

Multiparametric MRI for Characterization of Peripheral Zone Prostate Cancer

Dr Jaddour M*

Central Radiology Department, Ibn Sina Hospital, Rabat, Morocco

***Corresponding author:** Dr Jaddour M, Central Radiology Department, Ibn Sina Hospital, Rabat, Morocco

ARTICLE INFO

Received:  September 14, 2026

Published:  October 01, 2026

Citation: Dr Jaddour M. Multiparametric MRI for Characterization of Peripheral Zone Prostate Cancer. Biomed J Sci & Tech Res 67(1)-2026. BJSTR. MS.ID.010422.

ABSTRACT

Purpose: To evaluate the respective roles of T2-weighted imaging (T2WI) and diffusion-weighted imaging (DWI) in peripheral zone prostate cancer using PI-RADS v2.1.

Methods: mpMRI with T2WI and DWI sequences was analyzed.

Results: Lesion showed T2 hypointensity and marked diffusion restriction.

Conclusion: DWI is dominant for detection, T2 for staging.

Introduction

Multiparametric MRI is essential for prostate cancer detection and characterization. PI-RADS v2.1 standardizes interpretation.

Imaging Findings

T2-weighted imaging: focal hypointense lesion.

DWI: hyperintensity at high b-value and low ADC signal indicating restricted diffusion (Figures 1-3).

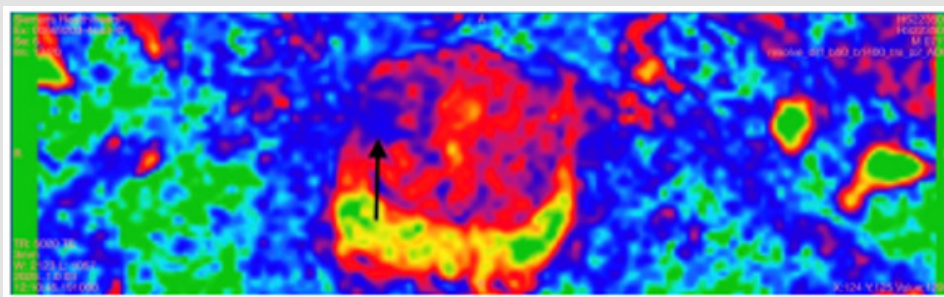


Figure 1: High b-value DWI showing hyperintense lesion.

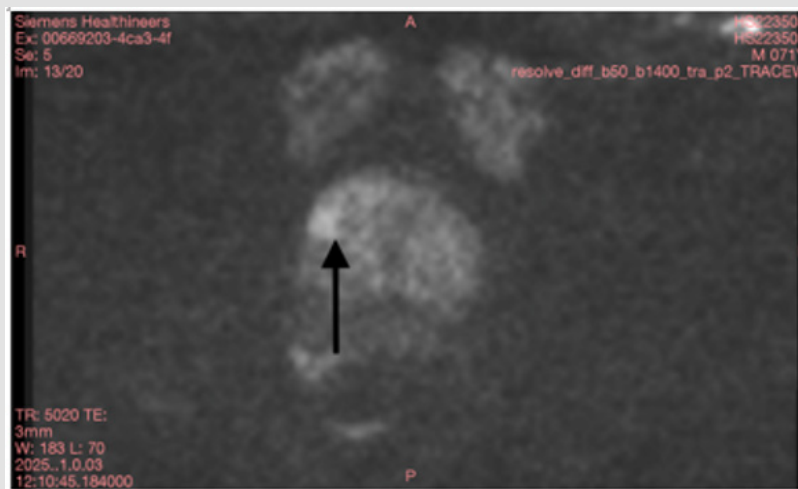


Figure 2: ADC map showing hypointensity.

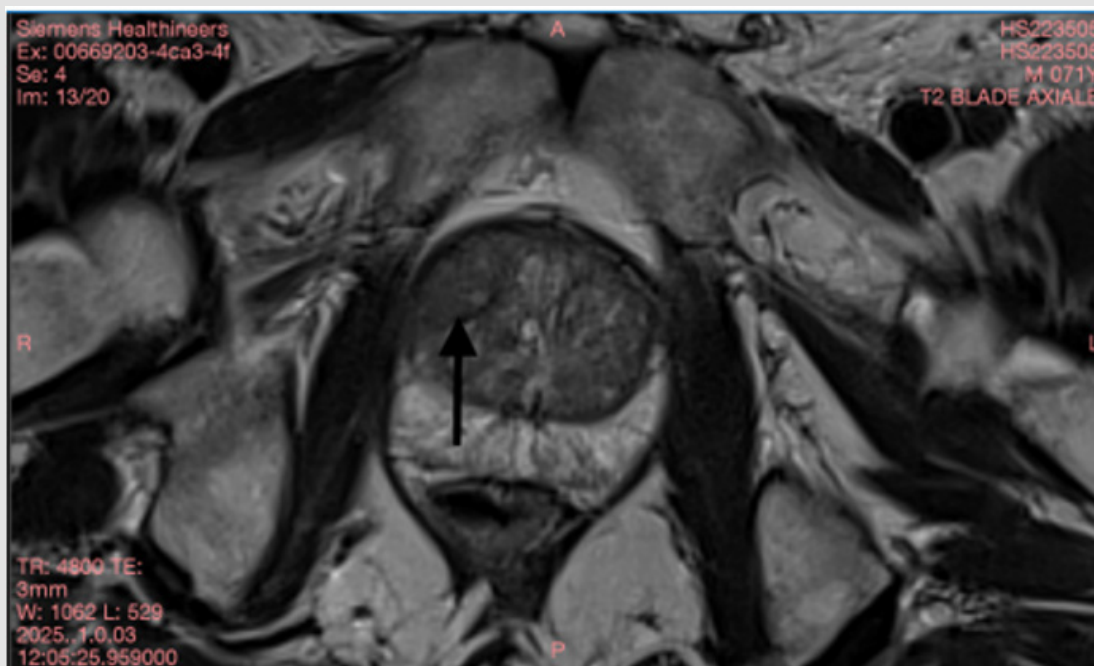


Figure 3: T2-weighted image showing hypointense lesion.

Discussion

Dominant-Sequence Paradigm in the Peripheral Zone

In the present case, the peripheral zone lesion showed marked hyperintensity on high b-value DWI with corresponding marked hypointensity on the ADC map, together with T2 hypointensity. This pattern is consistent with the PI-RADS v2 and v2.1 scoring algorithm, which assigns diffusion-weighted imaging (DWI) and its ADC map

the role of dominant sequence for peripheral zone lesions, while T2-weighted imaging (T2WI) remains dominant only in the transition zone and dynamic contrast-enhanced (DCE) imaging is relegated to a tie-breaker role for indeterminate (PI-RADS 3) lesions [1,2]. This zonal, sequence-weighted approach was a key conceptual change introduced in PI-RADS v2 and refined in v2.1, and it explains why, in our lesion, the DWI/ADC findings were the primary determinant of the overall assessment category rather than the T2 appearance alone.

ADC as a Quantitative Surrogate of Tumor Aggressiveness

Beyond qualitative characterization, the degree of diffusion restriction carries prognostic information. Several series have demonstrated an inverse relationship between ADC values and Gleason score in peripheral zone cancers, with lower ADC values corresponding to higher-grade, more aggressive disease [3-5]. This quantitative dimension supports the use of ADC not only for lesion detection but also as a non-invasive marker that may help stratify risk and guide biopsy targeting or active-surveillance decisions, complementing the categorical PI-RADS score.

Continuing Role of T2-Weighted Imaging in Local Staging

Although DWI dominates lesion characterization in the peripheral zone, T2WI remains central to the assessment of extracapsular extension (EPE), through evaluation of capsular contact length, capsular bulging or irregularity, and frank capsular breach. These morphological criteria underpin validated MRI-based EPE grading systems that stratify the risk of pathologic extraprostatic extension and improve prediction when combined with clinical parameters such as PSA and biopsy grade group [6]. The ESUR scoring system similarly incorporates capsular contact, irregularity, neurovascular bundle asymmetry and overt capsular spread to flag lesions at risk of T3a disease [7]. In lesions with equivocal T2 findings, DWI has been shown to add diagnostic value for detecting extracapsular extension, reinforcing the complementary rather than competing relationship between the two sequences [8].

Implications for TNM-Based Management

Integrating the DWI-dominant characterization of the index lesion with the T2-based assessment of capsular integrity allows multiparametric MRI to contribute directly to local (T) staging, distinguishing organ-confined (T2) from locally advanced (T3a/T3b) disease. This distinction, in turn, informs decisions regarding nerve-sparing surgery, margin planning, and the need for adjuvant therapy, underscoring the complementary and hierarchical use of DWI and T2WI advocated by PI-RADS v2.1 rather than reliance on either sequence in isolation [1,2,6].

Limitations

This report describes a single case and, as such, cannot establish diagnostic performance; it is intended as an illustrative correlation with the current mpMRI literature rather than a validation study. Histopathological correlation and larger case series are needed to confirm the applicability of these observations to routine practice.

Conclusion

DWI is the key sequence for peripheral zone lesion characterization, while T2 is crucial for staging.

References

1. Weinreb JC, Barentsz JO, Choyke PL, Francois Cornud, Masoom A Haider, et al. (2016) PI-RADS Prostate Imaging - Reporting and Data System: 2015, Version 2. *Eur Urol* 69(1): 16-40.
2. Turkbey B, Rosenkrantz AB, Haider MA, Anwar R Padhani, Geert Villeirs, et al. (2019) Prostate Imaging Reporting and Data System Version 2.1: 2019 Update of Prostate Imaging Reporting and Data System Version 2. *Eur Urol* 76(3): 340-351.
3. Woodfield CA, Tung GA, Grand DJ, Pezzullo JA, Machan JT, et al. (2010) Diffusion-weighted MRI of peripheral zone prostate cancer: comparison of tumor apparent diffusion coefficient with Gleason score and percentage of tumor on core biopsy. *AJR Am J Roentgenol* 194(4): W316-W322.
4. Hambrock T, Somford DM, Huisman HJ, Inge M van Oort, J Alfred Witjes, et al. (2011) Relationship between apparent diffusion coefficients at 3.0-T MR imaging and Gleason grade in peripheral zone prostate cancer. *Radiology* 259(2): 453-461.
5. Anwar SSM, Khan ZA, Hamid RS, Haroon F, Sayani R, et al. (2014) Assessment of Apparent Diffusion Coefficient Values as Predictor of Aggressiveness in Peripheral Zone Prostate Cancer: Comparison with Gleason Score. *ISRN Radiol* 2014: 263417.
6. Mehravand S, Shih JH, Harmon S, Clayton Smith, Jonathan Bloom, et al. (2019) A Grading System for the Assessment of Risk of Extraprostatic Extension of Prostate Cancer at Multiparametric MRI. *Radiology* 290(3): 709-719.
7. Schieda N, Quon JS, Lim C, Mohammed El Khodary, Wael Shabana, et al. (2015) Evaluation of the European Society of Urogenital Radiology (ESUR) PI-RADS scoring system for assessment of extra-prostatic extension in prostatic carcinoma. *Eur J Radiol* 84(10): 1843-1848.
8. Woo S, Cho JY, Kim SY, Kim SH (2015) Extracapsular extension in prostate cancer: added value of diffusion-weighted MRI in patients with equivocal findings on T2-weighted imaging. *AJR Am J Roentgenol* 204(2): W168-W175.

ISSN: 2574-1241

DOI: [10.26717/BJSTR.2026.67.010422](https://doi.org/10.26717/BJSTR.2026.67.010422)

Dr Jaddour M . Biomed J Sci & Tech Res



This work is licensed under Creative Commons Attribution 4.0 License

Submission Link: <https://biomedres.us/submit-manuscript.php>



Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

<https://biomedres.us/>