Case Series

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Radiology Section

MR Characteristics of Prostate Stromal Sarcoma: A Series of Four Cases

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ABSTRACT

Prostate stromal sarcoma is a rare neoplasm arising from the stromal component of the prostate. The clinical symptoms of prostatic sarcoma and prostatic adenocarcinoma are similar. It differs from more common prostatic adenocarcinoma in terms of age of presentation, biological behaviour, and imaging appearance. Magnetic Resonance Imaging (MRI), including Diffusion-Weighted Imaging (DWI), is the modality of choice for lesion characterisation, assessment of local extent, and surgical planning. We are presenting a case series of four patients presenting with lower urinary tract symptoms, including urinary urgency, frequency, dysuria, and pelvic pain, all of whom had normal serum Prostate-Specific Antigen (PSA) levels. MRI demonstrated a large T2-weighted hyperintense mass with internal cystic changes and marked diffusion restriction on DWI. The lesion appeared predominantly well-defined, with areas of heterogeneity corresponding to cystic or necrotic components. On Apparent Diffusion Coefficient (ADC) maps, these regions showed low signal intensity, consistent with true diffusion restriction, suggestive of high cellularity.

Keywords: Diffusion weighted imaging, Digital rectal examination, Magnetic resonance imaging, Prostate specific antigen

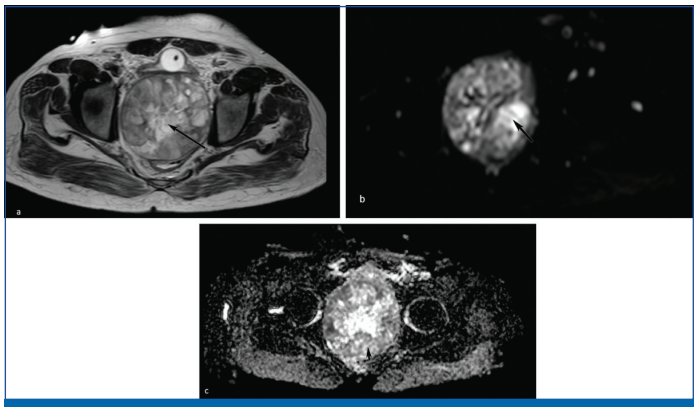
INTRODUCTION

Tumours arising from prostatic stroma are uncommon and form 0.1% to 0.2% of all primary prostatic neoplasms [1]. Rhabdomyosarcoma of the prostate is more common in the adolescent age group [2]. Stromal sarcomas are usually rapidly growing, locally aggressive and show early local invasion [3].

CASE SERIES

Case 1:

A 49-year-old male presented with increased frequency and urgency of urine for two months. The patient was on antihypertensive drugs for the last six years and had no significant family history. Urine routine examination was normal. On Digital Rectal Examination (DRE), the prostate was noted to be firm to hard, non-tender and freely mobile. His serum PSA level was within normal limits (1.3 ng/mL). Baseline screening was done with ultrasonography of the pelvis, which revealed a significantly enlarged (360 mL) heterogeneous prostate with multiple internal nodules and cystic changes. MRI revealed a large, relatively well-defined mass measuring 108×89×96 mm. Mass appeared heterogeneously hyperintense on T2-weighted images and isointense on T1-weighted images with internal cystic and necrotic areas. Mass was involving almost entire prostate gland and bilateral seminal vesicles. A well-defined T2W hypointense pseudocapsule was also seen. The mass was seen displacing the prostatic urethra and urinary bladder anteriorly. Few internal solid areas showed mild-to-moderate hyperintensity on diffusion-weighted images, with corresponding moderate hypointensity on the ADC map [Table/Fig-1]. Internal cystic areas were not showing diffusion restriction. Heterogeneous post-contrast enhancement noted within the solid part on post-contrast images. No rectal and urinary bladder invasion was seen. A Transrectal Ultrasound (TRUS) guided biopsy was done, which revealed leiomyosarcoma on histopathology. The tumour was staged as T2cN0Mx according to the TNM staging system, based on MRI findings. The patient underwent surgery for tumour removal and is recovering well.

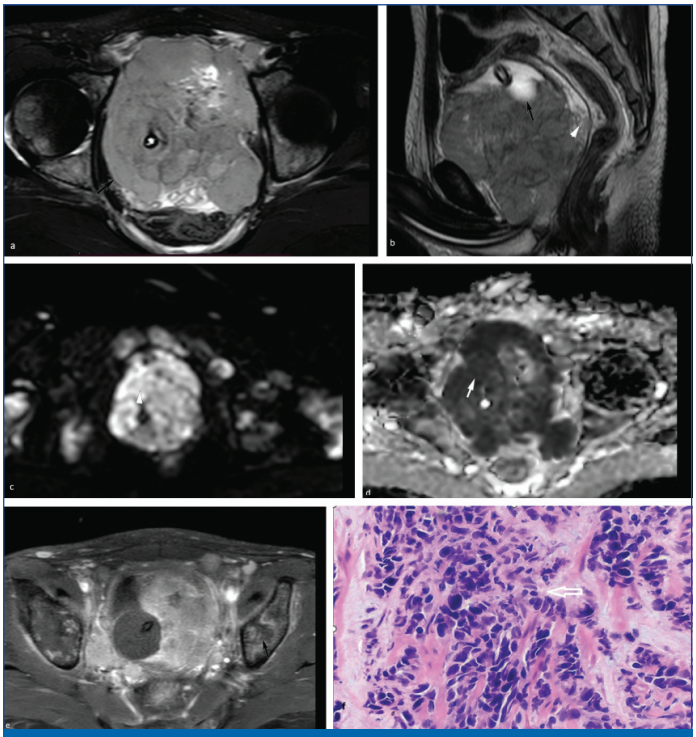


[Table/Fig-1]: a) T2W axial showing a heterogeneous hyperintense mass with internal cystic changes (black arrow) and anterior displacement of urinary bladders; b,c) hyperintensity on DWI with corresponding hypointensity on ADC map (as shown by black arrow).

Case 2:

A 17-year-old young male presented with complaints of urinary retention and haematuria since last one year. There was no family history of malignancy reported by the patient. Urine microscopy revealed numerous red blood cells with no significant pyuria or casts. DRE revealed a large irregular firm-to-hard prostatic mass with restricted mobility. His serum PSA level was normal (0.8 ng/mL). Ultrasonography revealed a significantly enlarged prostate with altered echotexture, irregular margins, significantly increased vascularity on colour doppler, and a few enlarged pelvic lymph nodes. MRI demonstrated a large lobulated mass measuring 98×89×97 mm showing intermediate to hyperintense signal on T2-weighted image and isointense signal on T1-weighted image. The mass was noted to involve the near-complete prostate gland, with only relative preservation of the apex region on the right-side. The mass was showing extra-prostatic extension to involve bilateral neurovascular bundles with infiltration of urinary bladder and the prostatic urethra. Laterally the mass is showing extension up to pelvic wall with few enlarged lymph nodes along bilateral external and internal iliac vessels. Bilateral seminal vesicles are not visualised separately. The lesion was markedly hyperintense on DWI

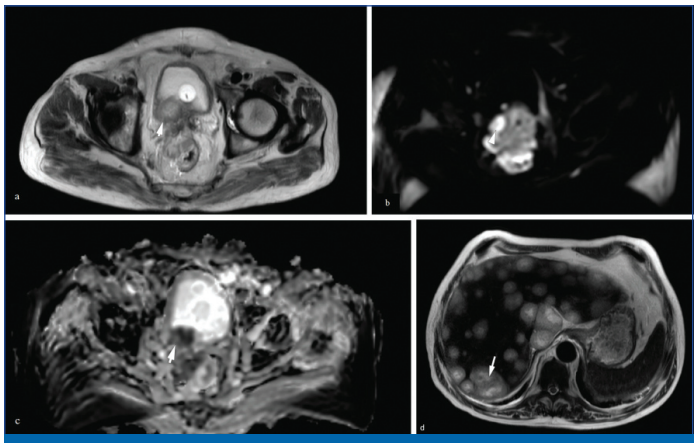
with corresponding markedly hypointense signal on ADC map. The mass was showing heterogeneous post-contrast enhancement. An enhancing nodule was also noted anterior to left obturator externus. Multiple T2W hyperintense lesions in the pelvic bones and lower lumbar vertebrae were showing diffusion restriction and post-contrast enhancement suggestive of metastasis [Table/Fig-2]. Histopathology report of TRUS guided biopsy confirmed the diagnosis of alveolar rhabdomyosarcoma. The tumour was staged as T4N1M1a according to the TNM staging system. The patient was treated with multimodal therapy consisting of systemic chemotherapy along with radiotherapy for local disease control. Management was planned in view of the metastatic nature of the disease.



[Table/Fig-2]: a) T2W axial image showing lobulated isointense to prostatic hyperintense mass; b) T2W sagittal images showing infiltration of urinary bladder (as shown by black arrow) and extension into pre-rectal space (as shown by white arrow); c,d) showing hyperintense signal on DWI with corresponding hypointensity on ADC map (as shown by white arrow); e) Post-contrast T1W axial image showing heterogeneously enhancing mass with enhancing metastatic lesions in pelvic bones (black arrow); f) Histopathology slide (on 10x magnification) showing tumour is very cellular and it is arranged in form of sheets, tumour cells have hyperchromatic nuclei, inconspicuous nucleoli, scant cytoplasm (as shown by white arrow).

Case 3:

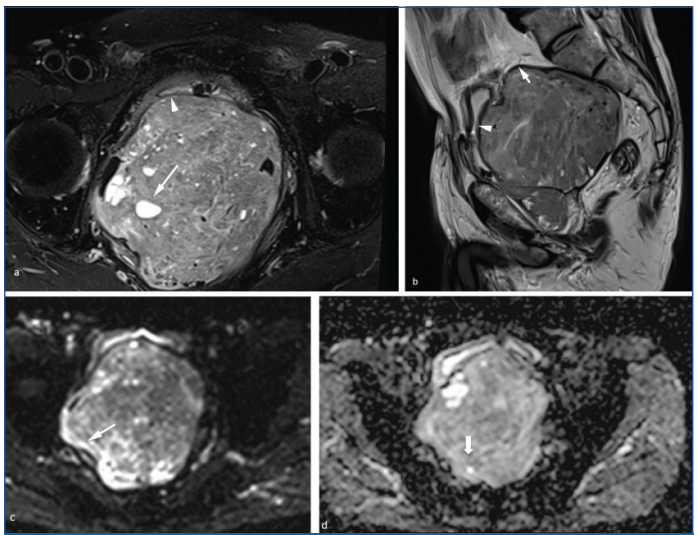
A 53-year-old male patient presented with complaints of frequency and dysuria for the last three to four months. The patient had a history of hypertension and diabetes mellitus for the past three years and was on regular medication. The patient reported no significant family history. His urine microscopy was insignificant. On DRE, a firm, nodular and fixed prostatic lesion was appreciated by the physician. His serum PSA level was borderline elevated (5.02 ng/mL). Ultrasonography of the pelvis revealed an asymmetrically enlarged prostate (53 mL) with heterogeneous echotexture and an asymmetrical bulge on the right-side. Upper abdomen ultrasonography revealed multiple iso to hyperechoic lesions with a peripheral hypoechoic halo. MRI revealed a mass measuring approx. 43×27×37 mm arising from the right peripheral zone in the base and mid part of the prostate, which was also extending into the central zone and was seen crossing the midline to involve the left peripheral zone of the prostate at the mid part. The mass showed an isointense-to-hyperintense signal on T2W images and a hypointense signal on T1W images. The mass showed a markedly hyperintense signal on DWI with a corresponding markedly hypointense signal on the ADC map [Table/Fig-3]. The mass showed extra-prostatic extension, infiltrating the right neurovascular bundle and right seminal vesicle. The mass was seen infiltrating the posterior wall of the right urinary bladder. Multiple T2W hyperintense lesions with restriction on DWI were seen in the liver and both lobes of the lung, suggestive of metastasis. Histopathology report of TRUS guided biopsy revealed leiomyosarcoma. The tumour was staged as T4N0M1c according to the TNM staging system. The patient was counselled for neoadjuvant chemotherapy along with radiotherapy for local disease control. However, despite counselling, the patient did not come back for further treatment.



[Table/Fig-3]: a) T2W axial image showing hyperintense lesion in right peripheral zone of prostate (white arrow); b,c) showing hyperintense signal on DWI with corresponding hypointense signal on ADC map (white arrow); d) T2W axial image showing multiple hyperintense metastatic lesions in liver(as shown by white arrow).

Case 4:

A 52-year-old male presented with dysuria, retention of urine and dull pelvic pain for the last five months. His urine microscopy and routine blood investigations were normal. No significant past and family history reported by the patient. On DRE, an enlarged prostatic mass was appreciated by the physician, which was hard in consistency. Ultrasonography revealed an enlarged (377cc) heterogeneous prostate with internal anechoic cystic changes. His serum PSA level was normal (4.2 ng/mL). MRI showed a large, well-defined mass measuring 101×89×99 mm, with heterogeneously isointense to hyperintense signal on T2W images and hypointense signal on T1W images, with complete involvement of the prostate. Mass was showing internal cystic changes. A well-defined T2W hypointense pseudocapsule was also seen. The mass showed a mildly patchy hyperintense signal on DWI and a corresponding mildly hypointense signal on the ADC map [Table/Fig-4]. The mass was showing heterogeneous enhancement on the post-contrast study. The mass was displacing the urinary bladder anterosuperiorly without



[Table/Fig-4]: a) T2W axial; and b) T2W sagittal showing well defined hyperintense mass with internal cystic changes (white arrow) and a T2 hypointense pseudocapsule (white arrow head) and anteriorly compressed urinary bladder (white arrow head); c,d) showing patchy mild hyperintense signal on DWI (white arrow) and hypointense signal on ADC map (white arrow).

its infiltration. There was no infiltration of bilateral neurovascular bundles and rectum. Histopathological examination of the TRUS-guided biopsy showed leiomyosarcoma. The tumour was staged as T2cN0M0 according to the TNM staging system. The patient underwent surgery for tumour removal. Long-term follow-up could not be taken.

DISCUSSION

Recent advances in MRI and its multiplanar approach have improved the ability to detect, stage, and differentiate various neoplasms of the prostate [1]. Clinical presentation is nonspecific because all patients with prostate neoplasm present with lower urinary tract symptoms such as urgency, frequency, dysuria, retention of urine, and haematuria [2,3]. Patients with stromal tumours show normal PSA levels due to non-epithelial origin. Internal necrosis and cystic changes in these tumours are common due to their highly malignant nature and rapid growth [4].

Prostatic sarcomas are rare stromal tumours accounting for 0.1%-0.2% of all primary prostatic neoplasms. Leiomyosarcomas are more common in adults and older men. Leiomyosarcomas usually present as bulky tumours with T2W hypointense signal intensity and necrotic/cystic areas with diffusion restriction in solid components, and normal serum PSA levels further support a non-epithelial origin [4].

Well-defined localised prostate sarcoma usually shows a well-defined T2W hypointense fibrous capsule, which is formed at the interface of the bulky tumour and adjacent periprostatic soft-tissue, as seen in our 1st and 4th cases.

Case 3 was a leiomyosarcoma with advanced stage at presentation, showing local extra-prostatic extension in the form of infiltration of the neurovascular bundle, seminal vesicle, and distant metastatic lesions in the lungs and liver. In a review of 54 published cases, Vandoros GP et al., showed a sizeable proportion of patients (23.5%) had metastatic disease at the time of diagnosis. Lungs were the most common sites of metastatic disease accounting for 17.6% of the cases, followed by liver (11.7%), and bone (5.8%). Only two patients had metastatic disease in the brain (3.6%). A 61.7% of the patients included in this review underwent surgical resection: 35.5% received external beam radiation therapy, and 41.1% were treated with adjuvant or neoadjuvant chemotherapy [5].

Tamada T et al., reported MRI features of a PSS identified in a 26-year-old man with dysuria and haematuria. MRI clearly depicted the extent and multinodular appearance of the tumour, which was mainly located in the central zone of the prostate. The tumour appeared as a heterogeneously signal-hyperintense mass with a pseudocapsule on T2-weighted imaging. Contrast-enhanced T1-weighted MRI showed necrotic portions within the gradually enhancing solid mass, and DWI enabled accurate assessment of the tumour's local extent [6].

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 [7].

CONCLUSION(S)

Prostate stromal sarcoma should be considered in patients presenting with a large prostatic mass and normal PSA levels, irrespective of their age. MRI demonstrates characteristic features that help in diagnosis and assessment of local extent, facilitating timely management.

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