Contrast-enhanced MR imaging in patients with BI-RADS 3-5 microcalcifications

**Abstract**

**Purpose.** The aim of this study was to evaluate the role of magnetic resonance imaging (MRI) in patients with microcalcifications classified as Breast Imaging Reporting and Data Systems (BI-RADS) 3–5.

**Materials and methods.** Fifty-five patients with mammographic microcalcifications classified as BI-RADS categories 3, 4, or 5 underwent MRI and biopsy with stereotactic vacuum-assisted biopsy (VAB). Our gold standard was microhistology in all cases and histology with histological grading in patients who underwent surgery. Patients with a microhistological diagnosis of benign lesions underwent mammographic follow-up for at least 12 months. MRI was performed with a 1.5-Tesla (T) unit, and T1 coronal three-dimensional (3D) fast low-angle shot sequences were acquired before and after injection of paramagnetic contrast agent (0.1 mmol/kg). MRI findings, according to the Fisher score, were classified into BI-RADS classes. In patients with cancer who underwent surgery, we retrospectively compared the extension of the mammographic and MRI findings with histological extension.

**Results.** Histology revealed 26 ductal in situ cancers (DCIS) and 11 ductal microinvasive cancers (DCmic), three atypical ductal hyperplasias (ADH) and 26 benign conditions. Histological grading of the 26 patients with cancer revealed four cases of G1, 11 cases of G2 and 11 cases of G3. If we consider mammographic BI-RADS category 3 as benign and BI-RADS 4 and 5 as malignant, mammography had 77% sensitivity, 59% specificity, 63% positive predictive value (PPV), 74% negative predictive value (NPV) and 67.2% diagnostic accuracy. If we consider MRI BI-RADS categories 1, 2 and 3 as benign and 4 and 5 as malignant, MRI had 73% sensitivity, 76% specificity, 73% PPV, 76% NPV and 74.5% diagnostic accuracy. As regards disease extension, mammography had 45% sensitivity and MRI had 84.6% sensitivity.

**Conclusions.** Mammography and stereotactic biopsy still remain the only techniques for characterising microcalcifications. MRI cannot be considered a diagnostic tool for evaluating microcalcifications. It is, however, useful for identifying DCIS with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades. An important application of MRI in patients with DCIS associated with more aggressive histological grades.

**Correspondence to:** C. Iaconci, e-mail: chiara.iaconci@tin.it; c.iaconci@med.unipi.it.

Received: 16 May 2006 / Accepted: 31 August 2006 / Published online: 19 March 2007
suspicious microcalcifications could be to evaluate disease extension after a microhistological diagnosis of malignancy, as it allows a more accurate presurgical planning.

**Key Words** Breast MRI • Microcalcifications • DCIS

---

**Introduction**

Evidence of microcalcifications is often the only sign of tumour, being the first clue in about 70% of ductal in situ carcinomas (DCIS) detected on mammography [1–5]. During the last 20 years, the prevalence of DCIS has grown from less than 5% before the start of mammographic screening to 15%–30% in women regularly checked with mammography [6]. The 30%–50% decrease in mortality is related to early diagnosis and correct management [7].

Mammography has high sensitivity and low specificity, the positive predictive value (PPV) being 15%–30% for malignant nonpalpable lesions [6]. Ultrasonography, on the other hand, has a limited role in the diagnosis of such lesions [8, 9]. Recent studies have shown that breast magnetic resonance imaging (MRI) with intravenous contrast injection has outstanding sensitivity for the diagnosis of invasive carcinomas (88%–100%) and a high negative predictive value (NPV) [6]. However, previous studies of the diagnostic capabilities of MRI in DCIS are controversial [6, 8, 10–13]: the sensitivity ranges between 50% and 80%. In contrast, the usefulness of MR imaging in surgical planning has been demonstrated [14].

Considering that DCIS is multifocal in more than 50% of cases and bilateral in about 30% of patients [1, 15], and also considering that the possible evolution into an infiltrating form depends on the histological subtype and size and adequacy of resection [16, 17], MRI could help in early diagnosis and surgical planning, giving useful information about disease extension [14]. The aim of our study was to evaluate the role of MRI in patients with Breast Imaging Reporting and Data Systems (BI-RADS) 3–5 microcalcifications.

**Materials and methods**

We selected 55 patients (age range 37–76 years, mean 56±11 years) with BI-RADS 3–5 microcalcifications on mammography who underwent MRI and stereotactic biopsy using vacuum-assisted biopsy (VAB) between November 2002 and November 2004. There was neither opacity nor distortion associated with the microcalcifications, which were studied using analogic mammography (Giotto IMS or Diamond Instrumentarium). Mammographic magnification was performed in the view that best visualised the microcalcifications, and the microcalcification extension was evaluated in the standard views.

All mammograms were evaluated in a blinded fashion by two radiologists with 15 years’ experience in breast imaging.