Radiography of Microcalcifications in Stereotaxic Mammary Core Biopsy Specimens

PURPOSE: To describe the technique of specimen radiography in stereotaxically guided core biopsies and evaluate its role in detection and diagnosis of microcalcifications in breast tissue.

MATERIALS AND METHODS: Specimens from 361 stereotaxic breast core biopsies of 72 nonpalpable lesions with mammographic evidence of microcalcifications were obtained from 65 patients. Specimens were placed in saline on microscope slides and radiographed.

RESULTS: Microcalcifications were detected radiographically in 146 of 361 (40%) cores. If calcifications were present on specimen radiographs, histologic detection of these calcifications was made in 114 of 146 (78%) specimens, and diagnosis was made in 118 of 146 (81%). If calcifications were not present on specimen radiographs, histologic detection was obtained in 27 of 215 (13%) specimens and specific diagnosis in 81 of 215 (38%).

CONCLUSION: Specimen radiography should be routinely performed in stereotaxic core biopsies of breast microcalcifications to ensure appropriate tissue has been obtained and to direct pathologic diagnosis of the tissue specimens.

Index terms: Breast, biopsy, 00.1267 • Breast, calcification, 00.81 • Breast radiography, 00.128 • Specimen radiography, 00.128, 00.1267

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RESULTS

Microcalcifications were demonstrated radiographically in 146 of 361 (40%) specimens (Figs 1, 2). For those specimens in which microcalcifications were seen on radiographs of the specimen, microcalcifications were present histologically in 114 of 146 (78%), and a specific histopathologic diagnosis was obtained in 118 of 146 (81%). For those specimens in which no calcifications were detected at specimen radiography, calcifications were present histologically in 27 of 215 (13%), and a specific histopathologic diagnosis was obtained in 81 of 215 (38%). The likelihood of detecting calcifications histologically was statistically significantly higher if calcifications were present on specimen ra-
diographs than if they were absent ($P < .0000001$). The probability of making a specific histopathologic diagnosis was also significantly higher if calcifications were present on specimen radiographs than if they were absent ($P < .0000001$).

In biopsies of 72 lesions, calcifications were present on specimen radiographs in at least one core in 61 of 72 (85%). In 65 of 72 (90%) lesions, calcifications were seen at pathologic analysis and a specific histopathologic diagnosis was made in at least one core. Specific benign entities were identified in 39 of 72 (54%), including sclerosing adenosis in nine, fibroadenoma in eight, fibrocystic change in seven, benign breast tissue with calcification in six, fibrosis with calcification in five, duct hyperplasia without atypia in two, fat necrosis in one, and benign breast tissue with apocrine metaplasia and calcification in one. Atypical duct hyperplasia was found in eight of 72 (11%) lesions; five of these yielded intraductal carcinoma at surgery. Malignant disease was diagnosed in 18 of 72 (25%) lesions, including intraductal carcinoma in 15 and infiltrating duct carcinoma in three. In seven of 72 (10%) lesions, no calcifications were detected either radiographically or at pathologic analysis, and these were deemed "inadequate."

Analysis of the seven inadequate specimens showed them to have a mean maximal dimension of 1.7 cm versus a mean maximal dimension of 1.3 cm for lesions in which diagnostic material was obtained. A mean of 6.3 cores (range = 5-10 cores) were obtained per lesion for those deemed inadequate versus 4.9 cores (range = 1-11 cores) for those in which diagnoses were made. Calcifications were classified morphologically into one of two groups: either predominantly punctate, rounded, or "granular" (group I) or dense, easily separable, or highly pleomorphic (group II). Overall, 48 of 72 (67%) lesions contained group I and 24 of 72 (33%) contained group II calcifications. Granular (group I) morphology was present in five of seven (71%) lesions in which inadequate material was obtained and in 43 of 65 (66%) lesions in which diagnostic material was acquired. Although the stereotaxic biopsy of 32% (23 of 72) of the lesions occurred during the first 4 months of the study, 71% of the inadequate samples also were obtained during the first 4 months. The inadequate rate was five of 23 (22%) in the first 4 months and two of 49 (4%) in the last 4 months.

DISCUSSION

The role of radiography of specimens in surgical biopsy for nonpalpable breast lesions has long been established (1-4). The specimen radiograph should be evaluated while the patient is still in the operating suite. If the lesion is not present, that information is communicated to the surgeon, who may then perform a wider excision. Documenting the presence of the lesion at specimen radiography ensures that the area of concern on the mammogram was truly sampled. Specimen radiography also assists the pathologist in choosing tissue samples for histologic evaluation. If calcifications are present on the specimen radiograph but not found at pathologic analysis of the sections taken after surgical biopsy of suspicious calcium,
Radiography of the tissue blocks may guide the pathologist in obtaining deeper sections of the area in question.

Radiography of specimens obtained during stereotactic core biopsy requires different technique than does radiography of surgical specimens. Typical settings for radiography of a surgical breast biopsy specimen are 25–32 kVp and 180 mAs. These settings are inappropriate for the smaller samples obtained stereotaxically. At 23 kVp and 20 mAs, the presence or absence of microcalcifications in core biopsy samples can be readily assessed. Even with careful examination, however, the correspondence between the presence of calcium on a specimen radiograph and at pathologic analysis is not 100%. Microscopic foci of calcification that are below the resolution of radiography may be detected histologically, as illustrated by 27 core specimens in our series. Similarly, the presence of calcium on the specimen radiograph does not guarantee the calcium will be identified at pathologic analysis. Among our patients, calcium was not evident at pathologic analysis in 32 of 146 (22%) core specimens in which it was identified radiographically. There are a number of possible explanations for this (8). Calcium may be lost during tissue preparation or the tissue may be incompletely sectioned. Calcifications can be dislodged from the tissue by the microtome blade and “kicked” out of the section, or they may be fractured. Finally, calcium may be present in the form of weddellite (calcium oxalate) crystals, which are difficult to visualize in histologic sections. Calcium oxalate calcifications may be indistinguishable radiologically from more common forms of calcification and are usually associated with benign conditions; calcium oxalate crystals are birefringent at microscope examination performed with polarized light (9–11).

Analysis of the inadequate specimens in this series suggests that the single strongest contributing factor is related to experience, as the rate of insufficient samples dramatically decreased during the course of the study. The size of the lesion and the morphology of the calcifications did not appear to affect the rate of insufficient material, although assessment of these factors is limited by the small number of inadequate samples obtained.

Although the technical settings for radiography of core specimens differ from those used for surgical specimens, the benefits of specimen radiography are the same for both. Identification of calcifications on specimen radiographs provides proof that the area in question was truly sampled. If multiple cores are obtained, this information may help guide the pathologist to those specimens most likely to yield the diagnosis (12). Our experience demonstrates that the presence of calcium on specimen radiographs statistically significantly increases the likelihood that calcium will be observed histologically and that a specific histopathologic diagnosis will be made. If the calcifications that were detected mammographically are not present on the specimen radiograph, the radiologist should obtain more tissue, thus increasing the likelihood the pathologist will make a definitive histopathologic diagnosis. The results of our investigation imply that specimen radiography should be routinely performed in stereotactic biopsy of breast microcalcifications, as it is in surgical biopsy of microcalcifications performed after needle localization.

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References