

学位論文の要旨

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学位論文名 Breast 3 T-MR Imaging: Indication for Stereotactic Vacuum-Assisted Breast Biopsy
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論文内容の要旨

INTRODUCTION

Percutaneous imaging-guided breast biopsy is widely used to evaluate predominantly impalpable breast lesions. There has been steady development of percutaneous biopsy techniques and stereotactic vacuum-assisted breast biopsy (SVAB) has been established as a reliable method for the diagnosis of impalpable lesions with microcalcification detected by mammography. Because of the wider adoption of mammography, an increasing number of women with microcalcification on mammography are undergoing SVAB for more detailed examination. SVAB is much less invasive than conventional open biopsy. However, it still involves physical and mental burdens for the patient, so it is important to avoid unnecessary procedures.

Breast magnetic resonance (MR) imaging has increasingly been performed over the past 10 years because of its well-documented high sensitivity for detecting breast cancer, especially occult tumors missed by conventional imaging modalities. Since malignant tumors typically exhibit increased vascularity, an early remarkable enhancement and some specific pattern of contrast enhancement, an essential part of many breast MR studies is T1-weighted dynamic contrast-enhanced imaging. In recent years, MR scanners with stronger magnetic fields (such as 3 T scanners) and thus a higher signal-to-noise ratio have become more widely available and have opened up new horizons for contrast-enhanced breast MR imaging.

The purpose of this study was to assess indications for SVAB evaluated by breast 3 T- MR imaging in patients showing suspicious microcalcifications on mammography and negative ultrasound (US) findings.

MATERIALS AND METHODS

Fifty-five patients with 55 breast lesions showing suspicious microcalcifications on mammography and negative US findings underwent preoperative breast MR examinations. All

patients underwent SVAB within 1 month of MR imaging. The pathological diagnosis of each breast lesion was made by examining tissues obtained by SVAB or radical/partial mastectomy.

MR imaging was performed using a 3T-MR system. The protocol included T1-weighted dynamic contrast-enhanced sequence.

3 T-MR imaging findings were evaluated by using the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS) MRI and lesions were categorized using the flowcharts and interpretation method of previous reports. Thus we classified MR findings into five categories: category 1-2 negative/benign, category 3 probably benign and category 4-5 probably malignant/malignant. And then we were correlated with the histopathological findings. Two radiologists of experience in breast MR imaging, who made consensus decisions about the diagnosis, evaluated the contrast-enhanced MR images retrospectively.

When BI-RADS 4 and 5 MR imaging lesions were assumed to be malignant, the usefulness of 3 T-MR imaging was evaluated for diagnosis of impalpable breast lesions by SVAB among lesions with microcalcification detected by mammography and negative US findings.

The Ethics Committee of Shimane University approved this retrospective study, as the retrospective study used the past acquired image data, and the need to obtain informed consent was waived.

RESULTS AND DISCUSSION

SVAB was performed successfully in all 55 patients without any complications. Examination of the biopsy specimens revealed that 21 patients (38.2%) had carcinoma and 34 patients (61.8%) had benign disease. In the patients with malignant lesions, surgical excision was performed. The final histopathological diagnosis was invasive ductal carcinoma in five patients, ductal carcinoma in situ (DCIS) in 16 patients.

Based on MR imaging findings, 21 lesions were in categories 1 or 2, 14 lesions were in category 3, 18 lesions were in category 4, and two lesions were in category 5. The detection rate of malignancy in category 3, category 4, and category 5 was 7.1% (1/14), 94.4% (17/18), and 100% (2/2), respectively. Malignant lesions were more frequent when the MR imaging diagnosis was positive (categories 4 or 5) than when MR imaging was negative (categories 1, 2, or 3) (Fisher's exact test, $P < 0.001$). The number of benign and malignant lesions in each category was significantly different (Mann-Whitney U-test, $P < 0.001$).

If BI-RADS categories 4 and 5 were assumed to be malignant, for selecting lesions that required SVAB, 3 T-MR imaging for lesions with microcalcification had a sensitivity of 90.5%, specificity of 97.1%, positive predictive value of 95.0%, negative predictive value of 94.3%, and accuracy of 94.5%.

The one false-negative lesion (high-grade DCIS) was less than 1.0 mm in diameter on

pathology and very small clustered pleomorphic microcalcification and bilaterally symmetrical enhancement (category 2). DCIS sometimes showed poor and indistinct enhancement on MRI because of relatively poor or absent angiogenesis. Moreover, bilaterally symmetrical enhancement lowers the sensitivity of breast MR imaging in previous reports. Therefore, it should be remembered that very small calcified lesions may be false negative on MR imaging.

The one false-positive case was ductal adenoma with a linear ductal pattern of enhancement (category 4). Ductal adenomas tend to show like malignant lesions on MR imaging, it would be difficult to distinguish from malignant lesions in previous reports.

3 T-MR imaging for lesions with microcalcification had a high sensitivity, specificity, PPV, NPV, and accuracy for deciding the indication for SVAB. Therefore, 3 T-MR imaging may be useful to determine candidate lesions for SVAB after mammography detects microcalcification. When the candidate lesion shows abnormal enhancement along with calcification, it should be subjected to SVAB. If the lesion has no abnormal enhancement on MR imaging, follow up could be a good choice.

CONCLUSION

3 T-MR imaging may be useful for deciding the indications for SVAB in patients who have breast lesions with microcalcification that are impalpable and are detected by mammography and negative US findings.