Prospective Evaluation of 68Ga-RM2 PET/MRI in Patients with Biochemical Recurrence of Prostate Cancer and Negative Conventional Imaging.


Abstract

Purpose: \(^{68}\)Ga-labeled DOTA-4-amino-1-carboxymethyl-piperidine-D-Phe-Trp-Ala-Val-Gly-His-Sta-Leu-NH\(_2\) (\(^{68}\)Ga-RM2) is a synthetic bombesin receptor antagonist that targets gastrin-releasing peptide receptors (GRPr). GRPr proteins are highly overexpressed in several human tumors, including prostate cancer. We present data from the use of \(^{68}\)Ga-RM2 in patients with biochemical recurrence (BCR) of prostate cancer (PC) and negative conventional imaging (CI).

Methods: We enrolled 32 men with BCR PC, 59-83 year-old (mean±standard deviation (SD): 68.7±6.4). Imaging started at 40-69 minutes (mean±SD: 50.5±6.8) after injection of 133.2-151.7 MBq (mean±SD: 140.6±7.4) of \(^{68}\)Ga-RM2 using a time-of-flight (TOF)-enabled simultaneous positron emission tomography (PET) / magnetic resonance imaging (MRI) scanner. T1-weighted (T1w), T2-weighted (T2w) and diffusion-weighted images (DWI) were acquired.

Results: All patients had rising prostate specific antigen (PSA) (range: 0.3-119.0 ng/mL; mean±SD: 10.1 ± 21.3) and negative CI (CT or MRI, and \(^{99m}\)Tc MDP bone scan) prior to enrollment. The observed \(^{68}\)Ga-RM2 PET detection rate was 71.8%. \(^{68}\)Ga-RM2 PET identified recurrent prostate cancer in 23 of the 32 participants, while the simultaneous MRI scan identified findings compatible with recurrent prostate cancer in 11 of the 32 patients. PSA velocity (PSAv) values were 0.32±0.59 ng/ml/year (range: 0.04-1.9) in patients with negative PET scans and 2.51±2.16 ng/ml/year (range: 0.13-8.68) in patients with positive PET scans (P: 0.006).

Conclusion: \(^{68}\)Ga-RM2 PET can be used for assessment of GRPr expression in patients with BCR PC. High uptake in multiple areas compatible with cancer lesions suggests that \(^{68}\)Ga-RM2 is a promising PET radiopharmaceutical for localization of disease in participants with BCR PC and negative CI.