

3 Tesla High Spatial Resolution Dynamic Contrast Enhanced and T2-W Prostate Magnetic Resonance Imaging (MRI): Detection of Extracapsular Extension and Staging of Prostate Cancer in Routine Clinical Practice.

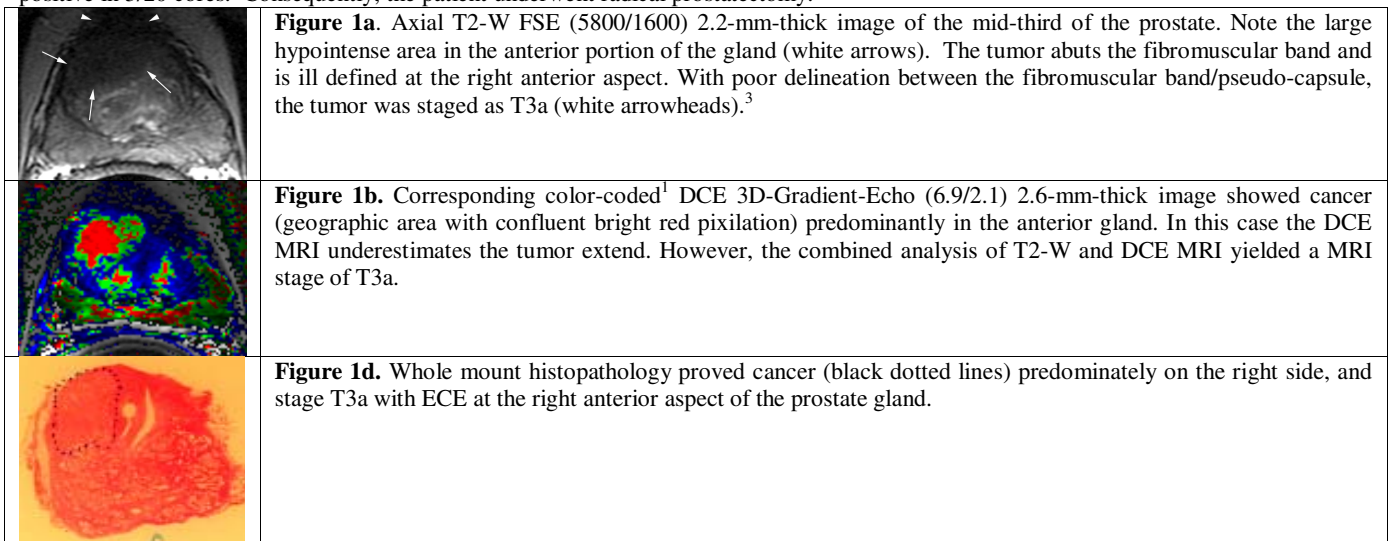
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Background: One reason that the promise of DCE MRI to improve the determination of ECE in prostate has not been realized may result from the limited spatial resolution used with prior studies. Such an approach is likely insufficient to assist with the fine morphologic details required for detection of ECE. A recent study that combined a T2-W and *high spatial resolution DCE-MR* protocol revealed a mean sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for ECE of 86%, 95%, 90% and 93%, respectively¹. The sensitivity for ECE MRI was improved by more than 25% using the combined T2-W/DCE-MRI approach compared to T2-W MRI alone. The combined T2-W/DCE-MRI approach had a mean overall staging accuracy of 95%, as determined by the area under the receiver operating characteristic curve.

Purpose: To determine the sensitivity and specificity of high spatial resolution dynamic contrast enhanced (DCE) MRI combined with high spatial resolution T2 weighted (T2-W) endorectal (ER)² coil MRI at 3 Tesla³ for assessment of extracapsular extension (ECE) and staging in prostate cancer patients in a routine clinical setting, using histopathology as the reference standard.¹

Methods and Materials: The study was approved by the Internal Review Board of the institution. MRI of the prostate at 3 Tesla was performed with combined surface and ER coils in 103 patients (mean age: 58.5; range 47-72; mean total PSA: 10.6 ng/ml; range: 1.5-117; mean Gleason score: 6; range: 6-9) prior to radical prostatectomy. High spatial resolution T2-W fast spin-echo and high spatial resolution DCE 3D gradient echo images were acquired using Gd-DTPA.³ DCE-images were analyzed with a computer generated color-coded scheme.¹⁻⁴ One very experienced, two experienced, and two less experienced readers independently assessed ECE, and tumor stage in a routine clinical setting. MRI based staging results (as noted in the clinical reports) were compared with histo-pathologic results. For the prediction of ECE sensitivity, specificity, positive predictive value, and negative predictive value disease were calculated, along with the corresponding 95% confidence intervals. Staging accuracy was determined by the area under the receiver-operating characteristic (AUC) using the Wilcoxon-Mann-Whitney index of diagnostic accuracy. **Figure 1.** T2-W MRI and DCE-MRI based, color-coded image in correlation with whole mount histopathology of a 56 year old patient with repeat negative biopsies and rising PSA. A third saturation biopsy prompted by the MRI was positive in 3/20 cores. Consequently, the patient underwent radical prostatectomy.



Results: The mean sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for ECE for all readers was 76%, 90%, 78% and 89%, respectively. The sensitivity, specificity, PPV and NPV for ECE for the most experienced reader was 83%, 93%, 83% and 93%, respectively. The overall staging accuracy (AUC) for all readers was 87% (range: 78-93%).

Conclusion: This clinical study demonstrates the pretherapeutic non-invasive staging utility of combined *high spatial resolution DCE MRI* and T2-W MRI at 3 Tesla, yielding improved assessment of ECE and high staging accuracy of prostate cancer *in routine clinical practice*.

References:

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