

## Clinical PET/MR of the brain: visions from the past and for the future

*Monday, 20 May 2024 09:10 (40 minutes)*

Hybrid PET/MRI systems have been available 2011 with diseases of the brain being identified as the most obvious application in routine clinical use. It was envisioned that the combination of advanced MRI methods, such as classical and hyperpolarized spectroscopy, contrast and non-contrast based perfusion, tractography and diffusion imaging combined with PET molecular imaging would be groundbreaking. From the perspective of nuclear medicine a number of technical MRI challenges became apparent including measurement robustness and the lack of an adequate attenuation correction solutions. The primary patient groups investigated are those with a need for both modalities and a PET tracer solution, primarily dementia ([<sup>18</sup>F]FDG, amyloid tracers), brain tumors (amino acid tracers, [<sup>68</sup>Ga]-DOTATOC), epilepsy ([<sup>18</sup>F]FDG), and Parkinsons disease ([<sup>18</sup>F]FE-PE2I, [<sup>18</sup>F]FDOPA). The added value of advanced MRI methods to diagnostic accuracy have only been limited owing to the high diagnostic accuracy of the PET tracers leading to an overall simplification with short PET/MRI scan of 20 min and only standard MRI sequences. Looking forward the next generation PET/MRI scanner will provide better image quality, faster scans and novel MRI sequences. This will increase patient through-put and convenience, that will be useful in monitoring the effects of new treatment directed at dementia and glioma. New patient groups (eg. MS), however, would require PET tracer development. Furthermore, the image simultaneity positions the method in novel generative AI approach build on both imaging modalities.

### Field

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**Session Classification:** PET/MR applications