

## Abstract

**Introduction:** Extension of prostate cancer (PCa) beyond the gland (T3 stage), including extraprostatic extension (EPE) and seminal vesicle(s) invasion (SVI) is a poor prognostic factor, posing a significant issue in terms of diagnosis and treatment. PET/CT PSMA (*Positron Emission Tomography/ Computed Tomography Prostate Specific Membrane Antigen*) improves the detection of nodal and distal metastases of PCa compared to conventional imaging. Its role in local staging has not yet been established.

**Aim:** The aim of the study was to evaluate the discriminatory ability of PET/CT using the radioligand 18F-PSMA-1007 in predicting EPE, SVI and T3 stage in comparison to currently used methods such as clinical nomograms (MSKCC, Partin tables) and multiparametric magnetic resonance imaging (mpMRI).

**Results:** The sensitivity and specificity of 18F-PSMA-1007 PET/CT for EPE were 0.51 and 0.91, respectively, and the accuracy was 0.76. For SVI, 18F-PSMA-1007 PET/CT demonstrated sensitivity, specificity, and accuracy of 0.46, 0.97, and 0.91. For T3 stage, a sensitivity of 0.50, specificity of 0.90, and accuracy of 0.76 were achieved. Cohen's kappa coefficient ( $\kappa$ ) for EPE (0.46), SVI (0.52), and T3 stage (0.43) demonstrated moderate, above-chance agreement between 18F-PSMA-1007 PET/CT and histopathological assessment. Among the analyzed nomograms and imaging methods, 18F-PSMA-1007 PET/CT had the overall highest diagnostic accuracy in detecting EPE, SVI, and stage T3. 18F-PSMA-1007 PET/CT, mpMRI, and their combination had a high negative predictive value in assessing side-specific extraprostatic extension of PCa, despite low sensitivity.

**Conclusions:** 18F-PSMA-1007 PET/CT is a useful tool for predicting EPE (including side-specific EPE), SVI, and T3 stage of prostate cancer in patients prior to surgery, with higher discriminatory power compared to nomogram MSKCC, Partin tables and mpMRI.

**Keywords:** prostate cancer, PET/CT 18F-PSMA-1007, multiparametric MRI (mpMRI), extraprostatic extension (EPE), seminal vesicle invasion (SVI)