In situ and minimally invasive breast cancer: morphologic and kinetic features on contrast-enhanced MR imaging

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Abstract

Purpose: This retrospective study was undertaken to investigate the morphologic and dynamic features of in situ and minimally invasive breast cancer on contrast-enhanced (c.-e.) MR imaging and to examine possible associations to pathology features.

Material and methods: A total of 71 patients underwent MR imaging. T1-weighted FLASH-3D images were obtained before and after intravenous administration of Gd-DTPA. Histopathologic analysis of 78 lesions revealed ductal carcinoma in situ (DCIS) n = 50 and DCIS with microinvasion n = 28. MR features were correlated with histopathologic findings. Results: Enhancement in DCIS was focal (73%), diffuse (10%) or ductal (17%). No enhancement occurred in two cases (4%). In 65% enhancement speed was classified as delayed. There was a tendency toward a more ill-defined (83 vs. 43%) enhancement pattern in high grade DCIS and a more ductal (29 vs. 12%) and faster (50 vs. 29%) enhancement in comedo type DCIS. However, significant differences in the enhancement behaviour could neither be demonstrated between high grade and non high grade DCIS nor between comedo and non comedo type DCIS. No significant differences were noted between pure and microinvasive DCIS. Conclusion: In this retrospective analysis the majority (96%) of DCIS lesions show contrast enhancement. However, in only about 50% of DCIS the criteria of a so-called 'typical' enhancement behaviour was fulfilled, that means strong, early, focal ill-circumscribed or ductal. Enhancement that follows a duct is often associated with malignancy, however this feature was only present in 17% of the cases. c.-e. MR imaging allowed the detection of 25 additional foci of DCIS. Therefore malignant in situ lesions can be present with atypical enhancement, and should be taken into consideration in high-risk patients in particular. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

Carcinoma in situ is defined as a proliferation of malignant epithelial cells within the ducts and lobules of the breast parenchyma without any extension across the basement membrane. The two non-invasive carcinomas of the breast — lobular and ductal carcinoma in situ — represent differently. Only ductal carcinoma in situ is considered a potential precursor of an invasive carcinoma.

Lobular carcinoma in situ (LCIS) is, according to the present classification, not considered to be a precursor of an invasive carcinoma but a high risk-indicator for developing cancer in the same or contralateral breast [1]. In general it is an incidental histologic finding, observed in a biopsy performed for another reason [2]. It is frequently multicentric (up to 50%) and bilateral (30%). It is generally acknowledged that LCIS has no characteristic mammographic features, just in a few cases microcalcifications, which are usually indeterminate in morphology and distribution, are seen.

Ductal carcinoma in situ is a heterogeneous group of carcinomas in terms of histopathologic characteristics, clinical presentation and biological behaviour.

Traditionally DCIS was classified based on the architectural growth pattern and cell type into non-comedo (cribriform, micropapillary, clinging and solid) and comedo type.
In recent years new pathologic classifications have been worked out. The group by Holland et al. [3] distinguishes between well-, intermediately- and poorly-differentiated DCIS subtype. This classification is based on cytonuclear differentiation and architectural growth pattern. Silverstein et al. [4] have introduced the so-called Van Nuys classification. In this classification DCIS is defined by the presence or absence of high nuclear grade and comedo-type necrosis (Table 1).

It is supposed that most invasive carcinomas are preceded by DCIS, however, not all patients with DCIS will develop an invasive carcinoma. It is assumed that the overall prognosis, that means risk of progression into invasive carcinoma and the recurrence rate, depend on the histologic subtype, size of the lesion and adequacy of excision [5–7]. Therefore, histopathological classification and the selection of the most aggressive group may play an important role for an optimal management of DCIS in the individual patient.

On mammography about 70% of DCIS become evident as microcalcifications or — more rarely (10%) — as a focal mass or architectural distortion [8]. Clinical manifestation of DCIS rarely include a palpable abnormality, sometimes nipple discharge or Paget disease. Ultrasound plays a limited role in the detection, exclusion or differential diagnosis of DCIS.

The very high sensitivity (up to 100%) of contrast-enhanced (c.-e.) MR imaging for the detection of invasive breast cancer has been well documented in many trials with a specificity of about 60–85%. Reported sensitivity for DCIS has been lower (about 70–80%). Furthermore cases with little or no significant enhancement have been reported for both comedo and non comedo type DCIS (Table 2). However, there also exist cases, where DCIS could only be detected by MR imaging [17]. The present knowledge concerning the diagnosis and assessment of DCIS on c.-e. MR imaging is still limited and in part controversial. This retrospective study was undertaken to explore morphologic and kinetic enhancement features of in situ and minimally invasive breast cancer on MR imaging and to examine possible associations to pathology features.

2. Material and methods

2.1. Patients

The study population consisted of 71 patients, which showed 78 lesions. Patients aged from 30 to 73 years (median age 52 years). Histopathologic analysis revealed DCIS n = 50 and DCIS with microinvasion n = 28.

Twenty-two patients had been examined in 1989–1990, 49 patients had been examined between April 1997 and April 1999 (at the time of evaluation data for patients examined between 1991 and 1996 were not yet completely available and were, therefore, skipped).

Indication for initial c.-e. MR imaging were preoperative MR imaging because of an abnormality on conventional imaging (n = 33) or on clinical examination (n = 11) compatible with the subsequently proven MR imaging.

In 11 patients c.-e. MR imaging was performed because of an abnormality in a different location of the same or contralateral breast. Furthermore patients with dense breast tissue, difficult to evaluate and a history of invasive breast cancer in the same or contralateral breast (n = 10), a first degree maternal relative with breast cancer (n = 4) and search for primary carcinoma (n = 2) were included.

In 47 patients (50 lesions) the diagnosis was verified by definitive surgical treatment alone. In the remaining 24 patients (28 lesions) vacuum biopsy was done under mammographic (n = 2) or MR-guidance (n = 26). MR-guidance was used in those cases, where the abnormality was only visible by c.-e. MR imaging. For core