

Thinking Beyond Adenocarcinoma of Prostate: A Case Series of T2W Hyperintense Prostatic Lesions

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ABSTRACT

The T2-weighted (T2W) sequences form an integral part of multiparametric Magnetic Resonance Imaging (MRI) protocol performed for evaluation of the prostate. Most commonly encountered prostatic pathologies are adenocarcinoma and benign prostatic hyperplasia, which are mostly T2W hypointense and heterogeneously hypointense, respectively. Apart from prostatic cysts, only a small proportion of prostatic lesions demonstrate predominantly high signal intensity on T2-weighted sequences. Herein, the authors present three such cases with T2W hyperintense prostatic lesions. The first case (60-year-old male) was a prostatic abscess, which apart from T2W hyperintensity, showed central restricted diffusion and peripheral enhancement. The second case (40-year-old male) was a cystic lesion in left side of prostate, which was an ectopic ureterocele opening into the prostatic urethra with associated left renal agenesis. The third case (35-year-old male) was of a metastatic prostatic malignancy, which was a rare prostatic sarcoma. Radiologists should be cognizant of such conditions so as to enable them to make accurate diagnosis and guide appropriate patient management.

Keywords: Benign prostatic hyperplasia, Ectopic ureterocele, Prostatic abscess, Prostatic sarcoma, T2-weighted

INTRODUCTION

Multiparametric Magnetic Resonance Imaging (MRI) is the imaging modality of choice for prostate imaging. Patients suspected to have prostatic cancer based on Digital Rectal Examination (DRE) and raised Prostate Specific Antigen (PSA) are evaluated with multiparametric MRI. T2 Weighted Imaging (T2WI) is the workhorse sequence for Transitional Zone (TZ) lesions; and Diffusion-Weighted Imaging (DWI) for Peripheral Zone (PZ) lesions as per Prostate Imaging-Reporting and Data System version 2.1 (PI-RADS v2.1) [1].

Most common lesion of prostate in elderly males is Benign Prostatic Hyperplasia (BPH), which has a heterogeneously hypointense whorled appearance with intact hypointense pseudocapsule on T2WI [2]. Second most common lesion is adenocarcinoma of prostate, which is also hypointense on T2WI with diffusion restriction. Prostatic lesions which are hyperintense on T2WI are less frequently encountered. Their differentials include granulomatous prostatitis/abscess, cysts, postbiopsy haemorrhage, and malignancies like prostatic sarcoma [3-5].

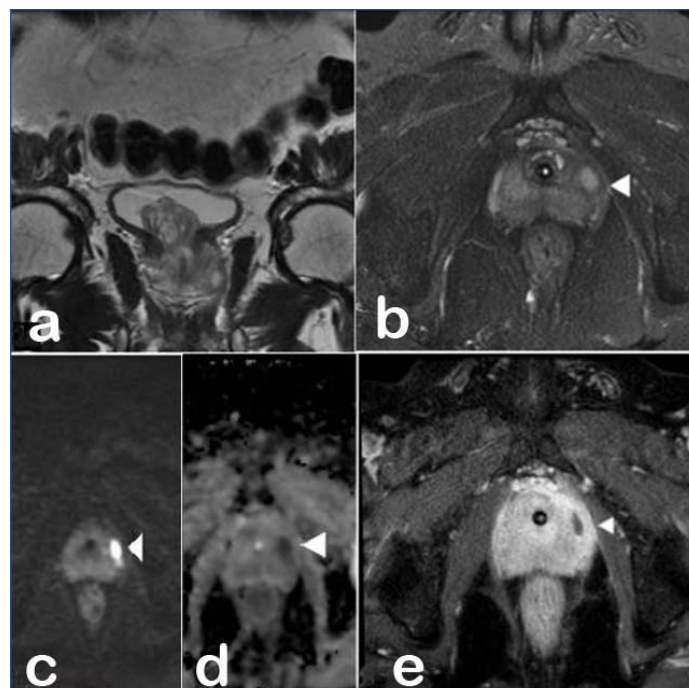
CASE SERIES

Case 1

A 60-year-old male presented to Urology Outpatient Department (OPD) with prostatism for one year; with exacerbation of symptoms with increased frequency and dysuria for the past two weeks. He was a known case of type 2 diabetes mellitus, controlled on oral hypoglycaemics for the past 15 years. He had no other significant medical or family history.

The DRE revealed painful firm lesion in the left side of prostate. PSA was 9 ng/mL. Multiparametric MRI revealed increased volume of prostate with obstructive changes in bladder. BPH nodule was present in TZ at prostatic base, bulging into the base of Urinary Bladder (UB). Left PZ at apex showed another T1WI hypointense, T2WI hyperintense lesion with periprostatic fat stranding. The nodule had shaggy wall with central restricted diffusion. Dynamic Contrast Enhanced (DCE) images showed peripheral enhancement and raised periprostatic vascularity [Table/Fig-1]. As per the PI-RADS lexicon, a DWI score of 4 was assigned to this lesion but could not assign

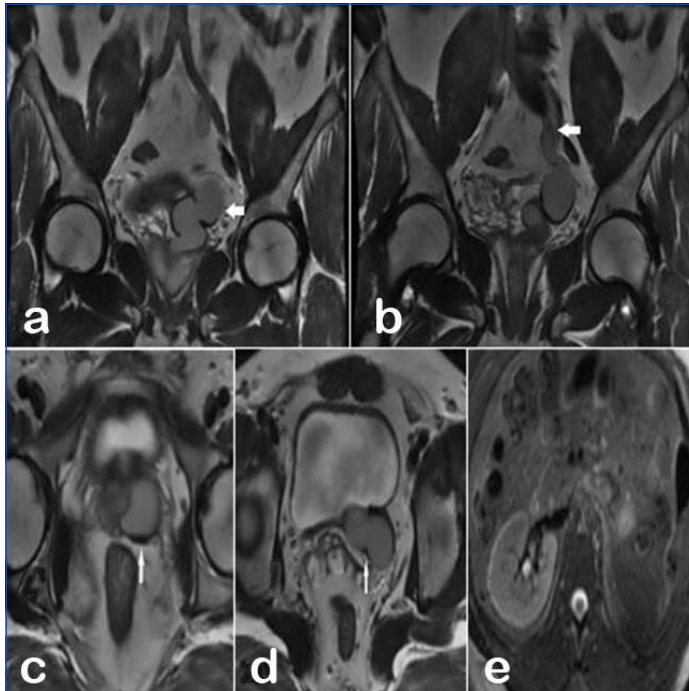
any T2WI score as the nodule was hyperintense. DWI being the chief determinant of PI-RADS score for PZ lesions, the overall PI-RADS score of the lesion was also 4; fallaciously implying high likelihood of clinically significant prostate cancer. However, in view of central diffusion restriction and peripheral enhancement, a diagnosis of a prostatic abscess was established. This was confirmed by purulent material obtained on Transrectal Ultrasound (TRUS) guided aspiration; with growth of *Staphylococcus aureus* on pus culture. Patient was subsequently managed with intravenous vancomycin 1 g twice daily for five days. The patient improved clinically, urine culture was sterile, and serial PSA levels showed a declining trend. The patient was advised conservative management for BPH at time of discharge.



[Table/Fig-1]: Multiparametric MRI of prostate. a) Coronal T2W image shows prostaticomegaly with median lobe hypertrophy. The left PZ at apex shows a focal lesion (white arrowhead) which is hyperintense on axial T2W image; b) Shows central restricted diffusion; c) Is markedly hypointense on ADC map; d) Shows peripheral rim enhancement; e) Suggestive of a prostatic abscess.

Case 2

A 40-year-old male patient presented with mild to moderate intensity dull aching pain in the left flank for three months. The pain was partially relieved with analgesics; and was not aggravated with movement or respiration. DRE revealed soft prostatic lesion with PSA of 4 ng/mL. Sonography revealed a cystic lesion in the left side of prostate. The right kidney and urinary bladder appeared normal. However, left kidney was not visualised in normal or ectopic locations. MRI revealed a T2WI hyperintense serpiginous lesion in left PZ extending into periurethral region, with no restricted diffusion or enhancement. The lesion was separate but adjacent to left seminal vesicle [Table/Fig-2].



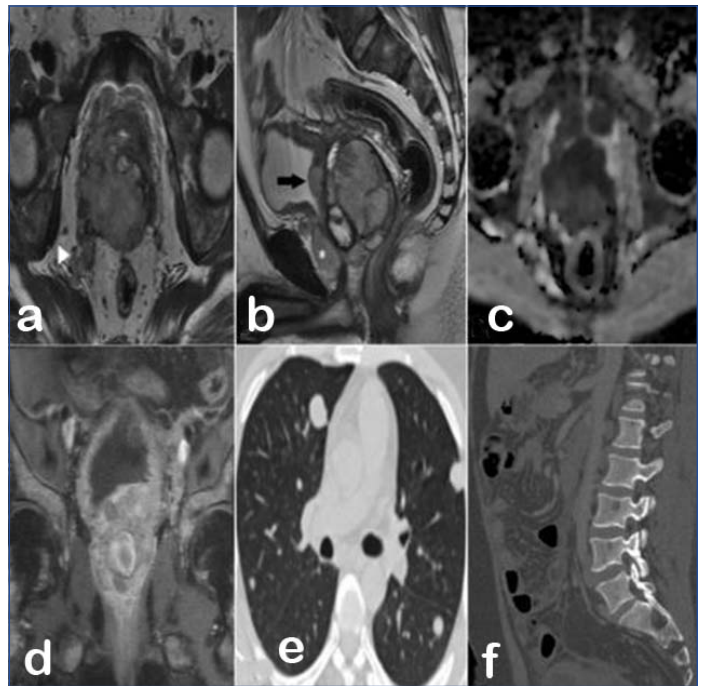
[Table/Fig-2]: a, b) Coronal T2W images show a hyperintense serpiginous lesion (white arrow) in a left PZ of prostate b) Cranially extending along the expected course of left ureter. (c, d, e) Axial T2W images show the serpiginous lesion extending to the periurethral region (c, d) with non visualised left kidney (e).

Differentials of ejaculatory duct cyst and ectopic ureterocele were established. However, ejaculatory duct was seen separately and appeared normal. Also, the lesion was seen following the expected course of left ureter till L2 level; but the left kidney was not visualised at its cranial extent indicating it was an ectopic ureterocele with left renal agenesis. The patient underwent left ureterectomy and ureterocele excision. No identifiable renal tissue was found on histopathological examination of the proximal blind end of excised left ureter. Patient had an uneventful postoperative course; and remained asymptomatic on six month follow-up after surgery.

Case 3

A 35-year-old male presented to Urology OPD with bladder outlet obstruction and haematochezia for two months. DRE revealed a firm to hard prostatic mass. Serum PSA was 4 ng/mL. Clinical suspicion of cancer prostate was considered. Multiparametric MRI revealed a large mass arising from prostate which was heterogeneously hyperintense on T2WI with intralesional haemorrhage. It showed restricted diffusion with heterogeneous postcontrast enhancement. There was extracapsular extension of the mass with involvement of bilateral seminal vesicles, neurovascular bundles, urinary bladder, lateral pelvic wall, anterior wall of rectum, with tumour thrombus in right internal iliac vein. Multiple focal lesions were present in pelvic bones and vertebrae. Contrast-enhanced Computed Tomography (CT) of the chest and abdomen was done for staging purposes. It additionally revealed pulmonary and hepatic metastasis; mediastinal, left supraclavicular and retroperitoneal lymphadenopathy; ascites

and omental smudging; with subtle lytic osseous lesions [Table/Fig-3].



[Table/Fig-3]: a) Axial T2W image shows a heterogeneously hyperintense prostatic mass involving both peripheral and transition zones, invading the right internal iliac vein (white arrowhead); b) Sagittal T2W image shows loss of fat plane between mass and lower rectum, extension of mass around the posterior urethra (asterisk) and invasion of the posterior wall of bladder (black arrow); c) Axial Apparent Diffusion Coefficient (ADC) map shows diffusion restriction within the mass; d) Coronal postcontrast T1W image shows multifocal enhancing pelvic bone lesions; e) Axial CT thorax (lung window) shows pulmonary metastasis; f) Sagittal CT reformat in bone window shows lytic vertebral metastasis.

Prostatic adenocarcinomas are usually seen in the geriatric age-group, are classically T2W hypointense with sclerotic bone metastasis; whereas this mass had high T2W signal with lytic bone metastasis. Therefore, rarer malignancies such as prostatic sarcoma, desmoplastic round cell tumour and prostatic lymphoma were the considered differentials. TRUS-guided biopsy confirmed that it was a prostatic stromal sarcoma with neuroectodermal differentiation. The patient was initiated on chemotherapy but did not respond and expired shortly thereafter.

DISCUSSION

Current state-of-the-art multiparametric MRI has dramatically improved the detection and characterisation of prostatic lesions. Adenocarcinoma is the most common malignancy of prostate but patients may have other benign or malignant lesions which can be diagnosed with MRI [4].

The first case in the present series was a patient with prostatic abscess in left PZ with Benign Prostatic Hyperplasia (BPH) nodule. Prostatic abscess develop as a complication of prostatitis caused by *Escherichia coli*, *Staphylococcus* or *Gonococcus*, mainly seen in patients with immunocompromised status or bladder outlet obstruction [6]. Generally the presenting features are perineal pain with dysuria [6]. MRI features of prostatic abscess in the present case was hyperintensity on T2WI with peripheral enhancement and central restricted diffusion which was similar to cases reported by Singh P et al., study. In both the cases reported by them, one a 22-year-old male with multiple small PZ lesions, and another a diabetic 62-year-old male patient with a single lesion in central gland of left midzone, the prostatic abscess appeared hyperintense on T2WI with central diffusion restriction and peripheral postcontrast enhancement [6]. Another study also reported a case of a 73-year-old diabetic patient with dysuria who had multiple prostatic abscess. His MRI revealed prostatomegaly with heterogenous glandular signal. The prostatic abscess appeared as multiple round cystic

lesions on T2W sequence, with ring enhancement on postcontrast T1W sequences [7]. Additionally, Ren J et al., reported presence of air foci in prostatic abscess; however, this was not present in our case [3]. The patient underwent pus drainage with intravenous antibiotics with clinical improvement; no follow-up imaging was warranted.

Second case was an adult male with left flank pain and MRI revealed dilated tortuous left ureter with an ectopic ureterocele and left renal agenesis. Renal agenesis results from failure of induction of metanephric blastema by ureteral bud. The dilated tubular structure seen at MRI in our case is the blind ending ureteral remnant which has an ectopic insertion with an ectopic ureterocele. These structures are thought to arise either from supernumerary ureteric buds or from lack of normal connection between the ureteric bud with metanephrogenic cap [8]. Findings in our case were similar to other case reports by Mohseni MG et al., and Ahmed A, though their patients did not undergo MRI for assessment and their patients had orthotopic ureteroceles [8,9]. In the former case, a 32-year-old male patient with left lower quadrant pain was found to have left renal agenesis with a solid, cystic non enhancing retrovesical mass on CT. Surgery confirmed cranial blind ending left ureter and revealed retrovesical mass to be a pyoureterocele [8]. In the latter case, a 30-year-old male with left flank pain and recurrent urinary tract infection, was found to have absent left kidney, left megaureter with proximal blind end and distal ureterocele on CT [9]. Another case reported by Bhayana A and Jain S, had similar features, albeit on the right side. The 20-year-old male patient had right ectopic ureterocele appearing as T2 hyperintense lesion opening into the prostatic urethra, with proximal blind end and ipsilateral renal agenesis [10].

Third case was that of a malignant prostatic stromal sarcoma with neuroectodermal differentiation. Prostatic sarcoma is a rare entity accounting for 0.1-0.2% of all primary prostatic neoplasms, and stromal sarcoma is even rarer. Rhabdomyosarcomas occur primarily in children and adolescents [11-13], whereas leiomyosarcomas occur in older men [14,15]. MRI features of prostatic sarcoma have been less commonly described due to its rare occurrence. It presents as large infiltrative mass in elderly patients, which is hypointense on T1W, heterogeneously hyperintense on T2WI, with heterogenous postcontrast enhancement due to necrosis [4,13]. These masses can be differentiated from adenocarcinoma on the basis of normal PSA level, mass being more infiltrative and hyperintense on T2WI with osteolytic bony metastasis and distant metastasis to lung and liver [13]. These radiological features were consistent with our case [13]. Tamada T et al., also reported a similar case of prostatic stromal sarcoma in a 26-year-old male. The tumour appeared as a multinodular mass with hyperintense T2W signal, diffusion restriction and heterogenous enhancement. Their patient also had haematogenous dissemination of malignancy with bone, lung and liver metastasis. The patient had a rapid downhill course and expired seven months after admission [16]. Neuroectodermal differentiation in prostatic stromal sarcoma is extremely rare. Yamazaki H et al., also described another case of prostatic sarcoma with neuroectodermal differentiation. However, they mainly focused on pathological and immunohistochemical findings; MRI findings were not discussed in detail [17].

Other neoplasm that can mimic prostatic sarcoma is desmoplastic round cell tumour, seen in young males of 15-25 years. It presents as single or multiple intraperitoneal soft tissue masses without an apparent organ of origin. The primary tumour usually arises in the retrovesical space and has necrosis and calcific foci along with extensive peritoneal implants and lymphadenopathy [18,19]. Thus, it was our second differential; however, lung and liver metastasis in our case made this less likely. Prostatic lymphoma also presents in older age group; most are Non Hodgkin's Lymphoma (NHL) [20]. They are typically homogeneously isointense on T1WI and

T2WI, rarely have haemorrhage and necrosis, and show moderate homogeneous postcontrast enhancement [21]. Imaging findings in our case was different from these. The radiological differentials of T2 hyperintense prostatic lesions is summarised in [Table/Fig-4].

Diagnosis and differentials	Key imaging features
Case 1: Prostatic abscess T2 hyperintense, central diffusion restriction, rim enhancement	
Differentials	
Mullerian duct or prostatic utricle cysts	Midline location. Infected cysts closely resemble abscess.
Prostatic retention cysts	Unilocular, smooth-walled, simple cysts. No diffusion restriction or enhancement.
Cystic degeneration of BPH	Located in transition zone, other features of BPH present.
Cystic prostatic carcinoma	Wall nodularity or solid components usually present, restriction in nodules or solid components not in central cystic part.
Cavitary prostatitis	Multiple small cysts scattered through the gland with "Swiss cheese" appearance
Case 2: Ectopic ureterocele, blind ureteral remnant with ipsilateral renal agenesis	
Differentials	
Zinner syndrome	Triad of ejaculatory duct obstruction, ipsilateral seminal vesicle cyst and ipsilateral renal agenesis. Obstructed ejaculatory cyst does not follow the expected course of ureter.
Case 3: Prostatic sarcoma Large infiltrative prostatic mass, serum PSA usually normal, heterogenous hyperintense T2WI signal and enhancement, osteolytic bone metastasis, haematogenous spread to lungs and liver	
Differentials	
Adenocarcinoma	Elevated PSA, T2 hypointense, sclerotic bone metastasis.
Lymphoma	Older age group, serum PSA usually normal, homogeneously isointense on T1W and T2WI, homogenous contrast enhancement, haemorrhage and necrosis rare
Desmoplastic round cell tumor	Multiple peritoneal soft tissue masses without definite organ of origin, retrovesical location involvement. Abdominopelvic lymphadenopathy, ascites, liver and lung metastasis are common. Calcification in around 20% cases.

[Table/Fig-4]: Radiological differentials of T2 hyperintense prostatic lesions.

CONCLUSION(S)

Although adenocarcinoma is the most commonly evaluated prostatic pathology on multiparametric MRI, radiologists should be aware of other alternative differentials, especially when encountering prostatic lesions which are hyperintense on T2W sequences.

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