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Use of the unique hybrid imaging system Biograph mMR in the clinical setting is on the rise. A great example is the University Hospital of Leipzig where all examinations conducted in children with oncological problems requiring whole-body hybrid imaging are performed exclusively using Biograph mMR.

Pediatric oncology is a special discipline in medicine engaged with diagnosis and treatment of children with cancer. As one of the most challenging disciplines, it also requires extraordinary caution and quality in imaging. In this field, the University Hospital of Leipzig in Leipzig, Germany, took big steps forward thanks to the use of Biograph mMR. It was installed in the fall of 2011 under the supervision of Osama Sabri, MD, PhD, director and chairman of the department of nuclear medicine, University Hospital Leipzig, and spokesman of the local positron emission tomography-magnetic resonance program. “Shortly after the Biograph mMR was taken into operation, all examinations conducted in children with oncological problems requiring whole-body hybrid imaging in our institution have been performed exclusively using PET/MR,” explained Franz Wolfgang Hirsch MD, PhD, the chair of pediatric radiology at the University Hospital of Leipzig.

By developing Biograph mMR, Siemens succeeded in fully integrating 2 modalities, with different functional methodologies that provide complementary information for the diagnosis and understanding of disease, such as cancers. While MR imaging delivers precise structural images of the body’s internal organs, PET shows metabolic activity in the human body. With Biograph mMR, it is now possible to scan once and acquire both MR and PET images simultaneously. Whole-body exams as well as exams of specific body regions are possible.

Siemens introduced the integrated MR and PET system in late 2010. Today, with close to 50 systems worldwide, Biograph mMR is now available in the clinical setting. Since September 2011, the innovative system has been in use in Leipzig. The physicians have been pleased with how well the new hybrid system has been running. “Being such a complex system, in our initial experience, PET/MR has turned out to be an unexpectedly stable and reliable hybrid imaging modality, which generates a complementary diagnostic study,” said Bernhard Sattler, MD, PhD, lead medical physicist of the department of nuclear medicine. “The evaluation in the system in a clinical and research setting revealed very promising results that we were able to publish, and which is still ongoing.”

One of the main reasons to perform pediatric examinations (Figure 1-3) on the new hybrid...
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FIGURE 2. A and B show a 2-year-old boy with a large abdominal neuroblastoma that emanates from the sympathetic chain. The highly differentiated tumor shows only slightly intense inhomogeneous FDG uptake. Because big tumors often exhibit large variability in local glucose uptake, the synergy of the 2 methods is obvious and can be used, for example, for the determination of the biopsy site and for treatment planning.

system is the low radiation exposure. In particular, there is no exposure to ionizing radiation emitted from the MR part of Biograph mMR. “In a diagnostic setting, it is likely that the radiation exposure from a PET/MR scan is significantly lower than the current gold standard of hybrid PET imaging. It is also important to consider that children with oncological diseases often require multiple hybrid imaging investigations,” said Regine Kluge, MD, PhD, vice chair of the department of nuclear medicine.

Another unique feature of Biograph mMR is the true simultaneous acquisition of the MR and PET data. In comparison to sequential solutions, simultaneity makes a big difference. “The advantage of this technical solution is that the acquisition of PET and MR data synchronously allows true simultaneous registration of morphological and metabolic processes that follow the same timeline, resulting in a significantly improved coregistration of the 2 modalities. Moreover due to the fact that the patient only needs to undergo an imaging exam once, the burden from anesthesia—often required for small children—can also be reduced,” commented Henryk Barthel, MD, PhD, who is the assistant medical director of the PET-MR program.

Simultaneous MR and PET examination has also become standard in pediatric oncology at other institutions. “Our mission is to move toward a more personalized treatment of that tumor. We think we can develop a better biopsy by using these combined structural assessments, which you can get with PET and MR in a simultaneous acquisition,” stated Robert C. McKinstry, III, MD, PhD, radiologist-in-chief, St. Louis Children’s Hospital, professor of radiology and pediatrics, and director, Center for Clinical Imaging Research, Mallinckrodt Institute of Radiology, Washington University, St. Louis, Mo.

The Center for Modern Diagnostics (CEMODI) in Bremen, Germany, was the first private installation worldwide of Biograph mMR, and doctors there have been using the scanner in the clinical setting since late 2011. Markus Lentschig, MD, CEMODI, said, “We at CEMODI were motivated to acquire a molecular MR system so that we could...
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FIGURE 3. A 13-year-old boy with a history of extraosseous metastatic Ewing sarcoma of the pelvis now shows new imaging findings with suspicious signs of soft-tissue metastasis in the adductor longus muscle. On MR imaging, size regression was seen within 7 weeks. Because of an intensive increase in glucose utilization, a biopsy was performed, which revealed inflammatory changes.

offer a procedure with as little radiation exposure as possible. This is especially important for frequent follow-up exams and younger patients.”

The University Hospital of Leipzig’s initial experience in children suffering from multifocal, oncological diseases shows that a 60-minute complete examination on the Biograph mMR provides all relevant information for pediatric surgeons and pediatric oncologists (Figure 3). This reduced time for the diagnostic procedure in the initial stages is important for the following steps in therapy planning. “The advantages show that in children with oncological diseases, combined PET/MR including whole-body diffusion weighting demonstrates a new quality in imaging and functional diagnostics,” concluded Dr. Sabri.

MR scanning has not been established as safe for imaging fetuses and infants less than two years of age. The responsible physician must evaluate the benefits of the MR examination compared to those of other imaging procedures.

The statements by Siemens’ customers described herein are based on results that were achieved in the customer’s unique setting. Since there is no “typical” hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.