Do Advanced MRI techniques add to Confidence in Diagnosis of Patients Scanned using Conventional Breast MRI Sequences?

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Introduction

The sensitivity of breast MRI for invasive cancer is well over 90% (1,2), but specificity has been widely variable. Given an economic environment emphasizing medical cost containment, radiologists must look for methods to decrease false positive (FP) MR results that may give rise to increased follow-up costs and patient anxiety. Over the past decade several new methods for analyzing breast lesions have been developed, but not frequently tested in the context of comparison to a complete clinical breast MRI. The aim of our ongoing study is to determine whether several new MRI techniques add value over a traditional clinical breast MRI examination.

Patients and Methods

With IRB approval, patients were recruited from those being sent for breast biopsy or who had prior breast biopsy confirming a benign or malignant solid lesion > 1 cm^3 (post biopsy lesions were selected only if at least 1 cm^3 of tissue remained without clip or biopsy artifact). DAY 1 scanning consisted of a complete, routine contrast-enhanced breast MRI. Additional methods added included Diffusion Weighted Imaging (DWI), MR Spectroscopy (MRS), and Blood Oxygen Level Dependent (BOLD) imaging. DAY 2 scanning substituted a fast DCE-MRI sequence with 15 – 30 sec temporal resolution for the clinical breast MRI (60 – 90 sec temporal resolution) to determine if differential early enhancement patterns existed independent of the overall time dependent signal intensity data. The advanced methods from Day 1 were repeated on Day 2 to check for reproducibility.

Results

Thus far 18 patients have been analyzed in regard to standard MRI, DWI, MRS and BOLD imaging, while processing of complete high temporal resolution scans was available for 7 patients. Pathology showed 8 malignant lesions, 7 fibroadenomas and 3 other benign pathologies. DWI and MRS results were concordant with, but didn't add value to the conventional MRI in 7 cases; would potentially upgrade a benign lesion to a malignant lesion (FP) in 6 cases; would potentially downgrade a malignant lesion to a benign lesion in 2 cases (FN) and provided equivocal additional data in 3 cases. In no case thus far did these additional methods provide a correct diagnosis when the conventional MRI resulted in a misdiagnosis. Though rapid DCE-MRI data was limited, no differential early enhancement patterns were seen that would have improved diagnosis. Furthermore, for this rapid imaging, noise increased to such an extent that important morphological detail, such as spiculation, could not be detected. Finally, we could detect no differential helpful information from BOLD results.
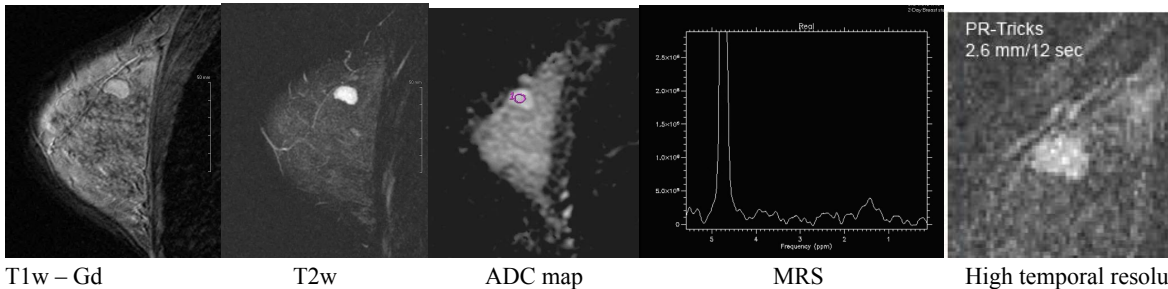

| T1w – Gd | T2w | ADC map | MRS | High temporal resolution |

Fig 1: 20 yo. *Conventional MRI:* 1.5 cm macrolobulated lesion Type I DCE-MRI (not shown); "cyst like" T2 SI; *Advanced Methods:* ADC=2.21; MRS – no choline peak. Rapid sequence loses edge definition, thus less helpful. Overall advanced methods were concordant, but did not add confidence to high clinical certainty of diagnosis of fibroadenoma, subsequently pathologically proven.

Conclusions

Preliminary results show that the advanced MRI methods tested, when compared to a complete conventional breast MRI, did not improve accuracy of diagnosis for 8 malignant and 10 benign lesions, all of which would have been accurately diagnosed using conventional MRI.

References

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