

Syllabus

Title: Vessel Function

Speaker: Allison Hays, MD

Overview:

The measurement of “vessel function” such as coronary vasomotor reactivity has traditionally required invasive coronary angiography with Doppler flow measures to quantify the vasodilatory and flow responses to endothelial-dependent stressors. This invasive approach has limited the extent of clinical and research investigations, particularly those that would most benefit from repeated studies or studies in healthy subjects. Abnormal coronary vasoreactivity predicts future cardiovascular events in both low and high risk patients. Thus, a non-invasive and safe means to quantify coronary endothelial function could be a powerful clinical and research tool.

MR flow mapping has been validated by comparison with Doppler ultrasound. Phase-contrast (PC) MRI can reliably measure absolute coronary flow in humans and can detect pharmacologically-induced changes in flow in healthy and diseased states. The measurement of both coronary velocity and flow enable the comprehensive measurement of coronary endothelial function.

Although MR studies of coronary flow have examined the effects of endothelial-independent stressors, they have not been exploited to study coronary endothelial-dependent responses in healthy and diseased states. Recently available higher-field 3T magnetic resonance imaging (MRI) scanners, however, offer improved image quality and spatial and temporal resolution. In more recent studies, 3T coronary MRI has been combined with isometric handgrip exercise to quantify coronary responses to an endothelial-dependent stressor in both healthy and CAD patients. Although not yet in wide use, MR imaging of coronary function may provide a more comprehensive characterization of coronary atherosclerosis at an earlier stage, before significant luminal disease develops. Imaging of coronary function may thus complement the evaluation of coronary anatomy.

AUDIENCE DESCRIPTION

This workshop is designed for:

- MR Physicists and Engineers
- Physicians interested in Coronary imaging

EDUCATIONAL OBJECTIVES

Upon completion of this workshop, participants should be able to:

- Describe basic MR methods to quantify coronary velocity and flow
- Understand the utility of measuring coronary flow velocity and coronary velocity reserve with stress
- Implement simple measures to plan flow studies in the coronaries
- Describe endothelial independent and dependent stressors that may be used in the MRI suite, understand basic patient hemodynamic monitoring
- Describe challenges arising from coronary flow imaging such as through plane motion correction
- Understand how to process coronary velocity data and correct for aliasing