Low energy 904-nm diode laser for the treatment of oral lichen planus (OLP)

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ABSTRACT
Background: Oral lichen planus is chronic inflammatory disease of the oral mucosa. The exact etiology is unknown but there are many factors associated with it. However there has been much research into immune and pathological mechanisms that underlie oral lichen planus. Low level laser therapy (LLLT) is use in base on the concept that certain doses of specific wave length can turn on or off certain immuno cellular components or functions as well as aid in healing and reducing pain of the lesion. The aim of this study was to clinical evaluation of low level laser therapy, at certain dose, on symptomatic OLP.

Patients and method: six patients with symptomatic OLP treated with low level GaAs laser, 5 minutes time of radiation exposure twice a week, for four visits.

Results: Pain sensation and erythema were disappeared but white hyperkeratosis did not affected by laser therapy.

Conclusions: LLLT act as biostimulation that inhibit pain and inflammation in OLP but not hyperkeratotic area.

Keywords: Oral, lichen planus, laser. (J Bagh Coll Dentistry 2008; 20(2):76-78)

INTRODUCTION
Lichen planus is a relatively common dermatitis that occurs in skin and oral mucous membrane(1,2). OLP affects from 0.1-4% of individuals depending on the population studied (3).

The etiology is unknown, but there are many factors associated with this lesion such as drug reaction, liver disorders, reaction to amalgam and graft versus host disease (1-3). Pathogenesis is not fully understood but probably involves a cell mediated immune response to antigenic changes in oral mucosa. This would be consistent with the predominantly T-lymphocytes infiltrate (2-4).

It occurs with onset beyond middle age. They may manifest in different form with more than one form of lesion evident in one patient. These are reticular, plaque-like, papular, bullous, atrophic, erosive and desquamative gingivitis. The cheeks are preferentially affected in many patients with OLP, then the tongue. Lips, gingiva, floor of the mouth and palate are less frequently involved. Because the reticular lesion is the most common form, they are seen most often on the cheek and tongue in many cases as bilateral lesions (2,3,5). In general these lesions are often quite symptom-free and are often noticed incidentally by the patient, although a sensation of roughness may be present (5). The erosive form described as the irregular areas of oral epithelial destruction which are covered in a yellow layer of fibrin.

Atrophic lesion, in which there has been epithelial thinning, present as irregular areas of erythematous mucosa. Both erosive and atrophic variants tend to be symptomatic (2,3,5). The essential histological changes are sub epithelial band of lymphocytes, predominantly T lymphocytes, and macrophages. Also there is epithelial acanthosis with orthokeratosi and parakeratosis.

Diagnosis is by clinical examination and biopsy (3). Because OLP is not a curable condition, treatment is administered for symptoms of discomfort or pain (3). These lesions appear, regress and reappear in a somewhat unpredictable fashion. Lesions are usually too diffuse for surgical removal, although cryotherapy and cauterezation have been used. Symptomatic treatment of oral lesions can be provided by topical analgesics or antihistamine rinses, or more specifically by use of topical corticosteroids (2). Topical corticosteroids promote healing of erosive areas (6,7) but do not eliminate reticular, papular, or plaque-like changes of OLP. Side effects of this treatment when applied unrestrictedly by the patients may lead to clinical signs of adrenocortical suppression and candida overgrowth (2,8,9). Retinoids are also useful on hyperkeratosis mucosa, topical application of retinoid will eliminate reticular and plaque like as well as erosive lesions. Systemic retinoid are also effective but has many adverse effects (10-13).

There have been many claims for the therapeutic effects of low level laser therapy (LLLT) on a broad range of disorders such as accelerate wound healing and pain attenuation, stimulation of endorphin release and modulation of immune system (14-17). The activation of life process under laser radiation often called
“biomodulation”\(^{(16,17)}\). Some studies showed that OLP do not completely controlled by the lasers but certainly appear to be palliated\(^{(18)}\).

The aim of this study is clinical evaluation of low level laser therapy, at certain dose, on symptomatic OLP.

**MATERIALS AND METHODS**

A 904 nm GaAs laser (Optodent) has been used; the average power at end of optic fiber was 5 mW. Six patients with symptomatic OLP unresponsive to conventional therapies were recruited from the dermatological department at Baghdad teaching hospital and from private dental clinics. Four participants completed the entire study and two are discontinued the treatment. The fiber optic tip applied directly to the lesion site. Lesions were irradiated with exposure time of 5 minute continuous move per 1 cm site, twice a week. A course of therapy consisted of 4 procedures.

The main outcome measurement was used to grade subjective disease severity is no pain, mild, moderate and severe pain.

**RESULTS**

The data are presented in the following tables:

<p>| Table 1: Data of the patients was recorded before laser irradiation |
|----------------------|----------------------|----------------------|----------------------|</p>
<table>
<thead>
<tr>
<th>Patient’s No.</th>
<th>sex</th>
<th>Age (Year)</th>
<th>Types of lesion</th>
<th>Sites of lesion</th>
<th>Sides involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>♂</td>
<td>51</td>
<td>Reticular</td>
<td>Cheek, tongue</td>
<td>Right</td>
</tr>
<tr>
<td>2</td>
<td>♂</td>
<td>34</td>
<td>Reticular</td>
<td>Cheek, angle of mouth</td>
<td>Right</td>
</tr>
<tr>
<td>3</td>
<td>♂</td>
<td>36</td>
<td>Erosive</td>
<td>Angle of mouth</td>
<td>Right</td>
</tr>
<tr>
<td>4</td>
<td>♂</td>
<td>56</td>
<td>Reticular</td>
<td>Cheek</td>
<td>Right and left</td>
</tr>
<tr>
<td>5</td>
<td>♂</td>
<td>36</td>
<td>Reticular</td>
<td>Cheek</td>
<td>Right and left</td>
</tr>
<tr>
<td>6</td>
<td>♂</td>
<td>25</td>
<td>Linear, patch</td>
<td>Cheek</td>
<td>Right and left</td>
</tr>
</tbody>
</table>

| Table 2: Data for each patient according to pain sensation and clinical presentation after laser therapy for each visit: |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Patients No.    | First visit     | Second visit    | Third visit     | Fourth visit    |
|                 | Pain            | Clinical presentation | Pain            | Clinical presentation | Pain           | Clinical presentation |
| 1               | Moderate        | White           | -----           | -----           | -----           | -----           |
| 2               | Moderate        | White           | -----           | -----           | -----           | -----           |
| 3(figure 1)     | Moderate        | Erythema+white  | Moderate        | No redness + white | Mild            | white lesion    | No              | White           |
| 4               | Moderate        | White           | Mild            | White           | Mild            | White           | Mild            | White           |
| 5               | Mild            | White           | No              | White           | No              | White           | No              | White           |
| 6               | Moderate        | Erythema+white  | Mild            | Erythema+white  | No              | White           | (left area was healed completely) | No | White |

**DISCUSSION**

Studies of the effect of LLLT on the healing of OLP have yielded equivocal results. In this study the results showed no apparent clinical effect of these certain parameters on healing of OLP, however pain syndrome associated with this lesion are decreased.

Worldwide studies have shown that laser energy reduced pain and inflammation and this may be interpreted by the following:

1. Biostimulation and photosimulation\(^{(16,17)}\).

2. Endogenous opiate production: as low energy laser can increase the level of serotonin in chronic pain patients\(^{(19)}\). In laser acupuncture, Laakso showed transcutaneous stimulation of human skin increased blood endorphin levels\(^{(15)}\).

3. Slowing sensory nerve production: laser causes in vitro changes in nerve action potentials, conduction velocities and distal latencies. Experimental evidence demonstrated significant pain relief following
low power He-Ne and infrared laser stimulation of acupuncture points (20).

Figure 1, a: Erosive lichen planus before treatment

Figure 1, b: Same lesion after two days of treatment

4. Stimulation the Na-K pump mechanism in the cell membrane: as the laser light can increase the activity of the ATP-dependant Na-K pump and the restoration of the sodium pump necessary to maintain the negative resting potential of neuronal membranes (16,21). LLLT inhibits a range of nociceptive signals arising from peripheral nerves including neuronal discharges elicited by chemical irritation of inflammation (16,21). In this case laser increases the potential difference across the cell membrane moving the resting potential further from the firing threshold, thus, decreasing nerve endings sensitivity (21,22).

REFERENCES