Assessment of Prospectively Assigned Likert Scores for Targeted Magnetic Resonance Imaging-Transrectal Ultrasound Fusion Biopsies in Patients with Suspected Prostate Cancer

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Abbreviations and Acronyms

DRE = digital rectal examination

mp = multiparametric

MRI = magnetic resonance imaging

PCa = prostate cancer

PI-RADS = Prostate Imaging Reporting and Data System

PSA = prostate specific antigen

TRUS = transrectal ultrasound

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Purpose: We assess the performance of prospectively assigned magnetic resonance imaging based Likert scale scores for the detection of clinically significant prostate cancer, and analyze the pre-biopsy imaging variables associated with increased cancer detection using targeted magnetic resonance imaging-transrectal ultrasound fusion biopsy.

Materials and Methods: In this retrospective review of prospectively generated data including men with abnormal multiparametric prostate magnetic resonance imaging (at least 1 Likert score 3 or greater lesion) who underwent subsequent targeted magnetic resonance imaging-transrectal ultrasound fusion biopsy, we determined the association between different imaging variables (Likert score, lesion size, lesion location, prostate volume, radiologist experience) and targeted biopsy positivity rate. We also compared the detection of clinically significant cancer according to Likert scale scores. Tumors with high volume (50% or more of any core) Gleason score 3+4 or any tumor with greater Gleason score were considered clinically significant. Each lesion served as the elementary unit for analysis. We used logistic regression for univariate and multivariate (stepwise selection) analysis to assess for an association between targeted biopsy positivity rate and each tested variable. The relationship between Likert scale and Gleason score was evaluated using the Spearman correlation coefficient.

Results: A total of 161 men with 244 lesions met the study eligibility criteria. Targeted biopsies diagnosed cancer in 41% (66 of 161) of the men and 41% (99 of 244) of the lesions. The Likert score was the strongest predictor of targeted biopsy positivity (OR 3.7, $p < 0.0001$). Other imaging findings associated with a higher targeted biopsy positivity rate included smaller prostate volume (OR 0.7, $p < 0.01$), larger lesion size (OR 2.2, $p < 0.001$) and anterior location (OR 2.0, $p = 0.01$). On multiple logistic regression analysis Likert score, lesion size and prostate volume were significant predictors of targeted biopsy positivity. Higher Likert scores were also associated with increased detection of clinically significant tumors ($p < 0.0001$).

Conclusions: The Likert scale score used to convey the degree of suspicion on multiparametric magnetic resonance imaging is the strongest predictor of targeted biopsy positivity and of the presence of clinically significant tumor.

Key Words: early detection of cancer, risk assessment, prostatic neoplasms, biopsy, magnetic resonance imaging

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THE establishment of multiparametric magnetic resonance imaging as an accurate tool for the detection of prostate cancer[1] and the development of MRI-TRUS image fusion software capable of overlaying MRI findings on the TRUS screen[2] have amplified the use of MRI before biopsy in the evaluation of patients suspected of having PCa (fig. 1). This change in clinical practice has dictated the need for novel, standardized approaches for reporting mpMRI findings so that appropriate management decisions can be made. PI-RADS, endorsed by the European Society of Urogenital Radiology and the American College of Radiology, attempts to provide such standardization by defining a scale that incorporates predefined, objective criteria for interpreting mpMRI examinations.[3]

Alternatively, a Likert scale score[4] has been proposed using a range from 1 to 5 to indicate the overall impression of the interpreting radiologist about the likelihood of a focal abnormality representing a clinically significant tumor. The Likert scores correlate with increasing degree of suspicion (1, 2, 3, 4 and 5, respectively, for clinically significant PCa highly unlikely, unlikely, equivocal, likely and highly likely). Noticeably the Likert scale approach does not recommend fixed criteria for interpretation, yet has been found to perform better than PI-RADS for the overall detection of prostate cancer.[5,6] However, data regarding the association between Likert scores and the presence of clinically significant cancer and the use of these scores to guide targeted biopsies are lacking. In this study we assess the

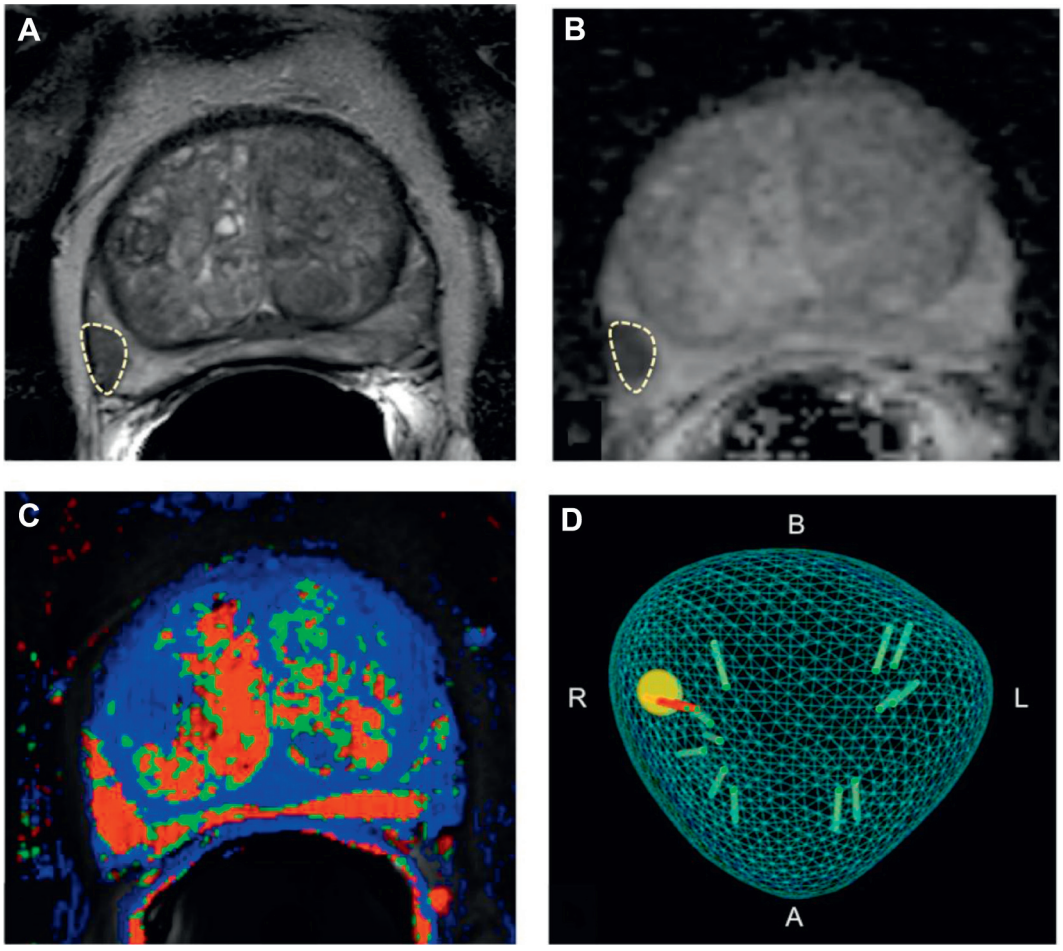

Figure 1. Example of targeted MRI-TRUS fusion biopsy detecting PCa missed by random biopsies in 67-year-old man. Patient with increased PSA (7.4 ng/ml) and 2 previous negative biopsies underwent mpMRI for identification of potential targets before repeat biopsy. MRI showed 1.3 cm nodule in right lateral mid gland peripheral zone with low signal intensity on axial T2-weighted images (*A*, area in broken line), restricted diffusion and low apparent diffusion coefficient values (*B*), and abnormal contrast kinetics (red in *C*) highly suspicious for cancer (Likert scale score of 5). Coronal view of 3-dimensional projection of prostate generated during biopsy (*D*) shows lesion detected with MRI (yellow), 2 positive (red) targeted cores revealing Gleason score 3+4 cancer with 50% of maximum core involvement by tumor and 12 negative (green) random cores obtained in same biopsy session. Radical prostatectomy confirmed site and Gleason score concordant, organ confined tumor with 1.2 × 0.9 × 0.8 cm. *R*, right. *L*, left. *B*, base. *A*, apex.

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