

Breast Cancer Response to NAC: How Reliable is MRI?

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Contrast-enhanced MRI is now used routinely for the detection and diagnosis of breast cancer. Compared to mammography and ultrasound, MRI has particular advantages for demonstrating the anatomic extent of cancer in the breast, essential information for disease staging and treatment planning. MRI can also provide quantitative *in vivo* information about the state of disease and can be used to measure changes associated with therapy. Quantitative MRI techniques such as dynamic contrast-enhanced (DCE)-MRI and diffusion-weighted MRI (DWI) have been applied to measure breast tumor changes associated with response to neoadjuvant chemotherapy (NAC). These techniques add functional information about breast cancer by sensitizing the MRI signal to tumor vascularity, known to be associated with tumor grade and aggressiveness, and water diffusion, a property affected by cell density that can reflect tumor growth as well as cell death from cytotoxic treatment⁷⁻¹². MR spectroscopic imaging has also been applied in the breast to study tumor metabolism, although the low spatial resolution currently limits the utility of this technique¹³⁻¹⁴. This course will discuss the emerging applications of functional MRI techniques for assessing breast tumor response to treatment in the pre-operative, or neoadjuvant setting. The various roles for use of quantitative imaging in assessing neoadjuvant treatment will be considered. Imaging criteria can be the basis for patient inclusion or continuation on therapy, and can also be used as a biomarker to quantify response. Depending on how well the efficacy of an imaging biomarker has been established, it can also serve as the endpoint for evaluating the benefit of treatment, or as a surrogate endpoint for other clinically meaningful outcomes. An exciting but more speculative role for imaging biomarkers is for prediction of therapeutic response.

Current findings will also be presented from the I-SPY (ACRIN 6657/CALGB 150007) trial, a multi-center study integrating biomarkers and imaging to maximize effectiveness of neoadjuvant treatment for patients with locally-advanced breast cancer. The experience implementing standardized MRI protocols in the multi-center setting will be discussed. This course is intended for imaging scientists and clinical researchers involved in the diagnosis and treatment of breast cancer. It is expected that the audience will gain knowledge leading to the appropriate application of breast MRI techniques in the neoadjuvant treatment setting.

Learning Objectives:

- Evaluate and compare functional MRI techniques for evaluating breast cancer
- Apply quantitative MRI approaches to measure breast tumor response to neoadjuvant treatment
- Critically assess the role of breast MRI for measuring neoadjuvant treatment response and its potential as a predictive biomarker

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