

# Detection, Localization and Exclusion of High Grade Prostate Cancer with Multiparametric MRI: Correlation with Radical Prostatectomy Histopathology

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## Purpose

To determine the value of multiparametric MRI (mpMRI) for the detection, localization and exclusion of high grade prostate cancer (Gleason 4+3 or higher) in patients with elevated serum PSA.

## Materials and Methods

29 patients (mean age 62 years, range 52-71) with mean PSA of 12.2 ng/ml (range 4.8-36.0 ng/ml) underwent mpMRI followed by radical prostatectomy within 54 days (range 2-194 days). mpMRI was performed on a 1.5T scanner with endorectal coil and included T2-weighted imaging, diffusion weighted imaging and spectroscopic imaging. The peripheral zone was divided into 18 segments, and MRI findings were correlated to whole mount histopathology.

Number of Patients	29	
Patient age (y)	62 (52-71)	
PSA level (ng/ml)	12,2 (4,8-36)	
Time between MRI and RP (Days)	54 (2-194)	
Maximum Gleason score	Low Grade	13
	High Grade	16
Pathologic stage	pT2a	3
	pT2b	2
	pT2c	15
	pT3a	7
	pT3b	2
Prostate Segments (Peripheral Zone)	18	
Total Number of Segments	522	
Segments without Tumour	356	
Segments with Tumour	166	
Gleason Score in Segments	Low Grade	130
	3+3	41
	3+4	71
	3+4+5	18
	High Grade	36
	4+3	6
	4+4	7
4+5	23	

Table 1. Patient Characteristics

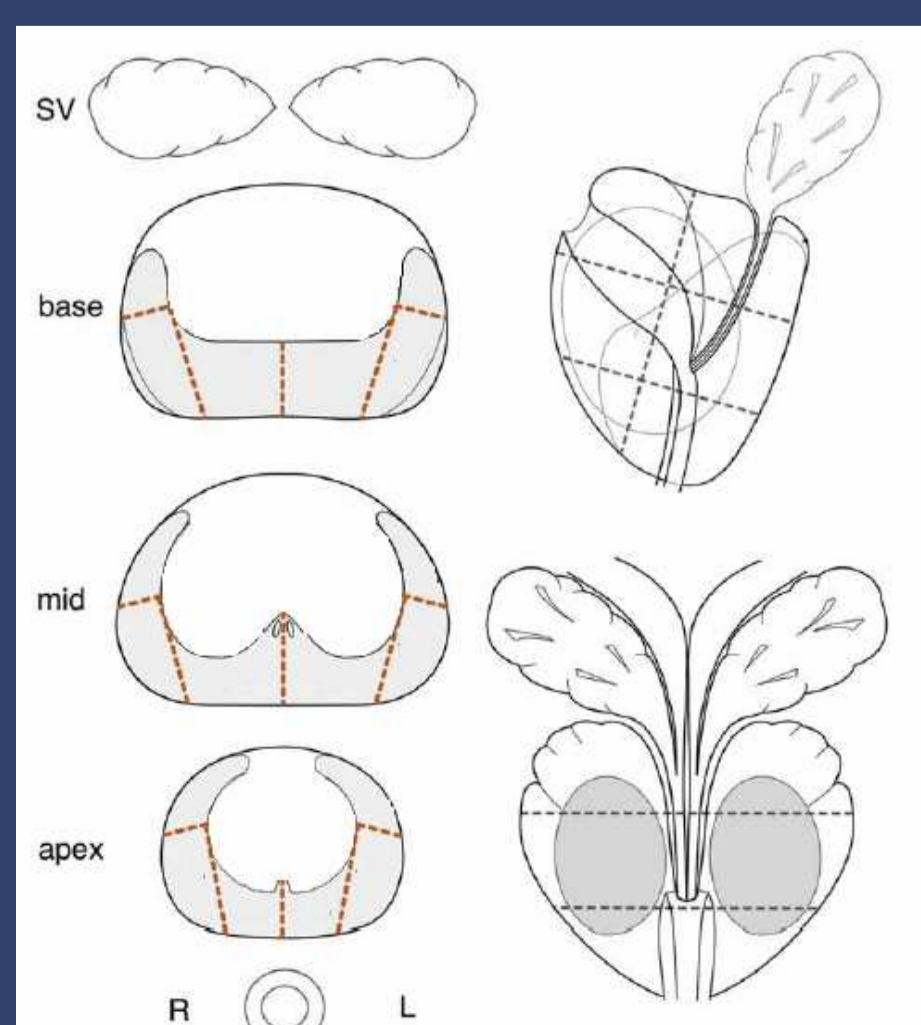
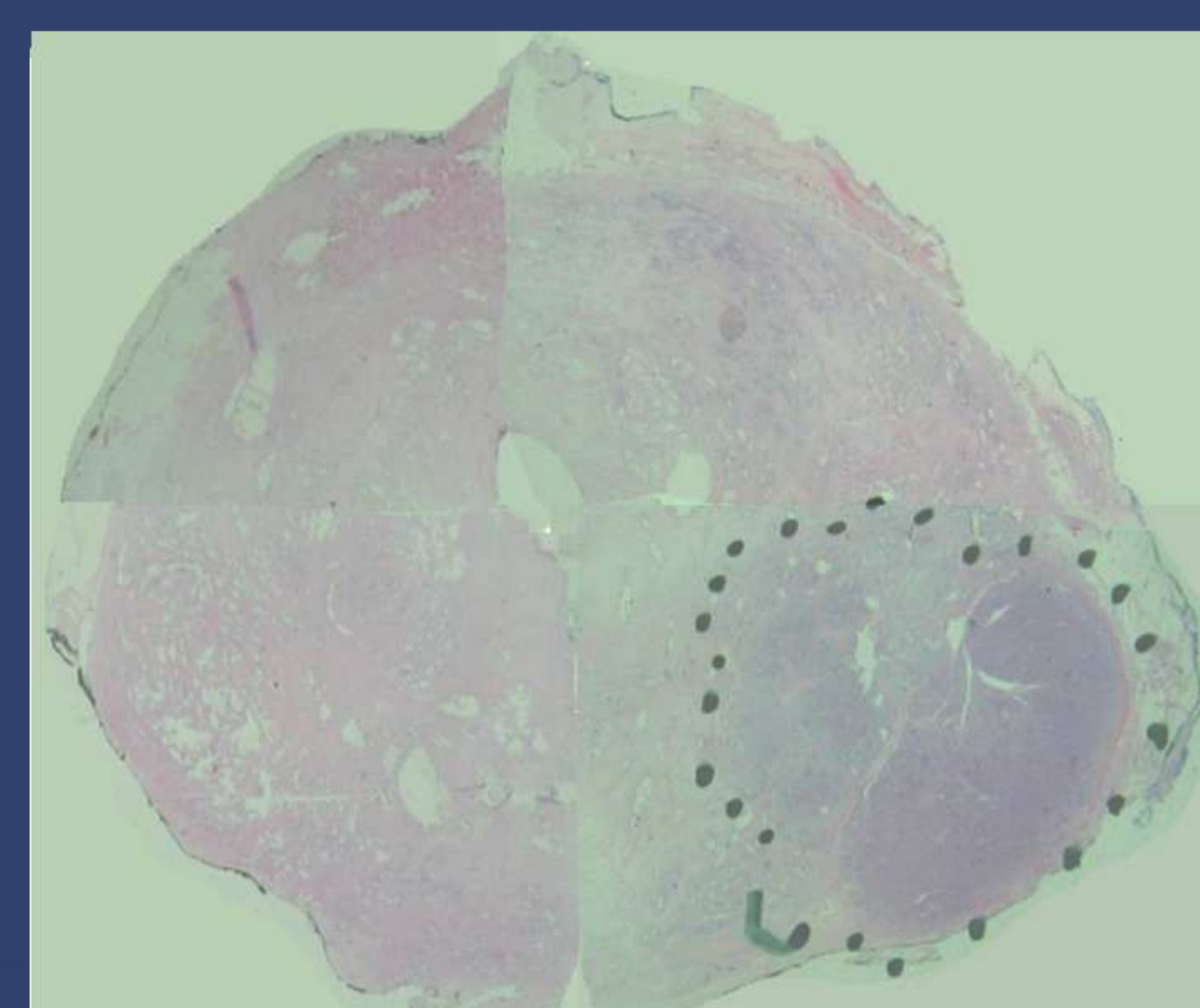
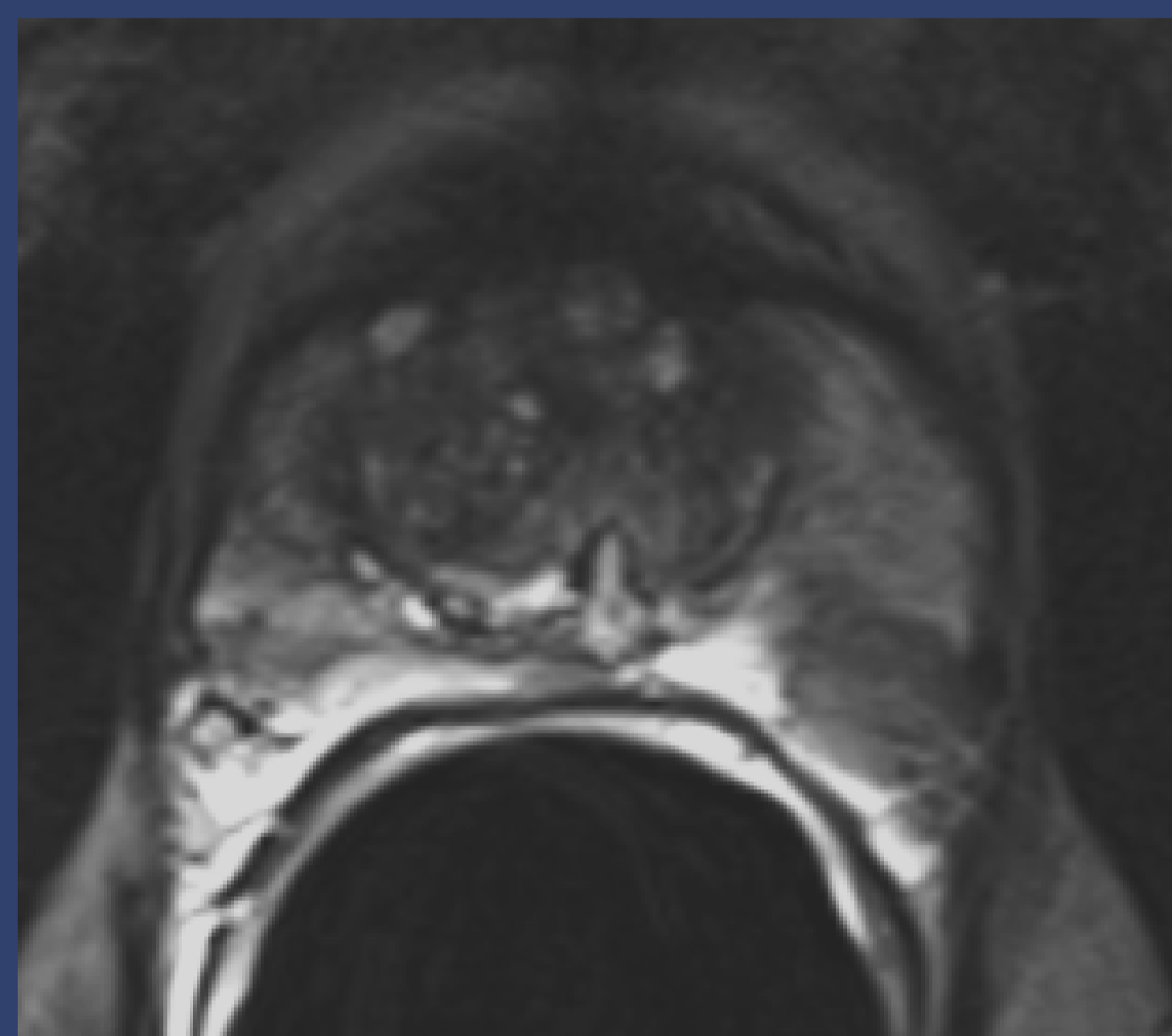


Figure 1: Prostate Peripheral Zone 18 segments  
Based on Dickinson L., Ahmed H., Allen C. et al. Magnetic Resonance Imaging for the Detection, Localisation, and Characterisation of Prostate Cancer: Recommendations from a European Consensus Meeting. Eur Urol 59 (2011) 477-494



	T2-WI	DWI	MRSI	Combined
sensitivity	72,2%	44,4%	29,0%	77,8%
specificity	82,1%	91,4%	89,9%	84,6%
accuracy	81,4%	88,1%	85,9%	84,1%
PPV	23,0%	27,6%	17,0%	27,2%
NPV	97,6%	95,7%	94,7%	98,1%

Table 2. Performance of detection and exclusion of high grade prostate cancer in the peripheral zone with T2-weighted imaging, DWI, MRSI and the three modalities combined

## Results

In total 522 segments were histopathologically evaluated. No tumor was found in 356 segments, low grade prostate cancer (Gleason 3+4 or lower) in 130 segments and high grade prostate cancer (Gleason 4+3 or higher) in 36 segments. Sensitivity, specificity and accuracy of mpMRI for the detection and localization of segments with high grade prostate cancer were 77.8%, 84.6% and 84.1% respectively. The negative predictive value for excluding high grade cancer was 98,1%.

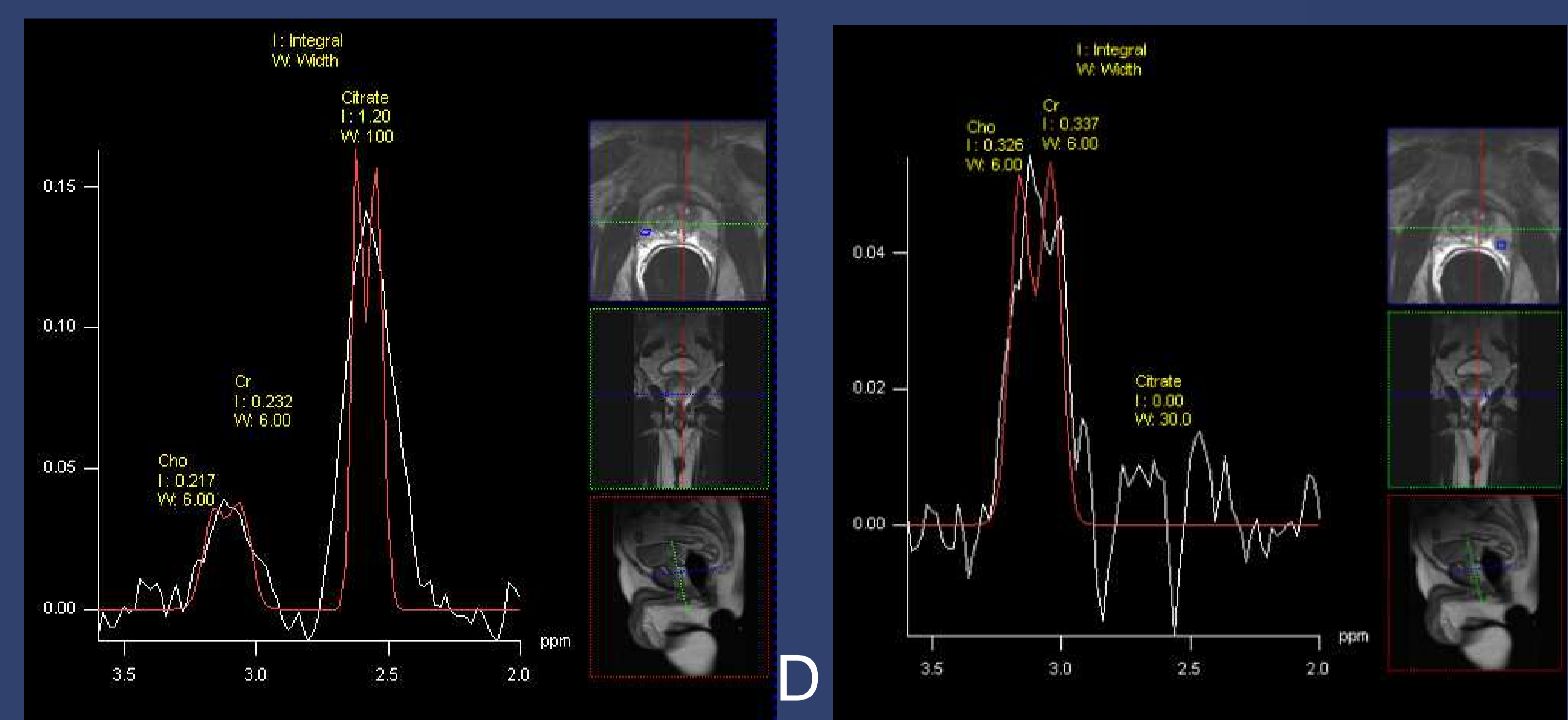


Figure 2: 66-year old patient with high grade prostate cancer, Gleason 4+3.  
A. Transverse T2-weighted MR image at level of the midprostate. The tumour is visible as a focal low-signal intensity lesion in the left posterolateral segment of the peripheral zone.  
B. Transverse ADC map of the diffusion weighted imaging at the same level as (A). The tumour shows restricted diffusion resulting in low signal intensity on the ADC map.  
C and D. Spectroscopy in the same patient. Healthy prostate tissue (C) shows high citrate peaks and low choline concentrations. High grade prostate cancer (D) demonstrates elevated choline peaks and reduced citrate values.  
E. Histopathological slice at the same level as (A) after radical prostatectomy. The tumour contour is delineated with green dots.

## Conclusion

mpMRI in a subset of patients with elevated PSA with radical prostatectomy correlation (i.e. excluding non-surgical indications) allows detection and localization of high grade prostate cancer, but has a higher value in the exclusion of high grade prostate cancer.