

▶ Integrated Brain PET/MR in Clinical Routine and Research

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In brain imaging, MRI and PET provide complementary anatomic, physiologic, metabolic, and functional information. With the recent introduction of new hybrid measurement systems, such as the integrated PET/MR Biograph mMR scanner, now it is possible to combine these former separate investigations into one examination.

In our department since installation of the Biograph mMR in November 2010 an increasing amount of patients are examined in clinical routine and research. Approximately 20% of clinical patients have neurological or neuro-oncological diseases, requiring a PET examination in addition to a structural MRI. One major advantage of such integrated PET/MR systems is that i.e. PET and functional MRI (fMRI) can be acquired simultaneously at the same time in the same place at the same conditions.

For each different disease specific protocols have been defined. In general PET acquisition can be combined with anatomical and functional MR sequences, incorporated flexible at different time points in the protocols.

A new important aspect of simultaneous PET/MR is the MR-based attenuation correction. In our department for the Biograph mMR the current standard attenuation correction of PET data is performed with the DIXON sequence. This MR sequence is based on the segmentation of fat and water, while bone is not included in this segmentation. This is a specific issue in brain PET/MR studies as the brain is surrounded by bone and not mainly by soft tissue as in whole-body studies. An alternative to the DIXON sequence for brain studies is the so-called UTE sequence, originally developed for the Siemens PET insert system (brain PET).

Integrated PET / MR promises many new and interesting informations for various diseases of the brain.

Integrated PET/MRI offers several promising options regarding the clinical and scientific evaluation of brain disorders. The known high diagnostic value of MRI and PET procedures for neuropsychiatric conditions may turn hybrid PET/MRI into the imaging modality of choice for diagnostic questions directed toward pathologies inside the brain.

According to our experience patients welcome the PET/MRI examination, because of an increased patient comfort due to a reduction in clinical imaging appointments, and a reduction in total examination time.

Whether hybrid PET/MRI shows a significantly improved diagnostic accuracy compared with the value of each of these individual procedures alone, remains to be proven in future studies.

References

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