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PI-Rads Scores and MRI-Targeted Prostate Biopsy

Karl Engelhard* and Florian Schneider

University Erlangen-Nuremberg, Hospital Martha-Maria, Germany

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***Corresponding author:** Karl Engelhard, University Erlangen-Nuremberg, Hospital Martha-Maria, Nuremberg, Germany, Tel: +499119591151; Fax: +499119591174; Email: Karl.engelhard@martha-maria.de/ karl.engelhard@t-online.de

Abbrevations: PSA: Prostate Specific Antigen; US: Ultra Sonography; ACC: American College of Radiology; ESUR: European Society of Urogenital Radiology; PI-RADS: Prostate Imaging Reporting and Data System

Introduction

Prostate cancer is the second most prevalent cause of cancer death of men in Western Europe and in the United States [1]. For patients with high clinical suspicion for prostate cancer (abnormal digital rectal examination and/or elevated prostate-specific antigen (PSA) level, the standard diagnostic tool for the diagnosis is the systematic trans rectal ultrasonography (US)-guided 10 to 12 core biopsy [1-4]. Multiparametric prostate magnetic resonance (MR) imaging by applying T2-weighted imaging, diffusion-weighted imaging (DWI), and dynamic contrast-enhanced imaging (DCI) has been proven to improve the early detection, and localization of prostate cancer [1-5].

Over the past 10 years, the use of multiparametric MRI as a tool for biopsy targeting of suspicious lesions for prostate cancer revealed significantly higher cancer detection rates. Overall, there exist a variety of methods, such as cognitive fusion, MRI-Ultrasound (US) fusion and direct in-bore MR-guided biopsy which can be compared with standard template-based the Prostate Imaging Reporting and Data System (PI-RADS), an expert consensus document has been introduced by the European Society of Urogenital Radiology (ESUR) and the American College of Radiology (ACC) as a standardized lexicon and diagnostic instrument for interpretation of multiparametric prostate MR images [6]. This stratified the malignant capability of individual lesions that could be detected on MR images. PI-RADS version 2, the improved system of the first version was updated and published in 2104. With PI-RADS version 2, the evaluation of DCE imaging was simplified and the criteria for category 3 lesions were elucidated [1,7,8]. In a multicenter, paired-cohort, confirmatory study [3].

Hashim U Ahmed could show, that the use of multi-parametric MRI for patients with a suspicion of prostate cancer might allow 27% of patients avoid a primary biopsy and allow to detect 5% fewer clinically insignificant cancers. Compared with the standard TRUS biopsy 18% percent more cases of clinically significant cancer might be detected. Moreover, MRI as a triage test before first prostate biopsy could reduce unnecessary biopsies by a quarter [3]. Multiparametric MRI and MRI-guided biopsy techniques thoughbear the risk to overlook or misscancers, especially cancers with small volumes (<0.5ml, and low grade, Gleason score ≤6) [4,5,9]. In a study of De Visschere the negative predictive value for the detection rate of high-grade cancers (tumor volume >0.5ml, Gleason score ≥7) was 95, 4% [3-5,9]. When stratifying multiparametric MRI and in-bore MRI-guided prostate biopsies according to PI-RADS 2 the system could identify 95% of prostate cancer foci ≥0.5ml, but this was limited to the assessment of tumors with a Gleason score, GS≥4+3=7 [1,5,10]. One study with a critical look at PI-RADS System, version2 summarized that a wide range of questions remains to be answered regarding how to apply the system in directing patient management [8]. For instance, which overall PI-RADS assessment categories are targeted by a reasonable biopsy? In lesions with PI-RADS 3, which are declared as intermediate "the presence of clinically significant cancer is equivocal" [7] the system recommends clinical follow-up. However, should we not in contrast to that debate applying a targeted biopsy for patients with rising PSA and a PI-RADS 3 lesion?

In our institute we evaluated the impact of PI-RADS 3 score in differentiating these equivocal lesions as benign or malignant for 54 men with elevated PSA levels (PSA>4ng/ml) and abnormal multiparametric MRI. For patients with PI-RADS score 4 and 5 we ruled out the sensitivity and the positive predictive value of MRI-guided prostate biopsy in determining positive histological tumor results. 34 men were biopsy naive, 20 patients had prior

tumor negative biopsies. The in-bore MRI-guided prostate biopsies were performed in a standard 1.5 Tesla scanner. A mean of 2.2 cores was taken from each tumor suspected lesion. The PI-RADS scores of the tumor suspected areas were compared with the histological findings of the biopsy. By applying the PI-RADS system 54% of cancers were detected by MRI-guided biopsy with a rate of 90% of significant tumors. In 25 cases of PI-RADS score 3 no cancerous tissue was found in the histology report. In one man a high grade prostatic intraepithelial neoplasia (PIN) was detected. The sensitivity of PI-RADS scores 4 and 5 was 90%, by a positive predictive value of 70%.

Conclusion

Based on our population we could assess a highly sensitivity and a fair positive predictive value in detecting significant prostate cancers by stratifying the MRI-guided biopsy with the PI-RADS system. For patients with PI-RADS 3 lesions a patient management is necessary in order to differentiate candidates fitting for a clinical follow up or suitable for a targeting biopsy. PI-RADS 3 score could not be confirmed as an absolute marker in patient clinical management care. In our study PI-RADS 3 lesions revealed only benign conditions.

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