Multiparametric MRI of the prostate: the hope for the urology community

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The introduction of PSA in the early nineties of the previous century has strengthened interest in the screening of prostate cancer (PCa). The urology community soon indiscriminately adopted PSA testing, witnessing a revolution in the detection and treatment of PCa. Subsequently, two randomized trials confirmed the significant favorable influence of PSA-based screening on prostate cancer mortality. Surprisingly, the United States Preventive Services Task Force declined PSA testing as a PCa screening modality, highlighting unacceptable rates of overdiagnosis and overtreatment. These two have become the major challenges our societies have to overcome in order to implement widespread PCa screening programs.

According to EAU Guidelines, the current strategy for detection of prostate cancer is based on TRUS-guided random systematic biopsy (TRUS-Bx) performed in men with elevated PSA and/or abnormal physical examination (DRE) [1]. Combined with other clinical characteristics, biopsy results are decisive in guiding a patient towards the most appropriate treatment modality, mainly either active surveillance (AS) or radical therapy. AS, tailored to cope with overdiagnosis, underestimates the stage or grade of disease in a third of cases, posing, at least theoretically, a risk to their prognosis. Therefore, there is an urgent need to embrace a detection tool that would diminish the rates of unnecessary biopsies leading to the diagnosis of insignificant PCa, improve risk stratification of those undergoing AS and guide the biopsy in those with previously negative TRUS-Bx to identify aggressive lesions that would be otherwise left undetected.

mpMRI as a novel diagnostic tool

In recent years, many studies have been devoted to the role of MRI in the prostate cancer imaging. Using different imaging modalities, multiparametric

MRI (mpMRI) provides complex information about tumor localization and its malignant potential. We have read with great attention the review by Bjurlin et al. in this issue of CEJU introducing different components of mpMRi and summarizing the utility of mpMRI-targeted biopsy in different clinical settings [2]. The authors acknowledge several targeted biopsy approaches to MRI-Bx: cognitive fusion MRI/TRUS-Bx, software fusion MRI/TRUS-Bx and in-bore MRI-Bx. Whichever type of mpMRI-guided prostate biopsy is in use, all rely on the same ability of mpMRI to detect the prostate cancer lesion, that is being subsequently targeted. Numerous lines of investigation suggest that MRI-targeted prostate biopsy (MRI-TBx) outperforms TRUS-Bx by offering more precise imaging-based identification of targeted lesions, found to be clinically significant, yet leaving insignificant lesions invisible.

Detection of clinically significant prostate cancer

The desirable feature presented by mpMRI is the possibility to reduce overdetection of clinically insignificant PCa and to enhance the detection of potentially aggressive lesions. This is worthy of particular attention. Although, the detection rate of clinically significant prostate cancer varies considerably among studies, ranging from 44% to 87%, the negative predictive value of mpMRI, in this regard, amounts to 98% [3]. As a corollary, this finding may be highly influential in limiting the number of unnecessary prostate biopsies. Unfortunately, the definition of clinically significant prostate cancer varies across the studies, so the results are somewhat inconsistent. Furthermore, mpMRI imaging is prone to interobserver and intraobserver variability. In order to overcome both variabilities, ESUR Guidelines have introduced PI-RADS as a 5-point scale that characterizes the probability of clinically significant PCa within a lesion detected

by mpMRI [4]. PI-RADS as a new scoring scheme, increasingly being used in clinical practice, is nicely presented in the review. The greater the PI-RADS score, the greater the probability of clinically significant disease. Given PI-RADS is a highly sensitive tool, clinicians can target lesions suspicious in mpMRI more reliably with MRI-TBx. Unfortunately, there is ongoing debate regarding how to define specific thresholds of the PI-RADS score below which further investigation may be omitted, as the likelihood of clinically significant PCa becomes negligible.

mpMRI in men without the diagnosis of prostate cancer

A recently published meta-analysis sheds some light on an optimal biopsy strategy among men with suspected prostate cancer by comparing MRI-TBx with TRUS-Bx in the same patient [6]. No differences in overall prostate cancer detection were observed between these two modalities at first biopsy, indicating that standard systematic TRUS-Bx may be sufficient in this clinical setting; however, MRI-TBx showed improved detection of clinically significant prostate cancer in men in whom TRUS-Bx failed to detect any abnormal lesion. Moreover, MRI-TBx showed lower detection of insignificant prostate cancers with 44% sensitivity and higher detection of significant prostate cancer with 91% sensitivity compared to TRUS-Bx. In the majority of sixteen studies included in the meta-analysis, mpMRI was used to guide the prostate biopsy.

A recently published prospective study corroborated these findings [7]. MRI-TBx diagnosed 30% more high-risk cancers and 17% fewer low-risk cancers when compared with standard TRUS-Bx. MRI-TBx combined with TRUS-Bx results in the diagnosis of an additional 22% of mostly low-risk PCa. These results question the need for standard TRUS-Bx in addition to MRI-TBx. Although, the majority of men included in this trial had undergone one previous biopsy, another prospective study, that included only men without any previous intervention, revealed similar results emphasizing the improvement in the detection of intermediate to high-risk prostate cancers by MRI-TBx [8].

mpMRI in men with prostate cancer

The role of mpMRI in cohort studies of men under AS has been widely investigated. Among potential candidates for active surveillance, mpMRI detects suspicious lesions in as many as 70% of cases [9]. As such, this was found to be linked with a greater probability of progression, amounting to 50%. Therefore, MRI has become an additional tool in patient risk-stratification and counseling before active surveillance. However, the role of longitudinal, repeated mpMRI with regard to the AS protocol remains to be determined, including the use of mpMRI to supplant repeated TRUS-Bx.

Although not a systematic review, Bjurlin et al. nicely summarize recent studies devoted to mpMRI. Future research is needed to establish a PI-RADS score cut-off to balance the detection of significant prostate cancer. Further prospective studies are also awaited to define a subset of patients, in whom MRI-TBx may replace TRUS-Bx to prevent overdetection of indolent disease and improve risk-stratification of men under active surveillance. Finally, how to corroborate the mpMRI findings with the results of genetic tests that are increasingly being used in North America remains to be established. To date, the EAU recommends mpMRI-targeted biopsy only in the case of a negative first biopsy.

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