SNMMI image of the year: In vivo selective imaging of tau pathology in Alzheimer's disease with F-18

June 10 2014

A PET image using F-18 THK5117, a novel tracer that labels neurofibrillary tangles with high selectivity, has been selected as the Society of Nuclear Medicine and Molecular Imaging's (SNMMI) 2014 Image of the Year. Researchers selected this image from more than 1,700 studies presented during the 2014 SNMMI Annual Meeting in St. Louis, Mo. Each year, SNMMI chooses an image that exemplifies the most cutting-edge nuclear medicine or molecular imaging research today and demonstrates the ability of molecular imaging to detect, diagnose and treat disease and help select the most appropriate therapy.

Dementia affects nearly 40 million people worldwide, and Alzheimer's disease (AD) is the leading form of dementia. There are two distinct pathological changes seen in Alzheimer's brain—senile plaques, which have amyloid deposition, and neurofibrillary tangles, which have hyperphosphorylated tau deposition. In comparison to well-established amyloid PET tracers, radiotracers that bind to tau/neurofibrillary tangles are still under development.

During the study, Nobuyuki Okamura, MD, PhD, of Tohoku University School of Medicine and his team had eight AD patients and six age-matched healthy control (HC) subjects undergo F-18 THK5117 PET scans for 90 minutes. PET scans were performed with C-11 Pittsburgh Compound B (PiB) on the same population. Standard uptake value ratios (SUVRs) were calculated 60-80 minutes post-injection for THK5117

and 40-70 minutes post-injection for PiB using the cerebellar cortex as the reference region. Partial volume correction, accounting for both grey matter atrophy and white matter spillover, was performed using PMOD 3.4 software.

"In this study, the selective binding ability of F-18 THK5117 to tau was confirmed by the direct comparison with the amyloid PET tracer PiB." stated Okamura. "I hope that this technique will contribute to the development of new anti-dementia drugs. I feel very honored to receive this award. I would like to thank all the team members and subjects who participated in this research project."

AD patients showed F-18 THK5117 retention in the lateral and medial temporal cortices, areas known to contain high concentrations of tau deposits. F-18 THK5117 SUVR in these areas reached a plateau at 60 minutes post-injection. Regional distribution of F-18 THK5117 differed considerably from that of C-11 PiB in AD brains. F-18 THK5117 retention in the temporal cortex was correlated with the severity of dementia. In addition, F-18 THK5117 retention in the hippocampus was correlated with hippocampal volume in AD patients. Intriguingly, F-18 THK5117 retention in the right temporal lobe was observed in HC subjects with right temporal lobe atrophy.

"Dr. Okamura's work is in the forefront of such research." noted Satoshi Minoshima, MD, PhD, chair of the SNMMI Scientific Program Committee. "His group has successfully developed an F-18 labeled tracer, F-18 THK5117, that binds to tau/neurofibrillary tangles seen in Alzheimer's disease. Owing to its longer half life, F-18 labeled tracers can potentially be distributed widely to many imaging centers. They demonstrated differential distributions of amyloid tracer versus tau/neurofibrillary tangle tracer in Alzheimer patients. Such observations shed critical light into pathogenesis and pathophysiology of Alzheimer's disease and will help develop better diagnostic methods and effective

treatments."

More information: Scientific Paper 136: N. Okamura, R. Harada, and K. Yanai, Tohoku University School of Medicine, Sendai, Japan; S. Furumoto, R. Iwata, and M. Tashiro, Cyclotron and Radiosotope Center, Tohoku University, Sendai, Japan; K. Furukawa, A. Ishiki, and H. Arai, Institute of Development, Aging and Cancer, Tohoku University, Sendai Japan; and Y. Kudo, Clinical Research, Innovation and Education Center, Tohoku University Hospital, Sendai, Japan, "In vivo selective imaging of tau pathology in Alzheimer's Disease with 18F-THK5117." SNMMI Annual Meeting, June 7-11, 2014, St. Louis, Missouri.

Provided by Society of Nuclear Medicine