Revolution in medical imaging: the Biograph mMR
Healthcare, magnetic resonance imaging

The Biograph mMR is the world’s first medical imaging system to combine magnetic resonance imaging (MRI) with positron emission tomography (PET) in a single system. These two technologies function differently and provide complementary information about diseases. While MRI generates millimeter-precise images of internal organs, PET mainly tracks the metabolic activity of cells. The Biograph mMR enables physicians, for the first time, to view changes in organ structure, function, and metabolism simultaneously using a single device.

Introduction:

- PET and MRI are key medical imaging technologies that are used to evaluate a variety of diseases, including cardiovascular diseases, cancer and neurological disorders. PET scans track metabolic processes, while MRI scans reveal the anatomical structures of tissues and organs.
- Until now, PET and MRI scans could only be performed in separate examinations. Because patients (along with their internal organs) always move somewhat between the two examinations, the precision of such separately performed scans is diminished. Furthermore, patients often have to tolerate long waiting times or make two separate visits to the hospital. Using the innovative Biograph mMR from Siemens, MRI and PET scans of the entire body can be done simultaneously in only about 30 minutes. This not only makes the procedure more comfortable for the patient, but also enhances precision and improves the hospital operating efficiency.
- Siemens foresees other clinical uses for the Biograph mMR – particularly, in the early detection of tumors and in therapy planning.
- The greatest technological challenge to be overcome in combining the two procedures in a single device was preventing the strong magnetic field of the MRI scanner from impairing the PET scanner.
- Furthermore, the new system must be compact enough to be used in a normal examination room, while providing sufficient room for the patient during the scan.

Description of technology:

- The Biograph mMR combines powerful PET and MRI technologies in a single system.
The Biograph mMR operates with a magnetic field strength of 3 tesla, which is 60,000 times greater than the earth's magnetic field. This makes it possible to generate high-quality images of areas of the body that are hard to scan. Using this technology, physicians can, for example, pinpoint the best location for performing biopsies much more precisely than before.

Previously, it was technically impossible to perform MRI and PET scans simultaneously because conventional PET detectors made from so-called photo-multiplier tubes could not be used within such a magnetic field as strong as the one generated by an MRI system. But thanks to avalanche photodiodes made from semiconductor compounds, the PET can withstand the strong magnetic field of the MRI. Furthermore, the detectors are small enough to be housed in the casing of a magnetic resonance imaging scanner, so that both systems can be combined in a single device.

Market success:

- The full-body MRI-PET system has been in operation since November 2010. Fifteen systems are currently installed at customers worldwide – including Universitätssklinikum Tübingen in Germany and Massachusetts General Hospital in the U.S.
- The Biograph mMR has proven its value in day-to-day clinical applications as well as in research: ZEMODI (Zentrum für moderne Diagnostik) in Bremen, Germany is using the system for routine patient examinations.
- Initial clinical studies with the Biograph mMR indicate value-added primarily in the field of oncology (cancer).
- As a "new product innovation," the device has been honored by North America's Frost & Sullivan Group with the red dot award: product design 2011 and the IF Design Award 2011.

Further information:

http://www.siemens.com/press/de/events/healthcare/2010-11-Biograph-mMR.php