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PD-L1 EXPRESSION AS A PROGNOSTIC MARKER IN PENILE SQUAMOUS CELL CARCINOMA: AN IMMUNOHISTOCHEMICAL STUDY

Oncology

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ABSTRACT

Penile squamous cell carcinoma (PSCC) is a relatively rare malignancy but is associated with significant morbidity and mortality, particularly in developing countries. Identification of reliable prognostic biomarkers is essential for better risk stratification and management. Programmed death ligand-1 (PD-L1) is an immune checkpoint protein that enables tumor cells to evade immune surveillance and has been implicated in tumor progression in several malignancies.The present study aimed to evaluate PD-L1 expression in penile squamous cell carcinoma and assess its association with clinicopathological parameters and prognosis. A retrospective study was conducted on 30 histopathologically confirmed cases of penile squamous cell carcinoma. Immunohistochemical staining for PD-L1 was performed on formalin-fixed paraffin-embedded tissue sections. PD-L1 expression was evaluated and correlated with tumor grade and lymph node metastasis.PD-L1 expression was observed in a significant proportion of cases and showed higher expression in tumors associated with nodal metastasis and higher histological grade. These findings suggest that PD-L1 may serve as a potential prognostic biomarker and therapeutic target in penile squamous cell carcinoma.

KEYWORDS

PD-L1, Penile carcinoma, Immunohistochemistry, Prognosis, Squamous cell carcinoma

INTRODUCTION

Penile squamous cell carcinoma (PSCC) is an uncommon malignancy accounting for less than 1% of male cancers in developed countries but has a higher incidence in developing regions. Risk factors associated with penile carcinoma include poor genital hygiene, phimosis, chronic inflammation, smoking, and infection with high-risk human papillomavirus (HPV). The prognosis of penile carcinoma largely depends on tumor stage and lymph node metastasis. Regional lymph node involvement remains the most important prognostic factor determining patient survival. Therefore, identification of reliable biomarkers that predict tumor aggressiveness and metastatic potential is important for patient management. Programmed death ligand-1 (PD-L1) is an immune checkpoint molecule expressed on tumor cells and immune cells. It interacts with the programmed death-1 (PD-1) receptor on T lymphocytes, leading to inhibition of T-cell activation and suppression of anti-tumor immune responses. Overexpression of PD-L1 allows tumor cells to escape immune surveillance and contributes to tumor progression. Recent studies have demonstrated PD-L1 expression in various malignancies, including lung carcinoma, melanoma, and urothelial carcinoma, where it has been associated with poor prognosis and response to immunotherapy. However, data regarding PD-L1 expression in penile squamous cell carcinoma remain limited.

The present study was undertaken to evaluate PD-L1 expression in penile squamous cell carcinoma and to analyze its association with clinicopathological parameters.

Aim of the Study

The aim of the present study was to evaluate the expression of programmed death ligand-1 (PD-L1) in penile squamous cell carcinoma using immunohistochemistry and to determine its association with important clinicopathological parameters such as tumor grade and lymph node metastasis, thereby assessing its potential role as a prognostic biomarker

Materials and Methods

Study Design

This retrospective observational study was conducted in the Department of Pathology at a tertiary care hospital.

Study Material

A total of 30 cases of histopathologically confirmed penile squamous cell carcinoma were included in the study.

Inclusion Criteria

Histologically confirmed penile squamous cell carcinoma Adequate formalin-fixed paraffin-embedded tissue blocks available

Exclusion Criteria

Inadequate biopsy samples
Poorly preserved tissue blocks
Immunohistochemistry

Paraffin-embedded tissue sections of 4 µm thickness were prepared. Immunohistochemical staining for PD-L1 was performed using standard protocols. Membranous staining in tumor cells was considered positive.

Evaluation of Staining

PD-L1 expression was evaluated based on membranous staining in tumor cells. Cases showing significant membranous staining were categorized as PD-L1 positive.

Statistical Analysis

The association between PD-L1 expression and clinicopathological parameters such as tumor grade and lymph node metastasis was analyzed using appropriate statistical tests. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 30 cases of penile squamous cell carcinoma were analyzed.

Table 1. Association between PD-L1 expression and lymph node status in penile squamous cell carcinoma (n = 30)

Lymph Node Status	PD-L1 Positive	PD-L1 Negative	Total
Node negative	4	11	15
Node positive	12	3	15
Total	16	14	30

Chi-square test: p = 0.003

Table 2. Association between PD-L1 expression and tumor grade in penile squamous cell carcinoma (n = 30)

Tumor Grade	PD-L1 Positive	PD-L1 Negative	Total
Well differentiated	2	8	10
Moderately differentiated	6	4	10
Poorly differentiated	8	2	10
Total	16	14	30

Chi-square test: p = 0.028

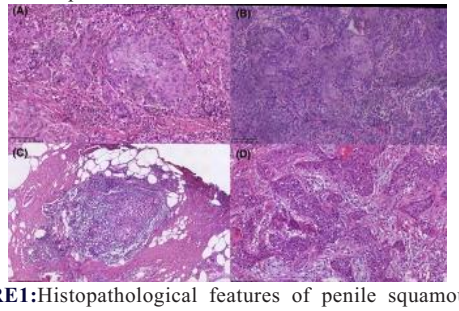

FIGURE1: Histopathological features of penile squamous cell carcinoma showing invasive malignant squamous cells forming keratin pearls (Hematoxylin & Eosin stain, ×200).

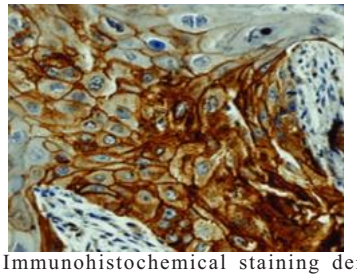

FIGURE2: Immunohistochemical staining demonstrating membranous PD-L1 expression in tumor cells of penile squamous cell carcinoma (PD-L1 IHC stain, ×400).

DISCUSSION

Penile squamous cell carcinoma is a rare malignancy but has significant clinical implications due to its aggressive behavior and potential for regional lymph node metastasis. Prognosis primarily depends on tumor stage and nodal involvement.

Immune checkpoint molecules such as PD-L1 have gained increasing attention in cancer research because of their role in tumor immune evasion. PD-L1 expression on tumor cells suppresses T-cell mediated immune responses by interacting with PD-1 receptors on activated T-cells.

In the present study, PD-L1 expression was identified in a considerable proportion of penile carcinoma cases. Increased PD-L1 expression was observed in tumors associated with lymph node metastasis and higher histological grade. These findings suggest that PD-L1 may contribute to tumor progression and aggressive tumor behavior.

Similar findings have been reported in previous studies where PD-L1 expression was associated with adverse prognostic factors in penile carcinoma. In addition, the presence of PD-L1 expression may have therapeutic implications, as immune checkpoint inhibitors targeting the PD-1/PD-L1 pathway have shown promising results in several malignancies.

Therefore, evaluation of PD-L1 expression in penile squamous cell carcinoma may help identify patients with aggressive disease and may also provide potential targets for immunotherapy.

CONCLUSION

PD-L1 expression is frequently observed in penile squamous cell carcinoma and is associated with adverse prognostic factors such as higher tumor grade and lymph node metastasis. Assessment of PD-L1 expression may serve as a useful prognostic biomarker and may have therapeutic implications in the management of penile carcinoma. Further studies with larger sample sizes are required to confirm these findings.

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