



## Prostate multi-parametric magnetic resonance imaging appearance of diffuse adenosis of the peripheral zone (DAPZ)

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### ABSTRACT

Imaging specialists must recognize potential mimics of prostate cancer (PCa) on multi-parametric magnetic resonance imaging (mpMRI). We describe the appearance of diffuse adenosis of the peripheral zone (DAPZ) on mpMRI. The features of DAPZ parallel those of diffuse PCa, with low signal on T2-weighted images, rapid enhancement on dynamic contrast-enhanced sequences, and restricted diffusion. DAPZ is typically encountered in younger men with elevated prostate specific antigen (PSA) levels and portends an increased risk of the development of PCa. Recognition of the imaging appearance of DAPZ may reassure patients with concordant pathologic findings and may aid in selecting patients for follow-up.

### 1. Introduction

In the modern era of prostate cancer (PCa) diagnosis, there is an ever-increasing use of multi-parametric magnetic resonance imaging (mpMRI) to risk stratify patients,<sup>1</sup> guide biopsy, and evaluate extent of disease. The accurate interpretation of mpMRI is dependent upon the recognition of potential pitfalls and mimics of PCa, which can include hyperplasia and inflammation.<sup>2</sup> Other pathologic conditions that lead to decreased signal on T2-weighted images, restricted diffusion, or increased dynamic contrast enhancement should be described so that they are not mistaken for malignancy.

A rare entity that has been described in the pathology literature is diffuse adenosis of the peripheral zone (DAPZ), which presents with multiple foci of small, nonlobular proliferation of relatively bland acini diffusely involving the peripheral zone of the prostate in young patients.<sup>3</sup> To date, the mpMRI findings of DAPZ have not been described. In this manuscript, we will demonstrate the appearance of that entity in a young patient who presented with an elevated serum prostate specific antigen (PSA) level.

### 2. Case report

A 38-year-old man with PSA of 5.9 ng/ml and atypical glands found on a prior 12-core prostate biopsy was evaluated with mpMRI in preparation for a potential targeted biopsy. The patient also had pertinent family history, as his father was diagnosed with prostate cancer at the age of 60 and treated with radiation.

On mpMRI, the peripheral zone demonstrated diffuse hypointense signal on T2-weighted imaging (T2WI), bilateral symmetric mild increased signal on diffusion weighted imaging (DWI) with corresponding mild hypointense signal on apparent diffusion coefficient (ADC) map, and rapid enhancement on dynamic contrast-enhanced images (Fig. 1). There was no discrete focal area of these signal abnormalities, as would be typical for malignancy. The transitional zone demonstrated mild hypertrophy with heterogeneous signal on T2WI, consistent with benign prostatic hyperplasia. Although these findings can be seen in prostatitis, the findings of the peripheral zone are not the classic pattern in prostatitis. The findings of mpMRI fall in Prostate Imaging Reporting and Data System (PIRADS) category 2.<sup>4</sup>

Two months after the initial biopsy, a repeat 12-core prostate biopsy was obtained, under the guidance of transrectal ultrasound (TRUS),

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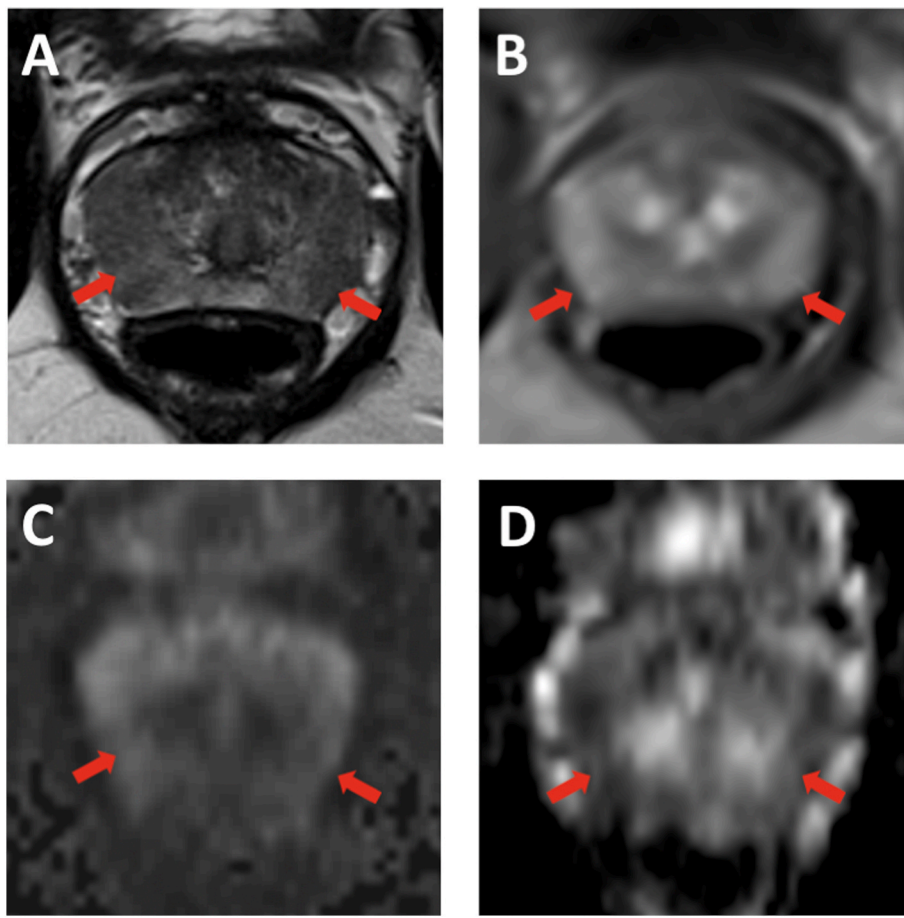
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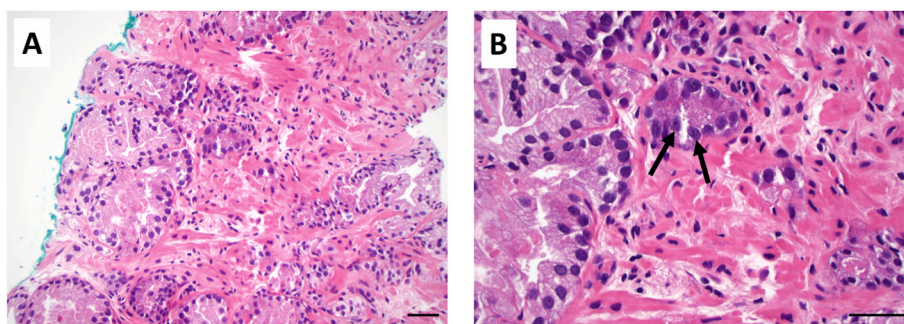
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**Fig. 1.** Prostate mpMRI in 38-year-old patient with DAPZ. (A) Axial T2WI demonstrates diffusely decreased signal in the peripheral zone (arrows). (B) Axial dynamic-contrast-enhanced T1WI showing early, symmetric, diffuse enhancement throughout the peripheral zone (arrows). (C) DWI and (D) ADC map show increased and decreased signal, respectively, indicating restricted diffusion through the peripheral zone (arrows).



**Fig. 2.** Representative micrographs of a core needle biopsy of this case. (A) Crowded small acini in a lobular growth pattern, consistent with DAPZ. (B) Scattered cells with mild nuclear atypia (arrows). Scale bar indicates 50  $\mu$ m.

which demonstrated crowded small acini in a lobular growth pattern in the peripheral zone of the prostate, consistent with a diagnosis of DPAZ. Scattered cells showed mild nuclear atypia with enlarged nucleoli (Fig. 2).

### 3. Discussion

Ultimately, mpMRI of the prostate is done in patients with known or suspected PCa, emphasizing the need for interpreting radiologists to be aware of potential pitfalls and patterns that may be more suggestive of other pathologies. DAPZ of the prostate is typically observed in younger patients presenting with an elevated PSA,<sup>3</sup> who may be undergoing a

work-up for PCa. Histologically DAPZ may mimic prostate cancer, similar to that of atypical small acinar proliferation (ASAP), and it may be a risk factor for prostate cancer.<sup>3</sup> Specifically, patients with DAPZ containing foci of atypical glands are considered at risk for harboring cancer and repeat biopsy is recommended for DAPZ, whereas focal adenosis may not require repeat biopsy.<sup>3</sup> In DAPZ, core needle biopsy may demonstrate involvement of 70% or more of the biopsy cores.<sup>3</sup>

Unlike in prostatic adenocarcinoma, the cells often do not demonstrate significant cytological atypia, but rather demonstrate an architectural atypia, which may be present diffusely throughout the biopsy. But unlike in traditional adenosis, these abnormal foci in DAPZ are located in the peripheral zone of the prostate.<sup>3</sup>

This case demonstrated that, on mpMRI, DAPZ may mimic features of prostatitis or diffuse malignancy, with peripheral zone iso- or hypointensity on T1-weighted imaging (T1WI) as compared to transition zone, as well as hypointensity on T2WI.<sup>5</sup> We further observed evidence of diffuse restricted diffusion with increased signal on DWI and decreased signal on the corresponding ADC map, which again might imply a diffusely infiltrative malignancy.<sup>5</sup> While differentiating DAPZ from PCa could potentially be challenging on MRI, the presence of bilaterally symmetric and diffuse signal abnormalities in a young patient with elevated PSA can suggest the diagnosis. Nonetheless, this diagnosis should be taken as an indication that the patient requires diligent follow-up to identify any focally suspicious abnormalities that may arise in the background of DAPZ and require an aggressive treatment course.

DAPZ is an important potential diagnosis to recognize on mpMRI, both to avoid mistaking it for PCa and also to ensure that the patients with this finding receive appropriate follow-up for their increased risk of developing PCa.

## Declaration of competing interest

None.

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