Tumor Multifocality on Multi-parametric MRI is Associated with Increased Detection Rate of Clinically-Significant Prostate Cancer in Lesions with Prostate Imaging Reporting and Data System (PI-RADS) Score 4

Kamyar Ghabili Amirkhiz, MD[1*], Ghazal Khajir, MD[1], Matthew Swallow, MD[1], Rachael L. Sherrer, MD[2], Jamil S. Syed, MD[1], Michael S. Leapman, MD[1], Soroush Rais-Bahrami, MD[2], Preston C. Sprenkle, MD[1]

[1]Department of Urology, Yale School of Medicine, New Haven, CT
[2]Department of Urology, University of Alabama at Birmingham, Birmingham, AL
**Contact author: ghazal.khajir@yale.edu*

Introduction

Magnetic resonance imaging (MRI)/ultrasound fusion targeted biopsy of a lesion with prostate imaging reporting and data system (PI-RADS) score 4 (P4) is associated with a high positive predictive value (~ 45%) for clinically-significant prostate cancer. However, it is unknown if multifocality on multi-parametric MRI (mpMRI) could further risk stratify P4 lesions. We sought to assess the detection of the clinically-significant prostate cancer in P4 lesions stratified by tumor multifocality on mpMRI.

Methods

Using the MRI-ultrasound fusion prostate biopsy databases at the Yale University and the University of Alabama at Birmingham (UAB), we identified patients with at least one PI-RADS 4 (P4) lesion on mpMRI who underwent targeted biopsy of those lesions. Each patient meeting the above criteria was grouped into one of three lesion MRI classifications – P4+P2/P3 (P4 lesion and an additional PI-RADS 3 or 2 lesions), single P4, or P4+P4/P5 (≥2 P4 lesions or a lesion with P4 and an index lesion with PI-RADS 5). The rate of grade group (GG)≥2 pathology on targeted biopsy of the P4 lesions was compared between the MRI classification groups. The clinical and radiological factors associated with finding GG ≥2 in P4 lesions were also evaluated.

Results

In total, 345 (Yale) and 300 (UAB) patients with at least one lesion with P4 were identified. The studied MRI classification groups P4+P2/P3, single P4, and P4+P4/P5 included 184, 267 and 194 men, respectively. For the combined cohorts, the rate of GG≥2 biopsy pathology in the groups P4+P2/P3, single P4 and P4+P4/P5 was 21.7%, 36.3%, and 46.4%, respectively ($p<0.001$). On multivariable analysis, age (OR 1.08, 95%CI 1.05-1.11, $p<0.001$), prostate volume (OR 0.79 per 10mL, 95%CI 0.70-0.89, $p<0.001$), and MRI classification group (single P4 vs. P4+P2/P3, OR 2.17, 95%CI 1.34-3.49, $p=0.001$; and P4+P4/P5 vs. P4+P2/P3, OR 2.56, 95%CI 1.54-4.25, $p<0.001$) were significantly associated with the risk of GG≥2 pathology on targeted biopsy of the P4 lesion.

Conclusions

Our data indicated that detection of clinically-significant (GG≥2) prostate cancer on biopsy of the high-risk lesion (P4) on mpMRI might be influenced by tumor multifocality on imaging.