

## 940nm Diode Laser Therapy for Treatment of Oral Lesions: Case Series



### Medical Science

**KEYWORDS :** Diode Laser, Oral Lichen Planus, Aphthous Ulcers, Oral lesions.

**Charu Tandon**

Senior Lecturer, Department of Periodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, Uttar Pradesh, India, 227015

**Vivek Govila**

Professor, Department of Periodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, Uttar Pradesh, India, 227015

**Sunil Verma**

Professor, Department of Periodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, Uttar Pradesh, India, 227015

**Tanu Tewari**

Reader, Department of Conservative Dentistry & Endodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, Uttar Pradesh, India, 227015

### ABSTRACT

**AIM:** Oral lesions like oral lichen planus and aphthous ulcers are chronic inflammatory disease characterized by episodes of relapse and remission. There is currently no definitive cure for these lesions as there are various treatment modalities available. So the aim of our study was to evaluate the efficacy of Diode Laser in treatment of oral lichen planus and aphthous ulcer.

**METHOD:** 940nm Diode Laser was used at high wattage in non-contact mode for oral lichen planus patients; and in milliwatts (Low Level Laser Therapy) and non-contact mode for aphthous ulcer patients.

**RESULTS:** Diode laser is an effective clinical tool without any adverse effects and recurrence for treatment of oral lichen planus and aphthous ulcers.

**CONCLUSION:** Treatment is aimed primarily at reducing the length and severity of symptomatic outbreaks of the oral lesions. Therapy by Diode Laser (940nm) is a painless procedure with rapid complete healing and good patient compliance.

### INTRODUCTION

Laser therapy is a recent evolution in dental treatments and providing palliative care for oral lesions such as oral lichen planus, aphthous ulcers. Lasers when operated in milliwatts, often referred as "low intensity level laser" / "therapeutic lasers" whereas when used in watts, the therapy is called "biostimulation" and "biomodulation". Therapeutic lasers generally operate in the visible and the infrared spectrum, 600-900nm wavelength.<sup>1</sup>

Oral lichen planus (OLP) is a chronic inflammatory disease that causes bilateral white striations (known as Wickham's striae), papules, or plaques on buccal mucosa, tongue, and gingiva. Its definite etiology is still unknown<sup>2</sup> but assumed to result from an abnormal T-cell-mediated immune response.<sup>3</sup> Treatment options of OLP are numerous, but as it is an immunologically mediated condition, corticosteroids are recommended.<sup>4</sup> Cryotherapy, surgery and cauterization have been used also. Hence Diode lasers provide great benefits over other treatment modalities<sup>2</sup>.

Oral aphthous ulcers are usually classified based on the number of lesions (single or multiple), the duration of the ulcers (acute or chronic), and the presence of disease in the past (primary or recurrent). Based on the causes, an appropriate treatment is selected. In most cases, a symptomatic treatment (viscous lidocaine, systemic analgesia) is necessary against pain to permit nutrition, hydration and good speech. Recently, laser therapies have been used for treatment of oral ulcers. Low Level Laser Therapy (LLLT) act through biostimulation mechanism which are non-thermal and photochemical reactions occurring in the cells.<sup>5</sup> Here by presenting a series of cases of OLP and aphthous ulcer which were treated with GaAlAs Diode Laser (940nm).

### CASE SERIES

Two patients reported to the Department of Periodontics, Babu Banarasi Das College of Dental Sciences, BBDU, Lucknow. First patient came with the chief complaint of burning sensation and discoloration of cheeks since 6 months and second with the complaint of recurrent painful ulcerations in mouth. On intraoral examination, the first case (Case 1) was provisionally diagnosed of Oral Lichen Planus. Various topical treatments had been prescribed for him over this period; however, none had promoted healing of the lesion. A biopsy was then performed to confirm the diagnosis. It was decided to use 940nm GaAlAs Diode laser as a therapy for treatment.

In second case (Case 2), intraoral examination presented with small round ulcers with erythematous halo on the buccal vestibule and mucosa. The diagnosis of minor recurrent aphthous ulcer was made on the basis of history and clinical findings. A detailed medical history was taken to rule out other ulcerative disorders and conditions. Written informed consent was obtained from both the patient. All the protective laser protocol was followed.

For case I, a GaAlAs Diode laser (940 nm wavelength) with 5 watts power, 800 joules of energy, 0.20 seconds pulse length and interval was applied per cm<sup>2</sup> of the affected areas on buccal mucosa in a non-contact (defocused mode) for 3-4 minutes (Figure 1) twice weekly, until patient's discomfort and the clinical symptoms were completely relieved. Patient was followed up after every 3 days to assess any postoperative complications and subjective evaluation.

**Figure 1: Laser therapy applied over the lesion in a defocused mode**



For case II, LLLT was used at 0.6 watts, 0.10 seconds pulse length and interval for 60 seconds in a non-contact mode. (Figure II) This procedure was repeated every alternate day that is thrice weekly, until complete healing was seen. The subjective sensation scoring and post-operative complications (pain, burning sensation, bleeding, swelling, and functional disorders) were performed by Visual Analogue Scale (V.A.S.). These findings were recorded once weekly.

**Figure II: Application of LLLT on aphthous ulcers**



## RESULTS

Both the cases responded well to the treatment resulting in complete healing of the lesions and no post-operative complications were recorded after the treatment. The affected area healed completely after five weeks of therapy for OLP patient and within a week for aphthous ulcer patient. Biopsy sample was again taken from the healed site of case 1 after 5 weeks which showed complete healing of the lesion. After 1 year follow up, recurrence was not seen, signifying complete healing of the lesions in both the cases.

## DISCUSSION

Oral lichen planus and aphthous ulcer are relatively common oral diseases, which can be both painful and interfering with normal masticatory functions for many patients. These diseases have been traditionally treated pharmacologically with steroids or anti-inflammatory drugs. Recently alternative therapies such as the use of Laser therapy / Low Level Laser Therapy (LLL) have been introduced for their abilities to accelerate wound healing and provide almost immediate pain relief.

*Oral lichen planus (OLP)* is a cell-mediated immune condition of unknown etiology, in which T lymphocytes accumulate beneath the epithelium of the oral mucosa and increase the rate of differentiation of the stratified squamous epithelium, resulting in

hyperkeratosis and erythema with or without ulceration. Corticosteroids only inhibit the humoral immunity without removal of the causative factors. NSAIDs have been also used as an alternative to corticosteroids but is less beneficial. Surgical removal may be effective in small and localized lesion. In addition, CO<sub>2</sub> laser has been used for treatment of OLP.<sup>2</sup> The target of CO<sub>2</sub> laser is water, and has a low power of penetration in deeper layers.<sup>6</sup>

We tried a new treatment modality that is diode laser for management of OLP which showed minimum side effects. Diode laser 940nm that possesses a deeper power of penetration reaching about 1.5mm. Application in 5 watts power in defocused continuous mode will rise temperature of affected tissues between 50 to 100 degrees; resulting in protein denaturation which clinically manifest as blanching of the treated mucosa. Denaturated protein acts as a dressing layer for the treatment site that may decrease pain, in comparison with CO<sub>2</sub> laser, and enhance healing with less risk of secondary infection. This modality satisfied the patients who suffered psychologically from the long treatment by corticosteroids and the fear and suffering from their side effects.<sup>7</sup> Cafaroet al<sup>8</sup> performed a prospective study with Diode Laser and shown significant reduction in the lesion size and pain, also no post-operative complications were observed. Jajaramet al<sup>9</sup> concluded that LLLT was as effective as topical corticosteroid therapy without any adverse effects.

*Aphthous ulcer* is one of the most agonizing oral mucosal inflammatory ulcerative conditions. Various treatment modalities like steroids, mouthwashes, topical agents etc., have numerous side effects and require patient compliance. On the contrary, LLLT not only provided instant pain relief but was also cost-effective and provided time benefit as single sitting can be sufficient in treating the condition. Other than diode laser; CO<sub>2</sub>, Nd: YAG lasers have been used. Brader I used Nd: YAG laser in a noncontact mode for the treatment of minor recurrent aphthous ulcer showed significant healing and good patient compliance.<sup>10</sup> Zand et al employed a low-intensity, non-thermal, single session of CO<sub>2</sub> laser and reported dramatic and immediate pain reduction.<sup>11</sup>

Healing by LLLT occurs by increase of adenosine triphosphate (ATP) production by laser, leading to increase in protein synthesis by mitochondria, resulting in greater tissue regeneration in the repair process. Also, by stimulation of microcirculation and formation of new vessels.<sup>12</sup> 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.

## CONCLUSION

As the laser therapy for treatment of OLP and LLLT for aphthous ulcer appears to be a painless procedure with no postoperative complications, resulting in successful complete healing of the lesions and better patient compliance as seen in these cases. This strongly signifies that 940nm GaAlAs Diode laser can be a new emerging treatment modality for oral lichen planus and aphthous ulcers.

## REFERENCE

1. Abergel P, Meeker CA, Lam TS, Dwyer RA, Lesavoy MA, Uitto J: Control of connective tissue metabolism by lasers: Recent developments and future prospects. *J Am Acad Dermatol* 1984; 11: 1142 | 2. Soliman M, Kharbotly El A and Saafan A. Management of oral lichen planus using diode laser (980nm). *A clinical study. Egyptian Dermatology Online Journal* 2005; 1(1): 3. | 3. Mehrotra C, Govila V, Govila S. Diode Laser - An Emerging Management for Oral Lichen Planus: A Case Report. *Archives of Dental Sciences* 2012, 2(4); 50-4. | 4. Edwards PC, Kelsch R. Oral Lichen Planus: Clinical Presentation and Management. *J Can Dent Assoc* 2002; 68(8):494-9. | 5. Basirat M. The Effects of Low Power Lasers in Healing of Oral Ulcers. *J Lasers Med Sci* 2012; 3(2):79-83 | 6. Anderson RR and Ross EV: Laser-tissue interactions in cosmetic laser surgery. Fitzpatrick, RE and Goldman, MP. Mosby, Inc, 2000, 1-15 | 7. Catone GA, Halusic E: Photobiology of lasers in oral maxillofacial surgery. In *Laser applications in oral and maxillofacial surgery*. Catone GA and Alling, C. Saunders company 1997, 29-38. | 8. Cafaro A, Albanese G, Arduino PG, Mario C, Massolini G, Mozzati M, Broccoletti R. Effect of low-level laser irradiation on unresponsive oral lichen planus: early preliminary results in 13 patients. *Photomed Laser Surg*; 2010; 28(2):99-103. | 9. Jajaram HH, Falaki F, Mahdavi O. A Comparative Pilot Study of Low Intensity Laser versus Topical Corticosteroids in the Treatment of Erosive-Atrophic Oral Lichen Planus. *Photomed Laser Surg* 2011; 29(6):421-5. | 10. Brader I. The treatment of aphthosis with the Nd: YAG laser. *Quintessenz J* 2008; 2: 77-86. | 11. Zand N, Ataie-Fashtami L, Djavid GE, Fateh M, Alinaghizadeh MR, Fatemi SM, et al. Relieving pain in minor aphthous stomatitis by a single session of non-thermal carbon dioxide laser irradiation. *Lasers Med Sci* 2009; 24: 515-20. | 12. Rocha AM Jr, Vieira BJ, de Andrade LC, Aarestrup FM. Effects of low-level laser therapy on the progress of wound healing in humans: The contribution of in vitro. *J Vasc Bras* 2007; 6(3): 258-66. |