Introduction

Several years ago, *The Journal of Nuclear Medicine* summarized the evidence for the usefulness of PET/CT in oncology (*1*). Since then, PET/CT has become a leading modality for diagnosing, staging, restaging, and monitoring cancer. More than 5,000 clinical PET/CT centers are operational worldwide, and more than 2 million patients were studied in the United States in 2013.

Recently, hybrid PET/MR imaging scanners have become available and have been placed in more than 50 centers around the world. This technology is attractive because it can provide anatomic and functional information (MR imaging) as well as molecular information (PET). The fact that both modalities play established diagnostic roles in a variety of diseases promises comprehensive PET/MR imaging examinations combining excellent tissue contrast, molecular targeting, and reduced radiation exposure as compared with PET/CT. Whether these capabilities will result in improved management of patients with neurologic, cardiologic, metabolic, and oncologic diseases has not been defined yet. PET/MR imaging is a complex and challenging technology requiring cross-disciplinary competence and collaborations among physicians, physicists, and technologists.

This supplement aims at updating physicians from various specialties and subspecialties on the current status of PET/MR imaging in research and the clinic. The contributors to this supplement were asked to describe their use of PET/MR imaging in research and the clinic and to delineate the strengths and limitations of the approach.

The principles of PET/MR imaging and its use in preclinical and translational research are described by Disselhorst et al. (*2*) and Wehrl et al. (*3*) from the Tuebingen group. von Schulthess and Veit-Haibach highlight the operational complexities of PET/MR imaging and propose efficient clinical imaging protocols (*4*). Potential clinical applications in neurology are reviewed by Drzezga and colleagues (*5*), and pediatric applications are discussed by Purz and coworkers from the group in Leipzig (*6*). Ratib et al. from the University of Geneva propose optimized protocols for cardiac imaging and describe initial cardiac applications (*7*).

Three contributions address the use of PET/MR imaging in oncology. Rauscher et al. from the Munich group focus on the use of non–^{18}F-FDG PET probes in conjunction with PET/MR imaging (*8*). Wolfgang Weber provides a critical appraisal and suggests that comparisons with PET/CT may not be the best initial approach to clinical PET/MR imaging research (*9*). Finally, Czernin et al. summarize the available clinical evidence that demonstrates feasibility but no diagnostic superiority (*10*).

This supplement does not intend to provide any guidelines. Rather, it summarizes the rapidly growing experience of the authors' institutions and proposes protocols for research and clinical applications in neurology, pediatrics, cardiology, and oncology.

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