PI-RADS and Gleason Scores: Are they Correlated? Experience in 298 Patients

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Target Audience: radiologists and clinicians involved in prostate cancer care

Purpose: to investigate the association between PI-RADS (Prostate Imaging Reporting And Data System) and Gleason scores.

Methods: From July 2012 to April 2013, 298 consecutive biopsy-proven prostate cancer patients underwent multiparametric magnetic resonance imaging (mp-MRI) of the prostate before robotic-assisted radical prostatectomy (RALP). The mp-MRI exams were performed on a 1.5-T scanner (Magnetom Avanto, Siemens, Erlangen, Germany) using combined anterior and posterior phased array cols (8 channels). The protocol used included T2-weighted imaging (T2WI) in axial, coronal and sagittal planes (0.6x0.6x3.0mm resolution), axial diffusion weighted imaging (DWI; 3.3X2.3x4mm interpolated to 1.1x1.1x4mm, b-values of 0, 500 and 1000 s/mm^2 sensitized in three orthogonal directions), and axial dynamic contrast enhanced (DCE) MR images (1x1x4mm, temporal resolution 9.4s for 5 minutes) following contrast agent injection (0.2ml/kg, 3ml/s). Mp-MRI exams were prospectively analyzed on a dedicated workstation by two radiologists, with 11 and 6 years experience in oncological MRI, and specific training in mp-MRI of the prostate. Readings were performed, according to ESUR prostate MR guidelines [1] using the PI-RADS classification for structured reporting. Each lesion was given a PI-RADS score and assessed for location, size and probability of extra-prostatic disease. The association of highest PI-RADS score reported for each patient with the Gleason score (GS) of final histology report. was evaluated by Chi-Square test and Mantel-Haenszel test for trend. Odds Ratio (OR) with 95% Confidence Interval (CI) was calculated to estimate the risk of having GS≥7 by PI-RADS scores.

Results: We found a significant association between PI-RADS score and the GS (p-value <0.0001) (Table 1): GS increased with increasing of PI-RADS score (p-value for trend <0.0001). An illustrative case, comparing mp-MRI with whole-mount histology is shown in Figure 1.

Patients with a PI-RADS score of 4 had a more than three-times higher probability of having a GS≥7 than patients with PI-RADS≤3 (OR: 3.11; 95%CI: 1.34-7.19).

Patients with a PI-RADS score of 5 had a more than 13-times higher probability of having GS≥7 than patients with PI-RADS≤3 (OR: 13.37; 95%CI: 5.81-30.79).

Table 1: Distribution of PI-RADS and Gleason Scores (% per GS)

	GS≤6	GS 7	GS 8	GS 9	*Total*
PI-RADS 1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	***1***
PI-RADS 2	4 (100%)	0 (0%)	0 (0%)	0 (0%)	***4***
PI-RADS 3	22 (71%)	9 (29%)	0 (0%)	0 (0%)	***31***
PI-RADS 4	41 (46%)	46 (51%)	2 (2%)	1 (1%)	***90***
PI-RADS 5	28 (16%)	110 (64%)	22 (13%)	12 (7%)	***172***
Total	***95***	***166***	***24***	***13***	***298***

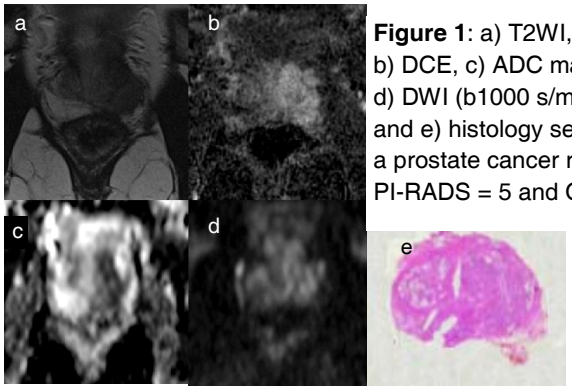

Figure 1: a) T2WI, b) DCE, c) ADC map d) DWI (b1000 s/mm^2) and e) histology section of a prostate cancer rated as PI-RADS = 5 and GS = 9.

Discussion: Since its publication in the 2012 ESUR guidelines[1], the application of PI-RADS scoring in prostate MR is becoming more commonplace. The strong association we have found between PI-RADS and GS scores suggests that the PI-RADS scoring of mp-MRI is a viable predictor of clinically significant tumour. In light of the frequent failure or underscoring of tumors with ultrasound guided biopsy, there are likely roles for the use of PI-RADS to inform biopsy guidance and in clinical decision-making. A dedicated, high-exposure training is essential to consistent use of PI-RADS.

Conclusion: Highest PI-RADS and Gleason scores were strongly associated in our cohort. Multivariate analysis, including other clinical variables is needed in order to define a decision tree for the management of prostate cancer patients.

References: [1] Barentsz JO, Richenberg J, et al. ESUR prostate MR guidelines 2012. Eur Radiol.2012 Apr;22(4):746-57.