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Original Research Article

Comparative evaluation of management of oral lichen planus using three different modalities: A clinical study

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ABSTRACT

Background: Oral lichen planus (OLP), a chronic inflammatory mucocutaneous disorder varying in appearance, affects the mucus membrane of the oral cavity and is potentially premalignant. Various therapeutic regimens have been developed for the management of OLP highlighting steroids as a first-line therapeutic procedure. Recently, modalities like lasers, photodynamic therapy (PDT), photobiomodulation (PBM) has also been mentioned in the literature to be equally effective with minimal intervention.
Materials and Methods: A total of 15 known cases of OLP were randomly allocated into three groups; topical corticosteroid applications, diode laser ablation (980 nm), and photodynamic therapy. Patients were evaluated for RAE score, Oral health-related quality of life (OHRQoL) using the VAS score following the intervention.
Results: Applications of PDT and diode laser ablation proved effective in the resolution of symptoms in RAE scoring and OHQOL and has proved that these have a bright future to evolve as a future trend.
Conclusion: Modalities like lasers ablation and PDT open new dimensions in the management of OLP providing safe and effective alternative techniques compared to the conventional method.

1. Introduction

Lichen planus is a common chronic immunological mucocutaneous disorder affecting the skin, scalp, nails, and oral mucosa. It was first reported by Wilson in 1869.[1] While skin lesions are more regressing, oral lesions are chronic, presents with periods of clinical intensifications and can represent only manifestations of the disease however, spontaneous resolution is uncommon. The clinical pattern of oral lichen planus (OLP) may change throughout life with more severe forms may occur in old age.[2]

Epidemiologically, the global prevalence is 1.01%, with a marked geographical difference with approx. 0.49% in Indian population.[3] It is primarily encountered in middle aged and elderly with increased predilection towards females with female to male ratio being 1.4:1.[3] The recurrence of OLP is encountered along with super-infection with fungal infection.

There are various clinical forms of OLP like reticular, erosive, atrophic, ulcerative, plaque type, bullous of which reticular is the most common presenting with characteristics lace like pattern known as wickam striae with a diffuse, overlapping and bilateral distribution in the oral mucosa commonly affecting the buccal mucosa, ventral tongue, and gingiva. The erosive forms present as erythematous patches and ulceration. Plaque-form LP resembles leukoplakia but has a multifocal distribution. The bullous form is usually rare, often resembling mucocele and other oral bullous disorders.[1,4] Malignant potential is low, between 0.3% and 3% and mostly reported in erosive and atrophic type of OLP.[5]

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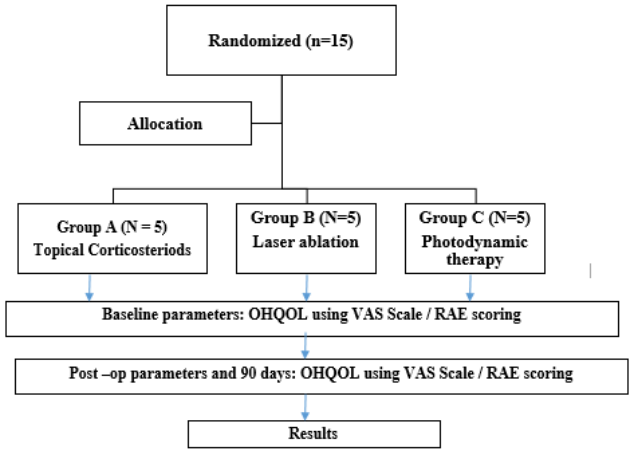


Fig. 1: Consort diagram.

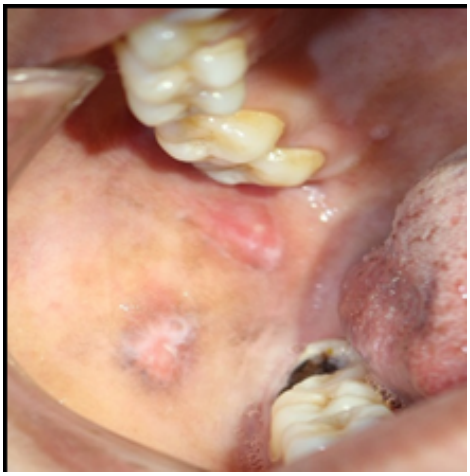


Fig. 2: Clinical presentation of the OLP white nonscrapable lesion on the right buccal mucosa

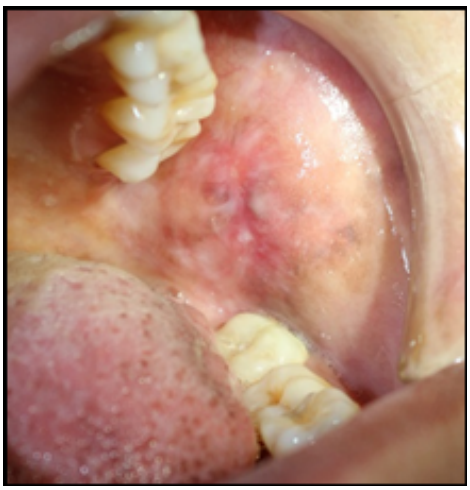


Fig. 3: Clinical presentation of the OLP white nonscrapable lesion on the left buccal mucosa

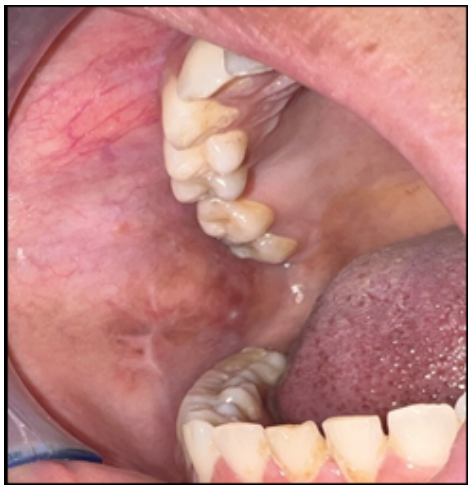


Fig. 4: Post- op 90 days presentation of Group A(Triamcinolone acetonide 0.01%) applied on the right buccal mucosa

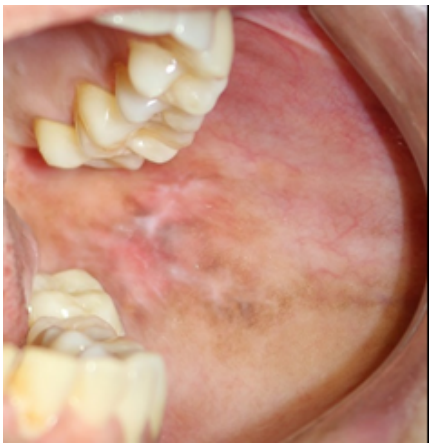


Fig. 5: Post- op 90 days presentation of Group A(Triamcinolone acetonide 0.01%) applied on the left buccal mucosa

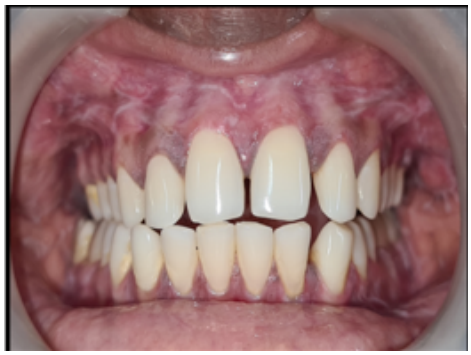


Fig. 6: Clinical presentation of the OLP white nonscrapable lesion on the right and left buccal mucosa

Fig. 7: 980nm diode laser used for ablation

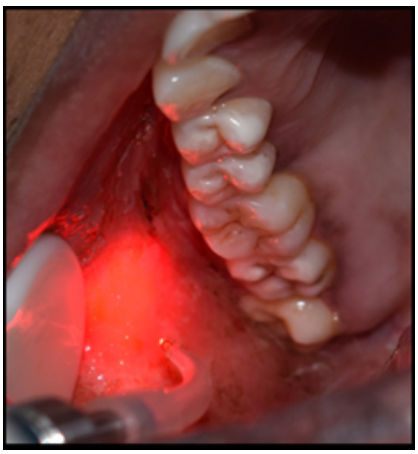


Fig. 8: Group B being ablated with 980 nm diode laser onthe right buccal mucosa

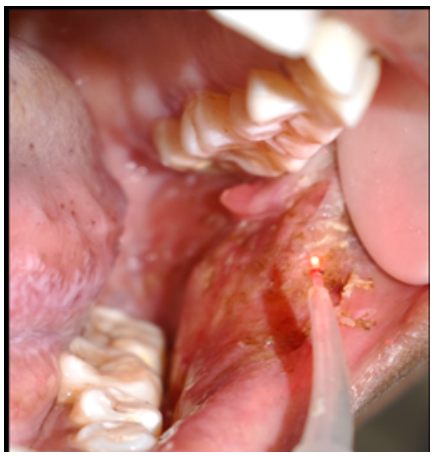


Fig. 9: Group B being ablated with 980 nm diode laser onthe left buccal mucosa

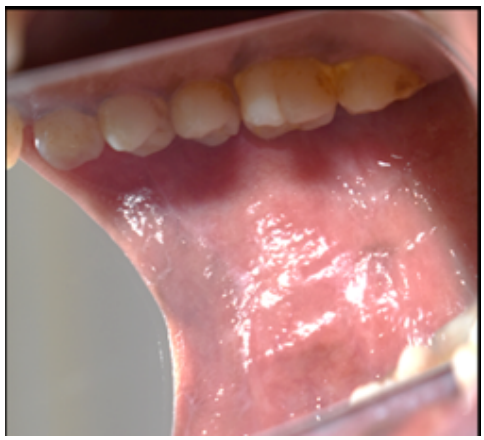


Fig. 10: Post- op 90 days presentation of Group B on theright buccal mucosa

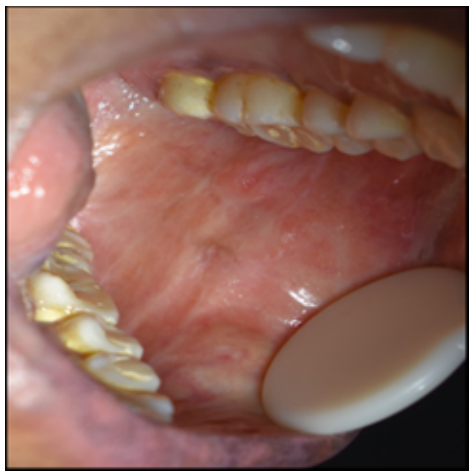


Fig. 11: Post- op 90 days presentation of Group B on theleft buccal mucosa

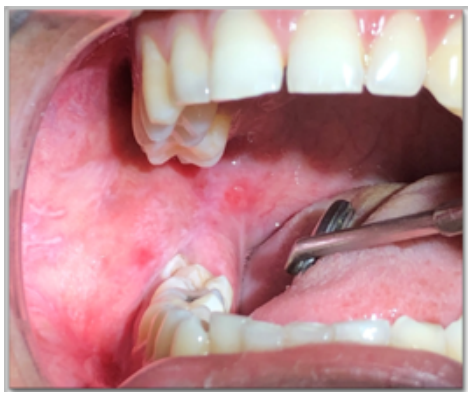


Fig. 12: Clinical presentation of the OLP white nonscrapable lesion with erythematous spots on the right buccal mucosa

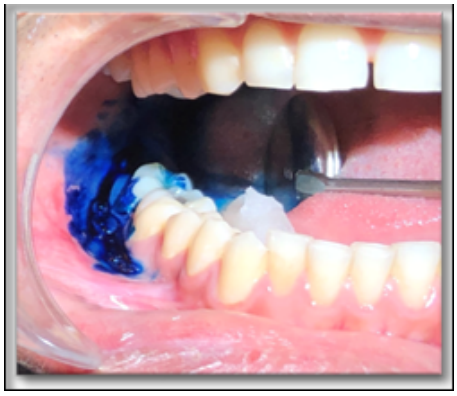


Fig. 13: Application of 1% photosensitizer dye on thelesional area

Fig. 14: 660 nm diode laser irradiating the lesional sitefor 1 min

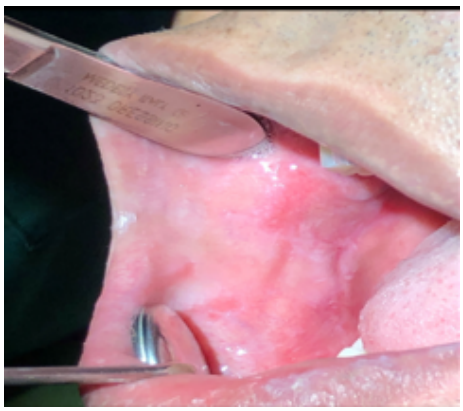


Fig. 15: Post- op 90 days presentation of Group C on theright buccal mucosa

Precise etiology of OLP is still not clear and potential predisposing factors includes tobacco smoking, dry mouth, mechanical irritants, lesion in response to trauma, dental materials including amalgam, gold and nickel , stress and bacterial plaque which have a role on pathogenesis.[6] It is thought to arise from an immune response presumably involving CD4+ and CD8+ T lymphocytes producing cytokines, interleukin-2, and tumor necrosis factor within the oral epithelium that induces a chronic inflammatory response and keratinocyte apoptosis. Histological picture shows predominance of T cell infiltration in the epithelium and surrounding connective tissue which are activated by CD8+ lymphocytes, features of saw tooth rete ridges and hyperkeratosis.[7]

Patient suffering from oral lesion range from being asymptomatic to having extreme burning sensation and severe pain with mucosal ulcerations posing difficulties in eating, speaking, and swallowing. These are present in two-thirds of OLP patients.[8] Diagnosis of OLP is usually based on clinical and histological examinations.[4] Additionally, Oral lichenoid lesions (OLL) which include lichenoid contact lesions, lichenoid drug reactions and lichenoid lesions of graft versus host disease confuses the differential diagnosis. For example, systemic medications, such as nonsteroidal anti-inflammatory drugs, anti-hypertensives, and oral hypoglycemic drugs can contribute to the development of oral lichenoid reactions (OLR).[9,10]

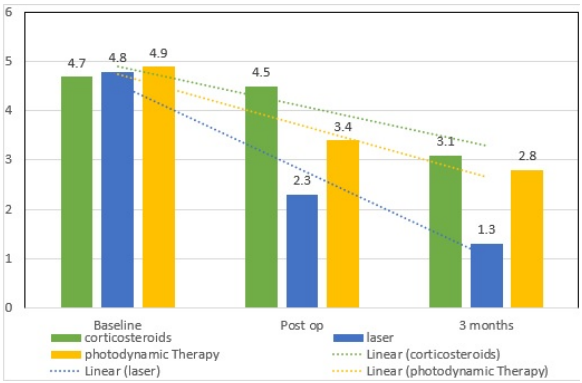
To better define the criteria for diagnosis of OLP, the World Health Organization (WHO) devised a set of clinicopathological criteria in 1978 which was further modified in 2003 as given in Table 1[4,11] However, histopathological study is a must for confirming the clinical diagnosis and to exclude dysplasia.[4,11,12] Lesions in the gingiva are tough to diagnose and direct immunofluorescence of perilesional mucosa may aid as an adjunct in further diagnosis which demonstrates a linear pattern and positive fluorescence with presence of fibrinogen in the basement membrane and cytoid like bodies with positive immunoglobulin M labeling.[12,13]

The aim of management in OLP is to reduce the severity of symptoms by eliminating precipitating factors.[2,14] Optimum oral hygiene and regular maintenance care are helpful for minimizing plaque and gingival inflammation. Various modalities have been proposed and tried in the literature where pharmacological therapies which is the gold standard is indicated, when symptoms are severe, lingering, or interfering with daily functions (e.g. tooth brushing, eating).

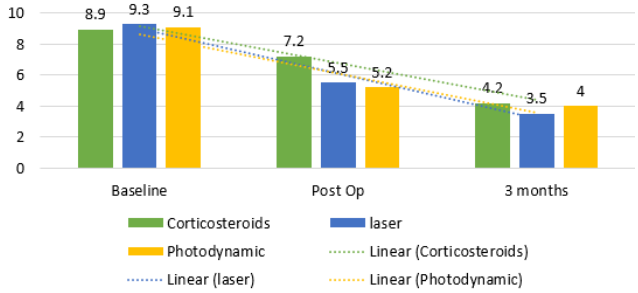
First- line medications includes 0.01% triamcinolone acetonide, which is the widely used drug. Alternative therapies like surgical removal of the lesion using scalpel, cryotherapy, cauterization, photodynamic therapy, laser therapy, PUVA therapy has also been tried.[15,16] Recently, Lasers including diode lasers, CO2 lasers,

photobiomodulation, and photodynamic therapy have been the newer modalities with marked results.

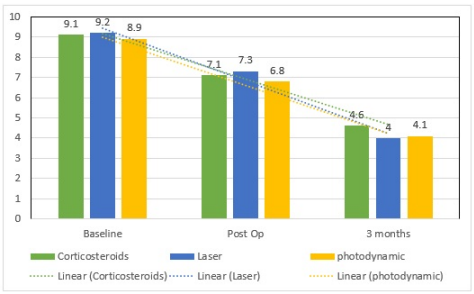
Combination therapy will reduce the symptoms early. The aim of this study is to evaluate the efficacy of management of oral lichen planus using three different modalities which includes topical steroids, diode laser and PDT.



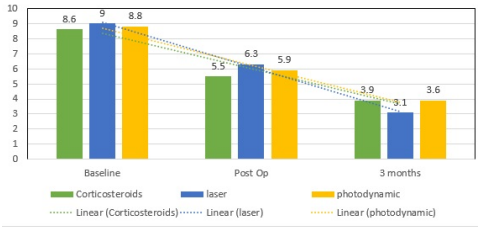
Graph 1: RAE scoring of all three groups



Graph 2: OHRQoL using VAS SCALE(pain and burning sensation felt) in all three groups



Graph 3: OHRQoL using VAS SCALE (self-performedoral hygiene) in all three groups



Graph 4: OHRQoL using VAS scoring(spicy food intake) in all three groups

2. Materials and Methods

The study being a comparative interventional study with randomized design, allocation of the site to test and control was done using computerized random block allocation method. Total number of subjects were fifteen with mean age of 43.2 years, which included 8 females and 7 males with oral lichen planus as shown in Figure 1. Patients incorporated had bilateral white non scrapable lesion as per the recent modified WHO criteria with good general health and non-smokers while pregnant, breast-feeding women or patients with any systemic diseases or any contraindication for use of steroids were excluded from the study. Study period was of 3 months.

2.1. Clinical assessment and scoring

1. RAE scoring (1-5) using the Thongprasom score to assess the initial size and dimension of the lesion preoperatively and resolution of the lesion after management[17]
2. Oral Health Related Quality of Life (OHRQoL) assessment by Visual Analogue Scale scoring (1-10) immediate post operatively and after 90 days (3 months) through designed questionnaires about whether their OLP lesions restricted their ability in food intake, self-performed oral hygiene and pain and burning sensation felt.[18]

Statistical method used for inter-group and intra-group were carried out using one way Anova with Tukey Test post hoc analysis (SPSS software ver 20.0 IBM).

2.2. Procedure

The treatment plan was explained and a written consent was taken for all the procedures. Patient were advised to abstain from eating hot and spicy food. All Patients were evaluated for oral hygiene measures and adequate modifications in brushing technique and regular mouth rinses were advised.

Table 1: Modified who diagnostic criteria 2003

Clinical Critera	Histopathological Criteria
Presence of bilateral, more or less symmetrical lesions	Presence of a well-defined, band-like zone of cellular infiltration that is confined to the superficial part of the connective tissue, consisting mainly of lymphocytes
Presence of a lacelike network of slightly raised gray–white lines (reticular pattern)	Signs of liquefaction degeneration in the basal cell layer
Erosive, atrophic, bullous, and plaque-type lesions are only accepted as a subtype in the presence of reticular lesions elsewhere in the oral mucosa	Absence of epithelial dysplasia

Table 2: Inter group comparison with mean RAE Scoring

Group	No. of Patients (after 90 days)		
	Complete remission	Partial remission	Mean Rae
Corticosteroids	3	2	3.1
Laser Ablation	4	1	1.3
Photodynamic Therapy	3	2	2.8
Total	10	5	P=0.023* (Laser & Corticosteroid) P= 0.045* (laser & photodynamic) P= 0.34 (photodynamic & Corticosteroid)

Table 3: Inter group comparison with mean OHRQoL

Group	No. of Patients (after 90 days)				
	Complete Remission	Partial Remission	Mean OHQOL (Pain and burning sensation felt)	Mean OHQOL (Self performed oral hygiene)	Mean OHQOL (Spicy food intake)
Corticosteroids	3	2	4.2	4.6	3.9
Laser Ablation	4	1	3.5	4.0	3.1
Photodynamic Therapy	3	2	4.0	4.1	3.6
Total	10	5	P = 0.013* (Laser & Corticosteroid) P= 0.042* (laser & photodynamic) P= 0.32* (photodynamic & Corticosteroid)	P = 0.041* (Laser & Corticosteroid) P= 0.63 (laser & photodynamic) P= 0.57 (photodynamic & Corticosteroid)	P = 0.035* (Laser & Corticosteroid) P= 0.065 (laser & photodynamic) P= 0.71 (photodynamic & Corticosteroid)

2.2.1. Procedure of topical corticosteroid application (Group A)

Five patients allotted to this group were advised to apply topical corticosteroids (triamcinolone acetonide 0.01% with orabase) on the lesion four times a day for 4 weeks followed by tapering the doses gradually to twice and once daily till 3 months. (Figures 2 and 3)

2.2.2. Follow up

Patients were subjected to follow up for 3 months and recalled for assessment of the lesion and recurrence if any. (Figures 4 and 5)

2.2.3. Procedure of diode laser ablation (Group B)

This group consisted of five patients in which 980nm diode laser was used to treat the lesion (Figure 6) under local anesthesia. Standard safety precautions as advised by the manufacturer were strictly followed during the entire procedure. The lesion was ablated using power output of 2.0 W in continuous, contact, defocused mode using fiber optic tip as a delivery system until the lesion color changes to white i.e. photocoagulation was completed with bleeding spots to remove the epithelium. (Figures 7, 8 and 9)

Post-surgical instructions included instruction of application of topical lignocaine for comfort of the patient and cold application to prevent edema followed by follow up in 3 months. (Figures 10 and 11)

2.2.4. Procedure of photodynamic therapy (Group B)

In this group, five patients underwent this therapy where 1% methylene blue dye was used as a photosensitizer which stained the lesion for 2 min. Lesional area was divided into 1 square cm blocks and each block was irradiated for 1 min with wavelength of 660 nm, power output of 100 mW and energy density of 6-8 J/cm2 in a scanning mode to cover the entire area. (Figures 12, 13 and 14) The frequency of PDT application was on the 1^{st} day, 7^{th} day, 14^{th} day and 28^{th} day. Follow up in 3 months was done. (Figure 15)

3. Results

Of all the groups, Group A where sites treated Of all the groups, Group A where sites treated with topical steroids showed delayed healing. Group B and group C patients had no postoperative bleeding or scar formation and the lased area was soft on palpation. During the three months follow up, more patients achieved significant remission in group B.

RAE score of OLP lesion was evaluated pre-operatively and post operatively on the basis of extent, size and clinical presentation. On evaluation, at baseline the RAE scoring of 15 subjects was 5, post operatively, RAE scoring markedly reduced in all 3 groups with highest resolution in the group B as compared to others. (Graph 1)

Oral health related quality of life assessment was done using VAS Score pre-operatively and post operatively. Based on the three different questionnaire's that was selected for this study and patient's perspectives, VAS scoring was recorded for all three modalities at baseline which was almost same for all the group but post operatively it significantly reduced in the group B. (Graphs 2, 3 and 4)

Inter group comparison of RAE and VAS index were done using one way Anova test where statistical significance results were reported in diode laser group in both the indices (Tables 2 and 3).

4. Discussion

Lichen planus (LP) is a dynamic disease involving stratified squamous epithelia of skin and oral mucous membrane with varied clinical presentation. Long-standing erosive and atrophic oral lichen planus has highest chances of malignant transformation into squamous cell carcinoma.[19] Due to chronic nature and unknown etiology of this disease, a complete cure is very difficult to achieve. Thus treatment is only supportive and palliative. Topical or systemic steroids have been the drugs of choice in the management of this disease.[20]

Recent advances like diode laser ablation, photodynamic therapy, photobiomodulation, PUVA therapy are the alternative techniques that has shown marked therapeutic benefits in the management of OLP.[15,16] Topical Corticosteroids are considered the gold standard for the management of OLP which modifies the humoral immunity, reduces the submucosal lymphocytic infiltration and the inflammatory reaction. 0.01% triamcinolone acetonide are the most widely used intermediate acting glucocorticoids although there is no proven scientific evidence of its therapeutic efficacy. The greatest disadvantage of topical therapy for OLP lesions is the lack of sufficient mucosal adherence. Therefore, 0.01% triamcinolone with orabase is used which consist of gelatin, pectin, carmellose in a plastic base and these adhesives addresses sufficient contact time between medicament and mucosal lesions that augments the efficacy of corticosteroids.[20] Even though it is widely used but it does not have potency for removal of the etiology. Hence, there are large number of cases documented with recurrence after cessation of its use.[20]

Intralesional steroids (ILS) maintains high concentration of the drug at the site, but its continuous use is associated with many systemic adverse effects such mucosal dryness and atrophy, candida infection, granuloma formation, hypersensitivity reactions, delayed wound healing and in later stages; hypothalamus pituitary adrenal suppression which limits its use. However, it is indicated in severe cases of erosive OLP.[21]

To overcome this shortcomings, surgical ablation of affected areas may be effective which removes epithelial cells that show signs of liquefactive necrosis from the site of the lesion, destroying keratinocyte surface antigens and autoantibodies.[16] Diode laser at 980nm possesses a power of penetration up to 1.5 mm deep.[21,22] Rise temperature between 50 to 100 degrees will cause protein denaturation revealed as blanching of the ablated mucosa.[22,23] The immune reaction components present in the range of the depth of penetration of the beam are denaturated due to the ablation of the epithelium and part of connective tissue.[23] Ablated area act a biological barrier which provides comfort to the patient by isolating the lesion from any thermal or chemical insults, prevents any infection of the area due to the presence of pseudo membrane and prevents the risk of secondary infection. Ice packs were advised post operatively at the ablated area.[23] TThis modality satisfied the patients who suffered psychologically from the long treatment by corticosteroids and the fear and suffering from their side effects.

Photodynamic therapy basically involves three components: visible light, a nontoxic photosensitizer and oxygen.[24] Photosensitizers are dyes composed of molecules capable of absorbing light energy and using it to promote chemical reactions in cells and tissues when exposed to light. The dyed molecules undergoes transition from active ground state to excited triplet state further reacting with endogenous oxygen forming reactive oxygen species which are extremely cytotoxic and cause cell death of the target tissue, thus showing the potential of tissue healing and tissue regeneration. PDT produces cytotoxic effects by three mechanisms: cellular, vascular

and immunological responses. Combination of these responses depends on the tissue oxygen availability, the photosensitizer and the laser scheme used.[25]

Evidence suggests that frequency of laser application also influences the overall efficacy of PDT. Due to significant heterogeneity with regards to the number of applications (ranging between 4 and 10 sessions) in various clinical studies, it is therefore difficult to determine ideal timings of the sessions to achieve favorable outcomes in the management of OLP. However, in our present study we used 4 sessions of PDT once a week as per Mostafa D et al regimen.[26] This new therapy is safe, convenient and non-invasive as it has selective toxicity towards target tissues. It has also excellent cosmetic results, where healing produced with little or no scarring. It can be repeated without producing any harm to normal tissues and can be used alone or in conjunction with other treatment.[27] Therefore, PDT can be used as an optional treatment method for resistant or recurrent OLP when pharmacotherapy is contraindicated.

5. Conclusion

Sample size was less. Since the study subjects were assessed for 03 months, long-term observation with multi-center randomized controlled trials for disease behavior and progression is needed before drawing a logical conclusion and generalizing the findings of the study. Also, there is a need to study the use of laser therapy with different power settings and wavelengths in the patients with symptomatic OLP to obtain the most favorable clinical outcomes.

6. Limitations

Sample size was less. Since the study subjects were assessed for 03 months, long-term observation with multi-center randomized controlled trials for disease behavior and progression is needed before drawing a logical conclusion and generalizing the findings of the study. Also, there is a need to study the use of laser therapy with different power settings and wavelengths in the patients with symptomatic OLP to obtain the most favorable clinical outcomes.

7. Future Consideration

The use of lasers in dentistry has a tremendous potential since they can be used without any side effects in terms of photobiomodulation and photodynamic therapy.

8. Source of Funding

None.

9. Conflict of Interest

None.

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