Preface

Prostate Cancer Imaging in the Era of Molecular Medicine

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Prostate-specific antigen (PSA) is currently the most widely used biomarker of prostate cancer (PCa). PSA suggests the presence of primary tumor and disease relapse after treatment, but it is not able to provide information on the site of disease. To that aim, molecular and functional imaging is a reliable tool for primary tumor detection and disease extension assessment, in both staging and restaging. ^{11}C and ^{18}F -Choline PET/CT are well established procedures that are currently used especially for restaging after radical treatment. However, those procedures are known to provide an insufficient detection rate in the case of low PSA values. That's why new compounds have been tested clinically, and some of them recently found a routine application in the workup of patients with PCa. Ga-PSMA, for example, is a tracer targeting a type II transmembrane protein with an extensive extracellular domain, a transmembrane segment, and an intracellular domain that is overexpressed in PCa, including androgen-independent, advanced, and metastatic disease. ^{68}Ga -PSMA PET/CT was proved to have a higher positivity rate as compared with Choline in the case of PCa relapse with low PSA values. Furthermore, by substituting the imaging isotope (Gallium) with a therapeutic one (such as Lutetium-177), it is possible to conjugate a molecular-targeted therapy that was proved to be effective in preliminary cases. Better results as compared with Choline were obtained also with ^{18}F -FACBC, a recently

FDA-approved synthetic amino acid analogue PET radiotracer for the evaluation of recurrent PCa. ^{18}F -FACBC has a more favorable distribution (low background) and provides a higher target-to-background signal as well as a higher specificity.

Other promising PET tracers are currently under evaluation. To this group belong to this group of compounds, ^{68}Ga -PSMA-labeled Bombesin, ^{64}Cu -PSMA, ^{18}F -labeled small molecular inhibitors of PSMA, and the uPAR-PET: future research will define the role and value of those compounds in the clinical management of patients with PCa.

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