



Abdomen

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Challenge and future of PET/MRI for oncology from the perspective of PET

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As PET/MR began to be used in clinical applications over the past 8 years, there were expectations and concerns. PET/CT has rapidly replaced PET-only system due to the effect of dramatically shortening the acquisition time through attenuation correction as well as providing additional anatomical information through CT, but PET/MR was a challenge and concern about what synergy could exist both technically and clinically.

Firstly, one of the technical difficulties in quantification was attenuation correction. As accurate quantification of PET requires attenuation correction, MR and/or PET-based attenuation correction methods have been developed. Although it was already used in clinical practice, there were many limitations in the existing attenuation correction. Recent advances in deep learning models not only increased the performance but overcome the previous limitation of CT-based attenuation correction in the practice. Secondly, PET/MR provides an opportunity to enhance image quality as well as sensitivity by combining information of MR with PET reconstruction.

In terms of the additive clinical value of integrating PET and MR, multi-dimensional quantitative information can be used. Precision medicine requires personalized information of tumors to predict prognosis, treatment response, and be used to choose the best treatment option. Tumor heterogeneity could be analyzed by PET and MR information with regard to metabolism, cellularity, and vascularity. In particular, recently, the remarkable growth of deep learning technology that can be used to noninvasively evaluate molecular information by integrating multiple images makes it easier to predict or extract biologically and clinically important information by fusion of different types of images.

There is still a long way to go from the real synergy in a clinical setting to obtain precise functional and molecular information through PET/MR. However, the advancement of technology capable of processing such complicated multimodal and high-dimensional data makes a new molecular imaging paradigm by using PET/MR as a clinical molecular imaging platform.

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