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Comparison of the effects of CO_2 laser therapy and topical corticosteroids for treatment of oral lichen planus lesions

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ABSTRACT

Oral lichen planus (OLP) is a T-cell-mediated chronic inflammatory oral mucosal disease of unknown etiology and patients with symptomatic lesions usually require treatment. Topical corticosteroids are widely used as the first choice of treatment. Laser therapy is a new method of treatment for symptomatic, resistant oral lesions. CO_2 lasers have been used to treat multi-centric lesions and lesions in difficult areas. The aim of this study was to assess the effects of CO_2 laser therapy and compare them with topical corticosteroids in the treatment of symptomatic OLP. In this interventional clinical trial ,thirty-six patients with symptomatic OLP were randomly allocated into two groups. The experimental group consisted of patients treated with a CO_2 laser and the control group consisted of patients who used a topical steroid, namely0.1% dexamethasone mouthwash. The laser group was treated with CO_2 laser ablative therapy in2 consecutive sessions during one week, in which2-3mm of normal tissue bordering the lesion was ablated. The control group used the steroid mouthwash 3 times daily in affected sites for 4 weeks. The visual analogue scale (VAS) used for pain and discomfort evaluation. Clinical data and treatment responses were graded according to Thongprasom criteria. Patients underwent a follow-up 2 months after the last treatment session to assess for recurrence of lesions. Collected data were analyzed using SPSS software version 15.Chi square tests and repeated measurement tests were used for analysis of appearance score, pain score, and lesion severity modification in this study. The laser group included 4 male and 14 female patients with a mean age of 45.89 years and the corticosteroid group consisted of 6 male and 12 female patients with a mean age of 47.68 years. Total of 112 oral lesion sites in both groups existed. The mean duration of lesion presence in the oral cavity was 5.67 months in the laser group and 5.53 months in the corticosteroid group. At the end of treatment, The mean VAS in the laser group was 4.83 ± 1.098 and in the corticosteroid group was 4.72 ± 1.32. The most common type of lesion according to the Thongprasom criteria had a score of 3 (white steria with atrophic area > 1cm2) in both groups. Chi square tests did not identify any difference between the two groups with respect to mean age and sex distribution (P value >0.05). Appearance scores, pain scores, and lesion severity were reduced in both groups after treatment according to repeated measurement tests, but no significant differences were found between the two groups .However , more accelerated pain reduction was found in the laser group, as indicated by the slope of the repeated measurement graph. No significant differences were observed across groups in terms of the response and relapse rates, according to the Mann-Whitney U test. (P value >.05). This study demonstrated that CO_2 laser was as effective as topical corticosteroid therapy and it may be considered as an alternative treatment for symptomatic OLP in the future. Key words: oral lichen planus, CO_2 laser, topical corticosteroid.

Introduction

Oral lichen planus (OLP) is an oral disease of unknown etiology first described in 1869 by Erasmus Wilson.1The disease is relatively common, affecting approximately 1–2% of the population.2 OLP develops most commonly in the fifth to sixth decades of life, though patients of all ages may develop this disorder.3Women are affected more often than men.1-6Inthe majority of cases, cutaneous lesions of lichen planus (LP) are self-limiting and chronic, rarely undergoing spontaneous remission and potentially premalignant.2,3,4Current data suggest that OLP is a T-cell-mediated autoimmune disease in which auto-cytotoxic CD8+T cells trigger apoptosis of oral epithelial cells.4The increased production of TH1 cytokines is a key feature ofLP.5

OLP may be found in any area of the mouth but common sites include the buccal mucosa, tongue and gingi classified according to its clinical features as reticular, papular, plaque, bullous, atrophic, erosive or ulcerative type.4 Reticular OLP is the most common form and predominantly affects the buccal mucosa, appearing as a network of white or grey threads (Wickham's striae) interspersed with papules.4 Atrophic lesions may appear with or without erosions.

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When they do occur, erosions are often extensive, and the erosive type of OLP is most likely to cause symptoms.1,4 Malignant transformation of OLP has been reported in a number of studies. Accumulation of inducible nitric oxide synthesis (iNOS) with 8-nitroguanine and 8-oxo-7, 8-dihydro-2'-deoxyguanosine (8-oxodG) in oral epithelium in OLP may reflect nitrative and oxidative damage to DNA that could be the basis of malignancy.7

Typical histological findings in OLP include hyperortho-keratinization or hyperpara-keratinization with thickening of the granular cell layer.1The epithelium displays local acanthosis with inter- and intracellular edema. Saw-tooth appearance of the rete ridges, which is commonly found in skin lesions, is rarely seen in OLP .6OLP may be diagnosed correctly if there are classic skin or other extra oral lesions. However, an oral biopsy with histopathological examination is recommended both to confirm the clinical diagnosis and to exclude dysplasia and malignancy.2Treatment of OLP depends on symptoms, the extent of oral and extra-oral clinical involvement, medical history and other factors. Reticular lesions that are asymptomatic generally require no therapy but only observation for change.2

Approximately two-thirds of OLP patients report oral discomfort. OLP lesions usually persist for many years with periods of exacerbation and quiescence. During periods of exacerbation, there is increased erythema or ulceration with increased pain and sensitivity. During periods of quiescence, there is a decrease in the extent of erythema or ulceration with decreased pain and sensitivity. Exacerbation of OLP has been linked to periods of psychological stress and anxiety, a predictable correlation with any condition that is related to an immune system imbalance. 8The aims of current OLP therapy are to eliminate mucosal erythema and ulceration, alleviate symptoms and reduce the risk of oral cancer.6

Corticosteroids are the mainstay of OLP therapy because of their activity in dampening cell-mediated immune activity. They can be administered topically, intra lesionally or systemically. Localized oral lesions are treated with topical ointment, applied two to four times daily after meals. Generalized oral lesions are often treated effectively with a steroid mouth rinse used twice a day after meals. Generalized atrophic or erosive oral lesions that do not respond to topical therapy may be treated with a short course of systemic corticosteroids. 6,8,9

Treatment of OLP with Cyclosporin, Azathioprine, Levamisole, Griseofulvin, retinoids, Hydroxychloroquine sulphate, Dapsone and Psoralen/UVA has been reported.2Cryosurgery has been used particularly in erosive drug-resistant OLP, but lesions may develop in the healing wounds and recur in scars. 10Low- and high-level lasers have also been used to treat OLP; carbon dioxide (CO_2) lasers have been used to treat multi-centric lesions and difficult areas.2,4,6,11,12,13

The use of laser treatment in the oral cavity has gained acceptance, including in the treatment of oral premalignant lesions such as leukoplakia.14A laser beam, being monochromic, coherent and collimated, is highly precise and its specific wavelength determines its optical properties such as laser spot size, power and interaction at the laser-tissue interface.15Of the many available types of laser, the CO_2 laser has become established as a tool for treating superficial mucosal lesions. 16 CO_2 lasers have been used for a variety of oral surgical procedures including gingivectomy, gingivoplasty, frenectomy, incisional and excisional biopsy, and operculectomy. CO_2 laser surgery on the oral tissues is generally performed with a power setting of five to fifteen watts in either a pulsed or continuous mode. 17 The CO_2 laser possesses many advantages over conventional surgical techniques. This laser allows superficial removal of just epithelium by evaporation.18The aim of our study was to assay and compare the effects of CO_2 lasers with those of topical corticosteroids in the treatment of symptomatic oral lichen planus.

Materials and methods

This interventional clinical trial was undertaken by the Oral Medicine Department of Shiraz Dental School in the period 2010-2011.36 patients with OLP lesions were selected for inclusion. They were randomly allocated into two groups. The 18 patients in the laser group consisted of 4 male and 14 female patients with an average of age 45.89 years and the 18 patients in the corticosteroid group consisted of 6 male and 12 female patients with an average of age 47.68 years. All of them were diagnosed by clinical findings confirmed by biopsy. All patients were informed about the study and provided ethical consent.

The experimental group consisted of patients treated with a10600 nm CO_2 laser (Smart US20D, DEKA)according to standard protocol (power 4w,2 J/Cm2,frequency 80Hz, pulse mode, straight tip, defocused mode and non-contact) in 2 consecutive sessions during one week and at least 2-3mm of normal tissue around the border of the lesion was ablated. All laser treatments were carried out with the patient under local anesthesia (Persocain 0.2%) on an outpatient basis. A 0.1% chlorhexidine mouthwash and Paracetamol analgesic were prescribed for postoperative pain relief. The laser defect was allowed to heal undisturbed.

The control group of patients used a topical steroid, 0.1% Dexamethasone mouthwash, 3 times daily for 4 weeks. Each patient in both groups underwent follow-up examination every 2 weeks for 2 months. A visual analogue scale (VAS) was used for measurement and evaluation of pain or oral discomfort. The VAS was based on a scale from 0 to 10, with 0 defined as having no pain or burning sensation and 10 defined the worst pain or burning feeling imaginable. The Thongprasom criteria, which are a set of 5 scores (Table 1), were used to identify changes in the size and type of lesions.

Lesion sizes were measured and digital photographs were taken before laser or local corticosteroid therapy and at follow-up sessions. Response rates were assessed clinically by three measures: the reduction in sign and symptom (pain) scores, the amount of reduction in type, and the amount of reduction in size of the lesions (Tables 2 and3).2 months after the last treatment for both groups, all patients underwent a final follow-up evaluation and the recurrence rate was measured. Collected data were analyzed using SPSS software (version 15). Repeated measurement analysis was used to evaluate changes in lesion size and pain scores. A Wilcoxon non-parametric test was used to assess the effect of treatment on relapse rate and clinical improvement.

Results

Among the 36 patients in the study, a total number of 112 oral lesions existed at the beginning of treatment. The mean duration of lesion existence in the oral cavity was 5.67months in the laser group and 5.53months in the corticosteroid group. At the end of the study, The mean VAS in the laser group was 4.83± 1.098 and in the corticosteroid group was 4.72 ± 1.32.

The most common site of involvement in both groups was the buccal mucosa (91.2%).Other sites of involvement were the gingiva (72%), labial mucosa (30.6%), tongue (27.8%), lips (11%) and floor of the mouth (8.7%). The most common type of lesion according to the Thongprasom criteria had a score of 3(47 % cases). The distribution of other lesion types according to the Thongprasom criteria was as follows: score 1, 15%; score 2, 16%; score4, 10%; score 5, 8%; and score 6 (ulcerative lesions), 4%.

According to repeated measurement analysis, appearance score, pain score, and lesion severity were reduced over the course of treatment in both groups. Significant clinical improvement was seen in both groups according to Wilcoxson tests (p value>0.05). The VAS decrease was more rapid in the laser group ,as evidenced by the more steeply sloping curve of treatment progress (Graph 1).No significant differences were found between the treatment groups with regard to the response and relapse rates, as evaluated by Mann-Whitney tests (P value >0.05).

At the final post-treatment assessment, it was determined that 2patients (11.1%) in the laser group showed no response to the treatment, while 13patients (72.2%) in the laser group had an excellent response to therapy, 2 patients (11.1%) had good response and 1patient (5.6%) had a fair response In the corticosteroid group, 2patients (11.1%) relapsed and showed no response to the treatment, while 9patients (50%) in the corticosteroid group had an excellent response to therapy, 2patients (11.1%) had a fair response and 5 patients (27.8%) had a good response. A Mann-Whitney test showed no significant differences between the treatment groups regarding the final assay. (P value >0.05)

Discussion

OLP is a chronic immunological disease which has no definite cure at present. As with any chronic condition, a crucial component of disease management is patient education. The OLP patient should be made aware of the nature of the disease, the unpredictable nature of its clinical course and the rationale behind current therapeutic recommendations.2,6,19

Treatment of OLP is aimed primarily at reducing the length and severity of symptomatic outbreaks. Topical corticosteroids are the mainstay in treating mild to moderately symptomatic lesions.9 Options include 0.05% Betamethasone valerate gel, 0.05% Fluocinonide gel, 0.1% Triamcinolone acetonide ointment and 0.1% Dexamethasone mouthwash. 20,21

Surgical excision of OLP has the advantage of eliminating the lesion and if submitted for histo-pathological examination can yield a histo-pathological diagnosis. However, it is not a common practice mainly because of the widespread nature of OLP on the oral mucosa. Carbon dioxide (CO_2) laser offers an alternative to the scalpel, in the treatment of symptomatic lichen planus. 22 CO_2 laser with a wave length of 10.6 μmis strongly absorbed by water. The absorbed energy causes vaporization of the intra-cellular and extracellular fluid and destruction of the cell membranes. It is consistently absorbed within 0.5 mm of the tissue surface without regards for pigmentation and is therefore well suited for the treatment of superficial mucosal lesion. 23

Surgical ablation with a CO_2 laser avoids the systemic adverse effects of drug therapy inthe treatment of lichen planus. In addition, it offers the advantages of minimal damage to surrounding healthy tissues and excellent wound healing with little scarring.18,23 cafaro et al in 2014 reported a significant reduction in clinical scores of the treated lesions and reported pain in a prospective cohort study of 30 patients with OLP, who received biostimulation with a 980-nm gallium-aluminum-arsenide (GaAIAs) diode laser (DM980, distributed by DMT S.r.l., Via Nobel 33, 20035, Lissone, Italy). 24 aghahoseyni et al In a randomized open clinical trial of 28 patients showed that LLLT displayed better results than CO(2) laser therapy as alternative or additional therapy.25Hoseinpour et al in 2011 demonstrated that LILT was as effective as topical corticosteroid therapy without anyadverse effects 26. There have only been few papers published on the use of CO_2 laser evaporation for the treatment of OLP. There have only been few papers published on the use of CO_2 laser evaporation for the treatment of OLP27,28. Loh et al. in 1992 treated 10 patients with OLP lesions using a CO_2 laser and found favorable response without adverse effects .28In this study, the duration and method of laser therapy were not defined. Lindebooma in 2003 treated 6 patients with corticosteroid-resistant OLP with a CO_2 laser. The laser used in this study was operated in a defocused, continuous mode at 4 W in order to vaporize the OLP lesion. Patients were assessed using VAS scores at baseline and at 2, 4, 12, and 24 weeks after treatment. All patients had an excellent response to the therapy. Pain relief and reduced burning sensation were observed after 3 months of therapy in 5 of the 6 patients.29 P. S. van der Hem et al. in the period from 1975 to 2003 performed CO_2 laser evaporation on 21 patients with a total of 39 lesions of OLP which caused pain, even after conservative therapy. Over a follow-up period of 1–18 years (mean 8 years), 21 patients were pain free (85%) and 6 patients (15%) experienced painful recurrence after treatment. After retreatment with CO_2 laser evaporation there were no complaints of pain.18

The mechanism by which laser treatment brings about symptomatic and clinical improvement in OLP is unknown. As lichen planus is a systemic disease, it is possible that laser surgery causes a systemic change through its local action on the oral tissues.22Oka et al. claimed that CO2 laser treatment caused no changes in IgG, IgA and IgM levels. However, other studies have shown changes in IgG levels. 27,30In this clinical trial, we evaluated the efficacy of CO_2 laser therapy in the treatment of the OLP in comparison to the current routine treatment (topical corticosteroids). All patients noticed immediate relief of all symptoms with no side effects. When lichen planus recurred, it did not occur in the laser treated areas but in untreated areas.

While high-potency topical corticosteroids remain the most consistent and effective treatment for OLP,18 this study demonstrates that CO_2 laser ablation of OLP causes minimal morbidity while achieving satisfactory healing and control of discomfort/pain associated with OLP lesions. It can therefore be an effective treatment modality for OLP.

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