Editorial

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The addition of MRI to prostate ultrasound: finally overcoming the random diagnosis of prostate cancer

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Prostate ultrasound (US) has been used for a long time for biopsy guidance in patients suspected for harbouring prostate cancer (PCa). However, the accuracy for PCa identification is low due to its heterogenous appearance on US [1]. As such, the biopsy was performed in a random manner, aiming to sample the whole gland, leading to missed diagnosis of clinically-significant disease and overdiagnosis of indolent cancers [2].

Recently, multiparametric magnetic resonance imaging (mpMRI) has become the investigation of choice in these cases due to its high positive and negative predictive values for the presence of clinically significant PCa [2]. Standardization of the MRI technique and of the reporting has led to the development of the PIRADS score [3], which assesses the risk of a lesion to be clinically-significant. The PIRADS score ranges between 1 and 5 (very low risk-very high risk, respectively) and the PIRADS score of 3 and higher is currently employed as a threshold for the indication of prostate biopsy.

The implementation of mpMRI has subsequently revolutionized the biopsy technique. As opposed to the standard US-guided systematic biopsy, nowadays supplementary biopsy cores are targeted towards suspicious areas with the help of mpMRI guidance. There are three techniques for performing MRI-guided prostate biopsy: cognitive, MRI-ultrasound (US) fusion and in-bore. By cognitive biopsy, the operator takes additional cores using ultrasound guidance, aiming to reach the same area as described on MRI. MRI-US fusion prostate biopsy entails the overlay of the MRI unto the ultrasound volume in real-time during the procedure, allowing a targeted biopsy. In-bore guided prostate biopsy is performed inside the MRI gantry and allows targeted sampling based on serial scans to assess for needle position inside the prostate. Although similar outcomes have been reported for all types of biopsies [4], there are several differences which guide the selection of the technique.

First of all, cognitive biopsy is subjective, based on the ability of the operator to understand prostate anatomy on US imaging and to mentally project and target the lesion seen on mpMRI, albeit it is not visible on US. Visible lesions larger than 1 cm could be sampled using this technique. MRI-US fusion prostate biopsy is a more complex procedure. It requires special US machines equipped with different magnetic field generators and sensors, in order to perform an overlay of the MRI and US volumes of the prostate and monitor the position of the biopsy needle in relation with the suspected lesion. All lesions can be biopsied using this approach, even the ones located in the anterior fibromuscular stroma [5]. In-bore guided prostate biopsy requires magnetic field compatible devices to perform the targeted biopsy, multiple scans to locate the needle in relation with the lesion before and after biopsy, together with a long time in the MRI machine, leading to very high costs of the procedure. It is currently recommended in highly selected cases, with small lesions and multiple negative biopsies. As such, the MRI-US fusion systems are the most frequently used, being the most cost-effective, accessible and easy to use for targeting of a wide range of lesions. The development of MRI-US fusion systems has renewed the interest in prostate ultrasound, which has regained its place in the diagnostic pathway of PCa.

Due to the high accuracy reported by centres performing targeted biopsy, the value of additional systematic sampling has been questioned. Several reports showed that in selected patients with lesions classified as PIRADS score 5, additional systematic cores do not change the therapeutic approach [6]. On the other hand,

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as reported also by Cauni et al [7] in this issue of the journal, systematic sampling in addition to targeted cores can lead to an increased detection rate for overall and clinically-significant PCa as compared to MRI-US fusion biopsy. In the lack of level 1 evidence for any of the forementioned approaches, concurrent systematic biopsy to MRI targeted is still recommended by the European Association of Urology especially in biopsy naive patients [2]. Indeed, as MRI targeting systems are a relatively new addition to the urological armamentarium, systematic sampling can overcome errors inherent at the beginning of the learning curve [5]. In this regard, efforts should be made for the standardization of the technique and teaching MRI and MRI-guided biopsy since residency. In our experience, we observed that minimal experience in MRI reading and the presence of a mentor ensures good outcomes of MRI-US fusion prostate biopsy after 52 cases performed, as opposed to double the number of cases needed to reach the same detection rates in inexperienced operators [8].

To conclude, the interest in prostate US has been renewed with the addition of mpMRI. MRI-US fusion systems for prostate biopsy are the most accessible to use in daily practice and allow an accurate targeting of suspicious lesions inside the prostate; as such their use has become the new standard of care in patients suspected for PCa.

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