

AI-Assisted Biparametric vs Multiparametric MRI for Clinically Significant Prostate Cancer

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BACKGROUND

Multiparametric MRI (mpMRI) is the pre-biopsy reference standard for detecting clinically significant prostate cancer (csPCa, ISUP ≥ 2). Biparametric MRI (bpMRI) offers a faster, lower-cost alternative. AI may improve diagnostic performance in both. We systematically reviewed AI models for csPCa detection using bpMRI and mpMRI.

METHODS

Systematic review of MEDLINE, PMC, EMBASE, SCOPUS and COCHRANE. Studies were evaluated using TRIPOD-SRMA and TRIPOD-AI.

6,389

records identified

202

full-text reviewed

6

studies included

6 studies met inclusion criteria: bpMRI (PMID 40259798, 36222324, 38876123) and mpMRI (PMID 40016318, 37345961, 33671533). Considerable methodological heterogeneity was observed in data preparation, sample size estimation, fairness assessment and external validation.

RESULTS

Table 1. Comparative diagnostic performance of AI-assisted bpMRI and mpMRI for csPCa

Metric	AI mpMRI (pooled)	AI bpMRI (pooled)	Human mpMRI (PROMIS trial)	AI bpMRI (PI-CAI benchmark)
Sensitivity	0.88 (0.75–0.98)	0.65 (0.39–0.84)	0.93 (0.88–0.96)	0.97 (0.95–0.98)
Specificity	0.68 (0.51–0.80)	0.93 (0.69–0.99)	0.41 (0.36–0.46)	0.50 (0.42–0.58)
AUC	0.84 (0.69–0.95)	0.88 (0.80–0.93)	Not reported	0.92 (0.89–0.94)

AI-assisted bpMRI demonstrated higher specificity than mpMRI, but with lower sensitivity — a trade-off between detecting all csPCa cases and minimising false positives, potentially influenced by model training and the simplified bpMRI protocol.

0.88

AI mpMRI pooled AUC

0.93

AI bpMRI pooled specificity

CONCLUSION

AI-assisted bpMRI may offer diagnostic accuracy comparable to mpMRI while reducing acquisition time and cost, supporting use in high-throughput or resource-limited settings, whereas AI-assisted mpMRI may improve precision at tertiary centres. External validation and multi-centre calibration are needed before routine adoption.