Effect of Core-Needle Biopsy vs Fine-needle Aspiration on Pathologic Measurement of Tumor Size in Breast Cancer

Jung-Hyun Yang, MD, PhD, FACS; Won-Suk Lee, MD; Sang-Wook Kim, MD; Sang-Uk Woo, MD; Jeong-Han Kim, MD; Seok-Jin Nam, MD, PhD

Hypothesis: Core-needle biopsy (CNB) and fine-needle aspiration (FNA) play an important role in the initial diagnosis of breast cancer. However, CNB might alter the size of the tumor, which might subsequently change its pathologic stage and thus affect the decision about adjuvant chemotherapy.

Patients: Between January 2000 and May 2002, we studied 291 patients with invasive carcinoma lesion in a retrospective analysis. One hundred ninety-nine patients underwent ultrasonography-guided CNB. Ninety-two patients had FNA before surgical manipulation.

Main Outcome Measures: The clinically measured tumor size using ultrasonography was compared with the pathologic tumor size in both the CNB and FNA groups. The difference in each group was determined and analyzed using a t test. The mean ± SD preoperative ultrasonographically measured size in the CNB group was 2.09 ± 1.06 cm and in the FNA group, 2.16 ± 0.92 cm (no significant difference). The pathologic measurement of the lesion on surgical specimens revealed that the mean pathologic tumor size was 2.09 ± 0.90 cm in the CNB group and 2.36 ± 0.92 cm in the FNA group. The changes in size from preoperative measurements by ultrasonography to pathologic measurements on surgical specimens were greater in the CNB group (0.003 ± 0.65 cm) than in the FNA group (0.20 ± 0.39 cm; P = .001).

Conclusions: Although the reduction in tumor size might be small with patients who undergo CNB, it must be considered when deciding adjuvant treatment, especially for tumor sizes on the “borderline” in establishing the indication for and the type of adjuvant treatment.

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The long-term survival of breast cancer patients is strongly correlated with the size of the tumor at surgical excision. Image-localized fine-needle aspiration (FNA) and core-needle biopsy (CNB) have been widely used for the initial evaluation of breast lesions because of their low cost, because they are less invasive, and because they facilitate a faster diagnosis compared with surgical biopsy. Each test aids in the preoperative planning of treatment options—which can translate to a single breast cancer operation rather than multiple surgical interventions—and patients with benign lesions are spared unnecessary surgery.1,2 Despite the advantages, surgeons have been concerned that preoperative CNB can alter pathologic staging. Furthermore, because the choice of adjuvant chemotherapy or hormonal therapy depends on the size of the surgically resected tumor specimen, a change in size caused by preoperative CNB might affect the long-term prognosis by downstaging.

Most pathologists use biopsy needles that are 14 gauge or larger, which are considered adequate for establishing diagnosis.3 However, these needles can completely excise malignant lesions that are smaller than 0.5 cm. One CNB completely removed a 0.2-cm tumor that was ductal carcinoma in situ so that no tumor was identified at surgery. When tumors are smaller than 0.5 cm, treatment should be based solely on clinical size. Because adjuvant treatment is conventionally indicated for tumors larger than 1 cm, alteration in the actual size of the tumor might result in undertreating patients of breast cancer who are indicated for adjuvant therapy.

Ultrasound measurement of tumor size is considered a more accurate imaging modality compared with needle biopsy.4 However, ultrasound has a tendency to underestimate the size of tumors. Pathologic tumor size equals ultrasonographic tumor size within a range of 3 mm.5

The effect of CNB on the measurement of pathologic tumor size has yet not

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been studied extensively. We evaluated the presurgical ultrasonographic measurements of tumor size with postsurgical pathologic tumor size in the CNB group and compared the outcome with that of the FNA group.

**METHODS**

We retrospectively analyzed 291 patients with invasive breast carcinoma who received percutaneous ultrasonography-guided CNB or FNA for ultrasonographically and mammographically detected breast lesions between January 2000 and May 2002. All patients were diagnosed with invasive breast carcinoma without intervening chemotherapy or a history of therapeutic irradiation to the breast. We excluded from the study patients who had a prior history of excisional biopsy, ductal carcinoma in situ, and lobular carcinoma in situ. In addition, we excluded patients with lesions that were undetectable with plain mammography. Mammographically detected lesions that were localized by ultrasonography were biopsied under ultrasound guidance. The choice of guidance was made by an experienced radiologist on the basis of lesion variability and patient preference. Ultrasound-guided CNB or FNA was performed with patients in a supine or supine oblique position using a multipurpose technique. The clinicopathological data—including surgical management, FNA cytological results and core biopsy histological results, mammographic and ultrasonographic findings, and the size of invasive tumor—were obtained from a review of medical records.

For 199 patients, tissues were acquired by a 14-gauge needle (diameter, 2 mm) and automated biopsy gun; 92 tissues were obtained by FNA with a 23-gauge needle (diameter, 0.8 mm). The choice between FNA or CNB was made according to palpable mass at the initial physical examination. Fine-needle aspiration was preferred over CNB if a patient had a palpable lesion. Radiologists sought the shortest way from the skin to the tumor in all cases by watching the needle’s progress on the ultrasound screen. Core-needle biopsy was performed with patients in supine or supine oblique position. Local anesthetics were applied before acquiring tissues. Each biopsy made 3 to 7 needle passes. The number of needle passes in an individual case depended on the site of lesion. The pathologic specimens were immediately stained and reviewed by pathologists. Cytological specimens were stained with Papanicolaou stain and hematoxylin-eosin, and histological sections were stained with hematoxylin-eosin. None of the procedures were performed using a vacuum-assisted device. Complications were uncommon. Significant hematoma formation or injection was infrequent.

Breast and endocrine surgery specialists performed all procedures. In consultation with the patient, the surgeon chose a breast-conserving surgery or a mastectomy, with or without sentinel lymph node biopsy or axillary lymph node dissection, on the basis of clinical and radiologic findings, and the patient’s preference. Tumors diagnosed by FNA underwent frozen section histological confirmation before the patients had breast surgery.

The size of the breast lesion was measured ultrasonographically before any manipulation and pathologic measurement were done on the surgical specimen. Each surgical specimen was dissected and measured in the largest gross dimension.

For the breast lesions diagnosed with FNA and CNB, we determined the difference between the ultrasonographically determined preoperative size and the pathologic size. We evaluated the differences between the 2 groups using a t test, and a P value less than .05 was considered statistically significant.

**RESULTS**

We retrospectively reviewed the medical records for 291 patients in this study. The patient characteristics appear in Table 1. The mean age was 48 years in the CNB group and 49 years in FNA group. Of 291 patients, 289 patients (99.3%) had ipsilateral lesions and 2 patients had bilateral lesions (0.7%).

The most common mammographic finding was spiculated mass (130/199 patients [65.3%] in the CNB group; 66/92 patients [71.7%] in the FNA group), followed by calcified mass, calcifications alone, and asymmetric densities in order of frequency (Table 2). The most frequent ultrasonographic finding was hypoechoic or poorly defined lesions suggestive of malignancy (186/199 patients [93.5%] in the CNB group; 87/92 patients [94.6%] in the FNA group). In 4 cases, ultrasonography suggested that the breast lesions were benign. Nine patients had negative mammographic findings with positive ultrasonographic findings or vice versa.

Of 199 invasive breast carcinomas diagnosed by CNB, 193 (97.0%) were ductal carcinoma, 5 (2.5%) were invasive ductal carcinoma with ductal carcinoma in situ, and 1 (0.5%) was invasive lobular carcinoma (Table 3). In the FNA group, pathologic examination showed that 86 patients (93.5%) had invasive ductal carcinoma and 6 patients (6.5%) had invasive ductal carcinoma with ductal carcinoma in situ. There were no cases of lobular carcinoma with lobular carcinoma in situ.
All 291 patients who were diagnosed with either FNA or CNB had surgery. In the CNB group (n=199), mastectomy was performed in 90 patients (45.2%) and breast conservation in 109 patients (54.7%). In the FNA group (n=92), breast-conserving surgery was performed in 54 patients (58.7%) and mastectomy in 37 patients (40.2%).

Table 3 outlines the staging results according to the American Joint Committee on Cancer's Cancer Staging Manual, 5th edition. The mean preoperative ultrasonographically measured size in the CNB group was 2.09 ± 1.06 cm and in the FNA group, 2.16 ± 0.92 cm (no significant difference). The pathologic measurement of the lesion on surgical specimens revealed that the mean pathologic tumor size was 2.09 ± 0.90 cm in the CNB group and 2.36 ± 0.92 cm in the FNA group. The mean changes in size between preoperative measurements by ultrasonography and pathologic measurements on surgical specimens (the absolute number of the pathologic tumor size minus the absolute number of the ultrasonographic tumor size) were greater in the CNB group (0.46 ± 0.44 cm) than in the FNA group (0.31 ± 0.30 cm; P = .002) (Table 4).

In conclusion, the pathologic assessment of tumor size is the most reliable standard in breast tumor staging. Determining the indication for and the type of adjuvant treatment is conventionally based on the status of hormone receptors and tumor size. Accurately measuring tumor size is an integral part of the therapeutic plan. Imprecisely measuring the tumor size can result in omitting otherwise beneficial adjuvant therapy and therefore changing the prognosis. Based on our results, the alteration in tumor size caused by CNB is significant compared with that by FNA, so clinicians should consider this change in tumor size when establishing therapeutic plans, especially for tumors smaller than 1 cm.

### Table 3. TNM Stage and Pathologic Outcome

<table>
<thead>
<tr>
<th>AJCC TNM Stage</th>
<th>CNB Group (n = 199)</th>
<th>FNA Group (n = 92)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>66 (33.2)</td>
<td>29 (31.5)</td>
<td>.78</td>
</tr>
<tr>
<td>II</td>
<td>83 (41.7)</td>
<td>29 (31.5)</td>
<td>.06</td>
</tr>
<tr>
<td>III</td>
<td>38 (19.1)</td>
<td>26 (28.3)</td>
<td>.09</td>
</tr>
<tr>
<td>IIIA</td>
<td>11 (5.5)</td>
<td>5 (6.4)</td>
<td>.61</td>
</tr>
<tr>
<td>IIIB</td>
<td>1 (0.5)</td>
<td>3 (3.3)</td>
<td>.99</td>
</tr>
<tr>
<td>pathologic measurement of tumor after FNA or CNB</td>
<td>2.16 ± 0.92 cm</td>
<td>2.36 ± 0.92 cm</td>
<td>.02</td>
</tr>
<tr>
<td>mean ± SD change of difference in size (US – P), cm</td>
<td>0.46 ± 0.44 cm</td>
<td>0.31 ± 0.30 cm</td>
<td>.002</td>
</tr>
</tbody>
</table>

Abbreviations: AJCC, American Joint Committee on Cancer; CNB, core-needle biopsy; FNA, fine-needle aspiration; P, pathologic tumor size; US, ultrasonography tumor size.

### Table 4. Changes in Tumor Size

<table>
<thead>
<tr>
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<th>CNB Group (n = 199)</th>
<th>FNA Group (n = 92)</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Mean ± SD ultrasonography tumor size, cm</td>
<td>2.09 ± 1.06</td>
<td>2.16 ± 0.92</td>
<td>.55</td>
</tr>
<tr>
<td>Mean ± SD pathologic tumor size, cm</td>
<td>2.09 ± 0.90</td>
<td>2.36 ± 0.92</td>
<td>.02</td>
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Abbreviations: CNB, core-needle biopsy; FNA, fine-needle aspiration; P, pathologic tumor size; US, ultrasonography tumor size.

### COMMENT

Image-guided needle biopsy using ultrasonography or mammography is increasingly used to evaluate breast cancer. Needle biopsy offers many advantages over surgical biopsy: it is faster, less expensive, and less invasive and it can avoid surgery in women who have benign lesions. Diagnosing breast cancer with CNB means that the surgeon and patient can discuss more treatment options before choosing surgical interventions. Although the specificity and sensitivity of needle biopsies are well established in diagnosis, their effect on tumor size has not been studied extensively. To determine the effect of CNB on tumor size, we compared the clinical size measured in ultrasonography with the final pathologic size of the tumor in each group. The mean preoperative ultrasonographic measurements in the CNB and FNA groups were not significantly different. The reduction in size between preoperative ultrasonographic measurements and pathologic measurements on surgical specimen was greater in the CNB group.

Numerous studies have discussed the assessment of accuracy in measuring tumor size, which is widely accepted as a strong predictive factor for survival. Although an imaging-guided percutaneous CNB or FNA is an accurate and cost-effective method for diagnosing undetermined breast lesions, their possible effect on tumor size has not been reported in detail. Clinical estimation by physical examination has been known to poorly correlate with pathologic measurement. Pain et al reported that clinical measurement overestimated the size of small tumors and underestimated the size of larger tumors. Although Tresserra et al did not consider the effect of the biopsy method on tumor size, the size of tumors measuring 20 mm or smaller tended to be underestimated by ultrasonography, whereas the size of tumors larger than 20 mm was more often overestimated. Charles et al reported that the pathologic size of breast cancer was not affected by the use of stereotactic core biopsy in 61 patients before surgical excision compared with 77 patients without preoperative stereotactic CNB.

This study showed a statistically insignificant difference in tumor size between the ultrasonographic measurements of tumors after FNA or CNB. However, it showed a statistically significant difference in tumor size between the mean pathologic measurements of tumor after FNA or CNB (P = .02). The comparison of mean values between the difference in size (the absolute number of the pathologic tumor size minus the absolute number of the ultrasonographic tumor size) among ultrasonographic and pathologic specimens was significantly greater in the CNB group compared with the FNA group (P = .002).

In conclusion, the pathologic assessment of tumor size is the most reliable standard in breast tumor staging. Determining the indication for and the type of adjuvant treatment is conventionally based on the status of hormone receptors and tumor size. Accurately measuring tumor size is an integral part of the therapeutic plan. Imprecisely measuring the tumor size can result in omitting otherwise beneficial adjuvant therapy and therefore changing the prognosis. Based on our results, the alteration in tumor size caused by CNB is significant compared with that by FNA, so clinicians should consider this change in tumor size when establishing therapeutic plans, especially for tumors smaller than 1 cm.
REFERENCES


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