

Multi-Sequence Validation Of A Web Browser-Based Semi-Automated Method For MRI Breast Density Measurement

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Introduction: Breast density, defined as the ratio of fibroglandular tissue to fatty tissue, can be estimated from mammograms and MRIs. High breast densities have increased risk of breast malignancy. A web browser-based semi-automated method (mcdcmViewer) has been shown to be useful in measuring breast density using T1-weighted sequences.

Purpose of Study: To validate a web browser-based semi-automated method for determination of breast density from MRI studies on VIBRANT, T2 and STIR sequences.

Methodology: Patients who underwent breast MRI in Universiti Malaya Medical Centre from August 2015 to February 2016, who had at least 1 normal breast MRI, were included. VIBRANT, T2 and STIR MRI images were loaded into mcdcmViewer. Separation of the chest wall was performed manually on at least 2 slices, with the software performing the interpolation of the in-between slices. Signal intensities for fibroglandular tissue, fat and air were determined manually. Subsequently, the software would automatically segment the relevant tissues and calculate the breast density for all the slices within the defined range (Figure 1). The densities of five slices per breast were compared to the reference standard, which was determined via blinded manual segmentation of those 5 slices by a single radiologist using commercial software (Adobe Photoshop).

Results: A total of 13 normal breasts (65 slices) were included. The semi-automated method shows excellent correlation for VIBRANT ($r=0.97$, $p<0.001$), T2 ($r=0.88$, $p<0.001$) and STIR ($r=0.96$, $p<0.001$) (Figure 2). There was a statistically significant overestimation of breast density on VIBRANT (reference: 23.3%, measured: 29.5%, $t=9.27$, $p<0.001$). No statistically significant over- or under-estimation was noted on T2 and STIR.

Conclusion: The tested semi-automated method shows excellent correlation with manual segmentation for all the tested sequences. However, STIR was found to have a combination of excellent correlation with no significant over- or under-estimation.