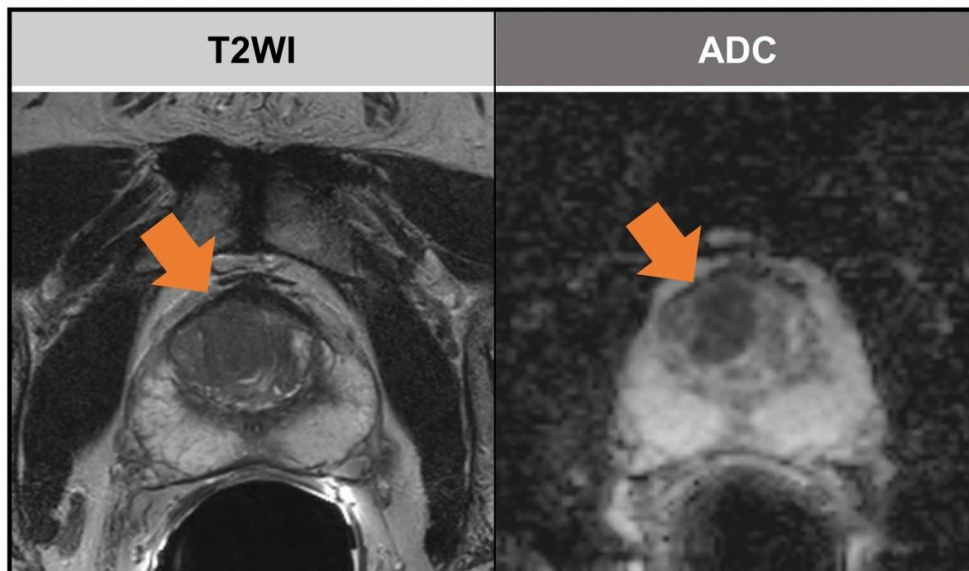


MRI Modalities & Sequences

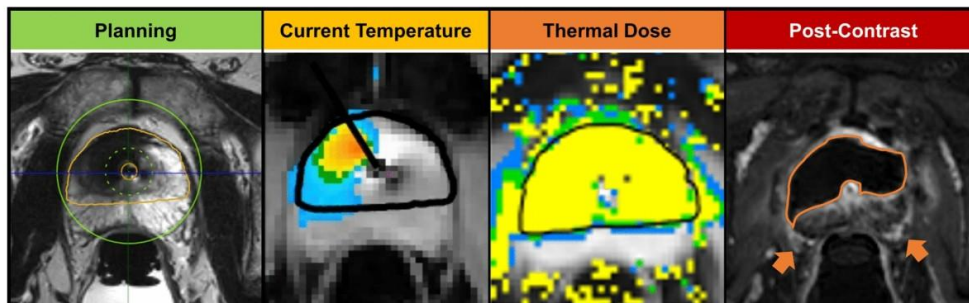
- **T2-Weighted (T2W):** Anatomy, hypointense lesions **(Most important)**
- **Diffusion-Weighted (DWI):** Restricted diffusion in tumors **(Most important)**
- **Apparent Diffusion Coefficient (ADC):** Low values = malignancy; **(Most important)**
- **Dynamic Contrast Enhancement (DCE):** Early enhancement patterns
- Not as important – Per Steve, it rarely helps

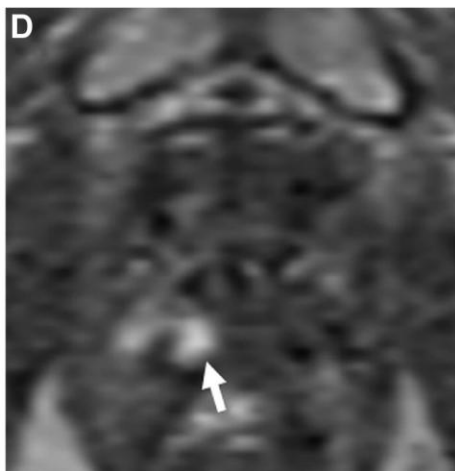
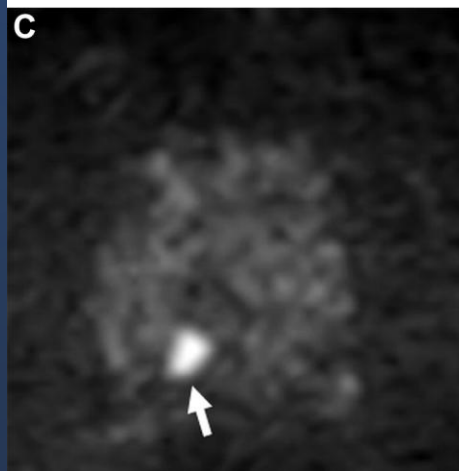
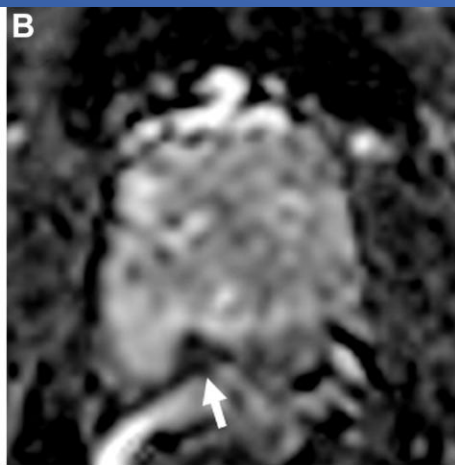
Key Principle: Combined T2 + DWI/ADC significantly improves detection (89% sensitivity in peripheral zone vs 81% T2 alone)

A



B





Peripheral Zone (PZ) Cancer

- Focal, round or ill-defined **low T2 signal**
- Disrupts normal linear capsule appearance
- **Hyperintense on DWI** with **low ADC** (restricted diffusion)
- Early, focal, intense **DCE enhancement**

Note: DWI/ADC is dominant sequence for PZ lesion assessment

Transition Zone (TZ) Cancer

- Homogeneously **low T2 signal** ("erased charcoal" sign)
- Lenticular or non-encapsulated appearance
- Ill-defined margins against heterogeneous BPH background
- **Restricted diffusion** on DWI/ADC (supporting malignancy)

Challenge: TZ morphology on T2 is dominant for PI-RADS scoring; heterogeneous BPH can complicate interpretation

PI-RADS v2.1 Assessment Scale

1 - Very Low: No abnormality on any sequence

2 - Low: Benign findings, linear/diffuse changes

3 - Equivocal: Unclear, may warrant follow-up or biopsy

4 - Likely: Likely clinically significant cancer

5 - Very High: Very likely clinically significant cancer

PI-RADS v2.1 Quick Reference

PI-RADS v2.1 Scoring System Reference Guide

Comprehensive imaging findings correlated with cancer risk

PI-RADS Score	T2-Weighted Appearance	DWI/ADC Appearance	DCE Pattern	Clinical Likelihood
1	Normal appearance	Normal	Gradual/normal	Very Low - No cancer
2	Linear or diffuse changes	Normal	Gradual	Low - Benign
3	Unclear morphology	Mildly restricted	Moderate early	Equivocal - Follow-up needed
4	Focal low signal	Restricted	Intense early	Likely - csPCa probable
5	Definite low signal focal	Markedly restricted	Very intense early	Very High - csPCa likely

Signs of Advanced Disease

Extracapsular Extension (ECE)

- Capsular irregularity or bulge
- Focal capsular disruption
- Tumor in contact with capsule over >10-15 mm surface
- Invasion of neurovascular bundles

Clinical Impact: ECE >5 mm radial distance associated with higher risk of positive surgical margins and early recurrence

Seminal Vesicle & Nodal Disease

Seminal Vesicle Invasion (SVI)

- Low T2 signal replacing normally high-signal fluid
- Expansion/asymmetry of vesicles
- Enhancing tissue continuous with base lesion

Lymph Node Involvement

- Enlarged pelvic nodes (>10 mm short axis)
- Morphologic abnormality (round shape, loss of hilum)

MRI Image Resources & Annotation Tips

Free Open-Access Collections[1]

- **TCIA PROSTATEX:** 346 studies with T2W, DWI, ADC, DCE sequences
- **Wikimedia Commons:** Annotated prostate MRI cases
- **PubMed Central:** Open-access figure collections

Key Annotations to Add

- Mark hypointense lesions on T2W with tumor boundaries
- Highlight restricted diffusion areas on DWI/ADC
- Indicate early enhancement zones on DCE
- Label capsular integrity and ECE findings

Clinical Integration

- Multiparametric MRI essential for detection & staging
- PI-RADS v2.1 standardized reporting improves consistency
- Combined T2 + DWI/ADC superior to single modality
- Early ECE detection impacts surgical planning
- MRI guides biopsy targeting for suspicious lesions