Science Briefs from the SNMMI 2017 Annual Meeting

Scientific studies reported at the 2017 SNMMI Annual Meeting in Denver, CO, June 10–14, covered a broad range of topics in molecular imaging, therapy, instrumentation, and practice. A number of these studies were reported by national and international media. Following is a selection and brief overview of some of these presentations. Numerals in brackets represent abstract numbers as published in *The Journal of Nuclear Medicine* (2017; 58[suppl 1]).

Sonni et al. from Stanford University and Stanford University School of Medicine (CA) reported on "Imaging patients with breast and prostate cancers using combined ^{18}F-NaF/^{18}F-FDG and time-of-flight (TOF) simultaneous PET/MRI" [755]. The authors compared detection of metastatic disease using dual-tracer TOF PET/MR imaging with ^{99m}Tc-methlyene diphosphonate (MDP) bone scanning in 17 women with breast cancer and 39 men with prostate cancer. They found that not only was combined ^{18}F-NaF/^{18}F-FDG PET/MR imaging superior to ^{99m}Tc-MDP scintigraphy for evaluation of skeletal disease extent but that it detected extraskeletal disease with results that could change management. This was accomplished with a significant reduction in radiation exposure from the much lower dosages of PET radiopharmaceuticals administered. "For certain patients with breast and prostate cancer who require evaluation of metastatic disease, a single PET/MR exam can provide more accurate information with less radiation dose in 1 procedure that is more convenient for patients and potentially less costly for the health care system," said Andrei Iagaru, MD, coauthor and associate professor of radiology at Stanford University School of Medicine.

Lohrmann et al. from Memorial Sloan Kettering Cancer Center (New York, NY) and MabVax Therapeutics Holdings, Inc. (San Diego, CA) reported on a "First-in-human study of ^{89}Zr-DFO-HuMab-5B1 (MVT-2163) PET/CT imaging with and without HuMab-5B1 (MVT-5873) in patients with pancreatic cancer and other CA 19-9 positive malignancies" [385]. The study included 9 such patients, subgroups of whom received escalating doses of unlabeled HuMab-5B1 (MVT-5873) (0, 17, and 47 mg) within 2 h before injection of the radiolabeled HuMab-5B1 (MVT-2163) for a total antibody mass of 3, 20, and 50 mg. All patients underwent a diagnostic CT scan before and 4 whole-body PET/CT scans after injection (day of injection, d 2, d 4 ±1, and d 7 ±1). Administrations were well tolerated across dose levels, and focal tracer uptake was seen in lesions beginning on d 2 and peaking on d 7. ^{89}Zr-DFO-HuMab-5B1 accumulated in known local recurrences, lung, lymph nodes, bone, and peritoneal metastases, with intense uptake in subcentimeter retroperitoneal and mesenteric nodes that were normal by CT criteria. "This new agent is intensely accumulated in pancreatic cancer and finds very small metastases with PET/CT imaging," said Christian Lohrmann, MD, lead author of the study, from Memorial Sloan Kettering Cancer Center. "There are promising data that HuMab-5B1 could become a theranostic drug used in both targeted imaging and therapy, which could eventually improve the prognosis for pancreatic cancer patients."

Florek et al. from Leipzig University Hospital and Max Planck Institute for Human Cognitive and Brain Sciences (Leipzig, Germany) reported that "Dual time-point ^{18}F-florbetaben PET delivers dual biomarker information in mild cognitive impairment (MCI) and Alzheimer's dementia (AD)" [556]. Building on previous work demonstrating that dual time-point ^{18}F-florbetaben PET can deliver both blood flow and amyloid load surrogates, the authors investigated whether these surrogates can serve as AD biomarkers. The study included 112 individuals (41 with MCI, 50 with probable/possible AD, and 21 with other dementia) who underwent hybrid PET/MR imaging at 0–10 and 90–110 min after tracer injection. Visual analysis showed AD-typical patterns in the early images in 35% of all subjects and Aβ-positivity in the late images in 37% of all subjects. Overall, the biomarker information provided by dual time-point ^{18}F-florbetaben PET enabled the authors to correctly categorize MCI and AD individuals according to 2 sets of international recommended diagnostic criteria. "Until now, researchers conducted 2 separate molecular imaging procedures to glean information about Aβ buildup and neuronal injury in the brain," said Henryk Barthel, MD, PhD, from University Hospital Leipzig and a study coauthor. "This study provides proof of concept that information about both biomarkers can be obtained from the administration of a single PET tracer."

Zaman et al. from Stanford University and the Stanford University School of Medicine (CA) reported on "Harnessing radioluminescence and sound to reveal molecular pathology of atherosclerotic plaques" [31]. The researchers described the development of the Circumferential Intravascular Radioluminescence Photoacoustic Imaging (CIRPI) system to enable detection and characterization of vulnerable plaque structures and associated biology in coronary artery disease. In preclinical studies, this dual-modality hybrid imaging tool was able to detect and characterize human and murine atherosclerotic plaques. The photoacoustic tomography imaging system detected thin-cap fibroatheroma (TCFA) constituents, such as calcification, severe lipid/fatty acid in the form of mostly cholesteryl ester, phospholipid, cholesterol, and triglyceride in human samples, as well as elastin/collagen. CIRPI images from human and mouse samples were highly correlated with histopathology. "This is the first clinical imaging system able to detect vulnerable plaque in its earliest stages," said

Raiyan T. Zaman, PhD, lead author and instructor in cardiovascular medicine at Stanford University School of Medicine. "Our novel imaging system can detect these vulnerable plaques despite their small size, complex biochemistry, and morphology. This could lead to a paradigm shift in the way coronary artery disease is diagnosed and assessed. This is an important and potentially life-saving tool that could one day be used by interventional cardiologists to identify the appropriate treatment plan for patients at risk of future TCFA rupture."

Ceccarini et al. from the Katholieke Universiteit (KU) Leuven and University Hospitals Leuven (Belgium) reported on "Recovery of decreased metabotropic glutamate receptor 5 (mGluR5) availability in abstinent alcohol-dependent subjects" [14]. The researchers used ^{18}F-FPEB PET to assess whether characteristically decreased cerebral mGluR5 availability in alcohol-dependent individuals normalized during longer term (6 mo) abstinence and whether initial mGluR5 imaging parameters could predict relapse. The study included 32 healthy controls and 16 alcohol-dependent individuals, who underwent ^{18}F-FPEB PET imaging within the 2 first wk of medically supervised abstinence. Follow-up imaging was performed at 2 mo (10 individuals) and 6 mo (8 individuals). Questionnaires assessed alcohol craving and consumption, and participants underwent serial hair analyses. During abstinence, alcohol-dependent subjects showed gradual increases in mGluR5 availability in cortical and subcortical brain areas compared to baseline, recovering to levels seen in healthy controls after 6 mo, except in the hippocampus, nucleus accumbens, and thalamus, which had not recovered fully at that point. A higher striatal mGluR5 availability at baseline was observed in patients who relapsed during the 6-mo follow-up period when compared with those who abstained, and better recovery of mGluR5 in the striatum was associated with higher reduction in 2 different measures of craving. "Lower mGluR5 bioavailability may represent a reversible and potentially beneficial neuroadaptation in alcohol-dependent subjects that helps to reduce cravings and risk of relapse during abstinence," said Gil Leurquin-Sterk, MD, a study coauthor from University Hospitals Leuven and KU Leuven in Belgium.

Del Prete et al. from the Université Laval in Quebec City (Canada) reported on "Personalized ^{177}Lu-octreotate peptide receptor radionuclide therapy (PRRT) of neuroendocrine tumors (NETs): initial dosimetry and safety results of the P-PRRT trial" [242]. The researchers reported on initial dosimetry and short-term safety results of an ongoing trial to prospectively evaluate a novel personalized PRRT (P-PRRT) approach in which renal absorbed dose is standardized. The analysis included 27 patients who underwent 55 personalized ^{177}Lu-octreotate cycles (48 induction and 7 consolidation/maintenance cycles) followed by quantitative SPECT dosimetry in all except 3 cycles. Administration was personalized to deliver 23 Gy to the kidney over a 4-cycle induction course, or 6 Gy during consolidation/maintenance cycles offered to responders. Prescribed renal absorbed dose was adjusted for observed toxicities and increased per protocol tolerances based on individualized data. This approach allowed a significant increase in administered activity per cycle of conventional fixed dosing in the majority of patients, without exceeding the conservative threshold of 23 Gy to the kidney over a 4-cycle induction course. "So far, the majority of PRRT treatments have been administered 1-size-fits-all, meaning every patient receives about the same amount of radioactivity," said Jean-Mathieu Beauregard, MD, assistant professor at the Université Laval. "This results in highly variable absorbed radiation doses to organs and tumors. Many patients may not draw the maximum benefits from PRRT because they end up receiving a lesser dose than their body can realistically tolerate." The authors noted that not only is this maximized tumor irradiation likely to result in improved therapeutic efficacy, but the personalization of the regimen also may facilitate avoidance of severe chronic renal toxicity.

Jonathan Strosberg, MD, from the H. Lee Moffitt Cancer Center (Tampa, Florida), and a consortium of investigators participating in the NETTER-1 trial reported that the "NETTER-1 phase III trial suggests quality of life improvements in patients with midgut NETs" [244]. The trial randomized patients with advanced progressive midgut NETs to treatment with ^{177}Lu-DOTATATE (Lutathera) or high-dose (60 mg) long-acting release octreotide. Questionnaires administered at baseline and every 12 wk thereafter assessed the effects of treatment on health-related quality of life. The authors found that clinically and statistically significant improvements in quality of life were seen in patients on ^{177}Lu-DOTATATE when compared with the octreotide arm. This finding is in addition to the increase in progression-free survival already reported for the PRRT arm in this study. "In nearly all quality of life domains, there were more cases of improvement and fewer cases of decline in quality of life with Lutathera compared to the control arm of the trial," said Strosberg. "This analysis is very important, as assessment of patient quality of life is increasingly viewed as highly relevant to cancer research. Ideally, new drugs should not only prolong survival, but also maintain patient quality of life. What is relatively unique in this study is that quality of life not only appears to be maintained but is actually improved in certain aspects with the investigational drug."