100 Use of the PHI assay as a first line triaging test in an image-guided prostate cancer diagnostic pathway. The PHI in Refining MRI (PRIM) study

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Gnanapragasam V.J. [1], Barret T. [2], Starling L. [3], George A. [3], Burling K. [4], Saeb-Parsy K. [5], Kastner C. [5], Lamb B. [5], Kim L. [6]

[1]University of Cambridge, Academic Urology Group, Cambridge, United Kingdom, [2]University of Cambridge, Dept. of Radiology, Cambridge, United Kingdom, [3]University of Cambridge , Dept. of Urology Translational Research and Clinical Trials, Cambridge, United Kingdom, [4]University of Cambridge, Dept. of Core Biochemistry and Analytical Laboratory, Cambridge, United Kingdom, [5]Cambridge University Hospitals Trust, Dept. of Urology, Cambridge, United Kingdom, [6]University of Cambridge, Dept. of Public Health and Primary Care, Cambridge, United Kingdom

Introduction & Objectives: Multi-parametric MRI (mpMRI) has revolutionized prostate diagnostics in improving the detection and accuracy of biopsies. mpMRI however remains a resource intensive tool and has operator dependent variability in its performance. Here we tested the value of PHI test in reducing and refining the use of mpMRI in prostate diagnostics.

Materials & Methods: 289 men referred for the first time to a prostate diagnostic clinic in our centre had a PHI assay done prior to image-targeted fusion biopsy + systematic biopsies. mpMRI were scored using the Likert scale. Men with no mpMRI lesion had systematic biopsies. Measured parameters included PSA, PSA density (PSAd), PHI, PHI density and outcomes of interest were mpMRI positivity (≥M3), and any significant cancer detection (≥Grade Group 2). Prostate volume was derived from the mpMRI measurements.

Results: The median age was 65y (IQR 59-69), PSA 8.5 ng/ml (IQR5.6-12.4) and PHI 42 (IQR 31-64). 212/289 men (73%) were mpMRI positive. 183/289 (63%) and 126/289 (44%) had any and significant cancers detected respectively. The median PHI was 47 (IQR 34-72) and 33 (IQR 24-43) in mpMRI positive and negative men respectively and 61 (IQR 44-81) and 34 (IQR 26-44) for significant cancers and non-significant cancers/benign lesions. In multivariate logistic regression, PHI was an independent predictor of a positive mpMRI (OR 1.7, 1.4-2.0) after adjustment for PSA, with an AUC of 0.72 (0.68-0.72) compared to 0.51 (0.44-0.58) for PSA ($p<0.0005$). PHI outperformed both mpMRI and PSAd in predicting significant cancer detection; AUC 0.81 (0.76-0.86) versus 0.68 (0.64-0.73) and 0.76 (0.71-0.82). It also outperformed mpMRI and PSAd in detection of any cancer though differences here were much smaller : AUC 0.77 (0.72-0.83) versus 0.71 (0.66-0.76) and 0.74 (0.68-0.80) respectively. The combination of mpMRI and PHI had the highest predictive value for a significant cancer (AUC of 0.84[0.79-0.88]) or any cancer (AUC 0.83[0.78-0.88]). Additional derivation of the PHI density did not add the performance characteristics in this study. Amongst mpMRI negative men, the AUC for predicting a significant cancer was 0.79 (0.63-0.95) and 0.68 (0.48-0.89) for PHI and PSAd respectively. For any cancer detection these values were 0.68 (0.54-0.81) and 0.62 (0.47-0.76) respectively.Using an initial threshold PHI of ≥30 as a cut-point for referrals and biopsying only men with a positive mpMRI would have saved 23% mpMRI and biopsies and missed only 7/126 significant cancers (6%).

Conclusions: Use of the PHI as an initial triage test can reduce the need for men to enter the diagnostic pathway, offering savings on imaging and biopsies yet still retaining a high level of significant cancer detection. Ongoing studies will continue to evaluate its use in a larger multi-centre cohort along with health economic modelling.