Can fast bi-parametric MRI help prostate cancer detection in biopsy naive men?

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Comment on: van der Leest M, Israël B, Cornel EB, *et al*. High Diagnostic Performance of Short Magnetic Resonance Imaging Protocols for Prostate Cancer Detection in Biopsy-naïve Men: The Next Step in Magnetic Resonance Imaging Accessibility. Eur Urol 2019;76:574-81.

With increasing level 1 evidence demonstrating improved detection of clinically significant prostate cancer and decreased detection of insignificant disease using multiparametric magnetic resonance imaging (mpMRI) in biopsy-naïve men, the EAU decided to incorporate mpMRI into their prostate cancer guidelines in 2019. In consequence, a steady increase in use of mpMRI scans can be expected over the next few years which represents a major challenge for radiologists and healthcare systems. Reducing scanning time and costs without compromising diagnostic accuracy are important measures to respond to increasing demands in the healthcare economy. In this publication, van der Leest *et al.* propose a new non-contrast biparametric MRI (bpMRI) scanning protocol which could lower scanning time and prevent potential harmful impacts of gadolinium injection (1). In this three-arm comparative study, three different scanning protocols were compared: The mpMRI approach with T2-weighted (T2WI), diffusion-weighted imaging (DWI), apparent diffusion coefficient (ADC) map and dynamic contrast-enhanced (DCE) imaging as recommended by the Prostate Imaging-reporting and Data System (PI-RADS) version 2 standards, a bpMRI protocol with T2WI in three planes, DWI and ADC and a "fast" bpMRI protocol with T2WI in the axial plane only, DWI and ADC. All three protocols were evaluated prospectively in 626 biopsy-naïve men and the images were assessed by two highly experienced radiologists of a single center before the biopsy. Patients

with PI-RADS category 1–2 findings underwent 12-core systematic biopsy while patients with PI-RADS categories 3–5 underwent in-bore MRI-guided biopsy and 12-cores systematic biopsy. With histopathology as the ground truth sensitivity was 95% in all three protocols with lower specificity for "fast" bpMRI (65%) compared to bpMRI and mpMRI (69%). Due to higher PI-RADS 3 rate 2.2% more men would undergo additional prostate biopsy with all of them having either insignificant or no cancer on final histopathology. Inter-reader agreement was almost perfect for all protocols while slightly lower (90%) for "fast" bpMRI compared to the other two modalities (93%). With a scanning time of 7:49 min compared to 13:07 min and 15:57 min for bpMRI and mpMRI, "fast" bpMRI demonstrated a significantly lower scanning time with acceptable compromises in diagnostic accuracy. These results, based on the Dutch healthcare system, also translated into a 54% reduction of scanning costs of the "fast" bpMRI approach compared to mpMRI.

The findings of this study are really encouraging and we congratulate the authors for this well-designed and clinically impactful study. With indications widening for mpMRI in prostate cancer diagnostics, this study represents a first step towards improved efficiency, cost effectiveness and hopefully accessibility for patients. Multiparametric MRI has been shown to be the best and only imaging modality which can reliably visualize prostate cancer lesions due to the combination of anatomic and functional

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MRI sequences. The functional sequences DWI, ADC and DCE are superior in detecting cancer lesions while T2WI due to better soft-tissue contrast is used for assessing the extent of the disease. It has been a matter of debate for many years whether DCE can be omitted in prostate MRI protocols due to questionable additional benefit and growing evidence of potential harmful long-term effects of gadolinium injection. As a result, the relevance of DCE for PI-RADS risk category assignment was gradually decreased starting from version 2 to the most recent version 2.1 (2). However, actual data proving that DCE can be omitted is scarce and limited to retrospective studies without sufficient populations. While the authors of this study are therefore filling an important gap in the current literature, it should be noted that all patients received all pulse sequences during their imaging sessions and afterwards, three different MRI protocols (fast bpMRI, bpMRI, mpMRI) were generated from this data and research based prospective interpretations were done by two readers afterwards. The defined three sequences were evaluated sequentially and inevitably interpretation process was impacted by all three types of protocols. In a clinical workflow, inevitably in few cases, most likely mpMRI impacted bpMRI. Finally, the study included two blinded readers, however most likely there had to be some sort of agreement or consensus between readers in cases of disagreements for the clinical biopsies to be done with minimum required intervention and this factor could possibly impact the reported high interobserver agreement among both study participants as compared to a rather moderate inter-reader agreement published in current literature (3,4).

Due to innate limitations of radiological multi-reader studies, a final conclusion on whether DCE can be omitted or not cannot be drawn yet. As the authors themselves correctly conclude, their study was conducted in a reference center for prostate mpMRI and both readers were highly experienced in this particular field of radiology. The diagnostic performance of the proposed "fast" bpMRI might therefore be lower in a non-expert environment. Based on the Dutch healthcare system, the authors predicted a more favorable cost-benefit ratio. However, it remains to be seen whether this is also reproducible when validating the proposed protocol in other centers and healthcare systems across the World. Furthermore, mpMRI is also used for staging and prognosis assessment when cancer diagnosis is confirmed on biopsy. A bpMRI scan might not be enough to assess the extent of disease accurately enough and patients might need to be scanned again on an mpMRI protocol, which may not necessarily be covered by some healthcare systems. This might counteract the cost-advantages but still be worthwhile when limiting mpMRI to a selected population is cost-effective. Future cost-effectiveness considerations need to take this into consideration.

In conclusion, the reported results of this study by van der Leest *et al.* are quite encouraging and contributing to the convincing evidence for the utility of MRI guidance for biopsy procedures in screening positive patients. As stated by the authors, further prospective studies are needed to implement this technique in low-volume practices with non-expert readers and lower-field-strength scanners.

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Footnote

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/cco.2019.12.14). BT reports cooperative research and development agreements with Philips and Nvidia 2-Royalties from Invivo 3-Patent for related intellectual property in field of prostate computer-aided diagnosis (National Institutes of Health owned), outside the submitted work. SM has no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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