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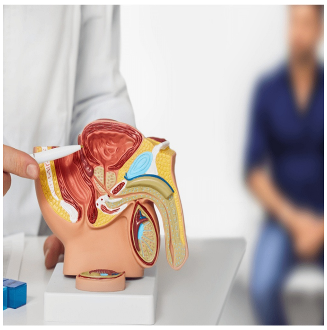
Biparametric MRI in Prostate Cancer Active Surveillance



Active surveillance (AS) has become a widely recommended approach for managing patients with low or favourable intermediate-risk prostate cancer. This strategy aims to delay or avoid radical treatments and their associated side effects while maintaining effective cancer control. Magnetic resonance imaging (MRI), particularly multiparametric MRI (mpMRI), is important in assessing patients for AS eligibility and monitoring disease progression. However, the growing demand for imaging has led to increasing interest in biparametric MRI (bpMRI), which eliminates the need for contrast administration, making the procedure faster and more cost-effective. A recent article in European Radiology explores the comparative advantages of bpMRI over mpMRI and its potential role in AS follow-up.

Multiparametric vs. Biparametric MRI in Prostate Cancer Surveillance

The conventional method for imaging patients undergoing AS is multiparametric MRI (mpMRI). This technique includes several sequences: T2-weighted imaging (T2W), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced imaging (DCE), which requires the use of gadolinium-based contrast agents. While mpMRI is the current standard for diagnosing and monitoring prostate cancer, it is not without risks and limitations. The use of contrast agents can lead to allergic reactions, gadolinium deposition in tissues, and complications such as nephrogenic systemic fibrosis in patients with renal issues. These risks have prompted the exploration of bpMRI, which excludes contrast-enhanced sequences.

Biparametric MRI, relying solely on T2W and DWI sequences, offers several benefits, particularly in patients who have already been diagnosed and are being monitored for disease progression. By eliminating the use of contrast agents, bpMRI reduces potential side effects, cuts costs, and increases patient throughput by shortening scan times. While mpMRI is still recommended for initial diagnosis or in cases where staging accuracy is crucial, bpMRI may be a reasonable alternative for routine AS monitoring, provided image quality remains high.

The PRECISE Role of MRI in Active Surveillance

The Prostate Cancer Radiological Estimation of Change in Sequential Evaluation (PRECISE) scoring system was developed to standardise the assessment of prostate cancer progression in patients on AS. PRECISE assigns a score based on MRI findings, ranging from 1 (indicating a reduction of previously suspicious features) to 5 (indicating definitive radiological progression). This scoring system helps guide clinical decision-making, triggering repeat biopsies or treatment based on radiological changes.

Current guidelines recommend MRI during AS but do not specify the frequency or whether contrast-enhanced sequences are necessary for follow-up imaging. The PRECISE guidelines suggest that MRI protocols should meet the minimum criteria of the Prostate Imaging Reporting and Data System (PI-RADS), but do not explicitly mandate contrast use. In practice, many institutions opt for bpMRI in routine AS follow-up for patients with stable disease, reserving mpMRI for higher-risk cases or those with clinical signs of progression. PRECISE-based MRI assessments provide a structured framework for evaluating changes, making bpMRI a potentially suitable option for monitoring disease progression, especially when combined with regular prostate-specific antigen (PSA) tests and clinical examinations.

The Benefits and Limitations of Biparametric MRI in AS

The shift toward bpMRI in AS is supported by several practical advantages. First, bpMRI reduces the need for contrast agents, avoiding the associated risks and making the procedure more accessible to patients who may be allergic to gadolinium or have impaired kidney function. Second, by simplifying the imaging protocol, bpMRI allows for shorter scan times, which can ease the burden on imaging services and improve patient compliance. Abbreviated MRI protocols are well-tolerated by patients undergoing repeated studies over long periods, an essential factor in maintaining adherence to AS protocols.

Moreover, studies have shown that bpMRI offers similar diagnostic performance to mpMRI in many settings, particularly in detecting clinically significant prostate cancer (csPCa). This equivalence suggests that bpMRI may be appropriate for many AS patients, particularly those with stable disease and low PSA levels. However, it is important to note that bpMRI does have some limitations. The omission of DCE in bpMRI may reduce sensitivity for detecting new lesions or staging more advanced disease, particularly in cases where image quality is compromised. In such situations, the "safety net" provided by contrast-enhanced sequences may be necessary to ensure accurate diagnosis and staging.

Individual patient risk factors should guide the balance between bpMRI and mpMRI in AS. For example, patients with fast PSA doubling times or significant changes in clinical or pathological status may still require mpMRI to ensure no significant cancer is missed. Additionally, in cases where prior interventions have altered the prostate's morphology, such as transurethral resection of the prostate (TURP) or radiotherapy, mpMRI may offer clearer imaging and more accurate assessment.

Conclusion

As the demand for prostate cancer surveillance grows, parametric MRI offers a promising alternative to multiparametric MRI for routine monitoring in patients on active surveillance. Biparametric MRI provides several benefits, including reduced costs, faster scan times, and improved patient tolerance, all while maintaining a diagnostic performance comparable to mpMRI in many cases. However, mpMRI retains its importance for higher-risk patients and those requiring detailed staging or follow-up after interventions.

Future studies are needed to evaluate further the safety and efficacy of bpMRI in active surveillance, particularly in large, multi-centre trials. The development of artificial intelligence (AI) solutions may also enhance bpMRI, helping to improve image quality, reduce the variability in interpretation, and provide more precise assessments of disease progression. For now, bpMRI represents a viable, lower-risk option for stable patients on AS, provided it is used in conjunction with regular clinical assessments and PSA monitoring. Ultimately, the choice between bpMRI and mpMRI should be tailored to each patient's individual risk profile and clinical status.

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