Addition of MR Prostate Volume and Apparent Diffusion Coefficient to D'Amico Classification Improves Prediction of Post-Operative Pathologic Outcomes

Nelly Tan[1], Daniel J. Margolis[1], David Y Lu[2], Htwe K Khin[1], Koroush Beroukhim[1], Robert E Reiter[3], and Steven S Raman[1]
[1]Radiology, UCLA, Los Angeles, CA, United States, [2]Patholgoy, UCLA, Los Angeles, CA, United States, [3]Urology, UCLA, Los Angeles, CA, United States

Target audience: Radiologists, Urologists

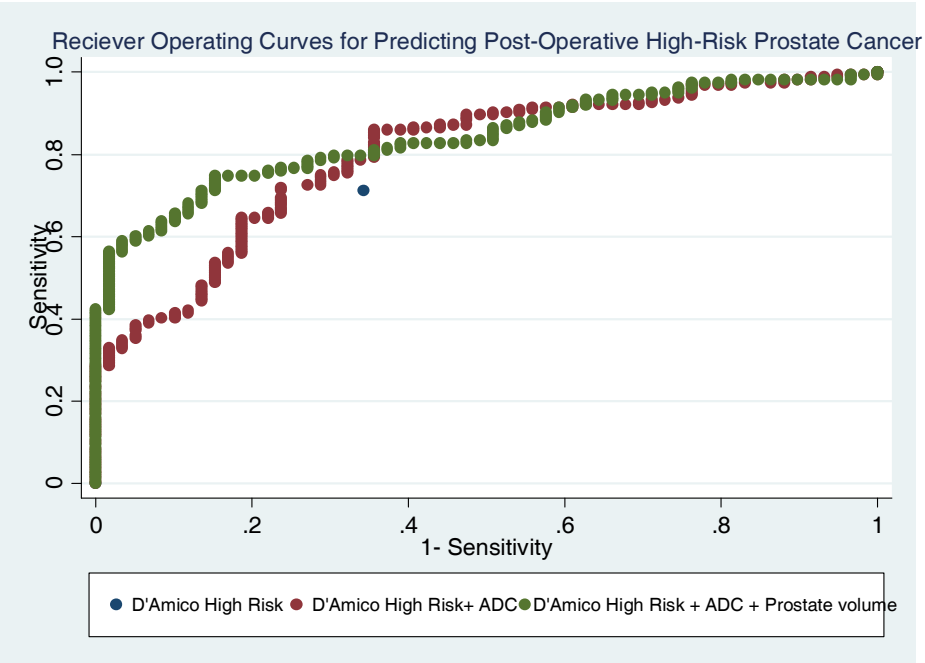
Purpose: Our objective was to determine the added value of MR prostate volume (PV) and apparent diffusion coefficient (ADC) to D'Amico Classification (DC) in predicting pathologic outcomes.

Methods: This was a retrospective study of 251 men who underwent prostate MRI prior to radical prostatectomy. We examined the relationship between MR PV, ADC, and pathologic outcomes. D'Amico Classification was used to stratified the cohort into low risk (biopsy Gleason Sum (GS) 6, PSA ≤10 and clinical stage T1a-c) and intermediate/high risk (biopsy GS ≥7, PSA>10, clinical stage ≥T2a). Outcomes were low (pT2, GS 6, and negative surgical margins(SM)) vs. pathological high risk (GS ≥7, positive SM, ≥pT3). Spearman's rank correlation test was performed to determine the relationship between ADC and MR prostate volume and Spearman's Rho was calculated. Multivariable logistic regression using MR PV, ADC and D'Amico Classification to predict high risk disease was performed. Area under the curve for D'Amico Classification alone, with ADC, with MR PV and all three parameters together for predicting high-risk disease was determined. Receiver Operating Curves (ROC) were graphed. Statistics was performed using STATA 11.5 and p=0.05 was considered significant.

Results: Of the 251 analyzed, 98 (39%) were D'Amico low risk and 153 (61%) were D'Amico high risk. The mean age of the cohort was 60.3 years and mean PSA was 6.84 ng/ml. Between pathologic low risk versus high risk, significant differences in PSA (5.6 v. 7.34, p=0.008), MR PV (54.8 v. 40.5 cc, p<0.0001), ADC (1050.8 v. 892.8, p<0.0001) were observed, respectively. A significant positive correlation between ADC and MR prostate volume was observed for Gleason sum ≥7 (Rho=0.18, p=0.026) and for pathologic high-risk tumors (Rho=0.21, p=0.005) but not for Gleason sum <7. In a multivariable analysis, lower ADC (OR 0.99, 95% CI 0.995-0.998) and lower MR prostate volume (OR 0.97, 95% CI 0.995-0.999) were independent predictors of Gleason sum ≥7. The area under the curve for predicting post-operative pathologic high risk patients with D'Amico alone, D'Amico and ADC, and D'Amico with ADC and MR PV were 0.68, 0.80 and 0.84 respectively.

Discussion: In high grade tumors (Gleason sum ≥7), there is a positive relationship between ADC and prostate volume. Despite this correlation, PV was still an independent predictor of high grade tumors. The ability to predict post-operative pathologic high risk patients was best with the addition of ADC and MR prostate volume together compared to D'Amico's classification system alone.

Conclusion: Our results suggest that adding MR prostate volume and ADC to D'Amico Classification may improve identification of surgical high risk patients.



References:
Vargas, H. A., O. Akin, et al. (2011). "Diffusion-weighted endorectal MR imaging at 3 T for prostate cancer: tumor detection and assessment of aggressiveness." Radiology **259**(3): 775-784.

D'Amico, A. V., R. Whittington, et al. (1998). "Biochemical outcome after radical prostatectomy, external beam radiation therapy, or interstitial radiation therapy for clinically localized prostate cancer." JAMA **280**(11): 969-974.

Freedland, S. J., W. B. Isaacs, et al. (2005). "Prostate size and risk of high-grade, advanced prostate cancer and biochemical progression after radical prostatectomy: a search database study." J Clin Oncol **23**(30): 7546-7554.