

2025 ACG-IRG Pilot Grant

Noninvasive Monitoring of Cancer Receptor Expression and Treatment Response Using PET/MRI Paired-Agent Imaging



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Abstract:

Immuno-oncologic treatments that target patient-specific tumor vulnerabilities and affect the complex interactions between tumor cells and the immune system have been transformational in cancer treatment, significantly improving patient survival in highly aggressive malignancies. However, while certain subpopulations of patients are highly responsive, others have low overall response rates. Despite increasing investments in drug research and development and the high price tag for immunotherapy treatments, many patients receiving immunotherapies do not actually benefit. Thus, there is a substantial gap between mechanistic laboratory understanding and deployment of these treatment strategies in patients. This gap stems from a deficiency in new technology to noninvasively quantify and monitor key biomarkers predictive of immunotherapy treatment response. Our prior work using a MRI-coupled fluorescence tomography paired-agent imaging (PAI) system has demonstrated capability of quantifying EGFR receptor availability in response to receptor-targeted immuno-therapy in orthotopic tumor models. This study proposes a quantitative cross modality receptor imaging technique using paired-agent PET/MRI. This novel imaging technique aims to bridge the current technology gap by noninvasively quantifying the availability of drug targets and determining whether the administered drug engages the target receptor as expected. **Our central hypothesis is that quantitative receptor expression monitoring in response to immunotherapy can be achieved non-invasively through PAI using PET/MRI.** Our premise is that better understanding of receptor expression immunotherapy will improve clinical timing and sequencing of systemic therapies.