions that dentists or dental specialists treat on a daily basis.⁴

Dentistry has entered an exciting era of high technology with lasers offering the dentist not only a window, but a door into this high-tech, rewarding arena.

The purpose of this study is to determine the use, efficacy and safety of the 810-nm diode laser for treatment of oral aphthous ulcers and to compare them with other studies of conventional modalities so as to answer the question of whether the 810-nm diode laser is the best choice.

The Diode laser is a semiconductor that uses solid-state elements, such as gallium, arsenide, aluminium, and indium, to change electrical energy into light energy.

The light energy from the diode is greatly absorbed by the soft tissue and poorly absorbed by the teeth and bones.⁵

The semiconductor diode lasers are available in four different wavelengths, as follows:

1) 810 to 830 nm, 2) 940nm, 3) 980nm, 4) 1064nm⁶
Diode lasers can be used for a multitude of dental procedures which are predominantly **soft tissue procedures** and include soft tissue surgery, periodontal pocket therapy, peri-implantitis but can

also be used for certain applications involving hard tissue (teeth), i.e. endodontics - root canal disinfection and laser-assisted tooth whitening. The most important characteristic is the wavelength of the diode laser used as the wavelength determines how the laser light will interact with the target tissue (absorption in the appropriate tissue chromophores, penetration depth into the tissue etc.). To date, research has shown that NIR (near infrared) laser light around **810 nm to 980 nm** with power range **100mW to 10 W** to be one of the most versatile wavelength ranges in diode lasers available to the dentist with regard to the number of different treatments it can be used for.⁵

Recurrent aphthous ulcers (canker sores, or aphthous stomatitis) is the presence of small, painful sores (ulcers) inside the mouth that typically begin in childhood and recur frequently. Mouth injury, stress, and some foods may trigger an attack.

AIMS & OBJECTIVES OF THE STUDY

To know the use, efficacy, limitations and safety of 810nm Diode Laser on aphthous ulcers and to incorporate Lasers into routine Oral Medicine practice.

MATERIALS AND METHODS

The study was carried out in the Department of Oral Medicine and Radiology of Mahatma Gandhi Dental College, Jaipur on 100 patients of oral aphthous ulcers. All OPD patients who fulfilled my inclusion and exclusion criteria were included in the study sample.

Before the start of the study, an approval from the Ethical Committee of MGUMST was obtained. An informed written consent was obtained from all participating adults and from parents or legal guardians of minors or incapacitated adults

Inclusion Criteria

- Patients diagnosed with oral aphthous ulcers

Exclusion Criteria

- Pregnancy and lactation
- Patients with malignant diseases
- Patients currently under treatment with any topical or systemic medication or corticosteroids for oral lesions

Patients with known cause of immunodeficiency like HIV

Treatment was carried out using 810nm Zolar photon Diode Laser system at laser output power range of 100mw to 3W, the pulse rate of 0.1 ms to 9.9s, and the frequency of 1Hz- 5000 Hz. (Figure 1).

All the patients were evaluated on visual analog scale (VAS) on the basis of pain, sensitivity, and comfort during and after the procedure in which 0 was considered as no pain and 10 determined the worst pain.

Post-operative complications assessment

Participants were asked to grade the VAS of the severity of their postoperative complications (such as the presence of pain, oedema, and functional disorders) in numbers from 1 to 10 in the first, second and third visits, according to the following:

1-2 no postoperative complications;

3-5 mild postoperative complications;

5-7 moderate postoperative complications;

8-10 severe postoperative complications.

The patients were reviewed for follow up periods from day 1 to day 7. Clinical photographs were taken before treatment and during follow up periods.

PROCEDURE

100 patients with clinically diagnosed oral aphthous ulcers of different sizes and locations were treated with a diode laser, with a power output of 3W, in pulsed mode with a cycle of 1 minute in non-contact mode. The lesions were treated with a spot size of 2mm. 2 cycles were given for each ulcer. Pain relief was evaluated on the visual analog scale on the same day and third and seventh day respectively. Healing of the lesions was also evaluated on the first, third and seventh post treatment days.

RESULTS

PAIN RELIEF

	<50%	50%	60%	70%	80%	90%	100%
SAME DAY		20	12	20	3	39	6
3 DAYS				14	10	10	60
7 DAYS						4	30

Table 1: Pain relief in aphthous ulcers (in percentage)

A total of 100 patients were observed for the parameter of Pain Relief. From the above table we can infer that approx. 6% patients experienced complete relief on the same day while 100% patients experienced at least 50% relief on the same day. 60% patients experienced complete pain relief by the end of 3 days while another 30% experienced complete relief by the end of 7 days. Only 4% patients could not attain 100% relief at the end of 7 days and their pain relief was around 90%.

HEALING

100% HEALING	N
1 DAY	6
3 DAYS	60
7 DAYS	30
>7 DAYS	4
TOTAL	100

Table 2: Healing of the ulcers

From the above frequency table, we can observe that out of 100 patients, 6% patients healed completely on the first day of treatment. 60% patients noticed complete healing by 3 days while another 30% patients healed completely by 7 days. 4% patients took more than 7 days to experience complete healing.

DISCUSSION

The term LASER was coined by Gordon Gould at a conference in 1959. LASER is an acronym for LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION.¹

The use of lasers in a variety of surgical procedures has been well documented. Diode lasers present a solid semiconductor as an active medium, by associating aluminium, gallium, and arsenide (with wavelengths varying between 800 and 980nm) in the visible and invisible range of near infrared waves. As its wavelength is poorly absorbed by the hard dental tissue, the diode laser is safe and well indicated for soft oral tissue surgeries in regions near the dental structures and for cutting, vaporization, curettage, blood coagulation, and hemostasis in the oral region.

In our study, an 810nm diode laser was used for treating aphthous ulcers ; no major complications occurred in the surrounding soft tissue or hard tissue. We adopted the 810nm diode laser for our patients due to its availability, the convenience of its application, the ability for large areas to be treated in a single application, and the possibility of precise control of laser energies in all areas of the mouth.

In my study of Aphthous Ulcers, it was noted that out of 100 patients, (**Table 1**) 68% of the patients had very good pain relief on the very first day with a minimum of 70% pain reduction. And, by the end of 3 days, 66% patients had 100 % pain relief while another 30% experienced complete relief by the end of 7 days. Only 4% patients could not attain 100% relief at the end of 7 days and achieved 90% pain relief.

Also, (**Table 2**) 6% patients showed complete healing on the day of treatment as no irregularity of mucosal surface was felt by the patient. And more than half, that is 60% patients showed complete healing at the end of 3 days, and 96% lesions healed in a time span of 7 days. Only 4% patients took more than 7 days to achieve complete regression due to the large size and abnormal location of the ulcer.

In case of RAS, we noted that the recurrence of the ulcers decreased in the same site probably due to sterilization of the site and due to sealing of nerve endings by lasers.

Bladowski et al also found similar results and stated that the diode laser used at low levels of energy (200 mw) cut the healing time in half when compared to a pharmaceutical method (Solcoseryl ointment).⁷

De Souza et al in a similar study showed similar results and 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. Total regression in the corticoid group was from 5 to 7 days⁸

In a similar study on aphthous ulcers treated by 980 nm diode laser, all the patients were satisfied and experienced pain relief directly after irradiation and only 2 patients reported back with recurrence at different locations.⁹

In our study, we evaluated the effects of the 810-nm diode laser in the treatment of 100 patients with aphthous ulcers and conditions and found out that the advantages of the 810 diode lasers as a treatment modality were evident. Pain relief in acute conditions was found to be excellent along with fastened healing. Satisfactory healing was observed in all the cases. All in all, the 810-nm diode laser proved out to be an excellent treatment modality.

CONCLUSION

In conclusion, despite the numerous therapeutic choices available for the management of oral aphthous ulcers, there is no precise treatment available. The effectiveness of its management depends on the decreasing the time of relieving the sign and symptoms of the ulcers such as pain and inflammation. Our diode laser 810 nm is an applicable effective alternative modality in the reduction of pain, ulcer size and healing time of the oral aphthous ulcers.

However, the study sample size was limited so we need to do similar studies on a larger sample size to verify the outcomes.

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