

Spring 2009 Seminar Series

Department of Biomedical Engineering

Wednesday, March 18th @ 3PM in Steinman T-402

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Multimodality Imaging by MR, PET, and CT for the Study of Atherosclerosis

Atherosclerosis is an inflammatory disease, where the degree of inflammation, not the plaque size, determines risk of rupture and therefore likelihood of a clinical event. Magnetic Resonance Imaging (MRI) can image atherosclerotic plaque with high resolution, and several MRI parameters of disease extent in the carotid arteries and aorta have been shown to correlate with atherosclerotic risk factors.

Dynamic-contrast-enhanced MRI (DCE-MRI) is a new technique for the study of plaque composition. In this study, the extent of plaque inflammation determined by FDG uptake was correlated with DCE-MRI. By providing a metabolic image of macrophage activity, F18-Fluorodeoxyglucose (FDG) positron emission tomography (PET) can image atherosclerotic plaque inflammation in patients and in animal models of disease, with a strong correlation between FDG uptake and plaque macrophage content. In addition, autoradiography has confirmed that the FDG signal originates from activated macrophages within the lipid core and fibrous cap of the plaque. This has led to the suggestion that FDG-PET might have a role in identifying 'high risk' plaques and monitoring their response to therapy. Computed tomography (CT) can be used in conjunction with PET to help co-register the PET images and for attenuation corrections. Moreover, CT with its exquisite coronary imaging has the potential to address atherosclerosis in the vessel wall of the coronary arteries. We review in this talk to use of multimodality imaging (MR, PET, and CT) for the study of inflammation of vessel wall may be useful in assessment of plaque vulnerability.

We will also discuss the use of these new imaging nanoparticulates not only for imaging but also for drug delivery and treatment of atherosclerosis.

