Case Report

Clear cell carcinoma of the seminal vesicle in a young adult

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Abbreviations & Acronyms
CK = cytokeratin
CT = computed tomography
HNF = hepatocyte nuclear factor
MRI = magnetic resonance imaging
PAX = paired box

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Introduction: Most seminal vesicle malignancies are secondary to prostate or bladder cancer. Herein, we report a case of primary clear cell carcinoma of the seminal vesicle.
Case presentation: A 27-year-old man was referred to our department for hematospermia and macroscopic hematuria. A digital rectal examination showed a soft elastic prostatic mass. Cystoscopy showed no bladder abnormalities, and tumor marker tests were unremarkable. Contrast-enhanced computed tomography and magnetic resonance imaging revealed a cystic tumor containing an enhanced nodule near the prostate and seminal vesicle. The tumor was removed en bloc with the prostate and seminal vesicle through a laparoscopic radical prostatectomy. A histopathologic examination confirmed the diagnosis, with the tumor likely arising from a remnant Müllerian epithelium. A 1-year follow-up revealed local tumor recurrence, prompting laparoscopy.
Conclusion: A standard therapy for primary seminal vesicle carcinoma has not been established. Further studies are necessary to determine the optimal treatment strategy.

Key words: clear cell carcinoma, laparoscopy, Müllerian duct, prostate, seminal vesicle.

Keynote message

This study highlights the importance of considering primary seminal vesicle malignancy as a differential diagnosis in patients with non-specific urologic symptoms.

Background

Most seminal vesicle malignancies are secondary to prostatic or bladder cancers.[1,2] Conversely, primary malignant tumors of the seminal vesicle are rarely reported.[3] Among the limited number of primary seminal vesicle malignancy cases, adenocarcinoma is the most common histological type. Diagnostic criteria for seminal vesicle malignancies include the absence of prostate-related tumors, adenocarcinoma focused primarily on the seminal vesicle, and papillary adenocarcinoma resembling the seminal vesicle mucosa.[4] Herein, we report a case of primary clear cell carcinoma of the seminal vesicle that did not meet these diagnostic criteria.

Case presentation

An otherwise healthy 27-year-old man was referred to our department for macroscopic hematuria following a 7-year history of intermittent hematospermia. A digital rectal examination showed a soft elastic prostatic mass. Urine cytology revealed atypical cells; however, cystoscopy showed no bladder abnormalities. Routine blood tests showed normal white cell (5500 cells/μL) and red cell (3.51×10^6 cells/μL) counts, as well as a normal hemoglobin level (17.3 g/dL) and platelet count (20.1×10^4 platelets/μL). Renal function tests revealed normal blood urea nitrogen (11.0 mg/dL) and serum creatinine (0.86 mg/dL) levels. Tumor

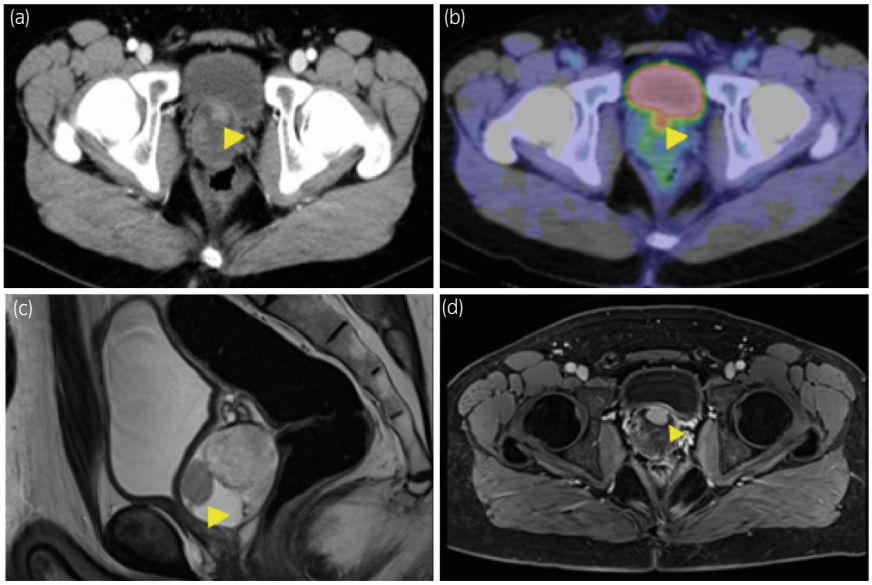

Fig. 1 Radiologic findings. (a) CT shows an enhanced papillary-like mass within a well-defined cystic structure on the dorsal aspect of the bladder (white arrowhead); (b) positron emission tomography reveals abnormal accumulation of ^{18}F-fluorodeoxyglucose with a maximum standardized uptake value of 6.3 in the solid component of the cyst (white arrowhead); (c) T2-weighted pelvic MRI demonstrates a solid mass within the cyst with mixed high and low intensities (yellow arrowhead); (d) T1-weighted MRI shows a solid mass with early dense staining (yellow arrowhead).

marker tests showed normal prostate-specific antigen (0.392 ng/mL), squamous cell carcinoma antigen (1.4 ng/mL), and neuron-specific enolase (16.4 ng/mL) levels.

Contrast-enhanced CT showed a papillary-like mass with contrast enhancement within a well-defined cystic structure on the dorsal aspect of the bladder (Fig. 1a). MRI demonstrated a solid mass within the cyst with mixed high and low intensities on T2 (Fig. 1c) and early dense staining on T1 (Fig. 1d). Positron emission tomography showed abnormal accumulation of ^{18}F-fluorodeoxyglucose (maximum standardized uptake value = 6.3) in the solid component of the cyst with no evidence of distant metastases (Fig. 1b). These findings were suggestive of seminal vesicle malignancy.

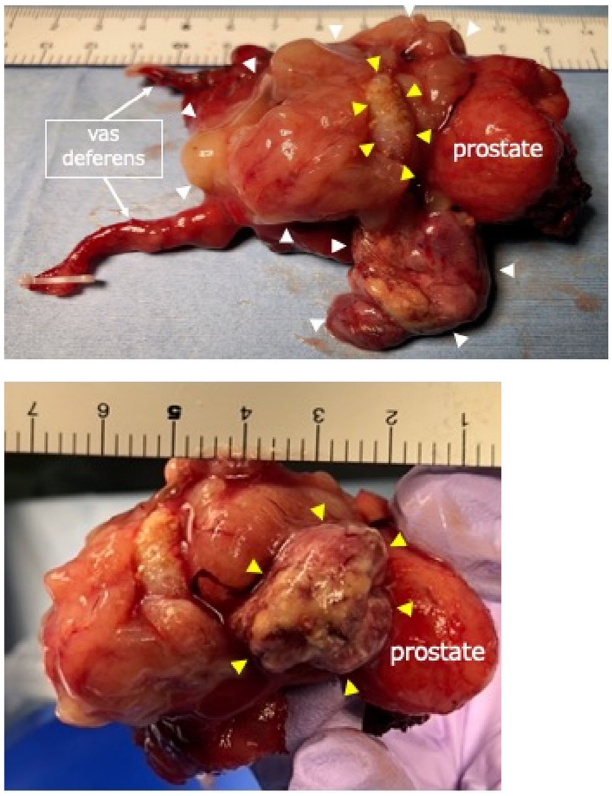

Fig. 2 A gross examination shows a cystic mass filled primarily with gelatinous (white arrowheads) and partly solid components (yellow arrowheads).

A bilateral nerve-sparing robot-assisted laparoscopic radical prostatectomy was performed using both anterior and posterior approaches. The tumor was completely removed en bloc with the prostate and seminal vesicles. However, pelvic lymph node dissection was not performed.

Gross examination of the resected tumor showed mucinous fluid-filled cystic structures with white-to-yellow solid portions (Fig. 2). A histopathological examination demonstrated proliferating atypical cells with abundant clear cytoplasm that were arranged in a papillary pattern with fibrovascular stroma and a bluish mucinous substance (Fig. 3a). Immunohistochemistry revealed that these atypical cells were reactive to CK 7, HNF-1β, and PAX8 (Fig. 3b–d). However, PSA and Nkx3.1, specific markers for prostate cancer, and GATA3 and p63, characteristic markers for urothelial carcinoma, showed negative results. (Fig. 3e–h) We also confirmed that CK20 and AFP were not expressed. These findings were consistent with a definitive diagnosis of clear cell carcinoma of the seminal vesicle.

One year after the initial surgery, the patient presented with local tumor recurrence, which was treated via laparoscopy.

Discussion and conclusions

The age at the time of a seminal vesicle cancer diagnosis varies from 10 to 90 years, but it generally occurs after 50 years of age.[1,2] The most common symptoms of seminal vesicle cancers are obstructive lower urinary tract symptoms (e.g., dysuria), which are seen in approximately 35% of cases.[1,3] In the present case, the patient initially presented with hematospermia and hematuria, which are non-specific for seminal vesicle malignancies.

Because many cases of seminal vesicle cancer are advanced once diagnosed, the prognosis is generally poor. In previous

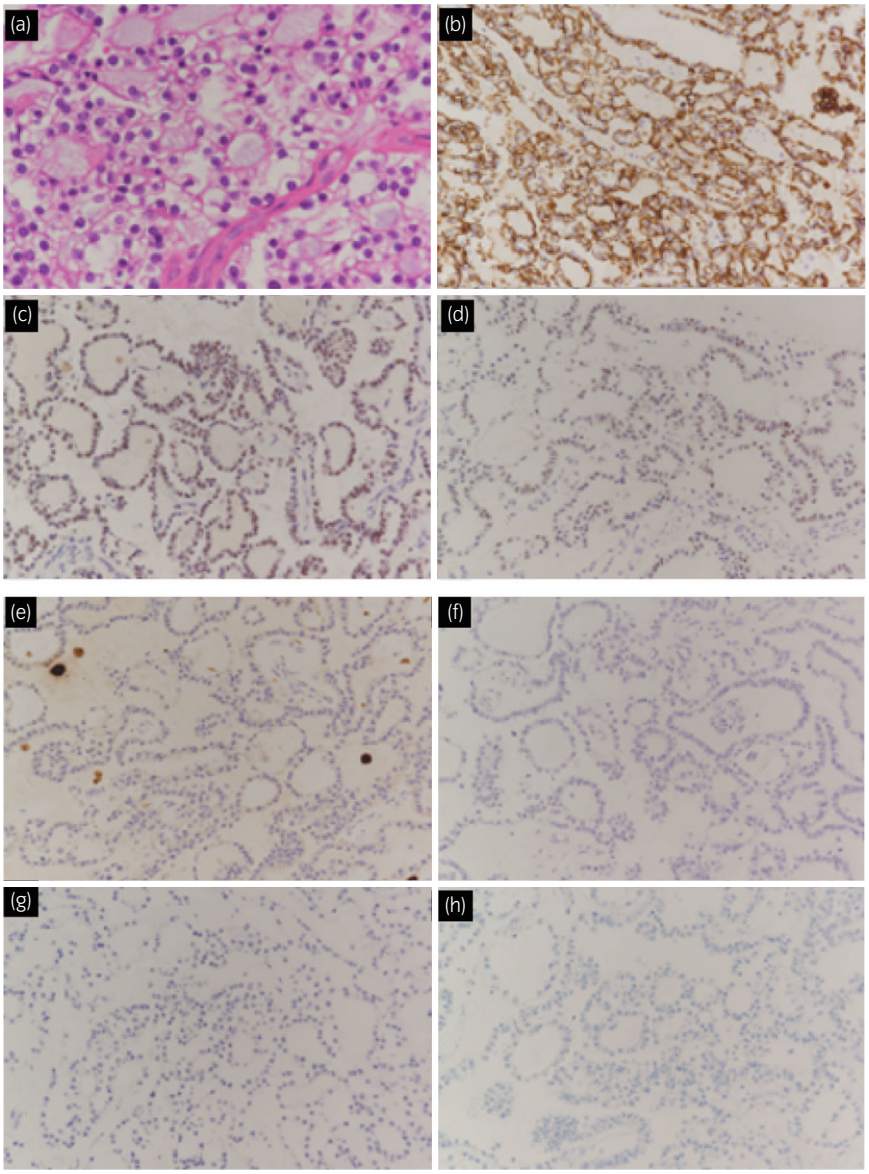

Fig. 3 Histopathologic and immunohistochemistry findings. (a) A microscopic examination reveals proliferating atypical cells with round nuclei and abundant clear cytoplasm. (b) The membranes of the tumor cells are reactive for CK7 on immunostaining. (c, d) The tumor nuclei are positive for HNF-1β and PAX8 expression. (e, f) The tumor nuclei are negative for Nkx3.1 and the membranes of the tumor cells are negative for PSA. (g, h) The tumor nuclei are negative for GATA3 and p63.

reports, the overall survival of patients with advanced seminal vesicle cancer was ≤3 years in 95% of the cases.[2,4]

CT and MRI are useful for assessing the location and local extent of tumors. These imaging modalities are also useful in the diagnosis of congenital malformations (e.g., ectopic ureters or kidneys).[5]

Due to the limited incidence of primary seminal vesicle carcinoma, no definite standard treatment strategy has been established. Nevertheless, complete tumor resection is considered the mainstay treatment. However, the overall survival of patients who undergo complete resection varies greatly (from 3 months to long-term survival).[1,6,7]

In the present case, erectile function and urinary continence in the patient were immediately restored after surgery. Because the patient desired to have children in the future, we tried to preserve his sperm before surgery. However, sperm collection was difficult due to oligozoospermia and hematospermia. Testicular sperm extraction and intracytoplasmic sperm injection may be performed in the future when the patient is ready to have children.

Dalgaard and Giertsin[8] established a three-point set of diagnostic criteria for primary seminal vesicle carcinoma. First, there must be a malignant seminal vesicle tumor confirmed via gross or microscopic examination. Second, there must be no other primary cancers in the body. Third, the tumor must be a papillary adenocarcinoma, preferably resembling the structure of a non-neoplastic seminal vesicle. Considering that clear cell carcinoma is a subtype of adenocarcinoma, our case fulfilled all three criteria for primary seminal vesicle carcinoma.

To the best of our knowledge, only Gaur *et al.*[9] have previously reported a case of primary clear cell carcinoma of the seminal vesicle. However, this tumor type might get overlooked due to the absence of consensus criteria. Notably, the histological features reported by Gaur *et al.*[9] are similar to clear cell ovarian carcinoma, as the papillary architecture was

composed of proliferating pale cells with round nuclei and abundant pale cytoplasm. Additionally, immunohistochemistry showed reactivity for CK7 and PAX8 and non-reactivity for CK20, which is similar to our case.

PAX8 is specifically expressed in the epithelia of Wolffian ducts, Müllerian ducts, and the kidneys,[10] making it a useful diagnostic marker for malignancies arising from these structures. However, this marker is also highly expressed in ovarian clear cell carcinoma.[11]

CK7 and CK20 are useful markers for identifying the origin of some malignant tumors,[12] although clear cell carcinomas of the seminal vesicle, bladder adenocarcinomas, and malignant tumors arising from the Müllerian duct are reactive for CK7 but non-reactive for CK20 on immunostaining.[5]

HNF-1β is a transcription factor that is primarily involved in organogenesis and development, and it is expressed specifically in the liver, kidneys, stomach, and small intestine. Similar to PAX8, HNF-1β is overexpressed in ovarian clear cell carcinoma.[13]

The histogenesis of clear cell carcinoma of the seminal vesicle is controversial. However, ovarian clear cell carcinoma is derived from endometriosis of Müllerian origin.[14] Clear cell carcinoma of the urinary bladder or urethra in female patients is closely related to endometriosis or ectopic Müllerian epithelia. Therefore, in our case, the patient's seminal vesicle clear cell carcinoma could have originated from a remnant Müllerian epithelium.

Author contributions

Hidetoshi Murakami: Formal analysis; investigation; writing – original draft. Takanobu Motoshima: Conceptualization; data curation; investigation; methodology; writing – original draft. Ryoma Kurahashi: Supervision. Yoji Murakami: Supervision. Yutaka Sugiyama: Supervision. Takahiro Yamaguchi: Supervision. Junji Yatsuda: Supervision. Tsuguharu Asato: Validation; visualization. Yoshiki Mikami: Methodology; supervision; validation; writing – review and editing. Tomomi Kamba: Supervision; writing – review and editing.

Conflict of interest

The authors declare no conflict of interest.

Data availability statement

All the data generated in this case are included in this article.

Approval of the research protocol by an Institutional Reviewer Board

N/A.

Informed consent

All informed consent was obtained from the subject(s) and/or guardian(s).

Registry and the Registration No. of the study/trial

N/A.

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