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Research Article

A Case of Primary Perineural Neuroendocrine Carcinoma of the Urethra

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Abstract:
This case report presents a 43-year-old female with primary perineural neuroendocrine carcinoma (NEC) of the urethra, an exceptionally rare malignancy accounting for less than 0.5% of urinary tract tumours. The patient presented with dysuria and pain, initially misdiagnosed as a urinary tract infection. Imaging revealed a urethral mass with cystic changes posteriorly, showing heterogeneous enhancement with a characteristic "target sign" on MRI and restricted diffusion on DWI, correlating with high Ki-67 expression (70%). Histopathological and immunohistochemical findings confirmed large-cell neuroendocrine carcinoma. This case provides comprehensive CT and MRI imaging features aiding in early diagnosis and differential diagnosis from more common urethral carcinomas.

Keywords: CT, MRI, Neuroendocrine carcinoma, Urethral carcinoma

Introduction

Neuroendocrine neoplasms (NENs) originate from peptide-producing neurons and neuroendocrine cells and can occur in virtually any organ containing epithelial tissue. Approximately 85% of NENs arise in the gastrointestinal tract and lungs[1]. The incidence of NENs shows a persistent upward trend. Epidemiological data from the United States indicates a significantly higher rate of increase compared to other tumour types, underscoring the urgency and importance of enhancing diagnostic and therapeutic capabilities for NENs. Literature reports indicate that neuroendocrine carcinomas (NEC) within the urinary system primarily occur in the bladder and ureter[2]. Neuroendocrine carcinomas arising in the urethra are exceptionally rare, accounting for less than 0.5% of urinary tract tumours[3]. Currently, there are very few reports in both domestic and international literature on primary neuroendocrine carcinomas of the urethra.

Case Summary

A 43-year-old female patient presented with dysuria accompanied by pain for over five months. She initially sought treatment at a local hospital where a urinary tract infection was suspected. Despite the patient receiving antimicrobial therapy, the response was inadequate, prompting her to seek further assessment at our hospital. Specialist examination: A firm mass palpable in the vaginal-urethral space, with indistinct borders and mildly tenderness. Computed tomography scan: A mass shadow within the urethral course, exhibiting heterogeneous density with indistinct borders. On non-contrast CT (Figure 1), the lesion measures approximately 5.1 cm × 4.2 cm × 4.9 cm with a mean Hounsfield unit value of 32 HU. Post-contrast imaging demonstrates irregular annular enhancement. Posterior to the mass, a cystic hypodense shadows are discernible. MRI examination (Figure 2): A mass lesion within the urethral course, with indistinct borders. On T1-weighted imaging (T1WI) it demonstrates isointense signal; on T2-weighted imaging (T2WI) it shows isointense to slightly hyperintense signal; on T2-weighted imaging with fat suppression (T2WI FS) imaging it exhibits

slightly hyperintense signal. Posterior to the lesion, a cystic structure is visible with low signal on T1WI, high signal on T2WI, and high signal on T2WI FS imaging, with well-defined borders. The lesion demonstrates marked hyperintensity on diffusion-weighted imaging (DWI), Corresponding apparent diffusion coefficient (ADC) values were low. Contrast-enhanced imaging: The lesion demonstrates marked annular, heterogeneous enhancement with central non-enhancement. The cystic wall posterior to the lesion shows marked enhancement. Puncture biopsy (Figure 3): Histological features and immunophenotypic characteristics confirm primary NEC of the urethra (large cell type). Immunohistochemical staining results for tumour cells: CK7 (+, partial cells), CK20 (+, partial cells), Ki-67 (+, approximately 70% locally), p53 (+, approximately 80% locally), Syn (+), CgA (+), CK (+), BRG1 (+), TTF-1 (+).

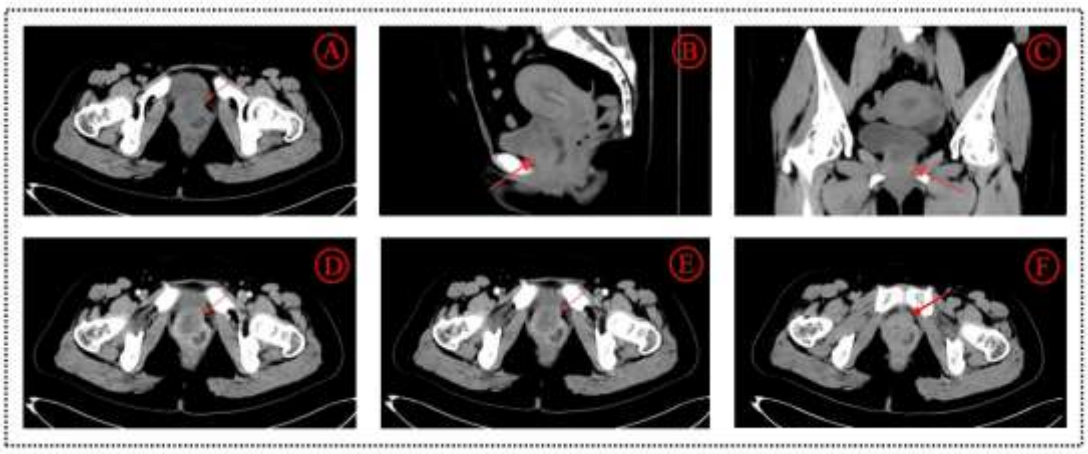

Figure1. CT Images of NEC. On non-contrast CT scans, a soft tissue mass is observed along the course of the urethra (Figures A-C); on contrast-enhanced CT scans, the lesion exhibits heterogeneous annular enhancement (Figures D-E).

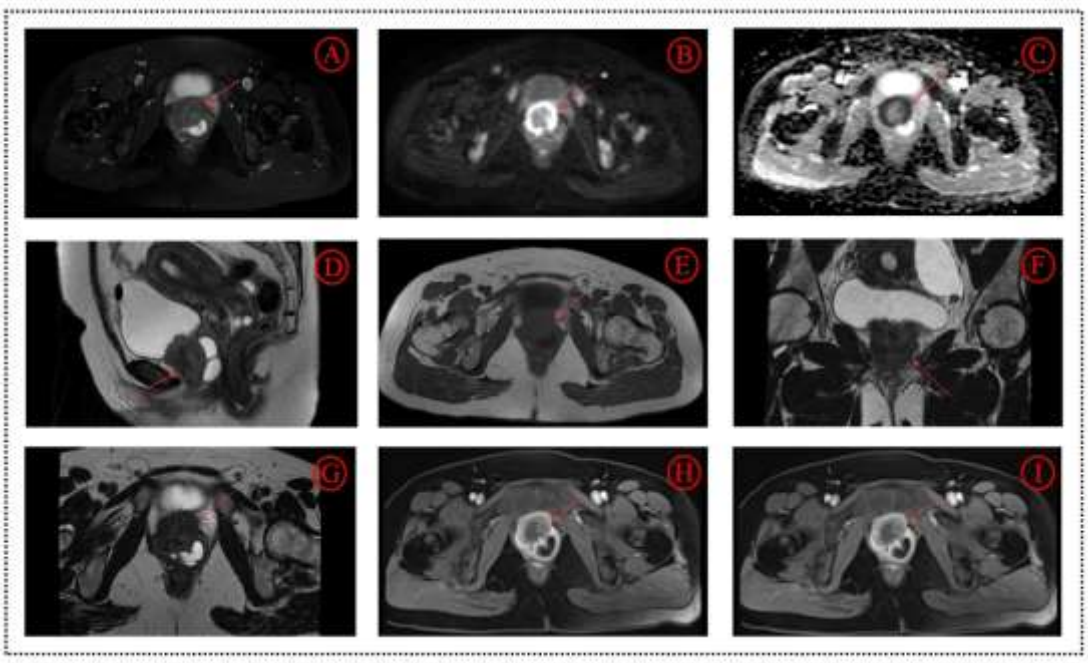

Figure2. MRI Images of NEC. The lesion exhibits isointensity on T1WI (Image E), isointensity to slightly hyperintensity on T2WI (Images D, F, G), and slightly hyperintensity on T2WI FS (Image A); the periphery of the lesion shows marked hyperintensity on DWI (Image B) with corresponding hypointensity on ADC maps (Image C); and on contrast-enhanced scanning, the lesion presents obvious heterogeneous rim enhancement while the central part of the lesion shows weak enhancement (Images H, I).

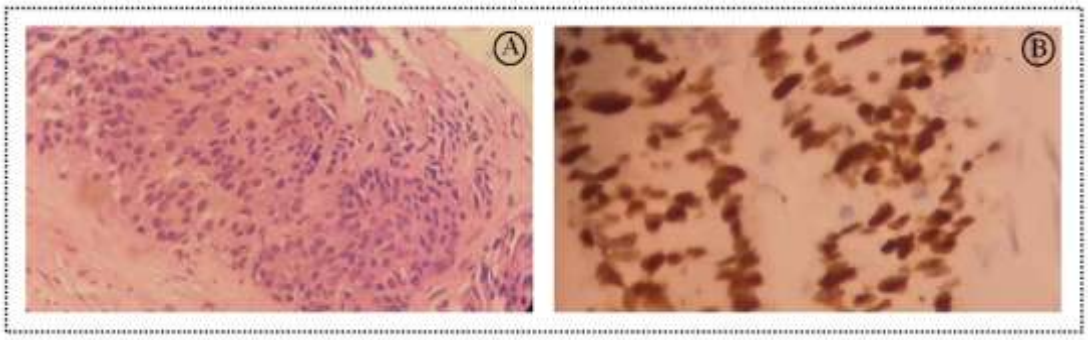

Figure3. Image A (Magnification: 200×): H&E-stained image, the tumor consists of medium-sized round, oval, or polygonal cells arranged in nests, sheets, and trabeculae, separated by loose stroma. The tumor cells exhibit nuclei with abundant chromatin; nucleoli are generally inconspicuous, though some cells show small nucleoli. The cytoplasm is scant, and mitotic figures are abundant. Image B (Magnification: 400×): IHC staining image, Ki-67 proliferation index detection reveals nuclear-localized positive expression (strong staining) with a 70% positive rate.

Discussion and Conclusions

NEC of urethral carcinoma is extremely rare, ommon histological types of urethral carcinoma include squamous cell carcinoma and adenocarcinoma[4], which share similar clinical presentations, thus often leading to misdiagnosis in early stages. In this case, CT and MRI revealed a mass lesion along the urethral course, accompanied by cystic changes posterior to the lesion. This may result from local obstruction or cystic degeneration caused by tumour compression or invasion of surrounding tissues. Regarding MRI sequence characteristics, the lesion exhibited isointense signal on T1WI, isointense to slightly hyperintense signal on T2WI, slightly hyperintense signal on T2WI FS, and markedly hyperintense signal on DWI. Corresponding ADC values were low, consistent with the restricted diffusion pattern typical of malignant tumours. The high signal intensity on DWI showed a strong correlation with the Ki-67 index (70%), indicating high tumour cell density and active proliferation. Notably, contrast-enhanced imaging revealed marked peripheral enhancement with relatively weaker central enhancement, forming a “target sign” appearance highly consistent with diffusion sequences. This heterogeneous enhancement pattern suggests potential internal tumour necrosis and markedly heterogeneous blood supply distribution, more evident on MRI. This feature may serve as a key distinguishing criterion from other types of urethral tumours.

In terms of differential diagnosis, given the extreme rarity of primary malignant tumours originating in the urethra, current research predominantly consists of case reports, and existing imaging data is often incomplete. Therefore, this analysis is based solely on the limited available information: ① Urethral squamous cell carcinoma: On MRI DWI sequences, the lesion exhibits overall high signal intensity[5], rather than marginal high signal intensity; ② Urethral epithelial carcinoma: The lesion exhibits higher signal intensity than NEC on T2WI FS MRI sequences, followed by overall heterogeneous enhancement on contrast-enhanced imaging[6]. This contrasts markedly with the “target sign” enhancement pattern characteristic of NEC.

Perineural carcinoma of the urethra, as a rare malignant tumour, is frequently misdiagnosed in its early stages as other urinary tract disorders due to the non-specific nature of its clinical symptoms. Compounded by the tumour's biological tendency towards early metastasis [9], this often results in patients missing the optimal window for treatment. This case report provides the first comprehensive presentation of both plain and contrast-enhanced CT and MRI imaging data, filling a gap in the literature on imaging findings for this condition. It will offer valuable reference material for the early diagnosis of similar cases in the future. Further accumulation of case studies and in-depth research will be required to enhance understanding and improve diagnostic and therapeutic approaches for this rare disease.

Conflict of Interests Statement

The authors declare no conflict of interest.

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