Low-field versus high-field MRI in diagnosing breast disorders

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Synopsis: The performance of low- and high-field MRI in diagnosing breast disorders was compared in 28 patients (34 breasts). Biopsy results were available from 27 breasts. Low-field MRI showed equal performance with a sensitivity of 100%, specificity 82% and accuracy 93% compared to 100%, 73% and 89%, respectively, at high-field.

Background and purpose: MRI is increasingly used as a complementary method in breast imaging. High-field MRI is very sensitive in detecting invasive breast cancer, while the performance of low-field MRI is unknown. Due to lower equipment costs and patient-friendly, open design it is an appealing concept. The open configuration is also of benefit in image guided procedures. Our purpose was to evaluate the performance of low-field MRI in diagnosing breast disorders and to compare the results with findings from a high field unit and biopsy.

Patients and methods: 28 patients (34 breasts) were examined by high-field MRI (1.5 T, Signa EchoSpeed, General Electric) and the following day by low-field MRI (0.23 T Panorama Power, Philips Medical Systems). The mean age of the patients was 52 years (30-74 years, range). A double breast coil was used. After T1-weighted sagittal images a dynamic 3D axial study was performed. One axial series was obtained before contrast. At high field the dynamic series was repeated 8 and at low field 6 times after contrast injection (power injector at high field 3 ml/s, manual injection (approximately in 10 s) at low field). The dose of i.v. contrast agent (Magnevist, Schering) was 0,2 mmol/kg at high field (maximum 30 ml) while at low field a dose of 30 ml was used in every patient. The imaging time for one dynamic axial series was 43 s at high and 60 s at low field. The images were analyzed separately by two radiologists paying attention to lesion morphology and enhancement kinetics. Time-signal intensity curves were obtained from enhancing lesions. At high field chemical shift fat saturation and at low field image subtraction and post-processing fat saturation based on phase shift was used for lesion detection. Lesions were considered malignant if a wash-out type time-signal intensity curve was observed or/and the lesion morphology was spiculated or a rim enhancement was seen. Lesions were also classified as malignant with irregular/ill-defined margins and a plateau curve while the same morphology with a sustained curve was characterized as indeterminate. Lesions with well-defined margins and a sustained type time-signal intensity curve were classified as benign. Results were compared with biopsy (27 breasts). Kappa statistics was used to compare the performance between the MR-scanners and readers.

Results: The findings on MRI compared to biopsy are shown in the Table. Sensitivity was 100% and 100%, specificity 82% and 73% and accuracy 93% and 89% at low and high field, respectively. The inter-MR-scanner kappa value was 0.77 (substantial agreement) while the inter-observer kappa value was 0.86 and 0.81 at low and high field, respectively (almost perfect agreement).

Conclusions: The performance of low-field-strength MRI seems comparable to high-field MRI in diagnosing breast disorders.

Table .Findings on low-field and high-field MRI compared to biopsy results in 27 breasts

	Biopsy result	
	Benign (n=11)	**Malignant (n=16)**
Low-field MRI		
Benign	9	
Indeterminate	2	
Malignant		16
High-field MRI		
Benign	8	
Indeterminate	1	
Malignant	2	16

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