AbstractID: 2345 Title: Breast MRI: Using Physics to Maximize Its Sensitivity and Specificity to Breast Cancer

Breast MRI has evolved to become an important diagnostic adjunct to mammography and breast ultrasound, yet it remains a technically challenging examination. This is due to the need for high spatial resolution bilateral imaging to obtain detailed morphology, and adequately short scan times to characterize the time-enhancement uptake of contrast agent in breast lesions. The specific equipment, pulse sequences, contrast agents, and post-processing requirements for high quality breast MRI, and some of the underlying physics, will be discussed.

Properly performed contrast-enhanced breast MRI using Gd-DTPA is known to have high sensitivity to breast cancer (greater than 90%). Reported specificities of breast MRI range from 37% to more than 90%, depending on the imaging techniques and interpretation criteria used. Specificity can be gained by performing dynamic imaging before and after administration of contrast agent, using details of the uptake and washout of Gd-DTPA to help separate malignant from benign breast lesions. In the past, this dynamic information has been gained at the expense of detailed morphology and breast coverage, which can improve sensitivity. We will demonstrate that the two approaches (high sensitivity and high specificity) can be combined in bilateral breast imaging. The technical requirements to achieve both will be described.

New techniques such as diffusion imaging and proton spectroscopy have been introduced to help improve the specificity of enhancing breast lesions. We will describe these approaches and present a summary of the data on their utility.

1) To describe the technical elements needed to perform high quality breast MRI

2) To describe the pulse sequences and image acquisition methods used for high quality breast MRI

3) To describe image post-processing and time-enhancement curve construction

4) To describe the sensitivity and specificity of breast MRI

5) To describe new techniques that may increase the specificity of breast MRI: diffusion imaging and proton spectroscopy