Introduction: The combination of clinical MRI and PET systems has received increased attention in recent years. In contrast to currently used PET/CT systems, PET/MRI offers not only improved soft-tissue contrast and reduced levels of ionizing radiation, but also a wealth of MRI-specific information such as functional, spectroscopic and diffusion tensor imaging. Combining PET and MRI, however, has proven to be very challenging, due to the detrimental cross-talk effects between the two systems. Objective: Significant progress has been made in the recent years to overcome these difficulties, with several groups reporting PET/MRI prototypes for animal imaging and a clinical insert for neurological applications being demonstrated at the 2007 Annual Meeting of the Society of Nuclear Medicine. Discussion: In this paper we review different architectures for clinical PET/MRI systems, and their possibilities, limitations and technological obstacles.

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