Axillary lymph node metastases in breast cancer: Preoperative detection with dynamic contrast enhanced MRI

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Introduction

Metastatic involvement of the axillary lymph nodes represents one of the most important prognostic variables for breast cancer and the presence or absence of nodal metastases is used to determine the need for adjuvant treatment (1). Axillary lymph node dissection (ALND) with histopathological examination of the surgical specimen is the gold standard for evaluation of nodal spread. Since this procedure has a significant morbidity, the ability of several non-invasive methods to detect lymph node metastases have been investigated with variable results (2-5). Dynamic contrast enhanced MRI is a sensitive method for breast cancer diagnosis (6). The method is mainly based on the fast and strong contrast enhancement in breast carcinomas, probably caused by increased vascularity and increased microvessel permeability in malignant tumors. The aim of the present study was to determine if the dynamic contrast enhancement in axillary lymph nodes could help differentiate between metastatic and normal nodes.

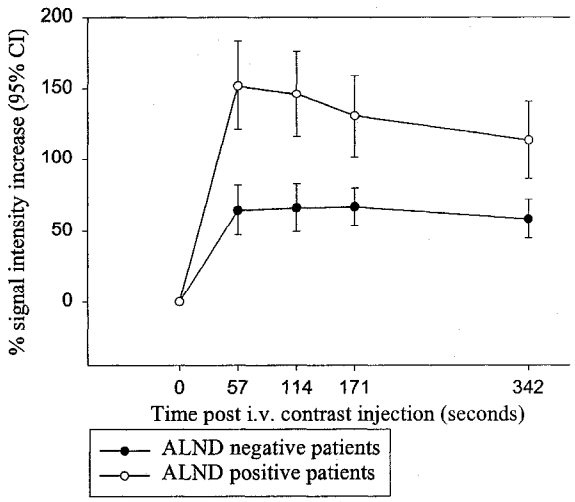
Methods and materials

65 patients with breast carcinomas were included in the study. All patients underwent breast surgery with ALND after the MR examination and the patients were classified as ALND positive or negative based on whether metastases were detected in at least one lymph node at histopathological examination. Clnical evaluation of the axilla was performed in all patients prior to surgery. All MR images were acquired at 1.5T (Picker Edge) using a commercially available breast coil (Picker Int.) that extends into the axillary region and thus allows coverage of both breasts and the axillary region. Dynamic contrast enhanced images were obtained using a 3D radio frequency spoiled gradient echo sequence (RF-FAST) with TR/TE/flip angle 9ms/3.4ms/30°. The 3D volume had a temporal resolution of 57 s and covered the entire breast and axilla. After acquisition of precontrast images 0.1 mmol /kg b.w. gadodiamide (Omniscan®, Nycomed) was administered as a bolus injection followed by a saline flush. At the end of the contrast injection the acquisition of six postcontrast image sets started. The images were evaluated by two radiologists unaware of the patient's ALND status. In the MR images the size and morphology of the lymph nodes were registered. Region of interests (ROI's) were positioned in the axillary lymph nodes and time-versus signal intensity curves obtained. A 100% signal intensity increase during the first postcontrast image compared to precontrast value was chosen as a malignancy threshold.

Results

At histopathology 24 patients were ALND positive and 41 patients were ALND negative. In the first postcontrast image the mean signal intensity increase in the most enhancing lymph node of ALND positive patients was 152%, and in ALND negative patients 62% ($p<0.001$). The mean time versus signal intensity curves in ALND positive and ALND negative patients are shown in Figure 1.

Figure 1



The results from the clinical evaluation and the MR imaging compared to histopathology are summarized in Table 1

Parameter	Clinical assessment	Abnormal SI increase (>100%)	Lymph node size>1 cm and abnormal morphology
True-positive	6	20	13
True negative	40	37	34
False-positive	1	4	7
False-negative	18	4	11
Sensitivity (%)	25	83	54
Specificity (%)	98	90	83

Conclusion

The dynamic contrast enhancement predicts the ALND status better than lymph node size or morphology. Clinical evaluation had a very low sensitivity for detection of axillary lymph node metastases.

Literature

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