Clinical Case Report

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Primary malignant peripheral nerve sheath tumor of prostate in a young adult

A case report

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Abstract

Rationale: Prostate sarcoma has been reported to represent 0.7% of primary prostate malignancies. Leiomyosarcoma and rhabdomyosarcoma are the most common sarcomas of the prostate. Malignant peripheral nerve sheath tumor (MPNST) of the prostate is very rare.

Patient concerns: A 22-year-old man presented with gross hematuria and voiding difficulty for 2 weeks. Magnetic resonance imaging showed a 6-cm mass in the left lobe of the prostate.

Diagnoses: Core needle biopsy results revealed high-grade sarcoma, suggestive of poorly differentiated synovial sarcoma. The final diagnosis of laparoscopic prostatectomy was MPNST, because it did not show the presence of *SYT-SSX* fusion transcripts on reverse transcription polymerase chain reaction analysis.

Interventions: Adjuvant radiotherapy was planned because preoperative positron emission tomography-computed tomography (CT) did not show any metastatic lesion and the resection margin was microscopically involved. However, chest CT showed multiple lung metastases a month after prostatectomy. A chemotherapeutic regimen of doxorubicin and ifosfamide was administered.

Outcomes: The best response to chemotherapy was partial response. After several courses of chemotherapy, he died 9 months after the surgery.

Lessons: Primary prostate sarcoma and even MPNST are extremely rare. MPNST of the prostate has seldom been reported. This report may help diagnose and manage the disease.

Abbreviations: CT = computed tomography, H&E = hematoxylin and eosin stain, MPNST = malignant peripheral nerve sheath tumor, NF1 = type 1 neurofibromatosis, SS = synovial sarcoma.

Keywords: chemotherapy, malignant peripheral nerve sheath tumor, prostate cancer

1. Introduction

Soft tissue sarcoma is a rare malignancy that represents 1% of all cancers.[1] It has tremendously heterogeneous pathologies and has been found in various sites. Prostate sarcoma has been reported to represent 0.7% of primary prostate malignancies.[2] Leiomyosarcoma and rhabdomyosarcoma are the most common sarcomas of the prostate,[3,4] whereas malignant peripheral nerve sheath tumor (MPNST) of the prostate has seldom been reported. Here, we report an extremely rare case of prostate sarcoma in early adulthood.

2. Case presentation

A 22-year-old man with a 2-week history of gross hematuria and voiding difficulty visited the local urology clinic. Digital rectal examination and transrectal ultrasonography revealed a hard mass on his prostate. He was referred to the urology department in our hospital. Magnetic resonance imaging showed a 6-cm mass in the left lobe of the prostate (Fig. 1A). The level of serum prostate-specific antigen was 1.89 ng/mL (normal range 0–4.0 ng/mL). The result of the core needle biopsy was high-grade sarcoma, suggestive of poorly differentiated synovial sarcoma (SS).

Positron emission tomography-computed tomography (CT) on November 30, 2016 showed no evidence of regional lymph node metastasis or distant metastasis. The patient underwent laparoscopic prostatectomy on December 6, 2016. The resection margin was positive, indicating R1 resection. The main differential diagnosis included MPNST and SS. SS was suspected more on the previous core needle biopsy because tumor cells were negative for S100 protein, but positive for pan-cytokeratin (Fig. 2A). The resected tumor did not show the presence of *SYT-SSX* fusion transcripts on reverse transcription polymerase chain reaction, but it did show focal immunoreactivity for S100 protein

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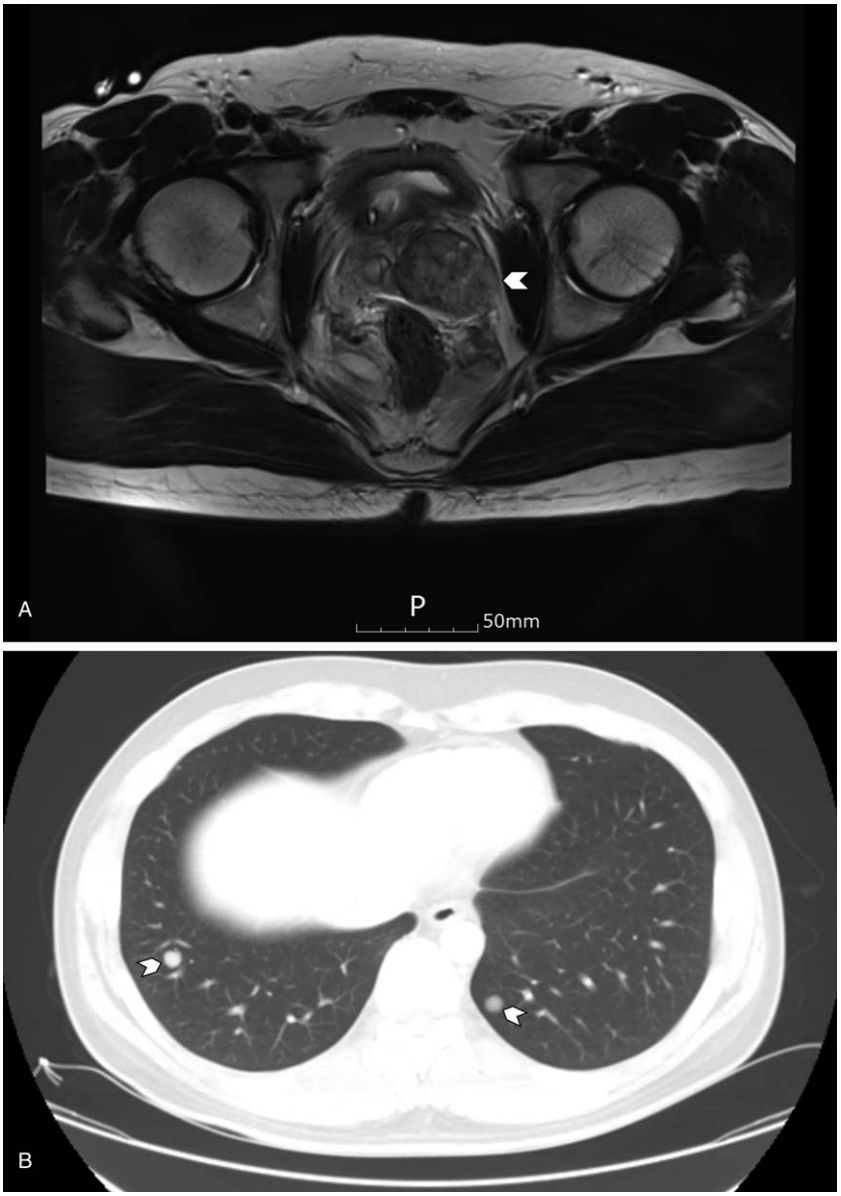

Figure 1. Magnetic resonance imaging (A) at diagnosis showed a 6-cm mass in the left lobe of the prostate, and (B) at recurrence showed multiple nodules in the lungs.

(Fig. 2B and C). It was compatible with MPNST based on the microscopic findings, and also ancillary studies.

He was referred to the oncology department, and adjuvant radiotherapy was planned. However, CT on January 1, 2017, before radiotherapy, revealed multiple pulmonary metastases with local recurrence and peritoneal seeding (Fig. 1B). A chemotherapeutic regimen of doxorubicin and ifosfamide was administered, and the disease showed partial response to 3 cycles of the regimen. However, he complained of severe general weakness and poor oral intake, and was switched to doxorubicin monotherapy. He received 3 cycles of doxorubicin monotherapy. His disease was stable during chemotherapy administration; however, it progressed 2 weeks after the last dose of doxorubicin. Second-line pazopanib treatment did not show any response, and third-line gemcitabine and docetaxel also showed no response. The patient was administered everolimus and olaratumab with doxorubicin, but the disease continued to progress. He died 9 months after the surgery on September 4, 2017.

The patient provided written informed consent and ethics approval was not required for this paper as it is a case report.

3. Discussion

Prostate cancer is the third leading type of cancer death in American men aged 60 to 79 years and the second in those older than 80 years.[5] In Korean men older than 65 years, prostate cancer was the fourth most common cancer in 2014.[6] However, the majority of prostate cancer is adenocarcinoma, and sarcoma is rare. MPNST is extremely rare in the prostate.

Four cases of prostate MPNST have been reported worldwide since 1999. The first case, in 1999, was a 21-year-old African-American man with neurofibromatosis.[7] This man underwent

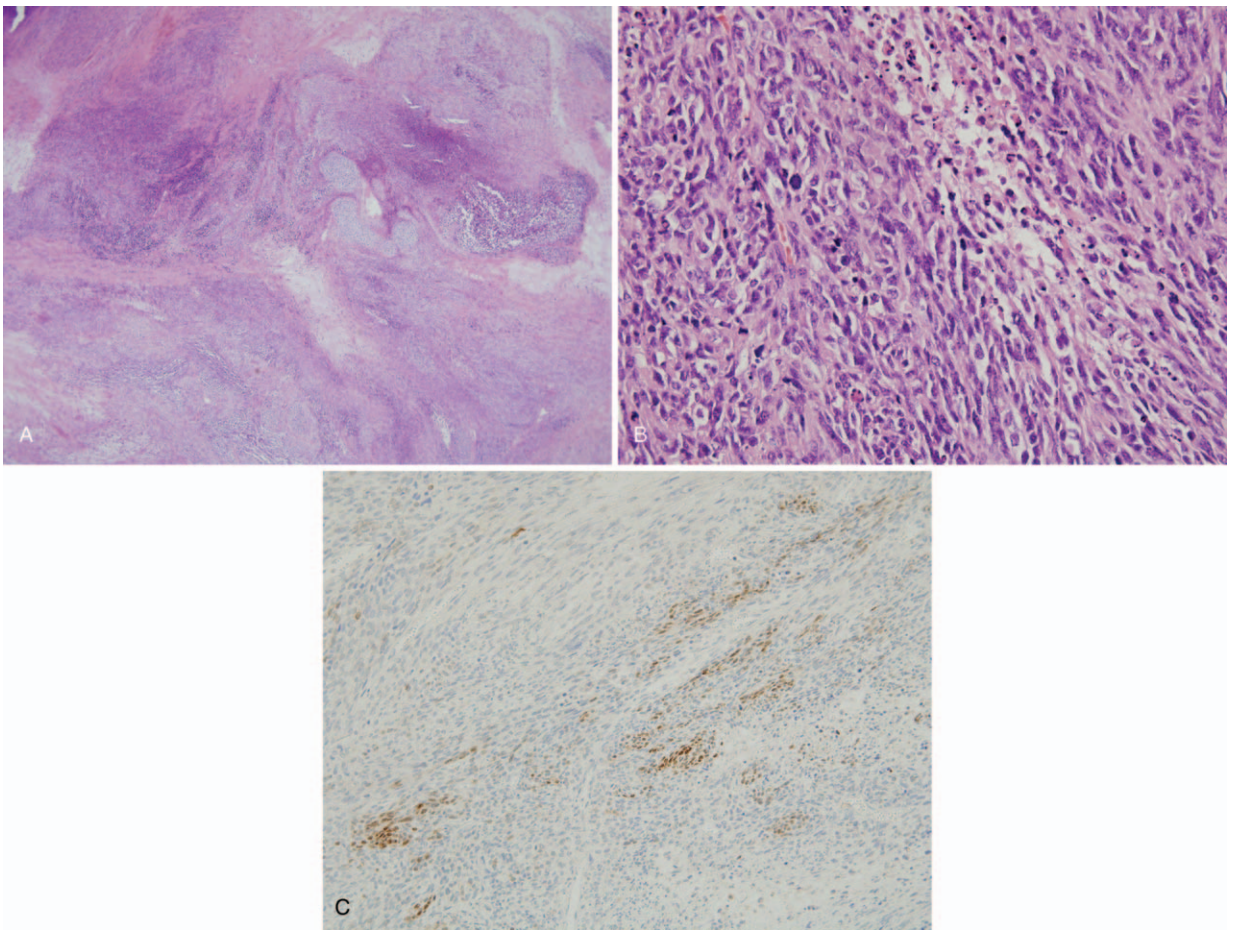

Figure 2. Microscopic findings of the prostatectomy specimen. (A) The tumor was composed of fascicles of spindle cells showing alternating hypercellular and hypocellular areas, and heterologous cartilaginous differentiation (center) (H&E, ×40). (B) Malignant spindle cells showed hyperchromatic nuclei and numerous mitoses (H&E, ×200). (C) Immunohistochemistry showed focal staining for S100 protein (×200).

radical cystoprostatectomy with ileal conduit urinary diversion and demonstrated no recurrent disease 1 year postoperatively. The second case was reported in Poland in 2015.[8] The third and fourth cases were reported in 2016 in Greece and Taiwan, respectively.[9,10]Table 1 summarizes these 4 cases.

Malignant peripheral nerve sheath tumor is a rare disease. About half of the cases are sporadic, and the other half are found with type 1 neurofibromatosis (NF1)—an autosomal dominant genetic disease.[11] NF1 is not a prognostic factor for survival in MPNST.[11,12] Like other soft-tissue sarcomas, presentation with recurrent disease, large tumor size, and tumor in the trunk (vs the extremities) were reported as the strongest independent predictors of shorter survival.[12] Zou et al[13] analyzed 140 MPNST patients and reported that size larger than 10 cm and p53 expression were independent poor prognostic factors.

Complete surgical resection with negative margins is the mainstay of treatment. MPNST is considered relatively chemoinsensitive.[14] Adjuvant radiotherapy could improve local control and it may benefit survival. However, solid evidence based on randomized controlled trials for the efficacy of any adjuvant treatment is limited because of the rarity of MPNST. Despite aggressive surgery and adjuvant treatment, its prognosis is so poor that the 5-year survival rate is about 34% to 44%.[11,15]

We cannot be sure that our patient would have had a better disease course if he could have received adjuvant radiotherapy. Although he had been administered several lines of chemotherapy for metastatic MPNST, only a doxorubicin-based regimen provided a brief response. It is assumed that the aggressive biology and poor response to therapy contribute to the poor prognosis of MPNST. Physicians should be alert to the symptoms of this rare cancer so that an early diagnosis can be provided, in addition to developing superior therapeutic modalities.

Author contributions

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Table 1

Clinical features of 4 patients with MPNST of the prostate reported in the English literature.

Study	Age (y)	Size (cm)	Serum PSA (ng/mL)	Signs and symptoms at presentation	Treatment	Follow-up
Rames and Smith, 1999[7]	21	12	NA	Urinary retention (with type 1 neurofibromatosis)	Radical cystoprostatectomy and low anterior resection	Free of disease 1 y later
Kuzaka et al, 2015[8]	73	$12 \times 6 \times 7$	1.15	Pain around the sacrum and disturbance in passing stool, urine flow impairment, and nocturia	Radical cystoprostatectomy	Died 6 mos later, probably due to cardiovascular insufficiency
Ferakis et al, 2016[9]	60	$7.0 \times 6.5 \times 5.7$	1	Painless, asymmetrically sizable prostate on digital rectal examination for routine urologic examination	Radical retropubic prostatectomy with en bloc removal of the mass and the seminal vesicles followed Adjuvant radiotherapy	Free of disease 6 mos after the operation
Hsieh et al, 2016[10]	44	Multiple nodules in the prostate, the largest 6.3 (300 g whole prostate)	0.42	Painless gross hematuria and urine retention (with lung nodule suspicious metastasis)	Five cycles of neoadjuvant chemotherapy (5-fluorouracil + cisplatin + ifosfamide). Radical cystoprostatectomy Adjuvant concomitant chemoradiation therapy (5-fluorouracil + cisplatin + ifosfamide with external beam radiation 6600 cGy, 33 fractions) Pazopanib 400 mg/d after liver metastasis on CT 3 mos postoperatively	Died of disease 6 mos after the operation
Kim, 2018	22	$6.3 \times 4 \times 3.7$	1.89	Gross hematuria, voiding difficulty	Laparoscopic prostatectomy The first line of palliative chemotherapy (3 cycles of doxorubicin + ifosfamide, 3 cycles of doxorubicin) Pazopanib Gemcitabine + docetaxel Everolimus Olaratumab + doxorubicin	Died of disease 9 mos after the operation

CT = computed tomography, NA = not applicable, PSA = prostate serum antigen.

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