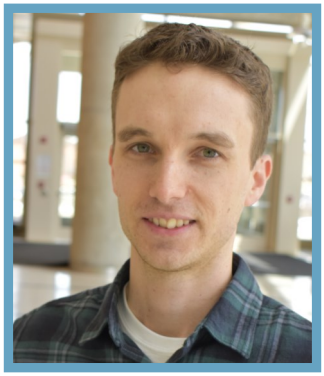
Medical Physics Seminar

Monday, April 23, 2018

1325 HSLC ~ 4:00 P.M.



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Assessing Treatment Response of Cancer Patients with Quantitative ^{18}F-FLT PET/CT imaging

In oncology, the current standard for assessing treatment response is to measure changes in tumor anatomic size following guidelines such as the Response Evaluation Criteria for Solid Tumors (RECIST). This is insufficient for evaluating emerging targeted and immunotherapies, where immediate decreases in gross tumor size may not occur in responding patients. Molecular imaging provides a potential solution by enabling assessment of changes in molecular and functional characteristics of tumors. This work utilizes molecular imaging with 3'-Deoxy-3'-^{18}F-fluorothymidine (FLT) PET to non-invasively quantify changes in cell proliferation in cancer patients undergoing targeted or immunotherapy. The overall goal is to characterize the pharmacodynamic effects of these therapies and assess the value of FLT PET/CT imaging as a biomarker of response. Methods to improve quantification are utilized, such as tracer kinetic modelling and parametric statistical modelling of PET measurements.

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Quantitative PET for Response Assessment: Monitoring the Development of Multiple Metastases

Positron emission tomography (PET) is a valuable functional imaging modality for diagnosis and staging in oncology. PET can be especially useful for treatment response assessment to identify small treatment-induced changes in physiology. Qualitative PET response assessment in the clinic has demonstrated high variability in interpretation, driving the need for standardized, quantitative response measurements. This work comprehensively characterized the repeatability and reliability of quantitative PET-based measurements, specifically in the application of multiple regions of interest (metastases) within a patient. We evaluated the impact of technical and biological factors on quantitative ^{18}F-NaF PET-based measurements in individual bone metastases in advanced castration-resistant prostate cancer patients, and further investigated how these uncertainties propagate to influence measured changes in tumor physiology throughout therapy. We present recommendations for quantitative ^{18}F-NaF PET treatment response criteria along with statistical requirements necessary for its implementation into the clinical routine.

1325 Health Sciences Learning Center (HSLC) 4:00 - 5:00 P.M.