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# Optimizing prostate magnetic resonance imaging: toward smarter imaging pathways

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Magnetic resonance imaging (MRI) has become a cornerstone in the diagnosis and management of prostate cancer, with established roles in initial detection, active surveillance, and post-treatment assessment[1,2]. Multiparametric MRI (mpMRI)—which includes T2-weighted imaging (T2WI), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced (DCE) imaging—has enabled more precise risk stratification, targeted biopsy, and treatment planning. However, as global demand for prostate MRI increases, concerns regarding scan duration, cost, and resource utilization are becoming more pressing. Biparametric MRI, which omits DCE-MRI, has shown comparable performance in certain populations, suggesting that it is feasible to take approaches that are more streamlined[3,4]. With rising case volumes, further optimization of MRI workflows is essential to balance diagnostic accuracy and clinical efficiency.

In this context, the pilot study conducted by Firoozeh et al.[5], published in **Radiologia Brasileira**, offers timely and provocative insights. The authors assessed whether an early negative result on T2WI or DWI could reliably predict a completely negative mpMRI, potentially allowing early scan termination. In 492 scans compliant with Prostate Imaging Reporting and Data System, version 2.1, they found that the scan could have been completed after just one negative sequence in 33% of the patients with suspected cancer and in 10% of those with known cancer. They also found that DWI was superior to T2WI: 88.9% of negative DWI scans were followed by negative T2WI/DCE sequences, compared with 62.4% for negative T2WI scans predicting negative DWI/DCE sequences. These results held after adjustment for patient and reader variables.

This hypothesis-generating study mirrors commonly utilized decision-making algorithms in other imaging workflows, such as adrenal computed tomography[6]. The appeal is evident: if a substantial proportion of mpMRI scans are ultimately negative, early scan truncation based on real-time interpretation could improve access, reduce costs, and limit unnecessary imaging. Patients would benefit from shorter scan times and, when contrast is avoided, reduced exposure.

The concept of using DWI as a first-line or stand-alone sequence has already been explored in the context of prostate cancer diagnosis. Reijnen et al.[7] recently showed that high-resolution monoparametric DWI achieved 100% sensitivity for clinically significant prostate cancer, suggesting that in a subset of patients, additional sequences may be unnecessary. Their findings complement and expand on those of Firoozeh et al.[5], supporting the strong negative predictive value of DWI, particularly in low- to intermediate-risk populations. However, some limitations must be acknowledged. Although early-sequence prediction appears statistically sound, the clinical risk of prematurely terminating a scan remains non-trivial. In the Firoozeh et al. study[5], 11% of negative DWI sequences were followed by positive findings in subsequent phases. In those cases, early termination could lead to underdiagnosis of clinically significant cancers—especially given the known pitfalls of each sequence when used in isolation[8,9]. In addition, the retrospective design and potential verification bias, despite mitigation attempts through re-review, limit the generalizability of these findings. Future validation should ideally involve blinded and sequential reading.

Operational barriers also exist. Requiring radiologists to interpret and act in real time would increase cognitive demands, introduce variability, and potentially slow workflow[10]. Artificial intelligence (AI) could eventually fulfill that role, assessing early sequences and determining whether further imaging is warranted. Although preliminary efforts in AI-based sequence optimization have shown promise[11], broader validation is needed, especially given the variability of DWI acquisition across vendors and platforms.

Despite these challenges, the Firoozeh et al. study[5] contributes to an emerging paradigm: personalized MRI protocols based on real-time imaging content and predictive modeling. Current guidelines emphasize standardization, whereas future directions may embrace adaptive protocols reflecting patient risk profiles and early imaging findings—similar to evolving approaches in computed tomography colonography and abbreviated breast MRI[12]. These abbreviated strategies are also

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aligned with the emerging role of MRI-based prostate cancer screening, in which the high negative value assurance of DWI may prove useful. Overall, protocols that are scalable and streamlined will be critical to manage the expected surge in demand[13].

In conclusion, Firoozeh et al.[5] present compelling early data suggesting a pathway to more efficient, intelligent prostate MRI. Although not yet ready for routine clinical practice, these findings set the stage for further investigation—particularly in conjunction with AI tools. As the role of prostate MRI continues to expand, such innovations will be essential to balancing diagnostic accuracy with operational feasibility in high-volume and resource-limited settings.

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