Section: Pathology

Original Research Article

CLINICO-HISTOPATHOLOGICAL CORRELATION AND CD4+ EXPRESSION IN LICHEN PLANUS PIGMENTOSUS AT A TERTIARY CARE CENTRE IN UTTAR PRADESH

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ABSTRACT

Background: Lichen planus pigmentosus (LPP) is a chronic acquired pigmentary disorder characterized by slate-grey to dark-brown macules, commonly involving the face and neck. Histopathology usually demonstrates basal-cell injury, pigment incontinence and a lichenoid inflammatory infiltrate. This study evaluated the clinicopathological profile of LPP and assessed CD4+ lymphocyte expression in lesional skin. **Materials and Methods:** A prospective cross-sectional observational study was conducted over 18 months in the Departments of Pathology and Dermatology at Hind Institute of Medical Sciences, Barabanki. Twenty clinically diagnosed patients aged 18–60 years underwent clinical assessment and 4-mm punch biopsy received. Haematoxylin and eosin sections were evaluated for characteristic histological features, and CD4+ immunohistochemistry was performed using anti-CD4 antibody (clone IS649; Dako). CD4+ cells were assessed semi-quantitatively according to their number and distribution. **Result:** Twelve patients (60%) were female and eight (40%) were male; the mean age was 38 years (range, 24–56 years). The face was involved in 14 patients (70%), the neck in 12 (60%), and the upper limbs in 9 (45%). Itching was reported by 10 patients (50%) and photo-aggravation by 8 (40%). Pigment incontinence was present in 17 cases (85%), basal-cell vacuolization in 15 (75%), orthokeratosis in 14 (70%), Civatte bodies in 6 (30%), and inflammatory infiltrates at the dermoepidermal junction in 13 (65%). CD4+ expression was detected in 16 patients (80%), mainly at the dermoepidermal junction and superficial dermis. Stronger expression was observed in early lesions with more prominent inflammatory changes; however, statistical significance could not be established. **Conclusion:** The findings demonstrate a consistent clinicopathological pattern of LPP and frequent CD4+ lymphocyte expression. CD4+ immunohistochemistry may provide additional information regarding the inflammatory component of LPP, particularly in early lesions, although larger controlled studies with longitudinal follow-up and broader immunophenotyping are required.

INTRODUCTION

Lichen planus pigmentosus (LPP) is a chronic acquired variant of lichen planus characterized clinically by insidious development of dark-brown to slate-grey macules. The face, neck and other sun-exposed or flexural sites are commonly affected. The condition was first described by Bhutani et al. in Indian patients in 1974 and has subsequently been reported predominantly in individuals with darker phototypes, particularly in South Asian and Middle Eastern populations.[1]

LPP is encountered mainly in adults and shows a female predominance in many published series. Ultraviolet exposure, cosmetics, friction and other environmental or infectious factors have been proposed as potential aggravating influences, although the precise pathogenesis remains

incompletely defined.[2,3] Histologically, the lesion shares several features with the lichenoid reaction pattern of conventional lichen planus, including basal-cell vacuolization, orthokeratosis, pigmentary incontinence and a variable lymphocytic infiltrate along the dermoepidermal junction (DEJ).[4]

Immunopathological observations indicate participation of T lymphocytes in LPP. CD4+ helper T cells have been described in inflammatory infiltrates and may contribute to the early immune response associated with basal keratinocyte injury. The distribution and intensity of CD4+ cells may therefore provide additional information about inflammatory activity in lesional skin.[5,6]

Despite these observations, clinicopathological studies integrating clinical findings, routine histology and CD4+ immunohistochemistry remain limited. The present study was undertaken to characterize the clinical and histopathological profile of LPP and to assess the distribution and semi-quantitative expression of CD4+ lymphocytes in lesional tissue.

MATERIALS AND METHODS

Study design and setting: This prospective, cross-sectional observational study was conducted jointly by the Departments of Pathology and Dermatology, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India, over 18 months. Twenty patients were included; the sample size was determined on the basis of prevalence statistics.

Participants: Patients aged 18–60 years with a clinical diagnosis of LPP and those willing to provide written informed consent were eligible. Patients receiving systemic immunosuppressive therapy, including corticosteroids or methotrexate; patients with another dermatological disorder producing hyperpigmentation; and pregnant or lactating women were excluded.

Clinical assessment: Demographic characteristics and clinical history were recorded, including age at onset, duration of lesions, distribution, symptoms, photo-aggravation, cosmetic exposure, comorbidities and family history. Cutaneous examination documented lesion morphology, anatomical distribution, pigmentation pattern and the presence or absence of Koebner phenomenon.

Histopathological examination: A 4-mm punch biopsy was obtained from lesional skin under aseptic precautions. Specimens were fixed in 10% neutral buffered formalin, processed and embedded in paraffin. Haematoxylin and eosin-stained sections were examined for orthokeratosis, basal-cell vacuolization, pigment incontinence, Civatte bodies and lymphocytic infiltrate, including its location and intensity.

Immunohistochemistry: Additional paraffin sections were stained for CD4+ lymphocytes using anti-CD4 antibody (clone IS649; Dako). Antigen retrieval was performed with citrate buffer (pH 6.0) using a steamer. Detection was performed with an HRP/DAB system followed by counterstaining with Mayer's haematoxylin. CD4+ expression was assessed semi-quantitatively according to the number and distribution of positively stained lymphocytes at the DEJ and in the superficial dermis.

Statistical analysis: Data were entered in Microsoft Excel and analysed using SPSS version 29.0. Descriptive statistics, including mean, standard deviation, frequency and percentage, were used for demographic and clinical variables. Associations between histopathological findings and CD4+ expression were assessed using the chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

Ethical considerations: The study received approval from the Institutional Ethics Committee of Hind Institute of Medical Sciences, Barabanki. Written informed consent was obtained from all participants before enrolment.

RESULTS

Demographic and clinical characteristics: Twenty patients with a clinical diagnosis of LPP were included. Twelve (60%) were female and eight (40%) were male. The mean age was 38 years (range, 24–56 years), with females presenting at a slightly younger age than males. All patients had hyperpigmented macules ranging from dark brown to slate-grey. The face was involved in 14 patients (70%), the neck in 12 (60%) and the upper limbs in 9 (45%); anatomical sites could overlap. Itching was reported by 10 patients (50%), whereas photo-aggravation was documented in 8 (40%). Burning and pain were not reported, and no patient had mucosal or nail involvement. [Table 1, Figure 1 & 2]

Histopathological findings: Pigment incontinence was the most frequent histopathological finding, identified in 17 cases (85%), and was commonly accompanied by dermal melanophages. Basal-cell vacuolization was present in 15 cases (75%), while orthokeratosis was observed in 14 (70%). Civatte bodies were identified in 6 cases (30%). A predominantly lichenoid inflammatory infiltrate at the DEJ was present in 13 patients (65%); in some cases, the infiltrate extended into the superficial dermis. The inflammatory infiltrate was generally mild to moderate. Lesions reported to be of shorter duration (<6 months) showed more conspicuous basal-cell injury and inflammatory activity. [Figure 3,5 & 6]

CD4+ Immunohistochemical expression: CD4+ lymphocytes were detected in 16 of 20 cases (80%). Positive cells were concentrated around the DEJ and within the superficial dermis, corresponding broadly to the areas of inflammatory-cell accumulation identified on haematoxylin and eosin sections. Semi-quantitative assessment indicated that stronger CD4+ positivity (≥30 cells per high-power field, as recorded in the study) was observed in early lesions with more prominent inflammatory changes. The observed relationship between CD4+ expression and inflammatory activity did not reach statistical

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significance, which may reflect the small sample size.
[Figure 4 & 7]

Table 1: Clinical and histopathological characteristics of the study cohort

Parameter	Number of patients	Percentage (%)
Female patients	12	60
Male patients	8	40
Face involvement	14	70
Neck involvement	12	60
Upper-limb involvement	9	45
Itching	10	50
Photo-aggravation	8	40
Basal cell vacuolization	15	75
Orthokeratosis	14	70
Pigment incontinence	17	85
Civatte bodies	6	30
Inflammatory infiltrate at DEJ	13	65
CD4+ positive cases	16	80

DEJ, dermoepidermal junction.

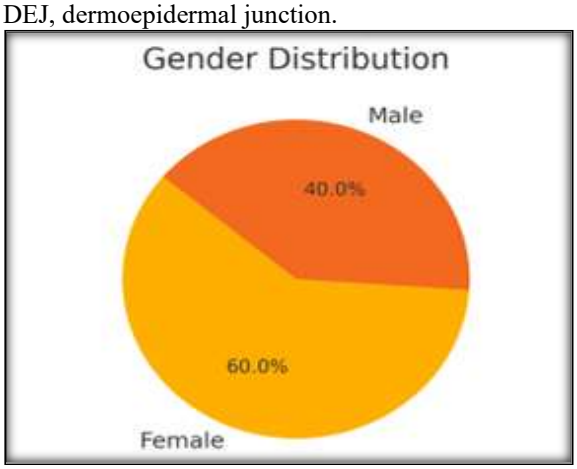


Figure 1. Gender distribution of the study cohort.

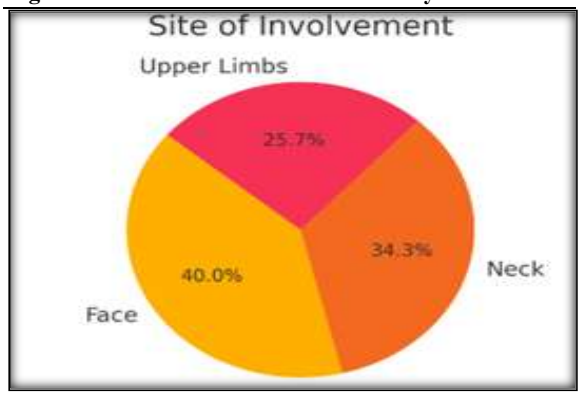


Figure 2: Distribution of anatomical sites involved In LPP

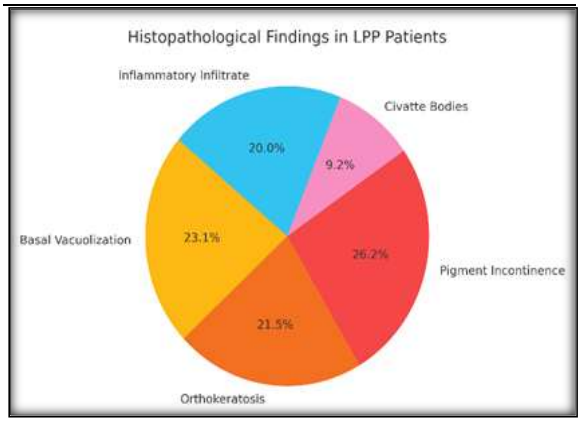


Figure 3. Histopathological findings reported in the study cohort.

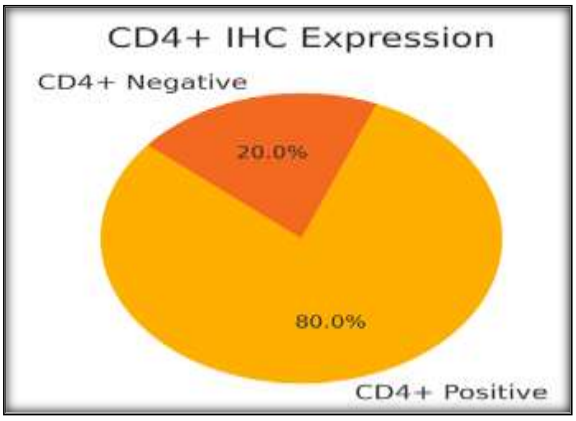


Figure 4: CD4+ immunohistochemical positivity in the study cohort



Figure 5: Representative H&E-stained section showing epidermal and superficial dermal changes with pigmentary incontinence.

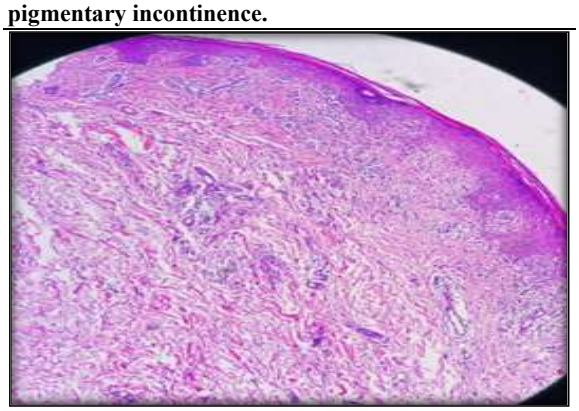


Figure 6: Representative histopathology photomicrograph showing a superficial lichenoid inflammatory infiltrate.

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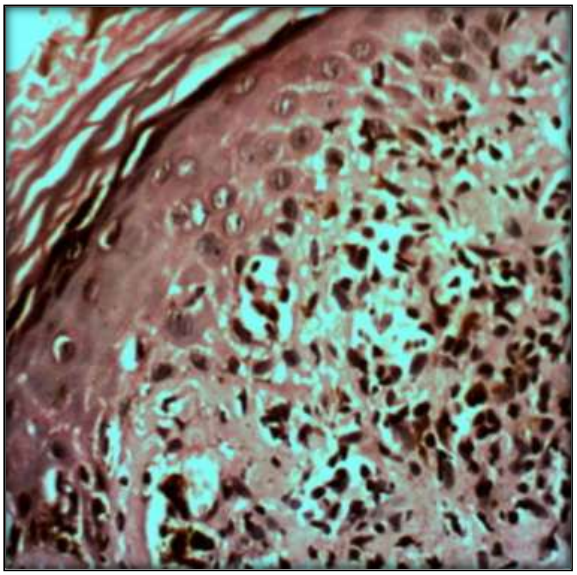


Figure 7: Representative CD4+ immunohistochemical staining

DISCUSSION

The present study demonstrates a recognizable clinicopathological pattern of LPP in a small tertiary-care cohort. Females constituted 60% of the study population, and the mean age at presentation was 38 years. Facial and neck involvement predominated, consistent with the distribution described in earlier Indian reports.[2,4] Photo-aggravation was reported in 40% of participants, supporting the clinical relevance of sun-exposed distribution, although the study was not designed to establish causality.

The routine histological findings were characteristic of a lichenoid pigmentary disorder. Pigment incontinence (85%), basal-cell vacuolization (75%) and orthokeratosis (70%) were the most frequent changes. These observations are in keeping with descriptions of LPP in which basal keratinocyte injury and release of melanin into the superficial dermis produce the prominent clinical pigmentation.[3,4] Civatte bodies were less frequent and were identified in 30% of cases.

A DEJ-centred inflammatory infiltrate was identified in 65% of cases. The greater inflammatory activity noted in lesions of shorter reported duration is compatible with the concept that inflammatory changes may be more conspicuous during the earlier phase of the disease. However, because the study was cross-sectional and involved only 20 patients, temporal relationships between lesion duration and histological activity cannot be established.

CD4+ lymphocytes were demonstrated in 80% of cases and were mainly distributed at the DEJ and in the superficial dermis. The localization of these cells alongside areas of inflammatory activity supports their potential participation in the local immune response. Previous immunohistochemical work in LPP has similarly reported CD4+ lymphocytes in lesional inflammatory infiltrates and has suggested an association between stronger staining and inflammatory activity.[5,6]

The present findings should nevertheless be interpreted cautiously. CD4+ positivity alone does not establish a causal role, and the study lacked a control group, longitudinal follow-up and parallel CD8+ staining. The small sample also limited the statistical power to demonstrate associations between immunohistochemical expression and clinical or histological variables. Consequently, CD4+ staining is better regarded as a potential adjunct to clinicopathological assessment rather than as an established diagnostic, prognostic or therapeutic biomarker on the basis of this study alone.

Limitations: The principal limitations were the small sample size (n=20), cross-sectional design, absence of longitudinal follow-up and lack of a control group. CD8+ immunohistochemistry was not performed, limiting characterization of the complete T-cell profile. These limitations reduce the extent to which the observed CD4+ associations can be generalized.

CONCLUSION

In this cohort, LPP showed a predominance of female patients and frequent involvement of the face and neck. Pigment incontinence, basal-cell vacuolization and orthokeratosis were the principal histopathological findings. CD4+ lymphocytes were detected in most cases and were concentrated at the DEJ and superficial dermis, particularly in lesions with more prominent inflammatory changes. These findings support further investigation of CD4+ expression as an adjunctive marker of the inflammatory component of LPP. Larger, controlled and longitudinal studies incorporating CD4+, CD8+ and other relevant immune markers are needed before diagnostic or prognostic utility can be established.

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