Intensity Grading of CD10 Expression in Urothelial Carcinoma of the Bladder: A Cross-Sectional Observational Study

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Abstract: *Urothelial carcinoma of the urinary bladder is one of the most common malignancies of the genitourinary tract and is characterized by a high rate of recurrence and progression. Conventional histopathological parameters such as tumor grade and stage remain the cornerstone of diagnosis and prognosis. However, additional molecular markers are increasingly being investigated to better understand tumor behavior and improve prognostic evaluation. CD10, also known as common acute lymphoblastic leukemia antigen (CALLA) or neutral endopeptidase, is a cell surface metalloproteinase involved in the degradation of bioactive peptides and has been implicated in tumor progression in several malignancies. This study aimed to evaluate the intensity grading of CD10 expression in urothelial carcinoma of the bladder and to correlate it with histopathological parameters including tumor grade, stage, and muscle invasion. A cross-sectional observational study was conducted on 50 cases of histologically confirmed urothelial carcinoma specimens received in the Department of Pathology at a tertiary care hospital. Formalin-fixed paraffin-embedded tissue sections were stained with hematoxylin and eosin for histopathological evaluation and immunohistochemistry was performed using CD10 antibody. The intensity of CD10 expression was graded from 0 to 3 based on staining intensity. The majority of patients were in the sixth and seventh decades of life with a male predominance. Most tumors were high-grade urothelial carcinomas. CD10 expression was observed in a significant proportion of cases and higher staining intensity was predominantly associated with high-grade tumors and advanced stage disease. A positive correlation was noted between CD10 intensity score and tumor stage as well as muscle invasion. The findings of this study suggest that CD10 expression intensity correlates with aggressive pathological features in urothelial carcinoma and may serve as a potential prognostic biomarker. Incorporating immunohistochemical markers such as CD10 along with conventional histopathological parameters may help in better risk stratification and management of patients with bladder cancer.*

Keywords: Urothelial carcinoma, CD10, Immunohistochemistry, Bladder cancer, Tumor grade, Tumor stage

1. Introduction

Urothelial carcinoma of the urinary bladder represents one of the most common malignancies of the urinary tract and accounts for a significant proportion of cancer-related morbidity and mortality worldwide. The disease demonstrates considerable biological heterogeneity, ranging from non-invasive papillary tumors with relatively indolent behavior to highly aggressive muscle-invasive carcinomas with poor prognosis. Accurate evaluation of tumor characteristics is therefore essential for determining prognosis and guiding appropriate therapeutic management.

The current classification and grading of urothelial carcinoma primarily rely on histopathological examination. The World Health Organization (WHO) classification categorizes urothelial neoplasms based on architectural and cytological features and distinguishes between low-grade and high-grade lesions. Tumor staging based on the depth of invasion into the lamina propria and muscularis propria is another critical determinant of prognosis. Despite these established parameters, predicting tumor behavior remains challenging due to the complex biological nature of bladder cancer.

Recent advances in molecular pathology have emphasized the role of immunohistochemical markers in improving diagnostic accuracy and prognostic evaluation. Several molecular markers have been investigated in urothelial carcinoma, including p53, Ki-67, FGFR3, and various cell surface proteins. Among these, CD10 has attracted increasing attention because of its role in tumor biology and potential association with tumor progression.

CD10 is a zinc-dependent cell surface metalloproteinase also known as neutral endopeptidase. It is normally expressed in various tissues including renal tubular epithelium, lymphoid cells, and certain epithelial structures. The enzyme functions by degrading biologically active peptides and thereby regulates cellular proliferation, differentiation, and apoptosis. Alterations in CD10 expression have been documented in multiple malignancies and have been associated with tumor invasion, metastasis, and poor prognosis.

In urothelial carcinoma, several studies have reported that increased CD10 expression is associated with higher tumor grade and advanced stage disease. The enzyme may contribute to tumor invasion by degrading extracellular matrix components and modifying the tumor microenvironment. This proteolytic activity may facilitate tumor cell migration and promote aggressive tumor behavior.

Immunohistochemical evaluation of CD10 expression provides a convenient and reliable method for studying its role in bladder cancer. In addition to the presence or absence of staining, the intensity of CD10 expression may provide further insight into tumor aggressiveness. Assessing staining

intensity and correlating it with clinicopathological parameters may help identify patients at higher risk for tumor progression.

Given the clinical importance of identifying reliable prognostic markers, the present study was undertaken to evaluate the intensity grading of CD10 expression in urothelial carcinoma of the bladder and to correlate it with histopathological grade and tumor stage in patients treated at a tertiary care hospital.

2. Literature Review

The study was conducted for period of 2 years in Osmania general hospital.

3. Materials and Methods

Study Design
This study was a cross-sectional observational study conducted in the Department of Pathology at a tertiary care hospital.

Study Period
The study included cases received during the study period from 2023 to 2025.

Study Sample
A total of **45 cases of histologically confirmed urothelial carcinoma of the urinary bladder** were included in the study. Specimens were obtained mainly from transurethral resection of bladder tumor (TURBT) and cystectomy specimens.

Inclusion Criteria
- Histopathologically confirmed cases of urothelial carcinoma of the bladder
- Adequate tissue available for immunohistochemical analysis

Exclusion Criteria
- Inadequate tissue samples
- Non-urothelial malignancies of the bladder
- Poorly preserved tissue unsuitable for immunohistochemistry

Histopathological Examination
All tissue specimens were fixed in 10% neutral buffered formalin and processed using routine paraffin embedding techniques. Sections of 4–5 µm thickness were prepared and stained with hematoxylin and eosin (H&E) for histopathological evaluation. Tumors were classified and graded according to the **WHO classification of urothelial tumors**. Tumor staging was determined based on the **TNM staging system**, considering the depth of invasion and involvement of the muscularis propria.

Immunohistochemistry
Immunohistochemical staining for CD10 was performed on formalin-fixed paraffin-embedded tissue sections using the standard immunoperoxidase technique. After deparaffinization and antigen retrieval, sections were incubated with primary CD10 antibody. Visualization was achieved using diaminobenzidine (DAB) as the chromogen. Positive staining was identified as membranous and/or cytoplasmic staining in tumor cells.

Scoring of CD10 Expression
The intensity of CD10 staining was graded as follows:
- **Score 0:** No staining
- **Score 1:** Weak staining
- **Score 2:** Moderate staining
- **Score 3:** Strong staining

The staining intensity was assessed by microscopic examination and correlated with histopathological parameters.

Statistical Analysis
Data were analyzed using statistical software. Associations between CD10 expression and clinicopathological variables such as tumor grade, stage, and muscle invasion were evaluated. Spearman correlation analysis was used to assess the relationship between CD10 intensity score and pathological parameters.

4. Results

A total of **45 cases of urothelial carcinoma** were included in the study.

Age Distribution
Most patients belonged to the **sixth and seventh decades of life**, indicating that bladder cancer predominantly affects older individuals.

Gender Distribution
There was a **marked male predominance**, reflecting the known epidemiological pattern of bladder cancer.

Histopathological Grade
Based on WHO classification, the majority of tumors were **high-grade urothelial carcinomas**, while a smaller proportion represented low-grade tumors.

Tumor Stage
Tumor staging revealed cases ranging from non-muscle-invasive lesions to muscle-invasive carcinoma. A significant proportion of cases demonstrated invasion into the muscularis propria.
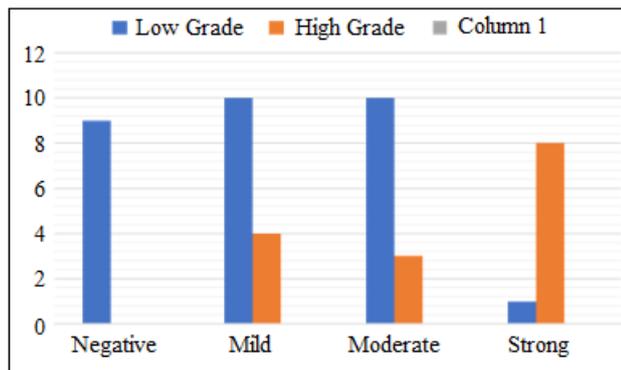
CD10 Expression
CD10 immunostaining showed variable expression among tumor samples. The intensity scores ranged from 0 to 3.
- Some cases showed **no expression** (score 0)
- A proportion demonstrated **weak staining** (score 1)
- Several cases showed **moderate staining** (score 2)
- **Strong staining intensity** (score 3) was observed in a subset of tumors

Correlation with Tumor Grade
Higher CD10 staining intensity was predominantly observed in **high-grade urothelial carcinomas**, suggesting an association between CD10 expression and tumor aggressiveness.
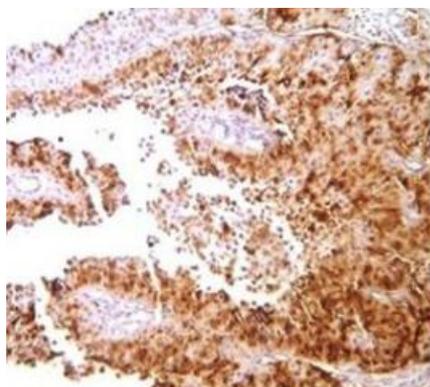
Correlation with Tumor Stage

A significant association was noted between **CD10 intensity score and advanced tumor stage**. Tumors invading deeper layers of the bladder wall tended to show stronger CD10 expression.

Muscle Invasion

Papillary urothelial carcinoma showing Cd10 positivity

Muscle-invasive tumors demonstrated **higher CD10 expression intensity** compared to non-muscle-invasive tumors.

Overall, the findings indicated that **increasing CD10 expression intensity correlates with aggressive pathological features** in urothelial carcinoma.

5. Discussion

Urothelial carcinoma is characterized by a wide spectrum of biological behavior, making accurate prognostic assessment essential for patient management. Although tumor grade and stage remain the most important prognostic indicators, additional molecular markers may provide valuable insights into tumor progression.

In the present study, the majority of patients were older males, which is consistent with the known epidemiological pattern of bladder cancer. Tobacco smoking remains one of the most important risk factors and may contribute to the observed gender disparity.

Immunohistochemical evaluation demonstrated that CD10 expression was present in a considerable proportion of urothelial carcinoma cases. The intensity of CD10 staining varied among tumors, suggesting heterogeneity in its expression.

A significant finding of this study was the correlation between CD10 expression intensity and tumor grade. High-grade tumors showed stronger CD10 expression compared to low-grade lesions. This observation is consistent with previous studies that reported increased CD10 expression in more aggressive tumors.

Similarly, CD10 intensity was found to correlate with tumor stage and muscle invasion. Tumors that invaded deeper layers of the bladder wall tended to demonstrate stronger staining intensity. This finding supports the hypothesis that CD10 may play a role in tumor invasion by facilitating degradation of extracellular matrix components.

The role of CD10 in tumor biology may be related to its enzymatic activity as a metalloproteinase. By degrading peptide substrates and extracellular matrix proteins, CD10 may contribute to tumor cell migration and invasion. In addition, its expression in both tumor and stromal components may influence interactions within the tumor microenvironment.

These findings suggest that CD10 expression may serve as a useful biomarker in assessing tumor aggressiveness. Incorporating CD10 immunohistochemistry in routine pathological evaluation may help identify patients who are at higher risk for disease progression.

However, the present study has certain limitations, including a relatively small sample size and the single-center design. Larger studies are required to further validate the prognostic significance of CD10 expression in urothelial carcinoma.

6. Conclusion

This study evaluated the immunohistochemical expression of CD10 in urothelial carcinoma of the urinary bladder and its correlation with histopathological parameters.

The results demonstrated that:
- CD10 expression is present in a significant proportion of urothelial carcinomas.
- Higher CD10 staining intensity is associated with **high tumor grade**.
- Increased CD10 expression correlates with **advanced tumor stage and muscle invasion**.

These findings suggest that **CD10 may serve as a potential prognostic biomarker** in urothelial carcinoma. Evaluation of CD10 intensity along with conventional histopathological parameters may improve risk stratification and assist in guiding clinical management.

Further large-scale studies are recommended to confirm the prognostic value of CD10 expression and explore its potential role as a therapeutic target.

References

[1] Bahadir B, Behzatoglu K, Bektas S, Bozkurt ER, Ozdamar SO. CD10 expression in urothelial carcinoma of the bladder. Diagn Pathol. 2009; 4:38.

[2] Miyamoto H, Miller JS, Fajardo DA, Lee TK, Netto GJ, Epstein JI. Non-invasive papillary urothelial neoplasms: the 2004 WHO/ISUP classification system. Pathol Int. 2010;60(1):1-8.

[3] Shipp MA, Stefano GB, D'Adamio L, Switzer SN, Howard FD, Sinisterra J, et al. Downregulation of enkephalin-mediated inflammatory responses by CD10/neutral endopeptidase 24.11. Nature. 1990;347(6291):394-396.

[4] Bircan S, Candir O, Kapucuoglu N, Serel TA, Ciris M, Karahan N. CD10 expression in urothelial bladder carcinomas: a pilot study. Urol Int. 2006;77(2):107-113.

[5] Kumagai-Togashi A, Uozaki H, Kikuchi Y, Watabe S, Numakura S, Watanabe M. Tumorous CD10 is more strongly related to the progression of urothelial carcinoma than stromal CD10. Anticancer Res. 2019;39(2):635-640.

[6] Shukla SK, Chandra S, Chauhan N, Sarpal R, Kusum A. Staining pattern and intensity of CD10 expression in urothelial carcinoma and its prognostic significance. Arch Cancer Res. 2019;4(1):70-74.

[7] Żurawski J, Talarska P, de Mezer M, Kaszkowiak K, Chalcarz M, Iwanik K, et al. Evaluation of CD10 expression as a diagnostic marker for colorectal cancer. Gastroenterol Hepatol Bed Bench. 2022;15(1):24-31.

[8] Wang S, Xiao Y, An X, Luo L, Gong K, Yu D. A comprehensive review of CD10: its function, clinical application, and future prospects. Front Pharmacol. 2024.

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