Molecular Signatures of Disease Treatment Efficacy: The Potential of Molecular imaging in Assessing Therapeutic Interventions

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MR molecular imaging agents are emerging that have the potential to improve the detection and biochemical characterization of pathologies with the ultimate goal of segmenting patients early in the natural history of disease and implementing individualized treatment strategies. In addition to diagnostic imaging, some of these agents have the added feature of drug delivery, combining the visual and quantitative attributes of an imaging agent with the improved risk-benefit profile of a site-directed therapeutic system. This new era of combined targeted imaging and therapy applications will have important impact on the traditional roles and future training of radiologists and medicine sub-specialists, which will challenge the "silo" discipline approach to disease, currently practiced in hospitals worldwide. After reviewing a few examples from the spectrum of molecular imaging agents understudy, focus will be placed on one nanotechnology platform, site-directed perfluorocarbon nanoparticles, to illustrate the opportunities and interdisciplinary challenges of nanomedicine.