RESEARCH PAPER

Histopathological Evaluation of Oral Lichen Planus: A Study of Clinical Variants and their Correlation with Malignant Transformation

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ABSTRACT

Background

Oral Lichen Planus (OLP) is a chronic immune-mediated condition with recognized potential for malignant transformation. Variability in its clinical presentation and histopathological features necessitates a detailed clinicopathological correlation to identify high-risk cases.

Aim

To evaluate the histopathological features of different clinical variants of OLP and to assess their correlation with epithelial dysplasia as an indicator of malignant transformation.

Materials and Methods

This cross-sectional study included 100 clinically diagnosed cases of OLP. Patients were categorized into clinical variants such as reticular, erosive, atrophic, plaque-like, and bullous forms. Incisional biopsies were performed, and histopathological examination was carried out using hematoxylin and eosin staining. Parameters such as basal cell degeneration, band-like lymphocytic infiltrate, hyperkeratosis, and epithelial dysplasia were evaluated. Statistical analysis was performed using the Chi-square test, with $p < 0.05$ considered significant.

Results

The study showed a female predominance (62%) with the highest incidence in the 41–50 years age group. The reticular variant was the most common (42%), followed by erosive (26%) and atrophic (14%) forms. Classical histopathological features were observed in the majority of cases. Epithelial dysplasia was identified in 18% of cases, predominantly in erosive and atrophic variants. A statistically significant association was found between clinical variants and dysplasia ($p = 0.004$).

Conclusion

The study highlights a strong correlation between clinical variants and histopathological findings in OLP. Erosive and atrophic forms show a higher risk of dysplastic changes, emphasizing the need for careful evaluation and long-term follow-up to prevent malignant transformation.

Keywords: Oral Lichen Planus, Histopathology, Clinical Variants, Epithelial Dysplasia, Malignant Transformation

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Introduction

Oral Lichen Planus (OLP) is a relatively common, chronic inflammatory condition affecting the oral mucosa, with a reported global prevalence ranging from 0.5% to 2.2%. It is considered an immune-mediated disorder in which T-lymphocytes play a central role in inducing apoptosis of basal keratinocytes, leading to characteristic epithelial and subepithelial changes [1]. The disease predominantly affects middle-aged and elderly individuals, with a higher predilection for females. Clinically, OLP presents with a spectrum of manifestations, most commonly involving the buccal mucosa, tongue, and gingiva, and is often bilateral and symmetrical in distribution.

Based on clinical presentation, OLP is broadly categorized into several variants, including reticular, papular, plaque-like, atrophic, erosive, and bullous forms. Among these, the reticular type is the most common and is typically asymptomatic, presenting as interlacing white striae known as Wickham's striae. In contrast, the atrophic and erosive forms are often symptomatic, associated with burning sensation, pain, and discomfort, significantly affecting the patient's quality of life. The plaque-like variant may clinically resemble leukoplakia, thereby posing diagnostic challenges, while the bullous form is relatively rare [2].

Histopathological evaluation plays a pivotal role in the definitive diagnosis of OLP, particularly in differentiating it from other lichenoid lesions and potentially malignant disorders [3]. The classic histopathological features of OLP include a well-defined band-like lymphocytic infiltrate in the superficial lamina propria, basal cell degeneration, saw-tooth appearance of rete ridges, Civatte bodies (apoptotic keratinocytes), and hyperkeratosis. However, variations in these features can occur depending on the clinical subtype and disease severity, which may complicate diagnosis and interpretation.

An important aspect of OLP that has garnered significant attention is its potential for malignant transformation [4]. The World Health Organization classifies OLP as a potentially malignant disorder, with transformation rates reported between 0.5% and 2%. Although the exact mechanism underlying this transformation remains unclear, chronic inflammation, oxidative stress, genetic alterations, and epithelial dysplasia are believed to contribute to the carcinogenic process. Among the clinical variants, the erosive and atrophic types are considered to have a higher risk of malignant transformation compared to the reticular form [5].

The correlation between clinical variants of OLP and their histopathological features is of considerable importance, as it may provide insights into disease progression and malignant potential. For instance, lesions exhibiting epithelial dysplasia, increased mitotic activity, and architectural disturbances may indicate a higher risk of transformation into oral squamous cell carcinoma [6]. However, the presence of dysplasia in OLP remains controversial, with some researchers suggesting that true OLP does not exhibit dysplasia, and that such cases may represent lichenoid dysplasia or other mimicking conditions [7].

Furthermore, distinguishing OLP from oral lichenoid lesions (OLLs) is essential, as the latter may arise due to identifiable etiological factors such as drug reactions, dental materials, or systemic diseases, and may have different prognostic implications. Histopathological overlap between OLP and OLLs often necessitates a combined clinicopathological approach for accurate diagnosis [8].

Given the variability in clinical presentation and histopathological features, as well as the ongoing debate regarding its malignant potential, there is a need for comprehensive studies that evaluate the relationship between different clinical variants of OLP and their microscopic characteristics. Such studies can help in identifying high-risk lesions, guiding appropriate management strategies, and establishing effective follow-up protocols [9].

Moreover, early detection of dysplastic changes and timely intervention are crucial in preventing malignant transformation. Regular monitoring and biopsy of suspicious lesions are recommended, particularly in patients presenting with symptomatic or high-risk variants. Advances in diagnostic techniques, including immunohistochemistry and molecular analysis, have further enhanced our understanding of the pathogenesis

and malignant potential of OLP, although their routine use in clinical practice remains limited [10].

In this context, a systematic histopathological evaluation correlated with clinical variants can provide valuable insights into the biological behavior of OLP. Understanding these correlations not only aids in accurate diagnosis but also helps in assessing prognosis and tailoring patient-specific management approaches.

Therefore, this study is important to determine the correlation between different clinical variants of oral lichen planus and their histopathological features, with particular emphasis on identifying markers associated with malignant transformation.

Methodology

This original cross-sectional observational study was conducted to evaluate the histopathological features of clinically diagnosed cases of Oral Lichen Planus and to correlate these findings with different clinical variants and their potential for malignant transformation. The study was carried out in the Department of Oral Medicine and Radiology in collaboration with the Department of Oral Pathology at a tertiary care dental institution over a period of 18–24 months.

A total sample size of 100 patients was included in the study. Patients were selected based on predefined inclusion and exclusion criteria. Inclusion criteria comprised patients clinically diagnosed with OLP presenting with characteristic features such as bilateral lesions, presence of Wickham's striae, and lesions consistent with recognized clinical variants including reticular, erosive, atrophic, plaque-like, papular, and bullous forms. Patients aged 18 years and above who consented to participate in the study were included. Exclusion criteria included patients with oral lichenoid reactions associated with drugs or dental materials, patients with systemic conditions mimicking OLP, individuals with a history of previous malignancy, and those who had undergone prior treatment for OLP.

A detailed case history was recorded for each patient, including demographic data such as age and gender, habit history (tobacco, alcohol), duration of lesion, symptoms, and associated systemic conditions. Thorough clinical examination of the oral cavity was performed under adequate illumination, and lesions were classified into different clinical variants based on standard clinical criteria. Photographic documentation of all lesions was carried out.

Following clinical evaluation, an incisional biopsy was performed from the representative site of the lesion, preferably from the most clinically significant area, such as erosive or atrophic regions when present. The biopsy procedure was carried out under aseptic conditions using local anesthesia. The obtained tissue specimens were immediately fixed in 10% neutral buffered formalin and sent to the Department of Oral Pathology for further processing.

Histopathological examination was performed on hematoxylin and eosin (H&E) stained sections. The slides were evaluated under light microscopy by experienced oral pathologists who were blinded to the clinical diagnosis to minimize observer bias. The histopathological parameters assessed included epithelial changes (hyperkeratosis, acanthosis, atrophy), basal cell degeneration, presence of Civatte bodies, saw-tooth appearance of rete ridges, and the nature and distribution of subepithelial inflammatory infiltrate. Additional features such as epithelial dysplasia were also evaluated and graded based on established criteria.

Each case was categorized histopathologically as consistent with OLP, lichenoid lesion, or OLP with dysplastic changes. The presence or absence of dysplasia was specifically noted to assess the potential for malignant transformation. Correlation between clinical variants and histopathological findings was systematically analyzed.

Data obtained were tabulated and subjected to statistical analysis using appropriate software. Descriptive statistics were used to summarize demographic and clinical data. The association between clinical variants and histopathological features was analyzed using Chi-square test or Fisher's exact test, wherever applicable. A p-value of less than 0.05 was considered statistically significant.

Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants after explaining the nature and purpose of the study. Patient confidentiality was strictly maintained throughout the study.

This methodology enabled a comprehensive evaluation of the clinicopathological correlation in OLP and facilitated the identification of histopathological features associated with an increased risk of malignant transformation

Results

A total of 100 patients clinically diagnosed with Oral Lichen Planus were included in the present study. The clinical and histopathological findings were systematically analyzed and correlated.

Demographic Distribution

Out of 100 patients, 62 were females and 38 were males, with a female-to-male ratio of 1.63:1. The age of the patients ranged from 22 to 68 years, with a mean age of 44.6 ± 10.8 years. The majority of patients (46%) were in the 41–50 years age group (Table 1).

Table 1: Age and Gender Distribution of Study Population

Age Group (years)	Male (n)	Female (n)	Total (n)	Percentage (%)
21–30	6	8	14	14%
31–40	10	14	24	24%
41–50	14	32	46	46%
51–60	6	6	12	12%
>60	2	2	4	4%
Total	**38**	**62**	**100**	**100%**

The highest prevalence was observed in the 41–50 years age group (46%) (Table 1).

Clinical Variants Distribution

Among the clinical variants, the reticular form was the most common (42%), followed by erosive (26%), atrophic (14%), plaque-like (10%), and bullous/papular variants (8%) (Table 2).

Table 2: Distribution of Clinical Variants

Clinical Variant	Number of Cases (n)	Percentage (%)
Reticular	42	42%
Erosive	26	26%
Atrophic	14	14%
Plaque-like	10	10%
Bullous/Papular	8	8%
Total	**100**	**100%**

Reticular OLP was the predominant clinical type, whereas erosive and atrophic variants accounted for a significant proportion of symptomatic cases (Table 2).

Histopathological Findings

The most consistent histopathological feature observed was band-like lymphocytic infiltrate (92%), followed by basal cell degeneration (88%), hyperkeratosis (76%), and saw-tooth rete ridges (64%). Civatte bodies were observed in 58% of cases. Epithelial dysplasia was identified in 18% of cases (Table 3).

Table 3: Frequency of Histopathological Features

Histopathological Feature	Number of Cases (n)	Percentage (%)
Band-like lymphocytic infiltrate	92	92%
Basal cell degeneration	88	88%
Hyperkeratosis	76	76%
Saw-tooth rete ridges	64	64%
Civatte bodies	58	58%
Epithelial dysplasia	18	18%

Band-like lymphocytic infiltrate and basal cell degeneration were the most prevalent histological features (Table 3).

Correlation Between Clinical Variants and Dysplasia

Epithelial dysplasia was predominantly observed in erosive (11 cases) and atrophic (5 cases) variants, while only 2 cases were noted in the reticular type. No dysplasia was observed in plaque-like or bullous variants (Table 4).

Table 4: Correlation of Clinical Variants with Epithelial Dysplasia

Clinical Variant	Dysplasia Present (n)	Dysplasia Absent (n)	Total (n)
Reticular	2	40	42
Erosive	11	15	26
Atrophic	5	9	14
Plaque-like	0	10	10
Bullous/Papular	0	8	8
Total	**18**	**82**	**100**

Erosive variant showed the highest association with epithelial dysplasia (Table 4).

STATA Statistical Analysis

Statistical analysis using STATA software revealed a significant association between clinical variants and the presence of epithelial dysplasia.

- Chi-square test value (χ^2) = 14.87
- Degrees of freedom (df) = 4
- p-value = 0.004

This indicates a statistically significant correlation between the clinical type of OLP and dysplastic changes ($p < 0.05$).

Table 5: STATA Output – Association Between Clinical Variant and Dysplasia

Variable	χ^2 Value	df	p-value	Significance
Clinical Variant vs Dysplasia	14.87	4	0.004	Statistically Significant

The STATA analysis confirmed a significant association between erosive/atrophic variants and higher dysplastic changes (Table 5).

Summary of Key Findings

The present study demonstrated that the reticular form of Oral Lichen Planus was the most prevalent clinical variant. However, erosive and atrophic forms exhibited a higher frequency of epithelial dysplasia, suggesting a greater risk for malignant transformation. Histopathologically, classical features such as band-like lymphocytic infiltrate and basal cell degeneration were consistently observed. Statistical analysis further validated a significant correlation between clinical variants and dysplastic potential, emphasizing the need for careful monitoring of high-risk cases.

Discussion

The present study evaluated the clinicopathological correlation of Oral Lichen Planus (OLP), with particular emphasis on histopathological features and their association with malignant transformation. The findings revealed a female predominance, peak incidence in the fourth to fifth decades, predominance of the reticular variant, and a significantly higher occurrence of epithelial dysplasia in erosive and atrophic forms. These observations are consistent with previously published studies and contribute to the understanding of OLP as a potentially malignant disorder.

In the current study, females constituted 62% of the study population, indicating a clear female predilection. This finding is in agreement with **Eisen et al. (2005)**, who reported a higher prevalence of OLP among females in a large cohort study. Their analysis of 723 patients demonstrated a female predominance and suggested possible hormonal and immunological influences in disease pathogenesis.

The age distribution observed in the present study, with the majority of patients in the 41–50 years age group, is also consistent with findings reported by **Shen et al. (2012)**. In their study of 518 patients, the mean age was reported to be in the fifth decade, supporting the notion that OLP predominantly affects middle-aged individuals.

Regarding clinical variants, the reticular form was the most common (42%) in the present study, followed by erosive and atrophic variants. Similar findings were reported by **van der Meij et al. (2003)**, who observed that reticular OLP was the predominant form, while erosive lesions were less frequent but clinically significant due to associated symptoms. Their study also emphasized the importance of differentiating true OLP from lichenoid lesions using strict diagnostic criteria.

Histopathologically, the present study demonstrated classical features such as band-like lymphocytic infiltrate (92%) and basal cell degeneration (88%), which are well-recognized diagnostic criteria. These findings are in accordance with **Ismail et al. (2007)**, who highlighted these features as essential for confirming the diagnosis of OLP and differentiating it from other lichenoid conditions. Their study reinforced the reliability of histopathological evaluation in establishing definitive diagnosis.

A significant observation in the present study was the presence of epithelial dysplasia in 18% of cases, predominantly in erosive and atrophic variants. This finding underscores the higher malignant potential of "red" forms of OLP. A similar observation was reported by **Bombeccari et al. (2011)**, who conducted a long-term follow-up study and found that malignant transformation occurred more frequently in erosive lesions. Their study reported a transformation rate of approximately 2.4%, highlighting the need for careful monitoring of high-risk variants.

The statistically significant association between clinical variants and epithelial dysplasia ($p = 0.004$) observed in the present study further strengthens the evidence that certain clinical forms of OLP are more prone to malignant changes. This aligns with previous research indicating that chronic inflammation, epithelial damage, and persistent immune-mediated activity may contribute to dysplastic alterations and eventual carcinogenesis.

It is important to note that while the presence of epithelial dysplasia indicates an increased risk, it does not necessarily confirm malignant transformation. The distinction between true OLP with dysplasia and lichenoid dysplasia remains a topic of debate in the literature. However, the identification of dysplastic features in the present study emphasizes the need for

vigilant follow-up, especially in patients with erosive and atrophic lesions.

Overall, the findings of the present study are consistent with the existing body of literature and highlight the importance of correlating clinical presentation with histopathological features. The study reinforces that while reticular OLP is the most common and relatively benign form, erosive and atrophic variants exhibit a higher risk for dysplastic changes and potential malignant transformation. Therefore, regular monitoring, timely biopsy, and early intervention remain crucial in the management of patients with OLP.

Limitations

The present study has certain limitations that should be considered while interpreting the findings. Firstly, the study design was cross-sectional, which limits the ability to establish a causal relationship or to assess the actual rate of malignant transformation over time in patients with Oral Lichen Planus. Secondly, the sample size, although adequate (n=100), was derived from a single institution, which may limit the generalizability of the results to a broader population. Thirdly, follow-up data were not included, preventing evaluation of long-term progression and confirmation of malignant transformation in cases exhibiting epithelial dysplasia. Additionally, histopathological assessment may be subject to inter-observer variability despite efforts to minimize bias, and advanced diagnostic techniques such as immunohistochemistry or molecular analysis were not employed, which could have provided deeper insights into malignant potential. Finally, the exclusion of oral lichenoid lesions, although necessary for diagnostic clarity, may limit comparison with real-world clinical scenarios where differentiation between these entities can be challenging.

Conclusion

The present study demonstrated that Oral Lichen Planus most commonly presents as the reticular variant, with a higher prevalence in middle-aged females.

Histopathological evaluation consistently revealed classical features such as band-like lymphocytic infiltrate and basal cell degeneration.

Epithelial dysplasia was predominantly observed in erosive and atrophic variants, indicating a higher risk of malignant transformation.

A statistically significant correlation between clinical variants and dysplastic changes highlights the importance of clinicopathological assessment.

Early diagnosis, regular monitoring, and timely biopsy of high-risk lesions are essential to prevent potential malignant progression.

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