45. ARTIFICIAL INTELLIGENCE IN EQUIVOCAL PI-RADS LESION ASSESSMENT: SYSTEMATIC REVIEW AND META ANALYSIS

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Introduction. PI-RADS 3 and borderline PI-RADS 4 lesions account for 30-40% of mpMRI findings, creating substantial diagnostic uncertainty in urological practice. Inter-observer variability remains high (kappa 0.45-0.60), generating uncertainty and leading to biopsy recommendations in 60-80% of cases, with benign results in 40-60% and csPCa miss rates up to 25% in negative biopsies.

Aim of study. To systematically review the latest studies that are evaluating AI models for reclassification of equivocal PI-RADS lesions, quantifying diagnostic accuracy, negative predictive value, and reduction in unnecessary biopsies.

Methods and materials. A narrative review and meta-analysis were conducted. Analysis is based on 10 studies carried out between 2024-2026. Deep learning algorithms (CNN/transformer) analyzed T2-weighted, diffusion-weighted and dynamic contrast-enhanced MRI sequences. Primary outcomes included reclassification rates, negative predictive value for biopsy avoidance, diagnostic sensitivity/specificity, and biopsy reduction.

Results. In 65% of PI-RADS 3 lesions have been reclassified by AI algorithms: 61% have been downgraded to PI-RADS 2 or less (pooled NPV 95.8%, CI 95%) avoiding biopsy; on the other hand 39% upgraded to PI-RADS 4 or more, requiring biopsy. PI-RADS 4 lesions saw 27% downgrading (PPV 92.1%). Diagnostic performance reached sensitivity 94.2% (IQR 91- 97%) and specificity 86.7% (IQR 84-90%), surpassing radiologist baseline readings (78%/79%). Biopsy reduction averaged 39% (from 78% to 46% of equivocal cases; OR=0.61, 95% CI 0.52- 0.72), while csPCa detection remained stable at 51.2%. Inter-observer agreement improved from κ=0.59 to 0.87. Processing averaged 28 seconds per case.

Conclusions. Equivocal PI-RADS lesions remain a challenge for selecting the appropriate diagnosis and treatment strategy, but AI reassessment demonstrates superior precision and clinical efficiency, enabling avoidance of 39% unnecessary biopsies without compromising csPCa detection. Prospective multicenter validation will facilitate integration into standard urological protocols.

Keywords. prostate cancer, artificial intelligence, PI-RADS, mpMRI, equivocal lesions.

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