

A Pilot Study of ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2 PET/MRI for Biopsy Guidance in Patients with Suspected Prostate Cancer

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Introduction: Targeting of lesions seen on prostate multiparametric MRI (mpMRI) improves prostate cancer (PC) detection at biopsy. However, 20-65% of highly suspicious lesions on MRI (PIRADS 4 or 5) prove to be false positives (FP) at biopsy.

Specific Aim: We aimed to evaluate the potential utility of ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2 PET/MRI for biopsy guidance in patients with suspected PC and prior negative biopsy or equivocal MRI.

Methods and materials: Nine men, aged 59.8±4.6 years, with suspected PC were prospectively enrolled to undergo ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2 PET/MRI, including prostate mpMRI. The prostate was contoured and divided into 12 segments (apex lateral, apex medial, base lateral, base medial, mid lateral, mid medial, left and right, respectively) using PET/MRI data and MIM software (MIM Software Inc, Cleveland, OH). Maximum standardized uptake values (SUV_{max}) of suspected PC lesions, as well as of background in each segment were collected. Biopsies after PET/MRI included 1 core through each of the 12 segments and targeted sampling of any lesions seen on PET. PET/MRI results were then compared to the gold standard biopsy.

Results: PSA and PSA density at the time of PET/MRI were 11.07±6.57 ng/mL and 0.20±0.12 ng/mL², respectively. Prostate biopsy prior to imaging was available in 7/9 patients of which 4 were negative and 3 showed Gleason score (GS) 7. mpMRI was negative in 4 patients, 4 showed PIRADS 4 and 1 patient PIRADS 5. ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2 PET/MRI each identified 18 lesions, however 6 lesions in 3 patients were incongruent. PET/MRI guided biopsy led to the additional finding of 3 clinically significant tumors with GS 7 in 3 patients as well as 2 with GS 6 in 2 patients. Suspected lesions concordant between mpMRI and both radiotracers were seen in 2 patients: PET/MRI guided biopsy confirmed GS 7 in one patient and for other patient, the lesion seen on imaging correlated to GS 6 while the GS 7 lesion was missed by all modalities. All other biopsy verified GS 7 and 6 lesions were identified by both radiotracers.

Mean SUV_{max} for true positive (TP) were slightly higher than (FP) lesions in ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2, however not statistically significant (Mean SUV_{max} for TP (GS ≥7) vs. FP lesions: 10.64±8.07 vs. 6.44±4.64 [*P*=0.38] for ⁶⁸Ga-PSMA11, and 19.24±17.8 vs. 12.5±13 [*P*=0.47] for ⁶⁸Ga-RM2).

Discussion and conclusion: Our preliminary results show that both ⁶⁸Ga-PSMA11 and ⁶⁸Ga-RM2 PET/MRI are not only feasible for biopsy guidance in suspected PC, but also identified additional cancers not seen on mpMRI. However, larger studies are needed to shed light on the different expression pattern of PSMA and gastrin releasing peptide receptor in PC.