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The role of artificial intelligence in MRI-driven active surveillance in prostate cancer

Nikita Sushentsev and Tristan Barrett

In a Review published in *Nature Reviews Urology*, Ploussard and colleagues discussed the evolving role of magnetic resonance imaging (MRI) in guiding active surveillance (AS) for patients with prostate cancer (Ploussard, G., Rouvière, O., Rouprêt, M., van den Bergh, R. & Renard-Penna, R. The current role of MRI for guiding active surveillance in prostate cancer. *Nat. Rev. Urol.* **19**, 357–365 (2022))[1]. We commend the authors for this informative Review, in which clear directions to overcome current limitations to the widespread acceptance of a fully MRI-guided AS pathway are outlined.

When discussing future perspectives, the authors briefly touch upon artificial intelligence (AI), suggesting that applications for assessing progression of MRI-visible lesions during AS are still awaited. We agree that AI could have a crucial role in overcoming some of the limitations in the field in different ways, including objectivizing serial MRI assessment, decreasing MRI inter-reader variability and levelling up performances of non-expert readers. Tackling these challenges could help radiologists manage the growing workload while delivering expert-level quality service[2].

To investigate the potential role of AI in the context of MRI-driven AS, our group developed a baseline MRI-derived radiomics model to predict prostate cancer histopathological progression in patients under AS with MRI-visible low-risk or intermediate-risk disease. In this study[3], we showed that the addition of radiomic features to clinical variables alone improved the area under the receiver operating characteristic curve (AUC) for predicting cancer progression from 0.61 (95% CI 0.481–0.743) to 0.75 (95% CI 0.64–0.86). We then investigated the technique of delta-radiomics as a tool to build a predictive model based on the magnitude of change in MRI-derived radiomic features between the last and first scans obtained over the course of AS[4]. Results from this study showed similar AUCs for the best-performing delta-radiomics model (0.82; 95% CI 0.71–0.93) and expert assessment using the clinically applied Prostate Cancer Radiological Estimation of Change in Sequential Evaluation (PRECISE) scoring system[5] (0.84; 95% CI 0.73–0.96). PRECISE had the highest specificity (94.7%) and positive predictive value (90.9%) for predicting histopathological disease progression; however, delta-radiomics had the highest sensitivity (92.6%) and negative predictive value (92.6%). Overall, these preliminary results highlight the potential of AI to improve baseline risk stratification and to benchmark expert performance when monitoring patients on AS.

Multiple limitations of radiomics research that have hindered clinical applicability of the developed models to date need to be acknowledged. These limitations include the lack of multicentre, multi-vendor datasets with overlapping follow-up protocols and clinical end points[6], poor repeatability and reproducibility of MRI-derived radiomic features[7,8], and a lack of consensus on appropriate image pre-processing, feature selection and predictive modelling strategies[9]. Overcoming these limitations will require a consolidated multicentre and multidisciplinary effort.

In summary, AI has a potentially substantial role in facilitating the adoption of an MRI-driven AS pathway in clinical practice provided that generalizability, safety and effectiveness of the developed models are shown. Work still needs to be done, but the foundations have already been laid.

Nikita Sushentsev ✉ and Tristan Barrett
Department of Radiology, Addenbrooke's Hospital and University of Cambridge, Cambridge, UK.
✉*e-mail: ns784@medschl.cam.ac.uk*

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Competing interests
The authors declare no competing interests.