Advances in MI of the Brain

The SNM Molecular Imaging Center of Excellence and the Brain Imaging Council cosponsored a symposium titled "Advances in Molecular Imaging of the Brain" at the 2007 SNM Mid-Winter Meeting in San Antonio, TX. Peter Herscovitch, MD, and Henry VanBrocklin, PhD, organized the symposium, which featured 4 lectures highlighting the breadth of molecular imaging (MI) applications and the potential for brain imaging to have significant effects on patient care. An international group of lecturers covered MI assessment of brain tumor physiology using probes other than ^{18}F-FDG, the measurement of β-amyloid (Aβ) plaque burden in Alzheimer's disease (AD), and the use of MI probes to evaluate drug delivery, development, and therapeutic efficacy.

Karl Herholz, MD, from the Wolfson Molecular Imaging Center (Manchester, UK), opened the session with an enlightening discussion of brain tumor imaging in his talk "Brain Tumors: Beyond FDG." The high uptake of ^{18}F-FDG in normal brain tissue often interferes with its use as a brain tumor imaging agent. Several other tracers, including amino acids (e.g., methionine, fluorotyrosines, iodomethyltyrosine), cellular proliferation markers (e.g., fluorothymidine), intermediary metabolic probes (e.g., choline, acetate), and hypoxia agents (e.g., ^{18}F-fluoromisonidazole) have been used for clinical assessment of brain tumors. The uptake and retention of many of these agents have been correlated with tumor grade. These agents have been used to measure properties associated with chemotherapy delivery and efficacy as well as for treatment planning for radiotherapy. Several more promising tracers are in the pipeline. These include receptor-based probes and labeled chemotherapeutics that may find utility in assessing treatment strategies.

The second lecture, "PET/SPECT in CNS Drug Development," was given by P. David Mozley, MD, senior director, imaging, Merck Research Laboratories (West Point, PA). Dr. Mozley provided an overview of the use of MI in the development of new central nervous system therapeutics. He discussed the need for multimodality imaging that uses

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MOC Featured at Annual Meeting

New requirements for maintenance of certification (MOC) will be the focus of special activities and sessions at the 54th Annual Meeting of the SNM June 2–5 in Washington, DC. Attendees visiting the SNM Molecular Imaging District (Booth 1031, Exhibit Hall) will see demonstrations of the SNM Lifelong Learning and Self-Assessment Program (LLSAP) modules. SNM staff and American Board of Nuclear Medicine (ABNM) board members will be available at the booth to answer MOC questions.

Two special sessions will be featured on June 5 at the Washington Convention Center. The first, "Are You Ready for MOC," was designed for ABNM diplomates with time-limited certificates and will be held in Room 201 from 8:00 to 9:30 AM. The next session, "MOC: Its Impact on Lifetime Certificate Holders," will follow at 9:45 in the same room and was created to provide clarification for diplomates with lifetime certification (those certified before 1992).

The ABNM and SNM have received numerous questions about MOC for lifetime diplomates. Although they are not required to participate in MOC (i.e., the ABNM will not revoke certification for those who do not participate), lifetime diplomates are strongly encouraged to do so. If a lifetime diplomate chooses to participate in MOC, all 4 components must be completed, including the MOC (recertification) exam (Part 3). The timing of these exams is dependent on original date of certification. Diplomates with lifetime certificates who choose to participate in MOC and were originally certified:

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- Between 1972 and 1976 are required to take the MOC (recertification) exam by 2015;
- Between 1977 and 1986, by 2016; and

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SNM was represented at the meeting by Robert W. Atcher, PhD, vice president-elect. More than 20 various professional and trade organizations were also represented, including the American College of Radiology, American Association of Physicists in Medicine, and Council on Radionuclides and Radiopharmaceuticals.

The primary objective of the meeting was to generate discussion and ideas from stakeholders. At this exploratory stage, OSHA staff did not disclose or verify any specific plans to modify their existing ionizing radiation regulations (29 CFR 1910.1096).

CARE Legislation

The American Society of Radiologic Technologists (ASRT) held their annual "RT in DC" event on March 18–20 in Washington, DC, to support the Consistency, Accuracy, Responsibility and Excellence in Medical Imaging and Radiation Therapy bill (CARE bill). The event featured an educational workshop on CARE and appropriate communication with legislators, followed by a full day of legislative visits for approximately 140 technologist attendees.

Senators Michael B. Enzi (R-WY) and Edward M. Kennedy (D-MA) introduced the Senate version of the CARE bill (S 1042) on March 29. The bill was referred to the Senate Committee on Health, Education, Labor, and Pensions.

The House of Representatives' version of the CARE bill (HR 583) was introduced in the 110th Congress on January 19. At this writing there are approximately 49 cosponsors of this bill.

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nuclear, MR, CT, ultrasound, and optical methods and described approaches that employ in vitro models, small and large animal imaging, and studies in humans. MI has a role to play in all stages of drug development. MI studies of the interaction of a proposed new drug with its target tissue can help test the underlying biological hypothesis about how the drug acts, select the range of drug doses to use in human studies, and provide early information to terminate development of a drug before carrying out more costly steps. Using MI in the later phases of drug development can result in smaller, speedier clinical trials, making them both less expensive and safer.

Christopher Rowe, MD, of the Department of Nuclear Medicine and Centre for PET at the Austin Hospital (Melbourne, Australia) presented the third lecture, on "Aβ Imaging with ^{11}C-PIB PET: A Biomarker for Early Detection of Alzheimer's Disease." ^{11}C-PIB is a radiopharmaceutical developed by scientists at the University of Pittsburgh specifically to image the Aβ plaques that accumulate in AD. Potential roles for ^{11}C-PIB include accurate diagnosis of early AD, early intervention when patients are minimally impaired, selection of patients for clinical trials of antiamyloid therapy, and monitoring the effectiveness of such therapy. This latter application is an example of the use of an MI biomarker in drug development, as was reviewed by Mozley. Data were shown demonstrating the superiority of ^{11}C-PIB over ^{18}F-FDG in the detection of AD and its utility in the differential diagnosis of dementia. Clinical trials with ^{11}C-PIB are now being carried out in numerous international sites.

In "Monitoring Gene Therapy in Parkinson's Disease," Krystof Bankiewicz, MD, presented several aspects of using imaging to assess local drug delivery in the brain and an elegant example of imaging to monitor the expression of a therapeutic gene. Parkinson's disease (PD) is characterized by the loss of dopaminergic neurons that project to the striatum. The gene replacement strategy involves the striatal delivery of the genes for amino acid decarboxylase (AADC) in an adeno-associated virus vector. The expression of AADC is visualized with ^{18}F-fluoro-m-tyrosine or ^{18}F-fluoro-L-DOPA. This gene therapy has been extensively evaluated in primate models of PD, where it was found that gene expression was sustained for many years and the PD symptoms were reduced. A phase I study of this therapy in humans with concomitant ^{18}F-fluoro-m-tyrosine imaging is underway.

The development and application of MI probes will be critical to understanding the pathophysiology of neuropsychiatric diseases and to developing and monitoring better therapies. Labeled agonists, antagonists, and substrates for components of neurotransmitter systems have been applied to assess neuroreceptor density and metabolic processes associated with a variety of neuropsychiatric diseases. MI agents are increasingly being used to monitor drug delivery, dose response, drug metabolism, and drug interactions, all key components of the drug development paradigm. Although this symposium presented examples that involved PET or SPECT probes, MR also has an important role in MI applications in the brain. It is clear that molecular neuroimaging will play a pivotal role in the future of patient management and care.

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