

Role of contrast-enhanced MR Mammography (CE-MRM) in women with dense breast parenchyma: comparison with x-ray mammography and ultrasound

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Purpose: To retrospectively compare contrast-enhanced MR mammography (CE-MRM) with conventional x-ray mammography and ultrasound for detection of breast cancer in women with dense breast parenchyma.

Methods and Materials: 238 women with dense breast (class 3 or 4 according to the Breast Imaging Reporting and Data System lexicon) and suspicious for breast cancer at conventional bilateral x-ray mammography and/or ultrasound underwent pre-surgical CE-MRM at 1.5T using a bilateral surface breast coil. The CE-MRM protocol comprised a pre-contrast T2-weighted STIR sequence and a dynamic 3D T1-weighted FLASH sequence acquired before and at 2 minute intervals after administration of 0.1 mmol/kg bodyweight gadobenate dimeglumine (MultiHance[®]). The diagnostic performance (sensitivity, specificity, accuracy, positive predictive value [PPV] and negative predictive value [NPV]) of each imaging modality for the detection of breast cancer was determined against final diagnosis (pathology or 12-18 month follow-up) for all patients undergoing each imaging technique and for women undergoing all three techniques.

Results: The 238 evaluated patients comprised 133 that underwent conventional x-ray mammography and CE-MRM, 195 that underwent ultrasound and CE-MRM, and 89 that underwent all three techniques. At final diagnosis 121/238 (50.8%) patients were considered to have one or more malignant lesions while 41 and 76 patients had benign lesions or no lesions, respectively. Lesions (malignant or benign) were identified in 74/133 patients on x-ray mammography (118 lesions), 135/195 patients on ultrasound (237 lesions) and 162/238 patients on CE-MRM (323 lesions). X-ray mammography and ultrasound "detected" lesions in 38 and 50 patients respectively that were not present at CE-MRM or follow-up. Among the 89 patients that underwent all three techniques CE-MRM detected 119 lesions, ultrasound detected 107 lesions and conventional mammography only 78 lesions. The diagnostic performance of the three imaging modalities is summarized below for all patients undergoing each technique and for patients undergoing all three techniques.

Imaging modality		Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
All Patients	X-ray mammography	75.7	38.2	57.2	55.8	60.5
	Ultrasound	82.5	60.9	72.3	70.2	75.7
	MR mammography	94.9	95.8	95.4	95.7	95.0
Patients with data from all modalities	X-ray mammography	72.7	45.2	60.8	63.5	55.9
	Ultrasound	85.5	40.5	66.0	65.3	68.0
	MR mammography	98.2	95.2	96.9	96.4	97.6

Conclusions: The diagnostic performance of CE-MRM is superior to that of x-ray mammography and ultrasound for detection of breast cancer in women with dense breast parenchyma.