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A prospective comparative study of Histoscanning™ and multiparametric 3Tesla MRI for the prediction of cancer foci in men undergoing radical prostatectomy

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Purpose: Histoscanning (HS) is an ultrasound-based method using computer-aided analysis to assess tissue disorganization that has shown potential for prostate cancer detection in pilot studies. Our aim was to prospectively compare the ability of HS and multiparametric MRI (mpMRI) to predict the presence and location of cancer foci within the prostate among men undergoing robot-assisted radical prostatectomy (RP).

Method & Materials: 23 consecutive men who underwent 3T pelvic phased-array coil mpMRI (T2WI, DWI, DCE) prior to RP were enrolled in an IRB-approved evaluation of HS. Following induction of anesthesia, HS was performed on each patient prior to incision for RP. HS, mpMRI, and step-section histology were independently reviewed with reviewers blinded to results of the other tests. The prostate was then divided into 8 regions of interest (ROI) and disease maps were generated for each modality. Data was then evaluated by a committee of 5 reviewers to determine concordance of reported lesions between each imaging modality and histology. Statistical comparisons between imaging modalities were carried out by the McNemar test.

Results: 57/184 (31%) of ROIs were positive for cancer. Accuracy for detection of cancer within individual ROI was 82.6% and 65.2% for mpMRI and HS, respectively ($p < 0.001$). While sensitivity by ROI did not differ between modalities (50.9% vs. 43.9%, $P = 0.503$), mpMRI was more specific (96.9% vs. 74.8%, $p < 0.001$). Within 57 positive ROI's, 62 lesions were identified. The sensitivity for lesion detection was 46.8% for mpMRI, and 38.7% for HS ($p = 0.192$). Among lesions ≥ 10 mm ($n = 24$), sensitivity was greater for mpMRI (83.3% vs 54.2%, $p = .033$). No difference was noted for detection of lesions with Gleason score ≥ 7 ($n = 13$; 76.9% vs. 46.2%; $p = .063$) or primary Gleason grade ≥ 4 ($n = 4$; 100% vs 25%, $p = 0.125$). The overall PPV by lesion was 87.9% for mpMRI and 41.4% for HS.

Conclusion: mpMRI showed greater accuracy in cancer detection both by ROI and individual lesion, largely due to superior specificity. Among individual lesions, both modalities showed relatively poor sensitivity, but mpMRI retained superior sensitivity for detection of larger, higher grade tumors. PPV was significantly better for mpMRI.