Case Report

Left testicular and pulmonary metastases of mucinous adenocarcinoma of the prostate after robot-assisted radical prostatectomy

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Abbreviation & Acronyms
ADT = androgen deprivation therapy
ARAT = androgen receptor-axis-targeted agent
CRPC = castration-resistant prostate cancer
CT = computed tomography
IMRT = intensity-modulated radiation therapy
MRI = magnetic resonance imaging
PSA = prostate-specific antigen
RARP = robot-assisted radical prostatectomy

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How to cite this article: Kato K, Kamei J, Yanase A *et al*. Left testicular and pulmonary metastases of mucinous adenocarcinoma of the prostate after robot-assisted radical prostatectomy. *IJU Case Rep*. 2023; 6: 222–225.

Received 4 November 2022; accepted 2 April 2023.
Online publication 13 April 2023

Introduction: We present a case of mucinous adenocarcinoma of the prostate with testicular and lung metastases following robot-assisted radical prostatectomy, androgen deprivation therapy, and radiotherapy.
Case presentation: A 73-year-old man with a prostate-specific antigen level of 4.3 ng/mL was diagnosed with prostate cancer. Following the robot-assisted radical prostatectomy, the pathological diagnosis was mucinous adenocarcinoma of the prostate (pT3bpN0, Gleason score of 4 + 4). Salvage hormonal therapy and irradiation were performed after the prostatectomy. Enlargement of the left testis was noted, and 28 months after prostatectomy, computed tomography detected a left testicular tumor and nodular lesions in the bilateral lungs. The histopathological diagnosis of left high orchiectomy was metastasis of a mucinous adenocarcinoma of the prostate. Chemotherapy with docetaxel followed by cabazitaxel was initiated.
Conclusion: Mucinous prostate adenocarcinoma with distal metastases following prostatectomy has been managed for longer than 3 years with multiple treatments.

Key words: chemotherapy, high orchiectomy, mucinous adenocarcinoma, prostate cancer, testicular tumor.

Keynote message

Mucinous adenocarcinoma of the prostate is a rare variant, and little is known about the treatment options in cases with metastases. Our patient showed testicular and bilateral lung metastases 28 months after prostatectomy and disease progression was managed by high orchiectomy and chemotherapy, even though evidence of treatment effectiveness for this rare variant with recurrence is limited.

Introduction

Mucinous adenocarcinoma of the prostate is a rare variant occurring in 0.2%–0.4% of all cases.[1–3] The frequency of metastases is less than 5%, and the bone is the most typical location for metastasis.[3,4] We report a case of mucinous prostate adenocarcinoma metastasizing to the testis and lungs following RARP, salvage ADT, and IMRT.

Case presentation

A 73-year-old man underwent prostate biopsy for a serum PSA level of 4.3 ng/mL and was diagnosed with prostate cancer with a Gleason score of 4 + 4, mucinous adenocarcinoma, or ductal adenocarcinoma in the differential diagnosis. MRI revealed low-intensity signals on T2-weighted images and high-intensity signals on diffusion-weighted images in the left peripheral zone and seminal vesicle (Fig. 1). There was no evidence of lymph node or distal metastasis (cT3bN0M0, high D'Amico risk stratification), and RARP with extended lymphadenectomy was performed. Histologically, columnar tumor cells floating in mucous lakes

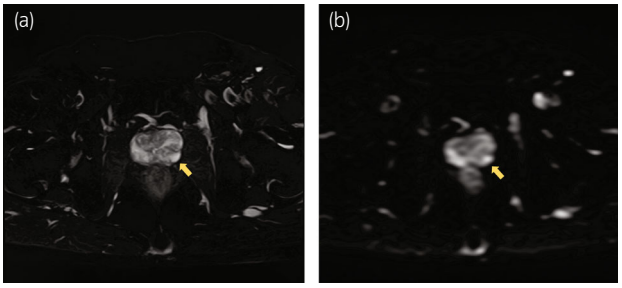

Fig. 1 MRI image of the prostate. Low-intensity signals on a T2-weighted image (a) and high-intensity signals on a diffusion-weighted image (b) in the left peripheral zone.

formed by large amounts of extracellular mucin were observed; the histopathological diagnosis was acinar adenocarcinoma, mucinous variant, Gleason score of 4 + 4/Grade Group 4 with seminal vesicle invasion without lymph node metastasis (0/9 nodes) (pT3bN0M0) (Fig. 2a,b). His PSA level 1 month after RARP was 0.13 ng/mL, suggesting residual tumor requiring adjuvant therapy. ADT monotherapy was started instead of radiotherapy because the patient was suffering from severe urinary incontinence (Fig. 3). His PSA level began to rise 11 months after RARP without any visible metastases from CT, and salvage radiotherapy to the prostate and seminal vesicle beds was performed using IMRT (66-Gy/33 fraction) 18 months after RARP. Painless swelling of the left testis developed 28 months following RARP, and CT revealed a cystic testicular mass with solid components inside and three nodules in both lungs (Fig. 4). No other metastases were seen on bone scintigraphy. His PSA level was 1.54 ng/mL, but tumor marker levels associating testicular tumor were all within the normal range. A left testicular tumor with bilateral lung metastases with negative tumor markers, or left testicular and bilateral lung metastases of mucinous prostate carcinoma were suspected. A left high orchiectomy was performed. The tumor's histology matched that of the RARP specimen, showing that the tumor cells were floating in lakes of mucin and had weak positivity for immunohistochemistry of PSA, suggesting metastasis of mucinous adenocarcinoma of the prostate (Fig. 2c,d).

Following high orchiectomy, his PSA level dropped to 0.28 ng/mL. Subsequently, chemotherapy with docetaxel 60 mg/m^2 but not ARAT was started because his PSA doubling time during ADT was <2 months. After three cycles of docetaxel, CT showed that lung metastases had increased and treatment was switched to cabazitaxel 25 mg/m^2. No new metastases or increased previous lung metastases were identified on CT and bone scintigraphy performed every 3 months after orchiectomy and cabazitaxel are still being continued. After six cycles of cabazitaxel, the PSA level remains below 0.1 ng/mL.

Discussion

Mucinous adenocarcinoma of the prostate defined by the presence of >25% extracellular mucin in the tumor is a rare variant accounting for 0.2%–0.4% of all prostate cancers.[1–4] The frequency of metastases is less than 5%, and the bone is the most typical location for metastasis.[3,5–7] Testicular metastasis is very rare, previously reported only in 1988; to the best of our knowledge, this is the second case ever reported in the literature.[8] The specific mechanism of testicular metastasis was unclear; however, intraoperative pneumoperitoneum might have been involved.

Several studies have shown that treatment outcomes of both surgery and radiotherapy for mucinous adenocarcinoma without metastases were similar to those for acinar adenocarcinoma.[3,5,6,9–12] A previous study reported that distant metastases and age > 65 years at diagnosis were poor prognostic factors for patients with mucinous prostate cancer.[5] Nevertheless, despite the patient's age (73 years), we deemed RARP to be appropriate as an initial form of treatment because there were no metastases at diagnosis and the needle biopsy specimen failed to provide a definitive diagnosis.

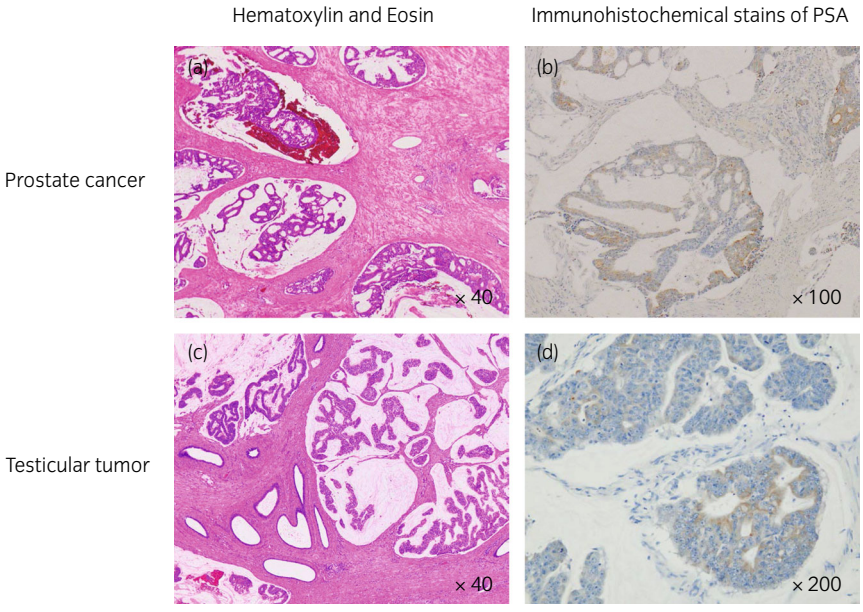

Fig. 2 Histopathological findings of the prostate cancer (a, b) and the testicular tumor (c, d). Both tumors contained more than 25% of extracellular mucin (a, c) and showed positivity for immunohistochemistry of PSA (b, d).

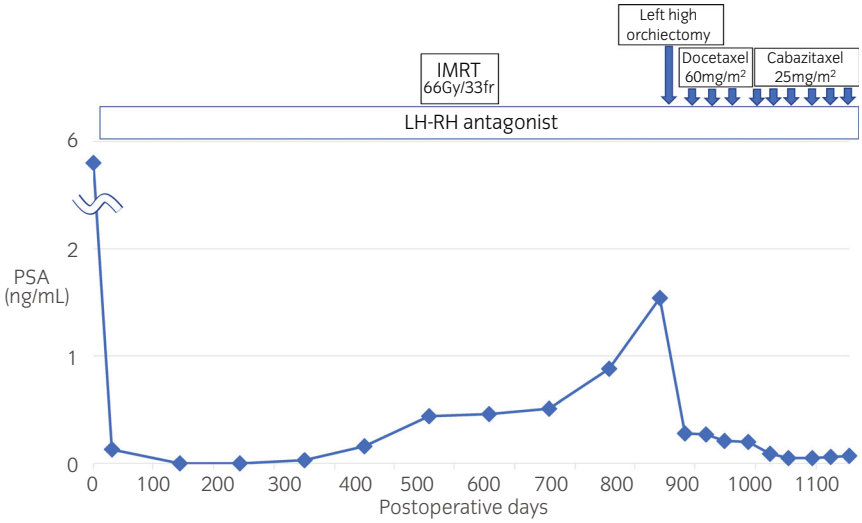

Fig. 3 PSA levels throughout the treatment period.

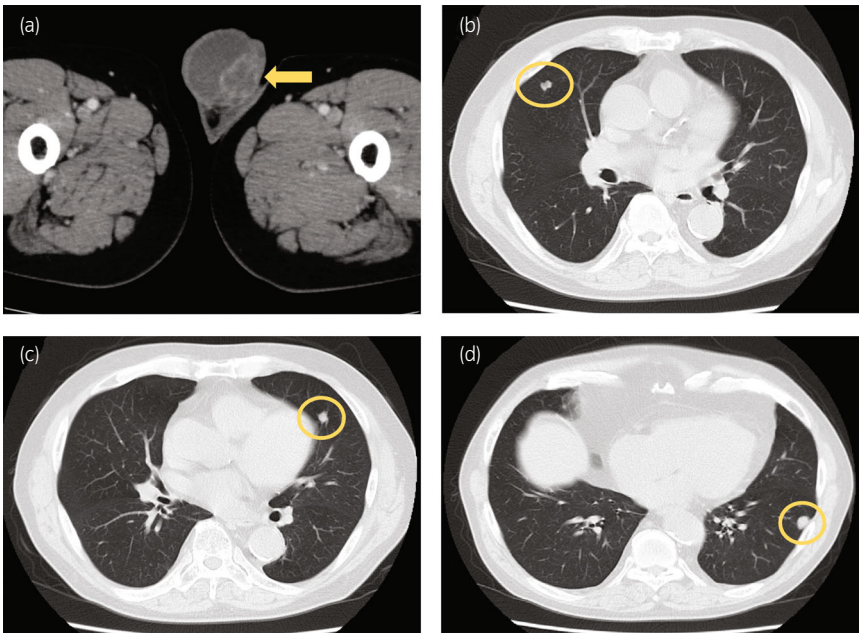

Fig. 4 Imaging findings. CT images of the left testis (a) and lung (b–d) metastasis. A cystic mass with a solid component was found in the left testis (arrow). Three small nodules were scattered in both lungs (circles).

A previous study reported that PSA levels reflect the biological behavior of this variant, especially metastasis.[5] In contrast, his lung metastases increased without PSA elevation during treatment with docetaxel. This suggested that PSA level monitoring alone was not enough to detect the disease progression of this variant with biochemical failure similar to that of acinar prostate cancer.[13,14] Follow-up CT/MRI imaging and bone scans every 2–3 months would be required in this case, as for acinar prostate cancer.[15] However, routine follow-up imaging before detecting distal metastases was not conducted in this case; this was less than ideal as it might have resulted in earlier identification of the metastasis.

A few studies reported favorable responses to ADT in mucinous prostate carcinoma[12,16]; however, the efficacy of recent therapeutic agents for CRPC such as ARAT, docetaxel, cabazitaxel, or olaparib has not been reported. Moreover, there were no reports about the results of cancer genome profiling tests such as FoundationOne or *BRCA* analysis for mucinous prostate cancer. It may be a good option to perform cancer genomic tests earlier for this rare variant to better understand which therapeutic agents may be more effective against it. Therefore, we intend to perform such tests for our patient.

Conclusion

We reported a case of mucinous adenocarcinoma of the prostate, emerging testis, and lung metastases after RARP. Disease progression was managed by high orchiectomy and cabazitaxel, even though the evidence of treatment effectiveness for rare variants of CRPC is limited.

Author contributions

Kisumi Kato: Conceptualization; data curation; visualization; writing – original draft. Jun Kamei: Conceptualization; methodology; project administration; writing – original draft.

Atsushi Yanase: Data curation; writing – review and editing. Hirotaka Yokoyama: Writing – review and editing. Toru Sugihara: Writing – review and editing. Satoshi Ando: Writing – review and editing. Yuka Hirota: Supervision; visualization; writing – review and editing. Naoki Sano: Supervision; visualization; writing – review and editing. Haruki Kume: Supervision; writing – review and editing. Tetsuya Fujimura: Supervision; writing – review and editing.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an Institutional Reviewer Board

The approval number is A19–199.

Informed consent

Written consent was obtained.

Registry and the Registration No. of the study/trial

Not applicable.

References

1 Karsiyakali N, Karabay E, Yucetas U, Koca SB, Akay AF, Kadihasanoglu M. The prostatic adenocarcinoma with mucinous features: a review of the literature with three case reports. *J. Cancer Res. Ther.* 2021; **17**: 596–8.

2 Osunkoya AO. Mucinous and secondary tumors of the prostate. *Mod. Pathol.* 2018; **31**: S80–95.

3 Bronkema C, Arora S, Sood A *et al.* Rare histological variants of prostate adenocarcinoma: a National Cancer Database Analysis. *J. Urol.* 2020; **204**: 260–6.

4 Epstein JI, Lieberman PH. Mucinous adenocarcinoma of the prostate gland. *Am. J. Surg. Pathol.* 1985; **9**: 299–308.

5 Zhao F, Yu X, Xu M *et al.* Mucinous prostate cancer shows similar prognosis to typical prostate acinar carcinoma: a large population-based and propensity score-matched study. *Front. Oncol.* 2019; **9**: 1467.

6 Samaratunga H, Delahunt B, Srigley JR *et al.* Mucinous adenocarcinoma of prostate and prostatic adenocarcinoma with mucinous components: a clinicopathological analysis of 143 cases. *Histopathology* 2017; **71**: 641–7.

7 Saito S, Iwaki H. Mucin-producing carcinoma of the prostate: review of 88 cases. *Urology* 1999; **54**: 141–4.

8 Krogh J, Georg LP. Mucinous adenocarcinoma of the prostate presenting as a Retrovesical cyst. *Scand. J. Urol. Nephrol.* 1988; **22**: 235–6.

9 Lane BR, Magi-Galluzzi C, Reuther AM, Levin HS, Zhou M, Klein EA. Mucinous adenocarcinoma of the prostate does not confer poor prognosis. *Urology* 2006; **68**: 825–30.

10 Osunkoya AO, Nielsen ME, Epstein JI. Prognosis of mucinous adenocarcinoma of the prostate treated by radical prostatectomy: a study of 47 cases. *Am. J. Surg. Pathol.* 2008; **32**: 468–72.

11 Ro JY, Grignon DJ, Ayala AG, Fernandez PL, Ordonez NG, Wishnow KI. Mucinous adenocarcinoma of the prostate: histochemical and immunohistochemical studies. *Hum. Pathol.* 1990; **21**: 593–600.

12 Guler OC, Onal C, Erbay G, Bal N. Prostate mucinous carcinoma treated with definitive radiotherapy and hormonal therapy: case report and review of the literature. *Clin. Genitourin. Cancer* 2014; **12**: e43–6.

13 Angelergues A, Maillet D, Fléhon A *et al.* Prostate-specific antigen flare induced by cabazitaxel-based chemotherapy in patients with metastatic castration-resistant prostate cancer. *Eur. J. Cancer* 2014; **50**: 1602–9.

14 Armstrong AJ, Eisenberger MA, Halabi S *et al.* Biomarkers in the management and treatment of men with metastatic castration-resistant prostate cancer. *Eur. Urol.* 2012; **61**: 549–59.

15 Scher HI, Morris MJ, Stadler WM *et al.* Trial design and objectives for castration-resistant prostate cancer: updated recommendations from the prostate cancer clinical trials working group 3. *J. Clin. Oncol.* 2016; **34**: 1402–18.

16 Gumus E, Yilmaz B, Miroglu C. Prostate mucinous adenocarcinoma with signet ring cell. *Int. J. Urol.* 2003; **10**: 239–41.