Clinical Utility of Bilateral Whole-Breast US in the Evaluation of Women with Dense Breast Tissue

PURPOSE: To evaluate the clinical utility of bilateral whole-breast ultrasonography (US) as an adjunct examination to mammography in asymptomatic women with dense (Breast Imaging Reporting and Data System [BI-RADS] density category 3 or 4) breast tissue.

MATERIALS AND METHODS: Between July 1998 and April 2000, 1,862 patients with negative findings at clinical examinations, negative mammographic results, and breast tissue with BI-RADS category 3 or 4 density were evaluated with bilateral whole-breast US for occult cystic and solid masses, areas of architectural distortion, and acoustic shadowing. Suggestive findings were compared with tissue diagnoses from US-guided core biopsy specimens. US was initially performed by a US or a mammography technologist. The average time to perform the examination was approximately 10 minutes. Abnormal findings were corroborated by a fellowship-trained breast-imaging radiologist.

RESULTS: In the 1,862 women examined with bilateral whole-breast US, 57 biopsies were recommended in 56 patients; follow-up data were available in 51 of the 56 patients. Six breast cancers were detected (cancer detection rate, 0.3%).

CONCLUSION: Bilateral whole-breast US, when performed in patients with dense (BI-RADS category 3 or 4 density) breast tissue, is useful in detecting breast cancer not discovered with mammography or clinical breast examination. The 0.3% cancer detection rate compares favorably with that of screening mammography and with that in previously published studies involving bilateral whole-breast US.

Ultrasonography (US) of the breast has traditionally been performed to evaluate specific areas of abnormality discovered either at clinical examination or at mammography. The utility of breast US was believed to be dependent solely on its use as a problem-solving modality and as an adjunct diagnostic tool to mammography (1–3). Until recently, studies (4–8) designed to evaluate the utility of US as a screening tool were performed with equipment that was markedly less precise than the equipment that is available today. In addition, these studies were not tailored to the evaluation of women with dense breast tissue, for these women have a greater likelihood of having a mass obscured at mammography. With the advent of high-frequency (≥7-mHz) transducers, the ability to detect clinically important findings in the breast has improved dramatically. In addition, the differentiation between cystic and solid masses is more reliable, and characterization of solid masses as benign or suggestive of malignancy can be established with confidence (9).

Findings in recent studies (10–14) with state-of-the-art technology show the ability of breast US to depict an occult malignancy in women with dense breast tissue. Our study was undertaken to further evaluate the clinical utility of bilateral whole-breast US as an adjunct examination to mammography in asymptomatic women with dense breast tissue.

MATERIALS AND METHODS

Between July 1998 and April 2000, 1,862 patients (age range, 35–87 years) with breast tissue designated as Breast Imaging Reporting and Data System (BI-RADS) density category
3 or 4 were examined with bilateral whole-breast US. Most patients had negative clinical examination findings and negative mammographic findings. In addition, in patients with focal abnormal mammographic findings or palpable abnormalities, all areas of the breast outside of the quadrant with the abnormal mammographic findings or palpable abnormalities were evaluated with US. Patients were selected from a population of women who presented for screening mammography at a freestanding independent breast imaging center.

Mammograms were obtained with dedicated mammography units (Lorad MII; Trex Medical, Danbury, Conn) by using dedicated mammography cassettes (EC-MA; Fuji, Tokyo, Japan), film (UM-MA HC; Fuji), and processing (FPM 4200; Fuji). All patients underwent a clinical breast examination performed by a physician or a nurse practitioner prior to undergoing mammography, which is part of the routine screening procedure at our institution. Mammograms were interpreted by a fellowship-trained breast imaging radiologist, who dedicated 100% of his clinical duties to breast imaging. Patients were eligible for bilateral whole-breast US if their breast tissue was categorized as heterogeneously dense (BI-RADS breast density category 3) or extremely dense (BI-RADS breast density category 4). Patients with negative mammographic findings were considered eligible. If abnormal findings were present on mammograms, or if a palpable abnormality was present, patients could still be included in the study. However, only US findings that occurred in a quadrant of the breast different from that of the abnormal mammographic finding or from that of the palpable abnormality were included in the study data.

The guidelines contained in the Principles of Helsinki were followed in this study. All patients were given a detailed verbal or written description of the procedure and the reason for its utility and validity. The patients provided oral consent. In addition, the patients’ primary referring physicians were also informed of the recommendation for bilateral US on the basis of findings of dense breast tissue at mammography. Journal articles in which investigators describe the use of bilateral US in women with dense tissue (4) and the treatment of benign-appearing solid masses detected at US (3) were available to patients and referring physicians. Finally, a discussion with the supervising radiologist was available as an option to further inform patients and physicians. All patients and their referring physicians were given the option of declining the procedure, and patients were told that declining the examination would in no way alter their clinical treatment.

US was performed in the majority of patients by a US technologist or a mammography technologist with extensive experience in breast US by using a high-frequency (7–12-MHz) linear-array transducer with a US unit (VST Master or Logiq 400; GE Medical Systems, Milwaukee, Wis). In the first 25 patients, both the technologist and the radiologist performed the US examination in the same patient, to confirm the accuracy of the technologist’s examination. In the remainder of the patients, only the technologist or the radiologist examined the patient. After the initial 25 patients, the radiologist examined 15 additional patients. All remaining patients were examined by the technologist alone, unless clinically important findings were present. The mean time to perform the complete examination of both breasts was 10 minutes, with a range of 7–20 minutes. The mean time was the same whether the technologist or the radiologist performed the examination. Situations in which the time to perform the examination markedly exceeded the mean time occurred in women with large breasts and occurred when clinically important or multiple findings were detected.

Abnormal findings were corroborated with repeat US scanning by a fellowship-trained breast imaging radiologist. The same radiologist interpreted all mammograms and US examinations. All pertinent clinical and imaging information was available to the radiologist at the time of interpretation of both the mammogram and the US scan. Results of the examination were then discussed with the patient, and follow-up recommendations were provided. If biopsy or aspiration was indicated, this procedure was usually scheduled before the patient left the office. This was followed up with a letter sent to the patient and with an updated report sent to the referring physician. On some occasions, the biopsy or aspiration was performed on the same day as bilateral US.

Patients were recruited for the study in the following way. In most situations, the patients underwent a clinical breast examination and mammography; the mammogram was later read in a batch-reading format, as is the usual practice in our institution. Patients who qualified for bilateral US on the basis of their tissue density were then contacted about the examination. At the beginning of the study, patients and referring physicians were contacted by telephone, and the examination was scheduled if the patient and her physician agreed to participate. As the study progressed, a paragraph explaining the bilateral US procedure was added to the letter sent to the patient regarding mammography results, and the patient was asked to call for an appointment if she was interested in undergoing the bilateral US examination. A statement was also added to the mammography report sent to the referring physician regarding the option for bilateral US.

US scanning was performed in a radial pattern, beginning either at the nipple and moving outward or at the periphery of the breast and moving inward. Each quadrant was scanned, with overlap at the 12-, 3-, 6-, and 9-o’clock positions. Scanning was performed in orthogonal planes, either transverse and longitudinal or radial and antiradial. Images were obtained and measurements were determined for all solid masses, complex cysts, areas of architectural distortion, acoustic shadowing, and dominant simple cysts (>1 cm in diameter). Cysts less than 1 cm in diameter were considered incidental findings, and descriptions of these lesions were not archived or reported, unless the cysts had a complex appearance. For examinations with negative findings, representative images were obtained in each of the four quadrants bilaterally.

Complex cysts were aspirated with a 20-gauge needle by using the standard freehand technique (15). Cytologic evaluation was requested after aspiration only if bloody fluid was aspirated. Core-needle biopsy of solid masses and other areas of suspected malignancies was performed with a 15-gauge biopsy needle (ASAP; Medi-tech/Boston Scientific, Watertown, Mass) by using the coaxial technique described by Kaplan et al (16). Five core samples were routinely obtained. If malignancy was diagnosed following core-needle biopsy, the patient received a surgical referral from either the referring physician or the radiologist who performed the biopsy. The mammograms of the patients who received a diagnosis of malignancy in this study were then retrospectively reviewed after the diagnosis was obtained, with special attention given to the area in which the cancer was detected at US, to verify the initial negative interpretation.

Six-month follow-up US examination was recommended for the following patients: those who had complex cysts that...
resolved following aspiration; those who had suggestive areas and solid masses that were proved benign at core-needle biopsy; and those who had solid masses classified as probably benign on the basis of the criteria described by Stavros et al (9).

RESULTS

Of the 1,862 patients evaluated with bilateral whole-breast US in this study, 1,612 (86.6%) had negative US examination findings. A negative examination finding meant that no dominant cystic masses, no solid masses, and no areas of architectural distortion or acoustic shadowing were seen.

Fifty-seven biopsies were recommended in 56 (3.0%) of 1,862 patients. In addition, 40 aspirations of complex cysts were recommended in 36 patients, and five aspirations of masses characterized as a complex cyst versus a solid mass were recommended in five patients. The mean size of the complex cysts was 0.8 cm (range, 0.4–2.0 cm). The mean size of the complex cysts versus solid masses was 0.7 cm (range, 0.5–0.9 cm). The total number of interventional procedures recommended after whole-breast US was, therefore, 102. Follow-up data were available in 51 of the 57 biopsies recommended. Five patients underwent biopsy elsewhere; the results of these biopsies were not available for analysis in this study. One patient decided not to undergo biopsy.

Six breast cancers (positive predictive value was calculated for the cases in which biopsy was recommended.

### TABLE 1

Malignant Diagnoses Established with Core-Needle Biopsy Findings

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<tr>
<td>Infiltrating ductal carcinoma*</td>
<td>1</td>
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<td>Infiltrating mammary carcinoma†</td>
<td>2</td>
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<tr>
<td>Features of apocrine carcinoma§</td>
<td>1</td>
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<td>Intraductal carcinoma</td>
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* Final pathologic finding after excision was tubular carcinoma with ductal carcinoma in situ.
† Final pathologic finding after excision was infiltrating lobular carcinoma.
§ Both occurred in the same patient.

In patients who had biopsy-proved benign lesions, follow-up US was performed at 6 months and then again at 1 year as part of the patient’s usual screening mammography visit. One-year follow-up was then recommended if there was no change in the lesion in which biopsy was previously performed.

Figure 1. (a) Craniocaudal and (b) mediolateral oblique screening mammograms show negative findings in a 65-year-old woman with dense (BI-RADS density category 3) breast tissue. An area of increased density seen medially on the craniocaudal mammogram was stable compared with findings on previous mammograms. (c) Transverse whole-breast US scan shows a 1.2-cm-diameter solid mass with acoustic shadowing. Cursors outline the mass.

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value for biopsy, 11.8%) of the 51 biopsies performed at our institution were diagnosed in five patients. The diagnoses of malignancy that resulted from US-guided core-needle biopsies included the following: one mucinous carcinoma in one patient; one well-differentiated infiltrating ductal carcinoma in one patient; two infiltrating mammary carcinomas in one patient (the cell type was not specified at core-needle biopsy); one diagnosis reported as malignant tissue with features of apocrine carcinoma in one patient; and one diagnosis determined as ductal carcinoma in situ in one patient (Table 1; Figs 1, 2). The two malignancies that occurred in the same patient were located within the same quadrant of the breast; however, they were separated by 4 cm and were clearly seen as separate lesions at US (Fig 3). At surgical excision, the two infiltrating mammary carcinomas were determined to represent infiltrating lobular carcinoma; the malignancy with features of apocrine carcinoma was infiltrating ductal carcinoma (moderately differentiated with apocrine features), and the case thought to be infiltrating ductal carcinoma at core-needle biopsy was determined to be a tubular carcinoma with associated ductal carcinoma in situ.

One of the malignancies in this study was classified as stage 0; the other five malignancies were classified as stage 1. Four of the six tumors were minimal cancers (stage 0 or 1, <1 cm). By using the largest diameter measured at US as a guideline, the mean diameter of the malignancies was 0.9 cm (range, 0.6–1.4 cm). All five patients with malignancies in this study underwent either axillary node dissection or sentinel node biopsy at the time of the definitive surgical excision. In all five patients, findings were negative for nodal metastases.

In this study, the five patients with malignancies ranged from 65 to 83 years of age. One of the five patients had a family history of breast cancer; her sister had the disease. Two of the patients were receiving hormone replacement therapy.

All 40 of the complex cysts resolved after aspiration. Four of the patients with masses described as complex cysts versus solid masses underwent aspiration; the fifth patient did not return for aspiration and was lost to follow-up. In all four aspirations, the masses did not resolve and were solid. Fine-needle aspirates were sent for cytologic evaluation in these cases. In all four cases, the aspirate was described pathologically as atypical cells. These four patients then underwent US-guided core-needle biopsy, and findings in all four patients were benign. Findings in these four biopsies were included in our biopsy statistics.

In 45 biopsies, findings were benign. Benign diagnoses are listed in Table 2. The most common benign diagnosis in this series was fibrosis or fibrotic breast tissue (Figs 4, 5). This diagnosis occurred in 15 biopsies as the only pathologic finding and was present along with adenosis in two other cases. Fibroadenoma was the second most common diagnosis,
followed by adenosis and sclerosis. The remaining benign diagnoses consisted of a variety of nonspecific benign entities. One hundred fifty patients had findings at bilateral whole-breast US that did not require biopsy or aspiration (Table 3). Seventy-two patients had circumscribed solid masses classified as probably benign on the basis of the criteria described by Stavros et al (9), and a 6-month follow-up US examination was recommended. In some of these patients, multiple benign-appearing solid masses were seen. Information about subsequent 6-month follow-up examination findings was available in 43 patients, and information about 12-month follow-up examination findings was available in 19 of 72 patients placed in the probably benign follow-up category. None of the masses seen at 6- or 12-month follow-up required biopsy due to growth or other changes. Sixty-three patients had simple cysts, some of which were multiple, and for these patients, routine follow-up was recommended. Eleven solid masses were found that corresponded to stable benign-appearing masses seen at
mammography. In one patient, a benign-appearing lymph node was seen. Routine follow-up was recommended for patients with these masses.

Two patients had subtle irregular hypoechoic areas seen at US that were not defined well enough to prompt biopsy. In these two cases, the patients were referred for contrast material-enhanced MR imaging to assess these questionable areas. No focal areas of abnormal enhancement were seen at MR imaging examinations in either of the two patients. At subsequent US follow-up at 6-month intervals, the two irregular hypoechoic foci remained stable. An additional patient had a nonspecific hypoechoic area for which a 3-month US follow-up was recommended. This area was stable at 3 months and remained stable at subsequent 6-month intervals.

The mammograms of the five patients with malignancy in this study were reviewed retrospectively. Mammographic findings in two of the patients were again negative for malignancy, and there was no change in findings from prior examinations. In one of the patients in whom a malignancy was discovered, an asymmetric density was seen in the left outer hemisphere on only the craniocaudal mammogram at the time of the patient’s initial evaluation. Mammographic work-up revealed no suggestive findings or discrete masses in the area of the asymmetric density. In the left outer hemisphere in the area of the asymmetric density, findings at US were negative. The remainder of the breast and the opposite breast were evaluated with US according to the study protocol. At US, an area suspected of being malignant was seen in the left upper inner quadrant at the 10-o’clock position, outside of the quadrant of, and clearly separate from, the area of the asymmetric density seen at mammography.

In another patient, spot compression images were obtained in the right upper hemisphere at the 12-o’clock position after whole-breast US demonstrated a suggestive finding in this location. An ill-defined density seen on the spot compression images corresponded to the abnormal area seen at US and later proved to be a malignancy. However, even at retrospective review, the ill-defined mammographic finding could not be detected on the routine screening images.

In the final patient, architectural distortion, which appeared stable compared with findings on several previous mammograms, was present in the right subareolar region at mammography. Several years earlier, findings at surgical biopsy in this location were benign, which accounted for the architectural distortion. In addition, a cyst, which had been aspirated and was no longer visualized on the mammogram, was seen in this area at an examination 1 year earlier. Findings in the right breast at mammography were interpreted as negative without marked change. In the left breast, masses were seen at mammography that were seen as cysts at US. Bilateral whole-breast US was performed to evaluate the remainder of the left breast and the right breast. A solid mass that was suspected of being malignant was found in the right subareolar region; this mass later proved to represent a malignancy at core-needle biopsy. At retrospective analysis of this case, the area of architectural distortion may have appeared slightly more prominent when compared with findings of previous serial examinations dating from the time of the surgical biopsy. Although this finding may have been worthy of further mammographic and US evaluation retrospectively, the examination findings were interpreted as negative for malignancy with no marked change at the time of interpretation.

Many of the 1,612 patients who had negative findings at bilateral whole-breast US during this study returned to our institution for subsequent annual screening mammography, and they also underwent follow-up bilateral screening US examinations at 1 year, and some at 1 and 2 years, after the initial examination. Although these data were not specifically tracked as part of this study, no malignancies were detected at either mammography or subsequent bilateral whole-breast US examinations. These follow-up data enhance the likelihood that the initial negative findings at screening US examinations, the majority of which were performed solely by a technologist, were true-negative findings.

**DISCUSSION**

US has long been used as an effective diagnostic tool in the evaluation of palpable and mammographic abnormalities (1–3). Until recently, all published reports (4–8), to our knowledge, demonstrated that US was not an effective screening mo-
Findings in several recent studies (10–14) performed with current state-of-the-art equipment show that US can be used in the early detection of occult breast cancer, especially in women with dense breast tissue.

Our results indicate that bilateral whole-breast US can be an effective adjunct imaging examination in the evaluation of women with dense (BI-RADS density category 3 and 4) breast tissue at mammography. We detected six breast cancers in five women in our study of 1,862 patients. The resulting 0.3% cancer detection rate is similar to that of screening mammography (17–19) and to that in previous studies (10,11) in which screening US was evaluated. These six cancers may have gone undetected for at least 1 year, unless they became palpable in the interval between screening examinations, given the fact that the mammographic and clinical examination findings in these patients were negative, and routine follow-up in 1 year otherwise would have been recommended. Although our study was not designed to evaluate the effect of bilateral whole-breast US on tumor staging or long-term survival, the fact that all the cancers in our study were classified as stage 0 or 1, with cancers ranging from 0.6 to 1.4 cm in diameter, indicates that a potential delay in diagnosis of at least 1 year may have had a marked effect on treatment and, therefore, possibly on long-term survival. This is an important issue that can only be properly evaluated with a trial involving a large number of patients and long-term follow-up.

Although we recommend bilateral whole-breast US in women with dense breast tissue on the basis of the results of this study, this recommendation cannot be made routinely for all women who undergo screening mammography. The similarity in cancer detection rates between screening mammography and bilateral whole-breast US demonstrated in this study would probably not hold true if women with primarily fat-replaced breasts (BI-RADS density category 1 or 2) were also included and if they underwent bilateral US. The reason for this is that most malignancies that are undetected at screening mammography are not seen because they are obscured by dense tissue. The number of additional cancers detected with bilateral US in women with fat-replaced breasts would likely be markedly fewer than in those with dense breasts. Therefore, performing screening US in all women who undergo screening mammography would not be cost-effective, as the cancer detection rate would likely be much lower than that in our study and would not be similar to that of screening mammography.

One of the previous arguments against bilateral whole-breast US has been that the quality of the mammograms obtained in patients who had bilateral whole-breast US may not have been acceptable; therefore, masses found only at US may have been detectable if mammograms with excellent image quality had been obtained. This argument is not valid in this study or in the previously published studies (10–14) in which screening US was also evaluated. This and other recent studies (10–14) have been performed with state-
of-the-art mammography units, dedicated screen-film combinations, and dedicated processing according to the guidelines of the Mammography Quality Standards Act. In this study, the interpretations of these mammograms obtained with excellent quality were interpreted by a fellowship-trained breast imaging radiologist with extensive experience in mammography, breast US, and breast interventional techniques. Other recent studies were also performed by radiologists specializing in breast imaging. Thus, the quality of mammography cannot be cited as a reason for the lack of mammographic detection of the malignancies found only with US in this study.

As previously described in Results, two of the five patients in whom malignancies were discovered had findings in the malignant areas at retrospective review of the mammograms. In one of these two patients, the mammographic finding was only apparent on spot compression images that were obtained in an area known to harbor an abnormality found at bilateral whole-breast US examination. The spot compression images would not have been obtained as a part of the routine mammographic evaluation; therefore, the malignancy would have been undetected if only screening mammography had been performed. In the other patient, although there was an area of architectural distortion present in the same location as the malignancy discovered at bilateral US, this area appeared relatively stable compared with that in previous examinations, and the patient had previously undergone surgery in the area that could have accounted for the architectural distortion. At initial interpretation, the mammographic findings were interpreted as negative without marked change. Even in retrospect, this would not have been an erroneous reading, and again the malignancy likely would have been undetected for at least 1 year. Additionally, even if one assumes a different radiologist may have interpreted the mammogram differently, and a work-up should have been recommended, the radiologist in this study would not have detected the malignancy on that year’s mammogram alone. Given the 10% overall false-negative rate for mammography that has been reported, subtle findings at mammography may be overlooked even by expert radiologists, especially in women with dense breast tissue. Therefore, the patient discussed herein represents an example of a situation in which bilateral whole-breast US can add to the diagnostic utility of breast cancer screening by potentially helping to detect cancers with findings that are overlooked at mammography and those that are not visible at mammography.

In our study, the majority of US examinations were performed by a technologist. Our cancer detection rate (0.3%) was identical to that described by Kolb et al (10) in their study of 3,626 women, in which a radiologist performed all of the bilateral US examinations. In the majority of patients in our study, a mammography technologist or a US technologist performed the initial bilateral examination. Only if there were questionable or suggestive findings did the radiologist perform rescanning of the area in question. However, this method can work only if several issues are addressed. The technologist must have extensive experience in breast US and should also have a basic knowledge of mammography. We believe general US technologists who perform breast US only on occasion should not perform bilateral whole-breast US for screening. The technologist and radiologist should develop sufficient experience performing diagnostic breast US together and should know each other’s limitations before attempting screening US. The radiologist must check any questionable areas prior to rendering a final interpretation. In our opinion, a screening US program with a technologist can be successful only if these requirements are met.

For bilateral whole-breast US to be incorporated into the usual routine of a breast imaging center, certain criteria must be met. The patient must first undergo screening mammography, with findings interpreted to determine both the density of the breast tissue and the need for any diagnostic work-up of abnormalities noted at mammography. Since most large breast cancer screening centers perform batch reading of screening mammograms, the bilateral whole-breast US examination usually must be scheduled separately after mammographic findings are interpreted. In our study, most of the whole-breast US examinations were performed at a separate visit. Although this is inconvenient for patients, the situation is similar to calling the patient back for additional mammograms and/or diagnostic US. Since our usual protocol is to perform diagnostic examinations at separate visits, very few of the patients in this study objected to having to return on a different day for the whole-breast US examination. We included a statement in the letters to the patient and to the physician that indicated the option for bilateral breast US and asked the patient to call for an appointment. The examination was scheduled according to 15-minute time slots in our US schedule. In facilities where mammograms are read while the patient is still present, US can be performed on the same day, if necessary, after the mammogram is read. Separate scheduling can be avoided in large breast cancer screening centers if the patient has had a previous mammogram that documented dense tissue, provided time is allowed for interpretation of the mammogram before the patient undergoes bilateral US.

The positive predictive value (11.8%) for biopsy in this study is lower than the positive predictive value (28%-30%) for mammographically detected lesions in our practice. This discrepancy is likely caused by several factors. First, there is much less experience with lesions seen at screening US compared with lesions seen at mammography; therefore, tissue diagnoses are necessary to verify the cause of many of these US findings. As experience with these findings increases, the number of biopsies should diminish. Second, when we began our study, the criteria for performing follow-up imaging rather than biopsy of solid masses seen at US (9) were not as widely accepted as they are now. More biopsies of circumscribed solid masses that are probably benign were performed in the early portion of the study, compared with the number of biopsies performed in the latter part of the study. Adhering to the criteria for follow-up of probably benign solid masses would improve the positive predictive value.

Limiting the number of biopsies performed on the basis of US findings is an important component to the success of bilateral whole-breast US screening.

The number of biopsies performed and the positive predictive value of biopsy recommendations should approach that of screening mammography. This can be accomplished in several ways. First, a radiologist with extensive experience in breast US and mammography should supervise the screening US program. A lack of experience in breast US with state-of-the-art high-resolution equipment could result in a large number of biopsy recommendations for findings that are part of the normal breast architecture. Second, one should adhere to the criteria described by Stavros et al (9) regarding features of solid masses at US. According to these criteria, patients with masses that meet the criteria for benign masses should undergo short-term follow-up in 6 months rather than biopsy. Third, correlation with mammographic findings is
essential. Many solid masses may be found at US that correlate with stable benign-appearing masses seen at mammography. Coarse benign-appearing calcifications often may be seen as an area of marked acoustic shadowing at US. This might be thought to represent a suggestive finding if not correlated with mammography findings. Postoperative scarring usually has the appearance of an irregular hypoechoic mass with acoustic shadowing. When correlated with findings of postoperative changes at mammography and the clinical history of previous surgery in the same location, no further follow-up is necessary. Adherence to these guidelines should help to limit the number of biopsies recommended on the basis of bilateral whole-breast US.

Breast cancer is a disease that can elude detection on a mammogram, especially in women with dense breast tissue. Any modality that can help decrease the number of false-negative mammograms should be considered for use. On the basis of the results of this and other recent studies, bilateral whole-breast US, when performed according to specific guidelines, appears to be an effective adjunct screening tool.

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References