Overcoming challenges: magnetic resonance imaging in the detection and monitoring of rare prostate involvement in granulomatosis with polyangiitis

Sirs,

Granulomatosis with polyangiitis (GPA) is a systemic granuloma vasculitis predominantly affecting small- and medium-sized blood vessels, typically associated with cytoplasmic anti-neutrophil cytoplasmic antibodies (c-ANCA). Commonly affected areas include the kidneys, lungs, upper respiratory tract and peripheral nerves (1). Prostatic involvement, however, is exceedingly rare. This report presents a case of GPA with prostate involvement.

A 53-year-old man presented with a nine-month history of rhinorrhoea, headache and urinary symptoms, including urinary frequency and urgency. Computed tomography (CT) revealed a mass in the maxillary sinus. Surgical pathology from this lesion indicated 'inflammatory granuloma', but his symptoms persisted post-operatively. He subsequently presented to our department.

Laboratory investigations revealed an elevated erythrocyte sedimentation rate (ESR) of 98 mm/h and C reactive protein (CRP) of 38 mg/L. Urinalysis indicated 300-350 white blood cells per high-power field, with negative bacterial cultures. Serology was positive for PR3-ANCA (92 RU/ml;) and c-ANCA (titer 1:10). Head magnetic resonance imaging (MRI) showed multiple sinusitis with an inflammatory mass in the left maxillary sinus. Chest CT demonstrated multiple solid nodules in both lungs.

Based on these findings, a diagnosed of GPA was established. However, the cause of his persistent urinary symptoms remained unclear, particularly given the lack of response to multiple antibiotic regimens (including levofloxacin, fosfomycin, cefradine, faropenem and fluconazole), suggesting a non-infectious aetiology.

Prostate gadolinium-enhanced MRI revealed irregular widening of the urethra, and multiple lesions. These lesions exhibited iso-intensity on T1-weighted images, slightly elevated signal on T2-weighted images, high signal on diffusion-weighted imaging (DWI), and enhancement on contrast-enhanced scans (Fig. 1). Biopsies of the maxillary sinus and prostate revealed granulomatous inflammation, vasculitis, abscess formation, and necrosis, with negative prostate tissue cultures.

Treatment was initiated with methylprednisolone (40mg daily) and cyclophosphamide (0.4g intravenously every other week). The patient demonstrated marked symptomatic improvement within three months, with symptoms predominantly resolved by six months. Follow-up imaging revealed complete resolution of the maxillary sinus mass and pulmonary nodules. Repeat prostate MRI showed a gradually shrinking prostate gland, with resolution of the previous inflammatory signals (Fig. 1).

Prostatic involvement in GPA is rare, with only about 50 cases reported globally among hundreds of thousands of GPA cases (2-4). A 2019 systematic review summarised the clinical manifestations, treatments and outcomes of 46 PGA patients with prostatic involvement (4), that can occur at any stage of GPA, with urinary symptoms as the first sign in 26.1% of cases. The symptoms include irritative voiding (frequency, urgency), haematuria, dysuria and acute urinary retention. ENT and lung involve-

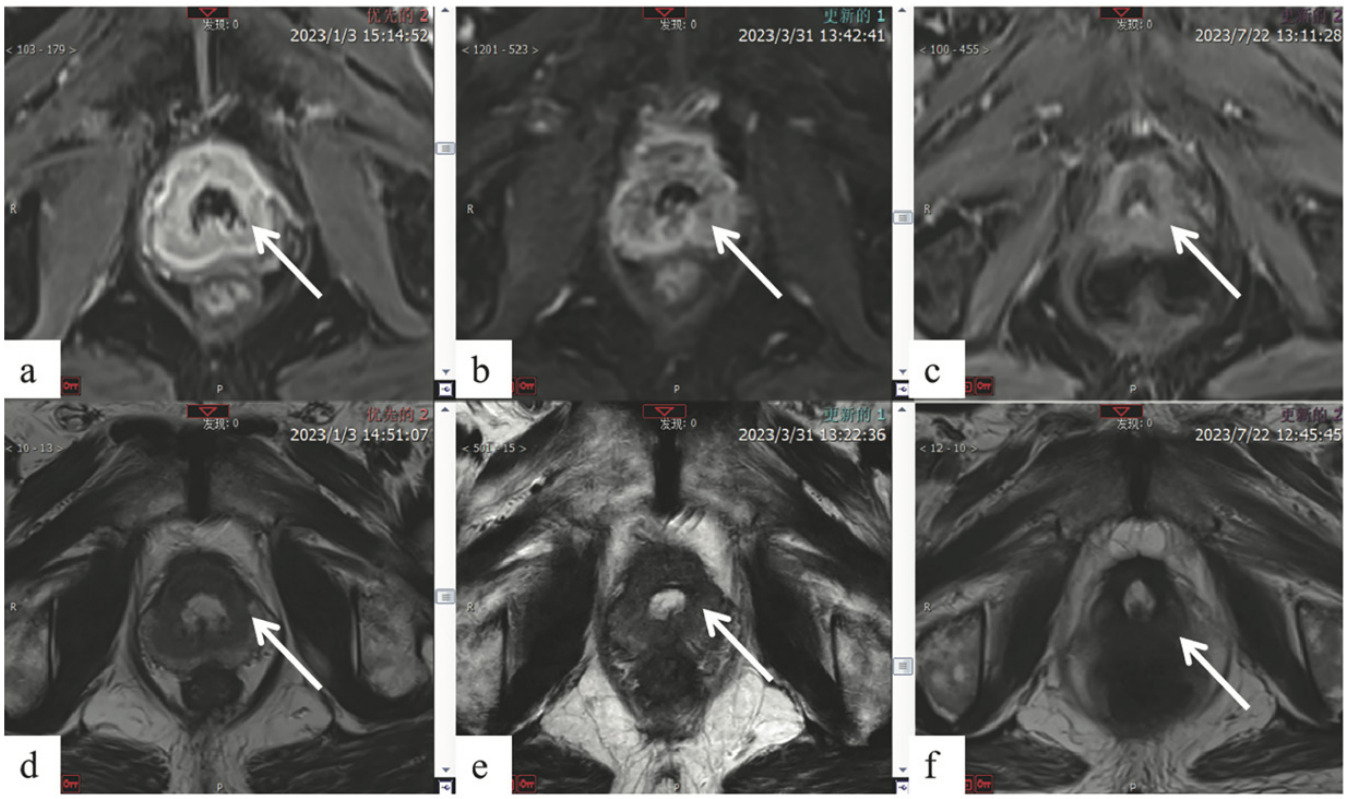

Fig. 1. Prostate MRI evolution before and after treatment for granulomatosis with polyangiitis.
a. Pre-treatment axial enhanced T1-weighted images (T1WI+C): Shows diffuse prostatic enlargement with marked heterogeneous enhancement (arrow); **b.** Axial T1WI+C at 3 months post-treatment: Significant reduction in prostatic enhancement (arrow), though mild residual enhancement and enlarged prostate persists. **c.** Axial T1WI+C at 6 months post-treatment: the previously enlarged prostate demonstrates significant volume reduction. Enhancement is markedly reduced and near-normal (arrow).
d. Pre-treatment axial T2-weighted image (T2WI): diffuse prostatic enlargement with mildly hyperintense signal(arrow). **e.** Axial T2WI at 3 months post-treatment: the prostate remains enlarged, continuing to show mildly hyperintense signal (arrow). **f.** Axial T2WI at 6 months post-treatment: The reduced-size prostate now exhibits predominantly low (hypointense) signal intensity (arrow), indicating resolution of the inflammatory process.

ment rates were similar to the general GPA population. Renal involvement was less common in prostatic GPA (22%) *versus* non-prostatic cases (40-100%). Diagnosis was nearly always confirmed by biopsy. The most frequent treatment combined glucocorticoids and cyclophosphamide, resulting in generally favourable outcomes.

Imaging characteristics of prostatic GPA are sparsely documented. CT scans may show prostate enlargement with abscess formation (5). MRI findings can include an enlarged prostate with lobular lesions exhibiting irregular margins and fluid collection (6, 7). In our case, MRI demonstrated diffuse inflammatory changes without discrete abscesses formation, potentially related to the shorter disease duration. Additionally, hypermetabolic enlargement of the prostate on PET-CT has been reported in two cases (8, 9).

This case contributes to the literature by offering the first longitudinal characterisation of prostate MRI findings in GPA. It highlights the utility of prostate MRI as a valuable non-invasive diagnostic tool for evaluating prostate involvement in GPA patients presenting with unexplained lower urinary tract symptoms and negative pathogen tests. Moreover, it supports its role of MRI in monitoring treatment response.

Acknowledgments

We gratefully acknowledge the doctors' contributions of Wei Wang (Department of Pathology), Bo Zheng (Department of Infectious Diseases), and Derun Li (Department of Urology) to the diagnostic evaluation of this case.

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Competing interests: none declared.

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