To the best of our knowledge, no specific data are available on the accuracy of MRM to differentiate recurrent lesions from normal changes of the surgical scar at the site of prior lumpectomy when a multifactorial MRM evaluation protocol is used to classify enhancing lesions.

This study was designed to determine whether MRM, performed with a multifactorial evaluation of enhancing lesions, improves the accuracy of diagnosis of recurrence on the surgical scar in patients who underwent quadrantectomy and local radiation therapy. Furthermore, the overall accuracy of contrast-enhanced MRM for the detection of suspicious enhancing lesions, even when not closely related to the surgical scar, has also been assessed in the series reported.

Materials and methods

Patients

The study cohort comprised 93 female patients who underwent breast MRI examination between April 1999 and July 2003 for suspected recurrence on the site of conservative surgery (quadrantectomy) for breast cancer, at least 6 months after the end of radiation therapy.

All patients underwent a yearly breast evaluation, performed by the breast radiologist with mammography, associated or not with an ultrasound examination, according to the characteristics of the breast tissue density, and underwent a clinical examination. The clinical examination routinely performed by the breast radiologists after the evaluation of mammographic scans, matched in the same report of mammography, and was also used to decide the level of suspicion.

Recurrence was suspected either by ultrasound or by mammography, or by both examinations. When a malignant lesion on the surgical scar was suspected (ultrasound and/or mammographic Breast Imaging Reporting and Data System (BI-RADS) III or BI-RADS IV), the patient underwent a contrast-enhanced breast magnetic resonance mammography (MRM), after signing a proper informed consent and after exclusion of contraindications to exposure to magnetic fields.

Magnetic resonance mammography technique

All MRM examinations were performed on a Signa Horizon LX (GE Medical Systems, Milwaukee, WI, USA), with a field strength of 1 T. The entire breast was scanned with a two-channel, phased-array, bilateral dedicated coil and the following parameters: Repetition Time = 7 ms, Echo Time = 1.6 ms, flip angle = 10°, TI = 25 ms, receiver bandwidth = 32 kHz, Number of Excitations = 1, matrix = 320 × 320, Field of View = 36 × 18 cm^2. The slice thickness was chosen between 2 mm and 3 mm, depending on the breast size, in order to maintain each sequence time within 90 s.

Coronal T1-weighted, fat-suppressed (spectral inversion at lipid) FSPGR 3D sequences were acquired once before and five times after intravenous contrast injection (Gadopentetate dimeglumine, 0.2 mmol/kg; flow rate = 2 ml/s). The acquisition of dynamic images started 10 s after the contrast injection.

To determine the contrast medium uptake, baseline images were subtracted from images obtained after contrast medium injection. All dynamic images were sent to a diagnostic workstation (Advantage Window 4.2; GE Medical Systems, Milwaukee, WI) where the maximum intensity projection and the multiplanar reformation were obtained.

Evaluation of magnetic resonance images and classification of lesions

One senior radiologist, aware of the time of surgery and the location of the primary breast cancer, and of the mammographic and ultrasonographic findings, reviewed each MRM examination on a diagnostic workstation.

Each lesion was retrospectively reviewed and classified by the reader according to a multifactorial evaluation protocol for enhancing lesions connected or not to the surgical scar. Morphological features and time–signal intensity curves of enhancing lesions were classified according to the Fischer multifactorial evaluation [1] to differentiate malignant lesions and benign lesions.

The morphological features evaluated and graded were form, margins and enhanced pattern. Form was considered suspicious for malignancy when it was branching or spiculated, whereas it was considered benign when it was rounded. Margins were considered suspicious for malignancy if indistinct, while they were considered benign if well defined. The enhancing pattern was suspicious for malignancy if it was inhomogeneous or ring shaped, whereas it was considered benign if it was homogeneous. Lesions were accordingly graded on a one-point scale for form and for margins (0 = benign, 1 = malignant), and on a two-point scale for enhancing patterns (0 = benign, 1 = suspicious, 2 = malignant).

According to the same classification of Fischer and colleagues [1], the dynamic course of enhancement was considered suspicious for malignancy if there was an initial strong increase and a postinitial washout, while a moderate initial increase and a postinitial plateau were considered benign. Accordingly, a two-point scoring scale system was used both for the initial increase of enhancement (0 = enhancement <50%, 1 = 50–100% enhancement, 2 = enhancement >100%) and for the postinitial enhancement (0 = steady increase, 1 = plateau, 2 = washout).

Using this multifactorial evaluation protocol, the overall maximum score achievable is 8: a total score lower than 3 points indicated benign lesions, whereas a total score higher than 4 points indicated malignant lesions.