

Specialty area: Hybrid Imaging PET/MR

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Title: **PET-MR in Oncology**

Target audience: radiologists, technicians and MR physicists with interest in hybrid imaging

Objectives

The talk aims to show the possibilities and challenges of clinical whole-body hybrid imaging with new positron emission tomography magnetic resonance (PET/MR) scanners in oncology with respect to existing literature.

Summary

The hybrid imaging modality PET/MR poses a challenge for both modalities: For **MRI**, it is essential to provide high spatial resolution in anatomical images and elaborated functional imaging techniques such as diffusion-weighted imaging, proton spectroscopy and dynamic contrast-enhanced imaging. As to **PET**, the challenge of PET/MR mainly consists in quantification since up to now, the vendors of PET/MR scanners offer MR-based attenuation correction maps leading to underestimation of tracer uptake in PET depending on the body region.

In PET/MR it is possible to acquire **morphological and functional** data in one examination with **lower radiation exposure** than in PET/CT. This offers a broad variety of applications for this new hybrid technique in **clinic and research, especially for oncologic diseases**. Using **PET/MR**, different considerations arise for research and clinical applications. In contrast to research application, where time constraints are secondary, in the clinical set-up, standardized, problem-orientated examination protocols need to be designed fulfilling all diagnostic demands. In the talk, the potential of PET/MR for different **tumor entities** will be illustrated in greater detail with respect to the current literature. Especially tumor entities which profit from the superior soft tissue contrast of MRI will be of interest in the next years, e.g. head and neck tumors, liver pathologies and pelvic tumors to name a few. Furthermore, correlation of morphological, functional and metabolic parameters is supposed to engross the understanding of tumor biology. Multiparametric imaging is also a promising tool for treatment monitoring of oncologic patients undergoing **novel targeted anticancer therapies**. This holds especially true in light of **new specific PET tracers** designed to depict certain tumor characteristics such as the somatostatin analogue ⁶⁸Ga-DOTATATE, or ¹⁸F-fluorothymidine (FLT) to depict tumor cell proliferation.

Despite the remarkable potential of whole-body PET/MR the working horse PET/CT will probably not be replaced by PET/MR for all clinical purposes as PET/CT is less cost-intensive and more widely available. Concerning **clinical and research imaging**, especially simultaneous PET/MR offers new possibilities, for example functional cardiac imaging, functional brain studies or the evaluation of new tracers in correlation with specific MR techniques since the MR examination can be performed during PET acquisition. To further evaluate the diagnostic performance of whole-body PET/MR in oncologic imaging **translational studies** with preclinical laboratories as well as broad **prospective clinical studies** are strongly encouraged.

References

1. Buchbender, C., et al., *Oncologic PET/MRI, part 1: tumors of the brain, head and neck, chest, abdomen, and pelvis*. J Nucl Med, 2012. **53**(6): p. 928-38.
2. Buchbender, C., et al., *Oncologic PET/MRI, part 2: bone tumors, soft-tissue tumors, melanoma, and lymphoma*. J Nucl Med, 2012. **53**(8): p. 1244-52.
3. Schwenzer, N.F., H. Schmidt, and C.D. Claussen, *Whole-body MR/PET: applications in abdominal imaging*. Abdom Imaging, 2012. **37**(1): p. 20-8.