Diagnostic value of contrast-enhanced computed tomography for diagnosing the intraductal component of breast cancer

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Summary

Background: It is important to reduce local residual cancer to avoid local recurrence after breast conserving treatment. We therefore tried to detect the intraductal components and small invasive foci of breast cancers by contrast-enhanced helical computed tomography (CE-CT). Methods: In 122 women whose breasts were examined by CE-CT preoperatively, intraductal spread detected on ultrasound (US), mammography (MMG), and CE-CT, and extensive intraductal components (EICs) detected by histological examination were analyzed for correlations among the extent and subtypes of intraductal components, and deviations in tumor size. Results: EICs were present in 44 patients. The sensitivities of EIC detection by US, MMG, and CE-CT were 35%, 61%, and 88%, respectively, and the corresponding specificities were 83%, 86%, and 79%, respectively. The sensitivities of detecting EIC and small invasive foci were 34%, 57%, and 91%, respectively. In 5 patients, EIC could only be visualized by CE-CT. The median deviation of the size of intraductal spread revealed by CE-CT from pathological EIC was 0.0 cm (range + 3.0 to -1.7 cm). Conclusion: CE-CT is useful for visualizing intraductal spread and small invasive foci of breast cancer.

Introduction

The preoperative identification of an extensive intraductal component (EIC) in invasive ductal carcinoma of the breast is an important factor determining the extent of breast resection required. Although mammography (MMG) and ultrasonography (US) are still the main tools used for the detection and diagnosis of breast cancer, they often underestimate the extent of the tumor. The sensitivity of MMG for detection of EIC has been reported to be 41%–83% [1–4]. MMG is of little value in cases without microcalcifications, since such microcalcifications are the only indication of EIC using this method, and multifocality is often undetected [5–7]. Some institutions have reported excellent visualization of EIC by US [2, 8], although the effectiveness of US seems to depend on the case examined, the investigator's skill, and the spatial resolution of the machine. In recent years, magnetic resonance imaging (MRI) has yielded additional information on the extent of invasion and intraductal spreading of breast cancer but has not been adopted in routine clinical practice because of its high cost and complexity. Although Chang et al. have had significant success in detecting small cancers using contrast-enhanced computed tomography (CT) [9], the utility of this technique has not been corroborated be-
cause of the high radiation exposure and long scan time involved. On the other hand, improvements in helical CT technology have brought about the possibility of using it as a new technique for the diagnosis of breast cancer. Helical CT has several advantages over conventional CT, since it can obtain images without a gap between slices, and has a more rapid scan time with lower radiation exposure [10]. Helical CT also has a higher spatial resolution and is less expensive than MRI. Pilot examinations of contrast-enhanced helical CT (CE-CT) have suggested its usefulness for detecting EIC [11].

The objectives of the present study were to determine whether CE-CT is more useful for detecting EIC and small invasive foci of breast cancer than US or MMG.

Materials and methods

Patients

Between November 1995 and May 1997, 514 women in whom MMG or US of the breast indicated breast carcinoma were admitted to the National Cancer Center Hospital for surgical treatment. The indications for CE-CT were as follows: 1) patients in whom MMG and/or US findings suggested widespread intraductal components (WSIC), as defined later (58 patients), 2) patients fulfilling our criteria for breast-conserving surgery (T ≤ 3 cm, N0 and absence of multiple tumors and/or diffuse microcalcifications on MMG) (64 patients). A total of 122 women were evaluated preoperatively by CE-CT.

Imaging examinations

For mammographic examination, a Mamnomat 3 (Siemens, Germany) was used. In addition to standard oblique and craniocaudal projections, craniocaudal or medio-lateral spot views (5 cm in diameter) without magnification were obtained in most cases. Whole-breast US was performed using a EUB-315 (Hitachi, Japan) with a 7.5-MHz transducer.

Helical CT scanning was performed using an X-Vigor (Toshiba, Japan) at 300 mA. The patients underwent one single spiral acquisition during deep inspiratory apnea for up to 30 s in the supine position. The first step was identification of the main tumor by a non-contrast-enhanced CT scan from the cranial end of the sternum to the inframammary