AbstractID: 7241 Title: Artifacts in High Resolution Magnetic Resonance Angiography

Magnetic resonance angiography (MRA) has become clinically useful in a variety of situations. The ability of MR to visualize vascular disease, the quality of the images and the nature of the artifacts have evolved over the last two decades. MRA techniques can be described as white blood (bright blood/dark background tissue) or black blood (dark blood/bright background tissue) techniques; contrast enhanced or non-contrast enhanced techniques, and can also be classified based upon the speed of acquisition. In addition to all of the artifacts inherent to MRI, these various MRA techniques suffer from artifacts that arise due to a variety of factors including: (1) the manner and timing of data acquisition, (2) non-uniform, pulsatile and often disordered blood flow patterns and the presence of nearly static blood at the vessel intima surface, (3) the changing concentration of injected contrast media, and (4) the uptake of contrast media into background tissues. The display of MRA image data also suffers from a variety of challenges. In this presentation, we focus on recent developments in MRA including new developments in both contrast- and non-contrast-enhanced MRA and the cause, nature and potential solutions for the artifacts that arise in these acquisition techniques. Techniques to be discussed include high resolution time-of-flight (TOF) MRA, phase contrast MRA, fast spin echo (FSE) wall imaging techniques, ultra-rapid steady state non-contrast techniques, and ultra-rapid steady contrast enhanced techniques. We will discuss techniques to reduce flow saturation effects, pulsatile motion effects, and to generally increase imaging speed and efficiency.

Educational objectives:

1. Understand very basic principles of MRI.
2. Understand basic lumen imaging MRA techniques including (TOF) MRA, phase contrast MRA, ultra-rapid steady state non-contrast techniques, and ultra-rapid steady contrast enhanced techniques.
3. Understand many of the artifacts that arise in these MRA techniques:
    - Signal to noise ratio dependencies
    - Flow saturation.
    - Slab boundary in multiple slab techniques.
    - Phase/frequency flow artifact.
4. Understand techniques that can be used to reduce or eliminate the artifacts.
5. Understand vessel wall and disease imaging techniques such as fast spin echo (FSE) wall imaging techniques.
6. Understand the nature of artifacts associated with wall imaging.
    - Non-flow saturation.
    - Slab boundary artifacts.