Pearls and Pitfalls in Diagnosing Prostate Cancer Using Multiparametric MRI (Mp-MRI)

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Accurate Mp-MRI interpretation of the prostate gland is a well-recognised challenge even amongst the most experienced of radiologists. Potential sites of tumour may be overlooked or normal anatomical structures and non-cancerous abnormalities may mimic tumour. This can potentially lead to false negative or false positive findings. We have performed over 500 transperineal biopsies using pre-biopsy MRI, interpreted using Pi-RADS. We have identified some important pearls and pitfalls in Mp-MRI evaluation which will help to improve diagnostic accuracy and more precisely target tumour. Thus, increasing the diagnostic yield and correctly influencing patient management.

### Periprostatic Venous Plexus (PVP)

**A:** Axial and coronal T2W image shows a few voids in a periprostatic vein in close proximity to the anterior prostatic capsule.

**C:** ADC map shows decreased SI in the same area.

### Neurovascular Bundle (NVB)

**A:** Axial T2W image. **B:** ADC map, and **C:** DCE T1W image shows the NVB coursing along the posterolateral margin of the prostate near the apex of the prostate.

The proximity of both the PVP and NVB to the peripheral zone can create a challenge in assessing for focal peripheral zone lesions. Both these structures will have a discrète, rounded appearance when viewed en face on axial slices. In addition, these structures exhibit low T2 signal intensity and a signal void on the ADC map.

### Central Zone

**A:** Coronal and axial T2W image shows a rounded, well-defined area of decreased signal intensity on T2 extending superior to PZ in symmetric fashion. **B:** DCE T1W b-500 and ADC map shows low signal intensity on ADC. Parametric perfusion map of DCE does not show focal enhancement in this area.

BPH compresses the central zone against the transition zone forming well-defined, symmetric, oval-shaped areas in homogeneous low signal intensity on T2-weighted images and decreased ADC. Commonly found at the base of prostate gland, either side of the ejaculatory ducts. Prostate cancer foci are more heterogeneous with ill-defined margins.

### Granulomatous Prostatitis (GP)

**A:** Axial and coronal T2W images show widespread decreased SI throughout the PZ and TZ of the prostate. **B:** DCE T1W b-500 and ADC map shows widespread restricted diffusion, ADC value <700 10^-6 mm^2/sec.

**C:** Parametric perfusion map from DCE shows decreased perfusion in this area.

May appear as a focal or diffuse area of low T2 signal intensity and ADC compared to other inflammatory pathologies. Associated infiltration of the periprostatic fat may mimic extraprostatic tumour extension. Histopathology is the only true method of obtaining the diagnosis.

### Stromal BPH Nodule

**A:** Axial and coronal T2W images demonstrate enlargement of the TZ consistent with BPH. There is a well-circumscribed, round, mixed but predominantly low SI nodule in the midline of the TZ. **B:** DCE T1W b-500 and ADC map shows restricted diffusion (ADC value 1187 10^-6 mm^2/sec). Parametric perfusion map from DCE shows focal enhancement and a type 2 curve.

Stromal BPH nodules exhibit T2 hypointensity, mimicking the T2 signal intensity of transition zone tumours. Additionally, there is a great deal of overlap between their ADC values. These nodules can be differentiated from tumour in that they are usually rounded or spherical in contrast to transition zone tumours which (often) have irregular margins and will exhibit invasive behaviour such as extension into the anterior fibromuscular stroma or peripheral zone.

### Ectopic BPH Node

**A:** Axial and Sagittal T2W images demonstrate enlargement of the TZ consistent with BPH. There is a well-circumscribed, round, mixed but predominantly low SI nodule in the midline of the TZ. **B:** DCE T1W b-500 and ADC map shows restricted diffusion (ADC value 1187 10^-6 mm^2/sec). Parametric perfusion map from DCE shows focal enhancement and a type 2 curve.

**C:** Axial and coronal T2W images show a wedge-shaped area of decreased SI in the posterior midline of the prostate base. **D:** Early phase DCE T1W image shows focal enhancement in this area.

It is seen as a wedge-shaped area of decreased T2 signal intensity and ADC within the peripheral zone, at the posterior midline of the prostate base. Tumour may also occur in this region and can be missed. A rounded/mass-like shape, caudal extension into the midgland and an affiliated DCE-MRI abnormality raises the index of suspicion for tumour.

### References:

