Case Report

Granulomatous prostatitis with high suspicion of prostatic adenocarcinoma on radiological imaging

Yoshiki Ambe,[1] Masaki Nakamura,[1] (iD) Norihide Shirakawa,[1] Hiroki Inatsu,[1] Ryo Amakawa,[1] Yasushi Inoue,[1] Tadashi Yoshimatsu,[1] Sakiko Miura,[2] Teppei Morikawa,[2] Masashi Kusakabe[3] and Yoshiyuki Shiga[1]

Departments of [1]Urology Shinagawa-ku, [2]Diagnostic Pathology, and [3]Radiology, NTT Medical Center Hospital, Shinagawa-ku, Japan

Abbreviations

MRI = magnetic resonance imaging
PET/MRI = positron emission tomography/magnetic resonance imaging
PI-RADS = prostate imaging-reporting and data system version 2
GP = granulomatous prostatitis
BCG = Bacillus Calmette-Guerin
mpMRI = multiparametric MRI
PSA = prostate-specific antigen
18F-FDG = fluodeoxyglucose-18F
ADC = apparent diffusion coefficients

Correspondence: Masaki Nakamura M.D., Ph.D., Department of Urology, NTT Medical Center Hospital, 5-9-22, Higashigotanda, Shinagawa-ku, Tokyo, 141-8625, Japan. Email: masakin64@gmail.com

Introduction: Granulomatous prostatitis is a benign inflammatory condition of the prostate that may mimic prostatic adenocarcinoma on magnetic resonance imaging findings. Even in the era of multiparametric magnetic resonance imaging, the differential diagnosis of granulomatous prostatitis from malignancy remains difficult.

Case presentation: A 69-year-old man with abnormal magnetic resonance imaging and positron emission tomography/magnetic resonance imaging findings, and a prostate-specific antigen value of 2.48 ng/mL underwent prostate needle biopsy. He had a history of urinary tract infection 3 months prior to presentation. Multiparametric magnetic resonance imaging showed low-intensity signals on T2-weighted images, slightly high-intensity signals on diffusion-weighted images, and low values on apparent diffusion coefficients. The prostate imaging-reporting and data system version 2 score was 3. Histological examination revealed granulomatous prostatitis.

Conclusion: For patients with preceding urinary tract infections, granulomatous prostatitis should be considered as a differential diagnosis, even when magnetic resonance imaging and positron emission tomography suggest prostatic adenocarcinoma.

Key words: apparent diffusion coefficient, granulomatous prostatitis, MRI, multiparametric MRI, PET, urinary tract infection.

Keynote message

Granulomatous prostatitis (GP) is a rare inflammatory condition of the prostate that may mimic adenocarcinoma on magnetic resonance imaging (MRI) and positron emission tomography (PET)/MRI findings. Low-intensity signals in the apparent diffusion coefficient and enhanced 18-FDG PET uptake cannot distinguish GP from adenocarcinoma. Urologists should consider GP to be a differential diagnosis of adenocarcinoma, especially in patients with a history of urinary tract infection.

Introduction

GP is a relatively rare inflammatory condition of the prostate. The incidence of GP in a cohort of prostate biopsies is reported to be 0.36%–1.86%.[1–3] GP can be classified into five groups: (i) idiopathic GP; (ii) infective (tuberculosis, syphilis, mycosis, etc.); (iii) malakoplakia; (iv) iatrogenic (transurethral surgery, BCG therapy); and (v) associated with systemic granulomatosis (Churg-Strauss syndrome, sarcoidosis, Wegener granulomatosis, etc.).[4] Histologically, GP is characterized by the presence of granulomas with aggregations of macrophages surrounded by mononuclear leukocytes and plasma cells.[5,6]

Although mpMRI for pre-biopsy diagnosis of prostate cancer has been established, differential diagnosis of GP from prostate cancer remains difficult.[7,8]

Here, we report a case of GP that was highly suspected of prostate cancer on mpMRI and PET/MRI.
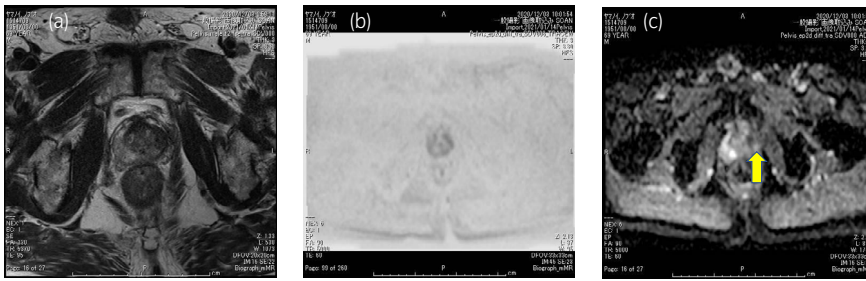
Fig. 1 Multiparametric MRI images of the prostate. (a) T2 weighted image. (b) Diffusion weighted image. (c) Apparent diffusion coefficient image. Yellow arrow points low value area in the left peripheral zone.

Case presentation

A 69-year-old man was referred to our hospital with abnormal findings on prostate MRI and 18F-FDG PET/MRI. He underwent thorough private medical check-up at another hospital, and 18F-FDG PET/MRI was included in the program. PSA was 2.85 ng/ml, and his other blood test results were normal. He had dysuria with pyuria, and body temperature of 38 three months prior and treated at another hospital. Results of urine test and urine culture were not available. The patient had neither additional medical history nor family history of prostate cancer. He had smoked twenty cigarettes a day for 40 years (Brinkman Index = 800) and ceased when he was 60-years old. He drinks a glass of wine four times per week.

MRI showed low-intensity signals in the left peripheral zone on T2-weighted images (Fig. 1a). The lesion showed slightly high-intensity signals on diffusion-weighted images (Fig. 1b), and low values on ADC (Fig. 1c). The ADC score was 453 mm/s^2. The PI-RADS score was 3. PET/MRI showed 18F-FDG uptake in the same lesion (Fig. 2).

The patient underwent a transrectal prostate biopsy. The result of urine test before biopsy was as follows; pH 6.5, proteinuria (−), glycosuria (−), occult blood (−), red blood cells 1–4/high power field, white blood cells <1/high power field. The prostate was stony hard in the left lobe and had a smooth surface on digital rectal examination. Ultrasound sonography examination revealed low echoic lesion on the left peripheral zone (Fig. 3). The prostate size was 19.7 cm^3. The PSA density (PSA value divided by the prostatic volume) was 0.144. Ten systematic biopsies and two additional
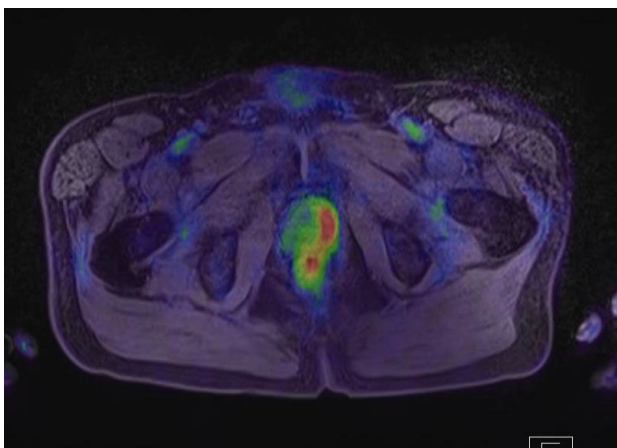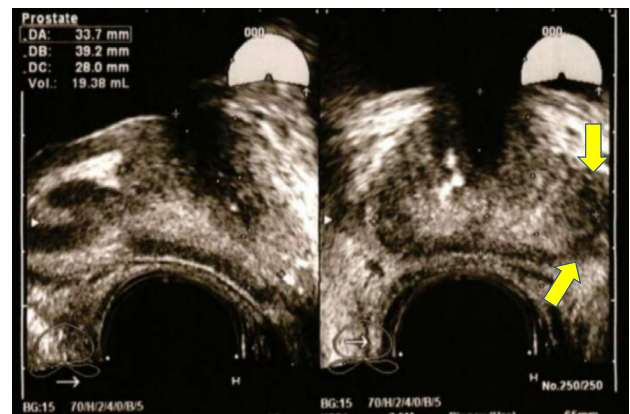

Fig. 3 Ultrasound sonography image of the prostate. Yellow arrows point low echoic lesion in the left peripheral zone.

target biopsies of the left peripheral zone were performed. Isepamicin sulfate 200 mg were injected into muscle prior to biopsy, followed by oral administration of tosufloxacin tosilate hydrate 450 mg a day for 3 days.

Histologically, epithelioid cell granulomas with caseous necrosis and scattered Langhans giant cells were observed only in the cores from the left peripheral zone (Fig. 4a). Carcinoma was not found. By immunohistochemistry, epithelioid cells were positive for CD68 (histiocyte marker) (Fig. 4b), and negative for cytokeratin AE1/AE3 (epithelial marker) (Fig. 4c). Microorganisms were not detected on special stainings.

Discussion

GP was first described by Tanner and McDonald in 1943.[9] According to the classification of GP, our case was infectious GP.[4] Clinically, patients with GP may present with a stony hard prostate on digital rectal examination with normal to elevated serum PSA levels. With these features, it is quite difficult to differentiate it from prostate adenocarcinoma.

Recently, prebiopsy mpMRI has become a standardized examination. Benign prostatic abnormalities that mimic adenocarcinoma on MRI findings include GP, post-biopsy hemorrhage, benign prostatic hyperplasia nodules, and acute and chronic prostatitis. The typical mpMRI findings of GP are as follows: (i) low-intensity signals on T2 weighted images, (ii) high-intensity signals on diffusion-weighted images, (iii) low values on ADC, and (iv) contrast media enhancement on the rim of the granuloma. The ADC score was reported as low
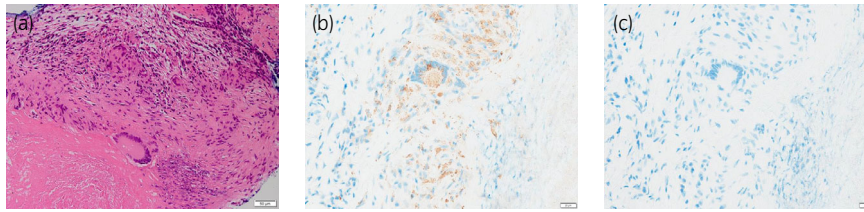

Fig. 2 18-FDG PET/MRI image of the prostate.

Fig. 4 Histopathological image (hematoxylin and eosin staining) of the biopsy specimen from the left peripheral zone. (a) Immunohistochemical image (CD68) of the biopsy specimen from the left peripheral zone. (b) Immunohistochemical image (cytokeratin AE1/AE3) of the biopsy specimen from the left peripheral zone. (c) Immunohistochemical image (cytokeratin AE1/AE3) of the biopsy specimen from the left peripheral zone.

(1051.0 $\pm$ 164.2 mm/s^2), but higher than that of prostatic adenocarcinoma (791.66 $\pm$ 128.6 mm/s^2).[10] In our case, the ADC score was 453 mm/s^2. Discrepancy between low ADC values and slightly high-intensity signals on DWI could be explained by extremely low-intensity signals on T2 weighted images (as low as skeletal muscle) (i.e., T2 blackout). The PI-RADS is commonly used to score prostate mpMRI, and in our case, the PI-RADS score was 3.

The efficacy of PET/MRI in the diagnosis of GP remains controversial. Thirty-five percent of BCG-treated bladder cancer patients showed uptake on 18F-PET/CT, and GP was assumed to be the potential cause of this 18F-FDG uptake.[11] Although there are few reports on PET uptake in GP patients without a history of BCG treatment, PET/MRI is prone to false positives in the diagnosis of GP.

Once GP is suspected, administration of antibiotics targeting the pathogen for one to two weeks is the standard of care. In case a patient had a history of urinary tract infection prior, we should consider urine culture and administration of antibiotics before we proceed to perform prostate biopsy. Negative conversion of urine culture could be an indicator when to plan prostate biopsy.

Conclusion

In cases with a preceding history of urinary tract infection and suspicion findings of prostatic adenocarcinoma on mpMRI, the possibility of GP should be considered.

Acknowledgment

Ethical statement

Written informed consent for publication was obtained from the patient.

Author contributions

Yoshiki Ambe: writing-original draft. Masaki Nakamura: writing-original draft, writing-review and editing, supervision. Norihide Shirakawa: writing-review and editing. Hiroki Inatsu: writing-review and editing. Ryo Amakawa: writing-review and editing. Yasushi Inoue: writing-review and editing. Tadashi Yoshimatsu: writing-review and editing. Teppei Morikawa: writing-review and editing. Masashi Kusakabe: writing-review and editing. Yoshiyuki Shiga: supervision.

Conflict of interest

The authors declare no conflict of interest.

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