Imaging tracers

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Diagnosis of neurodegenerative dementias – with Alzheimer’s Disease (AD) being the most important one is still seriously hampered by the lack of dedicated diagnostic tracers or imaging biomarkers. A basic problem for diagnosing dementia using nuclear medicine is that PET or SPECT tracers are not available for all the different molecular targets of interest. Imaging biomarkers are the subset of biomarkers that manifest themselves via imaging means, including the molecular imaging techniques PET or SPECT. They have a tremendous potential for accelerating the development of pharmaceuticals and therapeutic devices, as well as for improving the quality of patient care. Despite the fact that the search for novel imaging biomarkers for AD and other dementias has been intensified since the advent and wide-spread diagnostic applications of PET during the past two decades, there are still no optimal imaging biomarkers available for routine diagnostic use. This review will cover the imaging biomarker tracers available for diagnosis of dementia today.

Basically, in addition to fluorodeoxyglucose [18F]FDG PET other 18F tracers (1) and 11C tracers for the study of AD can be divided into the following major research lines. The main research area is beta-amyloid imaging: 11C-PIB has been tested in a series of proof-of-concept studies, demonstrating that it can indeed visualise beta-amyloid deposits in the brain of AD patients (2). Several other 11C-labelled compounds have been used for amyloid imaging in AD such as the stilbene derivative [11C]SB-13, and [11C]BF-227. There are also fluorine labelled amyloid imaging tracers such as [18F]BAY94-9172 (3), [18F]PIB and [18F]FDDNP. AZD2184 is a new beta amyloid tracer which in relation to the reference radioligand PIB, may enable PET-visualization of amyloid deposits in the living human brain with a higher sensitivity than currently used PET radioligands (4). Another main area is the peripheral benzodiazepine receptors (PBR), or, as recently called, 18 kD translocator protein (TSPO): In addition to the classical tracer [11C]PK11195, [11C]DAA1106 was recently used in PET studies of patients with mild AD and in healthy controls (5). In addition, tracers for other targets such as for the cholinergic, dopaminergic, serotonergic, histamine and sigma receptor systems will also be reviewed.

References