Seminal vesicle invasion on multi-parametric magnetic resonance imaging: Correlation with histopathology.

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OBJECTIVES: The pre-treatment risk of seminal vesicle (SV) invasion (SVI) from prostate cancer is currently based on nomograms which include clinical stage (cT), Gleason score (GS) and prostate-specific antigen (PSA). The aim of our study was to evaluate the staging accuracy of 3T (3T) multi-parametric (mp) Magnetic Resonance Imaging (MRI) by comparing the imaging report of SVI with the tissue histopathology. The additional value in the existing prediction models and the role of radiologists' experience were also examined.

METHODS: After obtaining institutional review board approval, we retrospectively reviewed clinico-pathological data from 527 patients who underwent a robot-assisted radical prostatectomy (RARP) between January 2012 and March 2015. Preoperative prostate imaging with an endorectal 3T-mp-MRI was performed in all patients. Sequences consisted of an axial pre-contrast T1 sequence, three orthogonally-oriented T2 sequences, axial diffusion weighted and dynamic contrast-enhanced sequences. We considered SVI in case of low-signal intensity in the SV on T2-weighted sequences or apparent mass while diffusion-weighted and DCE sequences were used to confirm findings on T2. Whole-mount section pathology was performed in all patients. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of MRI (index test) for the prediction of histological SVI (reference standard) were calculated. We developed logistic multivariable regression models including: clinical variables (PSA, cT, percentage of involved cores/total cores, primary GS 4-5) and Partin table estimates. MRI results (negative/positive exam) were then added in the models and the multivariate modeling was reassessed. In order to assess the extent of SVI and the reason for mismatch with pathology an MRI-review from an expert genitourinary radiologist was performed in a subgroup of 379 patients.

RESULTS: A total of 54 patients (10%) were found to have SVI on RARP-histopathology. In the overall cohort sensitivity, specificity, PPV and NPV for SVI detection on MRI were 75.9%, 94.7%, 62% and 97% respectively. Based on our sub-analysis, the radiologist's expertise improved the accuracy demonstrating a sensitivity, specificity, PPV and NPV of 85.4%, 95.6%, 70.0% and 98.2%, respectively. In the multivariate analysis PSA (odds ratio [OR] 1.07, p=0.008), primary GS 4 or 5 (OR 3.671, p=0.007) and Partin estimates (OR 1.07, p=0.023) were significant predictors of SVI. When MRI results were added to the analysis, a highly
significant prediction of SVI was observed (OR 45.9, p<0.0001). Comparing Partin, MRI and Partin with MRI predictive models, the areas under the curve were 0.837, 0.884 and 0.929, respectively.

**CONCLUSIONS:** MRI had high diagnostic accuracy for SVI on histopathology. It provided added diagnostic value to clinical/Partin based SVI-prediction models alone. A key factor is radiologist's experience, though no inter-observer variability could be examined due to the availability of a single expert radiologist.

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**KEYWORDS:** Magnetic resonance imaging; Prostate cancer; Tumor staging

PMID: 29279147  DOI: 10.1016/j.ejrad.2017.11.013