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Original Research Article

Management of erosive/ulcerative oral lichen planus by diode laser therapy with corticosteroid or topical therapy: a randomized controlled trial

Abdullah Al Mamun Khan[1]*, Nasrin Parvin Zahan[2]

[1]Department of Oral and Maxillofacial Surgery, City Dental College and Hospital, Dhaka, Bangladesh
[2]Department of Clinical Dentistry, German Dental and Implant Center Banani and Banasree Dental and Implant Center Banasree, Dhaka, Bangladesh

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***Correspondence:**
Dr. Abdullah Al Mamun Khan,
E-mail: drmamun@icloud.com

ABSTRACT

Background: Oral lichen planus (OLP) is a chronic inflammatory mucosal disorder, with erosive and ulcerative forms causing significant pain, discomfort and impaired quality of life. Although topical corticosteroids are considered first-line therapy, recurrence and adverse effects remain common. Low-level laser therapy has emerged as a promising adjunctive modality due to its anti-inflammatory and biostimulatory effects. This study evaluated the effectiveness of diode laser–assisted combined therapy compared with topical corticosteroid therapy alone in symptomatic OLP.
Methods: This randomized controlled clinical trial included 60 patients (45 females, 15 males; age 35–65 years) diagnosed with erosive or ulcerative OLP attending two dental centers in Dhaka between 2019 and 2025. Participants were randomly allocated into two groups (n=30 each). Group 1 received combined therapy comprising low-level red diode laser (630 nm, 1.5 J/cm², 10 mW, 120 seconds, 15 sessions) with 0.1% triamcinolone acetonide, while group 2 received topical corticosteroid alone. Pain was assessed using the visual analog scale (VAS). All patients were followed for 12 months. Data were analyzed using statistical package for the social sciences (SPSS) version 25.
Results: Combined therapy produced superior outcomes, with 100% of patients reporting nil pain, complete healing and no recurrence. In the topical therapy group, 60% achieved nil pain while 40% reported mild pain and recurrence. Mild adverse effects occurred in 10% of patients receiving corticosteroids alone.
Conclusions: Diode laser–assisted combined therapy is a safe and more effective treatment modality than topical corticosteroid alone for managing erosive and ulcerative OLP, providing better pain relief, faster healing and reduced recurrence.

Keywords: Oral lichen planus, Diode laser therapy, Photobiomodulation, Combined therapy, Topical corticosteroids, Visual analog scale

INTRODUCTION

Oral lichen planus (OLP) is a chronic inflammatory, immune-mediated mucocutaneous disorder that commonly affects the oral mucosa and presents with various clinical forms, including reticular, erosive and ulcerative types.[1] Among these, the erosive and ulcerative variants are considered the most symptomatic and debilitating, often causing persistent pain, burning sensation, ulceration and significant discomfort during eating, speaking and maintaining oral hygiene.[2] These symptoms adversely affect patients' quality of life and may lead to nutritional deficiencies and psychological stress. OLP predominantly affects middle-aged and older adults and shows a higher prevalence among females.[3] Although the exact etiology remains unclear, immune dysregulation, stress, local irritants and hypersensitivity reactions are believed to contribute to its pathogenesis.[4]

Topical corticosteroids are considered the first-line therapy for symptomatic OLP due to their anti-inflammatory and immunosuppressive properties.[5] Triamcinolone acetonide is widely used to reduce erythema, ulceration and pain. However, prolonged corticosteroid therapy may be associated with adverse effects such as mucosal thinning, secondary candidiasis and recurrence after discontinuation.[6] In addition, some patients exhibit incomplete response or frequent relapse, highlighting the need for alternative or adjunctive treatment modalities that are safe, effective and capable of promoting faster healing with fewer side effects.[7]

Low-level laser therapy (LLLT), also known as photobiomodulation therapy, has emerged as a promising non-invasive treatment option in oral medicine. Diode lasers have been reported to reduce inflammation, stimulate tissue repair, enhance microcirculation and provide analgesic effects through biostimulatory mechanisms.[8] These properties may facilitate faster epithelial healing and symptomatic relief in erosive or ulcerative OLP lesions.[9] Compared with pharmacological therapy, laser therapy offers the advantages of minimal systemic effects, better patient compliance and reduced risk of drug-related complications. Recent clinical studies suggest that laser therapy may be comparable or superior to corticosteroids in controlling symptoms and reducing recurrence; however, evidence remains limited and further randomized clinical trials are required.[10]

Considering the chronic nature of OLP and the limitations of conventional therapy, combining laser therapy with topical corticosteroids may provide synergistic benefits by enhancing healing while reducing inflammation and recurrence. Therefore, this randomized controlled clinical trial was designed to evaluate the effectiveness of diode laser therapy combined with topical corticosteroids compared with topical corticosteroid therapy alone in the management of erosive and ulcerative oral lichen planus, with assessment of pain reduction and recurrence during a twelve-month follow-up period.

METHODS

This randomized controlled clinical trial was conducted among 60 patients diagnosed with erosive or ulcerative oral lichen planus who attended the German Dental and Implant Center and Banasree Dental and Implant Center, Dhaka, from 2019 to 2025. The patients comprised 45 females and 15 males aged 35–65 years. Eligible participants were randomly allocated into two equal groups of 30 patients each. All participants were followed for twelve months and pain intensity was assessed using a visual analog scale (VAS) before and after treatment.

Inclusion criteria were patients aged 35–65 years with clinically diagnosed erosive or ulcerative oral lichen planus, experiencing symptomatic lesions and with no prior history of treatment for oral lichen planus. Exclusion criteria included patients with systemic illness affecting healing, pregnancy or lactation, history of immunosuppressive therapy, previous laser or corticosteroid therapy for oral lesions, malignant or dysplastic lesions and those unwilling to participate or attend follow-up.

Group 1 received combined therapy consisting of low-level red diode laser therapy (630 nm wavelength, 1.5 J/cm² energy density, 10 mW output power) applied for 120 seconds every three days for 45 days, totaling 15 sessions, along with topical 0.1% triamcinolone acetonide for 2–6 weeks according to lesion severity. Group 2 received only topical 0.1% triamcinolone acetonide for the same duration. All patients were advised to avoid triggering factors such as stress and irritant foods, maintain good oral hygiene and use cool compresses for symptomatic relief.

Data were recorded and analyzed using statistical package for the social sciences (SPSS) version 25. Descriptive statistics including frequency and percentage were calculated to summarize outcomes.

RESULTS

Table 1 presents the baseline socio-demographic characteristics of the 60 study participants diagnosed with erosive or ulcerative oral lichen planus. The patients were aged between 35 and 65 years, with the majority belonging to the 46–55 years age group (40%), followed by 35–45 years (36.7%) and 56–65 years (23.3%). A clear female predominance was observed, with 45 females (75%) compared to 15 males (25%). Regarding occupation, most participants were homemakers (46.7%), followed by service or office workers (23.3%), businesspersons (16.7%) and manual laborers (13.3%). The majority of patients belonged to the low–middle socioeconomic group (63.3%), while 30% were middle income and only 6.7% were from higher-income status. Notably, none of the participants had received any prior treatment for oral lichen planus before enrollment.

Table 2 shows the baseline clinical characteristics of oral lichen planus lesions among the 60 enrolled patients. The erosive type was more common, affecting 36 patients (60%), whereas 24 patients (40%) presented with ulcerative lesions. The buccal mucosa was the most frequently involved site, observed in 32 cases (53.3%), followed by the tongue in 12 (20%), gingiva in 9 (15%) and labial mucosa in 7 patients (11.7%). Regarding symptom duration, nearly half of the participants (45%) reported symptoms for 6–12 months, while 30% had symptoms for less than 6 months and 25% for more than 12 months. Baseline pain assessment using the Visual Analog Scale indicated that most patients experienced moderate pain (65%), with the remaining 35% reporting severe pain. Stress was identified as the most common triggering factor in 56.7% of cases, followed by spicy or irritant foods in 31.7%, whereas 11.6% of patients reported no identifiable trigger.

Table 1: Baseline socio-demographic characteristics of study participants (n=60).

Variables	Frequency (N)	Percentage (%)
Age range (years)	35–65	—
35–45	22	36.7
46–55	24	40
56–65	14	23.3
Sex		
Female	45	75
Male	15	25
Occupation		
Homemaker	28	46.7
Service/office worker	14	23.3
Business	10	16.7
Manual laborer	8	13.3
Socioeconomic status		
Low–middle income	38	63.3
Middle income	18	30
Higher income	4	6.7
Previous treatment for OLP	None	100

Table 2: Clinical characteristics of oral lichen planus lesions at baseline (n=60).

Clinical variables	Frequency (N)	Percentage (%)
Type of lesion		
Erosive	36	60
Ulcerative	24	40
Common site of involvement		
Buccal mucosa	32	53.3
Tongue	12	20
Gingiva	9	15
Labial mucosa	7	11.7
Duration of symptoms (months)		
<6	18	30
6–12	27	45
>12	15	25
Baseline pain (VAS)		
Moderate	39	65
Severe	21	35
Associated triggering factors reported		
Stress	34	56.7
Spicy/irritant foods	19	31.7
No identifiable trigger	7	11.6

Table 3 outlines the treatment protocol distribution between the two study groups, each comprising 30 patients. Group 1 received combined therapy consisting of low-level red diode laser treatment along with topical corticosteroid application, whereas group 2 received topical corticosteroid therapy alone. The laser parameters for group 1 included a wavelength of 630 nm, energy density of 1.5 J/cm², output power of 10 mW and an exposure time of 120 seconds per session, administered every three days for a total of 15 sessions. Both groups were treated with 0.1% triamcinolone acetonide topical preparation for 2–6 weeks depending on lesion severity. In addition, all patients were provided standard supportive care, including oral hygiene instructions and advice to avoid triggering factors. A uniform follow-up period of 12 months was maintained for both groups to assess treatment outcomes and recurrence.

Table 3: Treatment protocol distribution between study groups.

Treatment variables	Group 1 (combined therapy) (n=30)	Group 2 (topical therapy) (n=30)
Laser therapy	Yes	No
Wavelength (nm)	630	—
Energy density (J/cm²)	1.5	—
Output power (mW)	10	—
Exposure time (seconds/session)	120	—
Frequency	Every 3 days	—
Total sessions	15	—
Topical corticosteroid (triamcinolone acetonide)	0.1%	0.1%
Duration of topical therapy (weeks)	2–6	2–6
Oral hygiene advice given	Yes	Yes
Trigger avoidance advised	Yes	Yes
Follow-up period (months)	12	12

Table 4: Treatment outcomes and recurrence during 12-month follow-up.

Outcome variables	Group 1 (combined therapy), N (%)	Group 2 (topical therapy), N (%)
Post-treatment VAS pain score		
Nil (no pain)	30 (100.0)	18 (60.0)
Mild pain	0 (0.0)	12 (40.0)
Clinical healing		
Complete healing	30 (100.0)	18 (60.0)
Partial improvement	0 (0.0)	12 (40.0)
Recurrence within 1 year		
Present	0 (0.0)	12 (40.0)
Absent	30 (100.0)	18 (60.0)
Adverse effects reported	0	3 (10.0)*

Table 4 summarizes the treatment outcomes and recurrence rates observed during the 12-month follow-up period in both groups. Patients treated with combined therapy (group 1) demonstrated excellent clinical outcomes, with all 30 patients (100%) reporting nil pain on the VAS after treatment and achieving complete clinical

healing. No cases of recurrence or adverse effects were noted in this group. In contrast, the topical therapy group (group 2) showed comparatively mixed results, where 18 patients (60%) experienced nil pain while 12 patients (40%) reported mild residual pain. Complete healing was observed in 60% of cases, whereas 40% showed only partial improvement. Recurrence within one year was documented in 12 patients (40%). Additionally, mild adverse effects were reported in 3 patients (10%), likely related to corticosteroid use.

DISCUSSION

OLP is a chronic inflammatory mucocutaneous disorder that frequently presents with symptomatic erosive and ulcerative lesions, significantly impairing patients' quality of life. In the present randomized clinical study, we compared combined low-level diode laser therapy with topical corticosteroid therapy versus topical corticosteroid therapy alone for the management of erosive and ulcerative OLP. Our findings demonstrated superior clinical outcomes with the combined approach, as all patients in group 1 (100%) reported nil pain after treatment, achieved complete clinical healing and showed no recurrence during the 12-month follow-up. In contrast, the topical therapy group showed comparatively modest improvement, where only 60% experienced nil pain and 40% had mild residual pain and recurrence.

Topical corticosteroids remain the first-line treatment for symptomatic OLP because of their anti-inflammatory effects; however, recurrence and incomplete response are common. Davari et al and Sandhu et al reported that although corticosteroids provide short-term symptom relief, relapse rates and local side effects limit their long-term effectiveness.[11,12] Similarly, in our study, 40% of patients treated with topical therapy alone experienced recurrence within one year and 10% reported mild adverse effects, supporting these concerns.

Recently, phototherapy-based approaches, including photobiomodulation and photodynamic therapy, have gained attention as non-pharmacological alternatives. Systematic reviews by Roca et al and Hanna et al concluded that photobiomodulation significantly reduces pain and enhances tissue healing in erosive and atrophic OLP with minimal complications.[13,14] Our results are consistent with these findings, as laser-treated patients showed complete pain resolution and faster clinical recovery.

Several comparative studies further support the advantages of light-based therapies. Bakhtiari et al and Lavaee et al demonstrated that photodynamic therapy achieved outcomes comparable or superior to topical corticosteroids in terms of pain reduction and lesion regression.[15,16] Likewise, Dillenburg et al reported that laser phototherapy was as effective as clobetasol with fewer side effects.[17] In our study, the addition of diode laser therapy resulted in 100% nil VAS scores and no recurrence, suggesting that combining laser therapy with corticosteroids may provide synergistic benefits.

The biological rationale behind these results may be attributed to the biostimulatory effects of low-level laser therapy, which enhance microcirculation, reduce inflammatory mediators, promote epithelial regeneration and provide analgesic effects. Ferri et al and Liu et al highlighted that photobiomodulation accelerates wound healing and significantly decreases pain intensity in OLP patients.[18,19] These mechanisms likely explain the excellent healing and absence of recurrence observed in our combined therapy group.

Furthermore, non-pharmacological interventions have been recommended for ulcerative oral lesions. Veneri et al emphasized that such approaches reduce drug-related complications while improving patient comfort.[20] Khatoon et al also reported successful outcomes of photobiomodulation in refractory erosive OLP, further supporting its clinical applicability.[21] Narrative reviews by Andabak-Rogulj et al and Williams et al have similarly recognized laser therapy as a safe and promising adjunct or alternative to corticosteroids.[22,23]

Limitations

This study has several limitations that should be considered when interpreting the findings. The sample size was relatively small and participants were recruited from only two dental centers, which may limit the generalizability of the results to the broader population. Pain assessment relied primarily on the subjective VAS and additional objective clinical or histopathological parameters were not evaluated. Furthermore, the absence of long-term follow-up beyond twelve months and lack of blinding may have introduced potential bias. Larger multicenter randomized trials with extended follow-up are recommended to confirm these outcomes.

CONCLUSION

Within the limitations of the present study, combined low-level diode laser therapy with topical corticosteroid demonstrated superior clinical effectiveness compared with topical therapy alone in the management of erosive and ulcerative oral lichen planus. The combined approach resulted in complete pain relief (100%), better clinical healing, no recurrence and minimal adverse effects, whereas topical therapy alone showed partial improvement and higher recurrence rates. Therefore, diode laser–assisted combined therapy may be considered a safe, effective and promising treatment modality for symptomatic oral lichen planus.

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