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This paper will address various issues relevant to core-needle biopsy of the breast under stereotactic imaging guidance. Patient and equipment selection, indications, contraindications, complications, limitations, and advantages will be discussed. The role of stereotactic core biopsy in patient management will also be addressed.

Percutaneous imaging-guided biopsy is an increasingly used method for diagnosing breast abnormalities, particularly those that are nonpalpable. Imaging guidance can be provided with either radiographic (usually stereotactic) imaging or sonographic imaging. In the near future, the technology to provide guidance under magnetic resonance imaging (MRI) will likely also become available.

In addition to imaging options, tissue sampling can be performed with a variety of techniques, including fine-needle aspiration cytology or core-needle biopsy. If a core biopsy is performed, it can be done using either a gun-needle combination or vacuum suction-needle device.

This paper will address various issues relevant to core-needle biopsy of the breast under stereotactic imaging guidance. Patient and equipment selection, indications, contraindications, complications, limitations, and advantages will be discussed. The role of stereotactic core biopsy in patient management will also be addressed.

Advantages of Imaging-Guided Biopsy

As compared with traditional surgical biopsy, stereotactic core biopsy of the breast offers several advantages. For the patient, the traditional surgical approach requires a presurgical visit to the surgeon, another visit for the surgical procedure to be performed, and at least one more visit for postoperative care. At least 3 days are required for these physician visits, resulting in considerable time lost from work. The personal expense resulting from these visits may, therefore, may be significant.

In addition, the volume of tissue removed during a surgical procedure can cause contour deformity of the breast. Because 70% to 80% of breast biopsies are performed for benign lesions, only the volume of tissue necessary to make the diagnosis of a benign process is needed by the pathologist. Removal of additional tissue in such cases, with its attendant cosmetic issues, is medically unnecessary. Also, surgical removal of tissue can cause scarring within the breast that can be confused with carcinoma on future mammograms. This confusion can result in additional biopsies being performed.

Beyond the inconvenience and possible cosmetic effects of surgical biopsy, the time from discovery of a breast lesion to reporting of the pathology results can be long. The impact of the emotional stress on the patient and her family during this waiting period can be considerable.

In contrast to surgical biopsy, stereotactic core biopsy and other imaging-guided needle biopsy procedures can be performed after the patient has completed her imaging work-up and has consulted with the radiologist. Therefore, scheduling issues can be minimized, and a visit with an additional physician can be eliminated. In some instances, it may be possible for a facility to perform the biopsy at the time of the imaging work-up. However, equipment and personnel availability and medical considerations will sometimes make this impossible.

Because a needle biopsy requires the removal of only a small volume of tissue, post-biopsy scarring that is mammographically visible does not develop.[1] Therefore, there is no chance of confusing the scar with a possible new carcinoma. Also, the possibility of cosmetic deformity of the breast is eliminated.

Moreover, because a stereotactic biopsy is usually completed more quickly than a surgical biopsy, results are available faster, and the patient has to cope with anxiety about the procedure for a shorter period.
Cost Reduction

Stereotactic core biopsy also significantly reduces the cost of performing a breast biopsy. Using fees obtained from either Medicare or relative values for physicians, Liberman et al[2] found that stereotactic core biopsy was less than one-half the cost of surgical biopsy. They estimated that the routine use of stereotactic core biopsy, when appropriate, could result in an annual national savings approaching $200 million.

In a study conducted at the University of Utah, Doyle et al[3] determined that the use of large-core needle biopsy could reduce the cost of biopsy per cancer detected from $11,555 to $8,356—a 28% reduction. When estimating the cost per year of life saved with mammographic screening, Lindfors and Rosenquist[4] found a comparable reduction, 23%, when core biopsy was used to replace surgical biopsy and when screening was done on women between the ages of 40 and 85 years.

In the current era of capitated care and limited health care dollars, the reduction in the cost of care that can result from the use of stereotactic core biopsy becomes increasingly important, as long as these programs are instituted without compromising the quality of patient care.

Patient Selection

Lesions Appropriate for Stereotactic Biopsy

Stereotactic core biopsy is an appropriate technique for the biopsy of nonpalpable, mammographically evident lesions that require tissue sampling. These include lesions that, according to the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS), would be classified as category 4 lesions, ie, those that are indeterminate but have a high enough possibility of malignancy to require biopsy.[5] Category 5 lesions, ie, those that have a pattern highly suggestive of malignancy, may also benefit from stereotactic core biopsy when preoperative confirmation of the diagnosis of carcinoma by tissue sampling will make it possible to downstage a two-stage surgical procedure (initial surgical biopsy followed by a second surgery for definite treatment) to a one-stage surgical procedure. In a one-stage procedure, the surgery to perform the biopsy is replaced by stereotactic core biopsy.

One study of the impact of core biopsy on the surgical management of 197 mammographically detected breast carcinomas showed that breast cancer was treated using a single surgical procedure in 84% of women whose cancers were confirmed histologically with stereotactic core biopsy vs 21% of women who did not undergo a stereotactic procedure.[6] Interestingly, at the time of the definitive surgical procedure, there was no difference in the ability of the surgeon to obtain resection margins free of tumor in either of the study groups.

In an assessment of the impact of stereotactic core biopsy on the cost of treating lesions that had a very high likelihood of being carcinomas based on their mammographic patterns (BI-RADS category 5), stereotactic core biopsy was also useful in reducing the number of surgeries required and the cost of treatment.[7] In 31 women who underwent stereotactic core biopsy for highly suspicious calcifications seen on their mammograms, the number of surgical procedures was reduced in 42% of patients, and cost savings were estimated at about $100 per patient.

Women with multiple lesions within a single breast may also benefit from stereotactic core biopsy, as multiple areas can be biopsied as part of a single biopsy procedure, if necessary. Some patients will present with an obvious, palpable cancer and an indeterminate nonpalpable mammographic abnormality; in other instances, more than one suspicious mammographic abnormality may be present. In these situations, it is possible to determine whether the patient has multiple sites of carcinoma within a breast, thereby contraindicating breast conservation, or whether she has only a single carcinoma and can be treated without mastectomy.

In a study of 25 women with multiple breast lesions, Rosenblatt et al[8] found that, in 80% of patients, stereotactic core biopsy was able to determine which surgical procedure was needed. In these cases, stereotactic biopsy either confirmed the need for mastectomy or eliminated the need for preoperative needle localization.

It is important for the physician considering stereotactic core biopsy in an individual patient to reflect on whether or not this procedure will increase or decrease the number of interventions required and will increase or decrease the cost of care for that patient. Stereotactic core biopsy should not be used when it is thought that it will add an additional interventional procedure to those required for diagnosis. However, if stereotactic core biopsy may possibly decrease the number of surgeries needed to treat a patient, it should be considered an appropriate procedure. In some instances,
therefore, the radiologist performing stereotactic core biopsy will need to consult with the breast surgeon to determine how the results of stereotactic core biopsy will impact on treatment. In lesions that are most likely to be benign, this consultation may be unnecessary.

Lesions Inappropriate for Stereotactic Biopsy

Lesions that are inappropriate for stereotactic core biopsy include those that are clearly benign on imaging work-up and those that are probably benign (BI-RADS category 3) and are best assessed using short-term mammographic follow-up. The availability of stereotactic core biopsy, therefore, should not be viewed as a reason to change the indications for breast biopsy and should not increase the number of breast lesions that undergo tissue sampling.

Lesions that are not apparent mammographically, such as those that are only evident sonographically, are not amenable to stereotactic core biopsy because they cannot be seen during the procedure. These lesions should be approached with sonographically guided biopsy.

Lesion Location--Depending on the type of stereotactic biopsy equipment used, the location of some lesions can make them difficult to biopsy because of the inability to place the lesion in the field-of-view of certain types of equipment.[9] This is particularly true for lesions situated close to the chest wall or in the axilla when dedicated, prone stereotactic tables are used (see “Equipment Considerations” below). With digital imaging equipment, some faint calcifications and areas of asymmetric density or architectural distortion can be difficult to identify so that they can be biopsied.[10]

Because of the geometry of the biopsy needle and the need for some types of needles to travel through the breast in order to obtain tissue, some lesions that are very close to the skin or located in breasts that are very thin when compressed or in thin areas of the breast may be unable to undergo stereotactic core biopsy. Some of these lesions can be biopsied under sonographic guidance, for which these issues are not important, or can be biopsied using fine-needle aspiration techniques, in which the needle travels only a few millimeters while cells are being dislodged for analysis.[11]

Lesion size can be a criterion for the exclusion of patients from stereotactic core biopsy. For very small lesions, particularly those ≤ 5 mm, stereotactic core biopsy can result in removal of the entire lesion. This is especially true when a vacuum-suction biopsy needle is used. If it is possible that the entire lesion may be removed during stereotactic core biopsy and a localizing clip cannot be placed at the biopsy site (see below), it may be disadvantageous to perform stereotactic core biopsy. If the lesion is found to be malignant and a wide surgical excision of the tumor site is necessary, it may not be possible to localize the site after removal of the lesion. Therefore, it may be necessary to remove a larger volume of tissue than would otherwise have been needed, and cosmetic deformity of the breast may result. In this situation, it may be desirable to perform a needle-localized surgical biopsy rather than stereotactic core biopsy.[12]

Small lesion size is never a contraindication to stereotactic core biopsy because of the inability of the technology to accurately direct the needle into the lesion. In fact, lesions well below 5 mm in size can be accurately targeted and biopsied with stereotactic core biopsy technology.[13]

Medical Conditions

Certain medical conditions can contraindicate the performance of stereotactic core biopsy. Women who are unable to remain in position for the duration of the procedure should not be selected for stereotactic core biopsy. This may be a problem for those with severe arthritis of the neck, shoulders, or back. Also, women who have neuromuscular disorders, such as Parkinson’s disease, that make it impossible for them to remain still for the 30 to 60 minutes required for stereotactic biopsy are not appropriate candidates.

Patients with coagulopathies may develop significant hemorrhage during stereotactic core biopsy and may be better cared for with surgical biopsy, during which bleeding may be more easily controlled. For women taking an anticoagulant medication or a platelet-inhibiting agent, such as aspirin, the drug can be discontinued for the length of time required for its anticoagulant effect to abate.[11]

Equipment Considerations

Patient selection and results of the biopsy procedure depend, in part, on the equipment available at each facility. The two most important pieces of equipment used during stereotactic core biopsy are the stereotactic guidance unit and the needle that obtains the tissue for histologic examination.

Stereotactic Guidance Unit

The stereotactic biopsy unit operates on the principle of triangulation. The lesion is localized within
the breast by calculating its position on the horizontal (x) and vertical (y) axes, as well as its depth within the breast, or z-axis. The x- and y-axes are evident on any frontal radiograph showing the lesion. When two images are taken at equal angles from this frontal image, the extent of shift of the lesion on these two pictures is a function of its depth within the breast. By tradition, these angled pictures are taken at 15° along the horizontal (x) axis.

A computer within the stereotactic unit calculates the depth of the lesion (z-axis) from the surface of the breast. The unit then positions the biopsy needle at the appropriate site within the breast to obtain tissue from the abnormal area.[14]

Stereotactic units are of two designs. In one, the patient lies prone on a table with her breast hanging through a hole in the table (Figure 1), and the biopsy is performed under her (Figure 2). Alternatively, an "add-on" device can be attached to a standard mammography unit. With such a device, the patient sits during the procedure, and the biopsy is performed in front of her.

Not surprisingly, the patient is more likely to experience a vasovagal reaction when the add-on type of unit is used.[15] Because these types of units also require that patients remain sitting during the biopsy, as they would if having a mammogram, it can be more difficult for some women to remain in position for the entire length of the procedure (see above). However, add-on units may be more successful at positioning the patient so that lesions in the axilla or near the chest wall can undergo stereotactic core biopsy.

**Needle Design**

A variety of needle designs are available to perform core biopsy. Needles should be at least 14-gauge in order to obtain sufficient tissue for accurate diagnosis (Figure 3), as diagnostic accuracy decreases with needle size less than 14-gauge. In one study of 26 surgically removed carcinomas, 14-gauge core biopsy specimens provided an accurate diagnosis in 100% of cases, 16-gauge cores in 92%, and 18-gauge cores in 65%.[16] Similar diagnostic accuracy problems were found with benign diseases. In this study, the success of the larger, 14-gauge needle appeared to due to the larger volume of tissue available for the pathologist to examine.

**Gun-Needle Combinations**—Even when 14-gauge needles are used, the gun-needle combinations from various manufacturers have varying levels of success in obtaining tissue. In a study comparing the size of specimens obtained from large-core (ie, 14-gauge) biopsy guns from seven manufacturers, specimens varied in size from 15.2 to 24.5 mm3.[17] Crush artifact and sample fragmentation were not appreciably different among the seven specimens. The study was unable to determine whether differences in the ability to make an accurate diagnosis resulted from these differences in tissue retrieval.

Gun-needle combinations remove tissue by firing a cutting needle through the breast, slicing through tissue to obtain the specimen. These needles can be designed to travel at varying distances through breast tissue. The "long-throw" devices, which travel 22 to 23 mm at the time of biopsy, are most successful at obtaining a diagnostic sample. However, these devices require thicker breast to accommodate the longer distance that they travel, as compared with shorter-throw needles. In thin breasts or thin areas of the breast, such as the periareolar region, it may not be possible to use the long-throw needles, and tissue sampling may be less successful.

Adequate tissue sampling of areas of calcifications is particularly difficult with gun-needle combinations. This may be due to the difficulty in accurately targeting a single calcification when many calcifications have a similar appearance. It may also be due to problems in retrieving tissue from a disease process that is more dispersed than is the case with a focal breast mass. Another study by Liberman et al found that while five 14-gauge core samples were adequate to obtain a definitive diagnosis in 99% of 92 masses, only 87% of 53 clusters of calcifications could be successfully diagnosed with a similar volume of tissue.[18]

The success of stereotactic core biopsy diagnosis of lesions that appear to be calcifications on mammography depends on the ability to obtain calcification at the time of biopsy. Calcification in the core may be adjacent to the lesion of importance in the biopsy specimen, but the ability to obtain calcification at the time of stereotactic core biopsy indicates that the worrisome site within the breast has been accurately targeted and sampled. Therefore, it is necessary to perform specimen radiography on tissue obtained during stereotactic core biopsy when the targeted lesion is characterized by calcification (Figures 4A, 4B, and 4C).

In a study of 72 lesions containing microcalcifications from which 372 cores were obtained, it was found that if calcifications were not seen on specimen radiography, a diagnosis could be made in only 38% of those cores. In contrast, it was possible to make a diagnosis in 81% of those cores with calcifications seen on specimen radiography.[19]

**Vacuum-Assisted Core Biopsy**—Recently, percutaneous vacuum-assisted core biopsy has been
developed as an alternative to large-core gun-needle biopsy.[9,20] This newer device consists of a 14- or 11-gauge probe that is attached to a vacuum. The probe is positioned within the breast in proximity to the area to be sampled. Through a side hole within the probe, the vacuum draws tissue into the lumen of the probe. A cutting needle is then advanced through the probe lumen; this needle captures the tissue within its lumen and withdraws the sample. The outer needle can be rotated 360° so that circumferential sampling around the cutting needle is possible. This technique enables larger volumes of tissue to be removed than can be extracted with gun-needle combinations and requires less precise positioning of the needle to obtain an adequate sample. These factors may be particularly important when calcifications or lesions requiring large volumes of tissue are being biopsied.[21,22] Unfortunately, percutaneous vacuum-assisted needles add considerable expense to the cost of performing stereotactic biopsy, as compared with traditional gun-needle combinations.

In our experience, vacuum-assisted needles, particularly the 11-gauge size, may be more traumatic, and hemostasis may be more difficult to obtain in some patients. However, because the vacuum needle does not need to travel within the breast in order to cut through tissue, this technology may enable stereotactic core biopsy to be performed in women whose breast tissue is too thin under compression to undergo biopsy with gun-needle combinations.

Complications

In reported large series of stereotactic core biopsy, major complications have been rare. Parker et al[23] followed 3,765 women and found major complications in only 6 (0.2%). Among these patients, there were three hematomas requiring surgical drainage and three infections treated with drainage and/or antibiotics. Of note, no cases of needle-track seeding occurred. Hann et al[24] found that when clinically significant bleeding develops after stereotactic core biopsy, it is invariably evident while the patient is at the facility performing the biopsy. Minor complications are not unusual after stereotactic core biopsy. Of 100 women interviewed after stereotactic biopsy, 33 said that they experienced pain following the procedure, in some cases lasting up to 2 weeks, and 15 required analgesics.[25] In 28 women, noticeable bruising was reported. The most common side effect was the inability to return to normal activity after the procedure because of emotional stress. This occurred in more than half of the women. Other authors have also cited a high rate of minor complications among their patients undergoing stereotactic core biopsy. Hardy et al[26] reported that patients undergoing these procedures were more concerned with the results than with the procedure itself. Jackman et al[27] noted that 69% of their patients experienced post-biopsy pain. A few unusual complications have also been reported. In one case, a 14-gauge core biopsy done under sonographic guidance in a nursing mother produced a milk fistula, which healed during a 2-week weaning period.[28] In another instance, a large hematoma developed in a woman with factor XI deficiency, obscuring a small carcinoma diagnosed by stereotactic biopsy and making it impossible to localize the cancer for definitive surgical treatment.[29] After 3 months, the hematoma had resolved sufficiently to allow for treatment.

Diagnostic Limitations of Stereotactic Biopsy

The accuracy of stereotactic core biopsy in patient care depends on appropriate tissue sampling, histologic analysis, and correlation of histopathology with imaging findings. A limited number of studies have been published in which histologic findings at stereotactic core biopsy were correlated with those at surgical biopsy. These studies are listed in Table 1.[30-33] Accuracy in these series is approximately 90%. In any individual practice, this percentage will be influenced by the experience of the physician performing the biopsy, the type of lesion undergoing biopsy,[34] and the patient population.[35] Accuracy appears to be comparable with prone table and add-on units.[36] In a series of 230 lesions biopsied with guidance from an add-on device, in which five cores of each lesion were obtained and results were correlated immediately with surgical biopsy findings, stereotactic core biopsy diagnosis was accurate in 98% of masses, 100% of masses with calcifications, 100% of focal asymmetries, and 86% of architectural distortions.[36] Of those lesions seen only as calcifications, 91% were accurately diagnosed. In this series, the overall accuracy of stereotactic biopsy was 97%.

Discordance of Biopsy Results and Imaging Patterns
These results of stereotactic core biopsy are comparable to the 96% to 98% accuracy rate of needle-localized breast biopsies. However, the total stereotactic biopsy procedure does not end with tissue sampling. The appropriateness of the histologic diagnosis should be determined by correlating it with the imaging pattern. If the histology does not correlate with the imaging pattern, it should be assumed that the lesion in question was not sampled at the time of stereotactic core biopsy and that a repeat biopsy needs to be performed.

In a study of 3,765 percutaneous large-core breast biopsies performed with either stereotactic or sonographic guidance, 5 (0.1%) were found to be malignant at 6-month follow-up examination.[23] In this series, 925 carcinomas were diagnosed. Of these cancers, 910 were detected at the time of stereotactic core biopsy, 10 were diagnosed at a surgical biopsy immediately after stereotactic biopsy, and the remaining 5 were found at the 6-month follow-up mammogram. The study’s criteria for immediate surgical biopsy after stereotactic core biopsy were not clearly stated.

In another series of 314 consecutive stereotactic core biopsies, 22 (7%) were found to have carcinoma at surgical biopsy done shortly after stereotactic biopsy that failed to diagnose carcinoma.[35] Of these cases, 15 were surgically biopsied because of a stereotactic core biopsy diagnosis of ductal atypia, and 7 were rebiopsied because of discordance between the stereotactic biopsy histologic diagnosis and the imaging pattern. This experience reinforces the need for correlating the histologic results with the presumed diagnosis made on the basis of imaging findings. If a BI-RADS category 5 lesion (high probability of malignancy) is discovered before stereotactic core biopsy and the biopsy results show a benign lesion, the need for a repeat biopsy, either a stereotactic core or surgical biopsy, should be strongly considered. In one series, 47% of lesions in which stereotactic core biopsy results and imaging diagnosis were discordant were found to be malignant on repeat biopsy.[35]

**Diagnosing Carcinoma Coexisting With Benign Disease**

In some lesions, carcinoma and benign entities can coexist. These coexistent lesions are commonly found when larger volumes of tissue are removed at surgical biopsy. However, because of the smaller volume of tissue obtained at stereotactic core biopsy, only the benign part of the lesion may be excised. When these high-risk histopathologies are removed, surgical biopsy should be routinely performed to assess for the possibility of coexistent carcinoma. The most common of these entities is atypical ductal hyperplasia or ductal atypia. Radial scars should also routinely be considered for surgical excision.

In other cases, a pathologist may require a larger volume of tissue than that obtained at stereotactic core biopsy to make a definitive diagnosis. Most commonly, this occurs in patients with fibroepithelial lesions, in whom it may be difficult to differentiate a fibroadenoma from a phyllodes tumor.

**Atypical Ductal Hyperplasia or Ductal Carcinoma?**—The coexistence of atypical ductal hyperplasia and ductal carcinoma, especially ductal carcinoma in situ (DCIS), has been explained on the basis that these lesions arise from a central focus that can develop into atypical ductal hyperplasia or one of the many subtypes of DCIS. In one study of 100 consecutive cases of pure DCIS, it was found that atypical ductal hyperplasia was also present in 17 cases.[37] It is therefore not surprising to find DCIS present when atypical ductal hyperplasia is diagnosed.

In one series, 25 consecutive women diagnosed with atypical ductal hyperplasia at stereotactic biopsy were recommended for surgical excision of the biopsy site.[38] Surgical results were reported in 21 of these women, and carcinoma was found in 11 (52%) cases, of which 8 (73%) were pure DCIS and the remaining 3 (27%) were invasive ductal carcinoma.

In another study, 9 (50%) of 18 lesions diagnosed as atypical ductal hyperplasia at stereotactic core biopsy were found to contain carcinoma, which was DCIS in 6 cases and DCIS with invasive ductal carcinoma in the remaining 3 cases.[27] Of 30 women with atypical ductal hyperplasia at stereotactic biopsy reported by yet another group, 15 (50%) were found to have ductal carcinoma at surgical excision.[35]

Because of these data, lesions found to be atypical ductal hyperplasia at stereotactic core biopsy should be surgically excised. When stereotactic biopsy was performed using a 14-gauge gun-needle combination, about 50% of these reexcisions upgraded the lesion to ductal carcinoma, usually DCIS. Because larger volumes of tissue are removed with vacuum-suction biopsy needles, carcinoma may be missed less frequently when it coexists with atypical ductal hyperplasia. Jackman and colleagues[21] found stereotactic core biopsy using a 14-gauge gun-needle combination missed carcinoma in 26 (48%) of 54 lesions diagnosed as atypical ductal hyperplasia. Using a vacuum-suction biopsy probe, this was reduced to 13 (18%) of 74 lesions.

This reduction in the underestimation of lesions with vacuum-suction biopsy was due to the
acquisition of a larger number of cores, 10 per lesion, and a greater volume of tissue in each core, resulting in better sampling of the area. The use of vacuum-suction biopsy will decrease the number of cases of coexistent atypia/carcinoma in which only atypical ductal hyperplasia is diagnosed. However, in those women in whom this diagnosis is made at stereotactic core biopsy, surgical biopsy of the site remains necessary.

**Understaging Lesions With DCIS/Invasive Cancer**—Limited tissue sampling can also result in understaging of lesions in which DCIS and invasive carcinoma coexist. Because some lesions are largely DCIS but also have sites within the tumor that harbor invasive carcinoma, not sampling the entire lesion can result in failure to diagnose the invasive component.[39] This, in turn, can cause one to fail to appreciate the need for possible axillary dissection during the surgical procedure.[40] Consequently, the patient may need to undergo additional surgery when the diagnosis of invasion is made following histologic assessment of the surgical specimen.

One series has reported that 19% (8/43) of lesions diagnosed as DCIS at large-core needle biopsy had areas of invasion at surgical excision.[27] In another series of 12 cases diagnosed as DCIS at stereotactic core biopsy, 3 (25%) were found to have invasive ductal carcinoma also present within the lesion at surgery. Because of this experience, a stereotactic core biopsy diagnosis of DCIS needs to be confirmed by surgical histopathology. Although the presence of DCIS within the lesion is invariably confirmed, areas of invasion may be discovered in about 20% of cases. If axillary dissection is required for adequate treatment, planning of the complete surgical treatment may not be possible based on stereotactic core biopsy results.

**Significance of Lobular Carcinoma in Situ**

Special note should be made of the stereotactic core biopsy diagnosis of lobular carcinoma in situ (LCIS). Because LCIS has no specific mammographic findings and is an incidental diagnosis made at the time of excision of another lesion, it should not be accepted as consistent with the imaging findings that mandated breast biopsy.[41] If LCIS is the diagnosis made at stereotactic core biopsy, it should be assumed that the lesion in question was missed and a repeat biopsy is necessary.

**Other Potential Problems**

Specimens obtained at stereotactic core biopsy should be sent for paraffin sectioning, not frozen-tissue analysis. The diminished quality of cytologic detail in frozen-section analysis increases the possibility of overdiagnosing invasive carcinoma due to the mingling of proliferative epithelium and stroma in such lesions as sclerosing adenosis and radial scar.[42] Stereotactic core biopsy also results in the displacement of epithelial fragments beyond the main tumor mass in a considerable percentage of patients. Youngson et al.[43] found that this occurred in 28% (12/43) of cases examined at surgical pathology obtained after stereotactic core biopsy had been performed to establish a preoperative diagnosis. Epithelial displacement is also seen following needling procedures, including anesthesia injection, suturing, needle localization, and fine-needle aspiration biopsy. Pathologists should be careful not to interpret these foci of displaced epithelium as sites of invasive carcinoma.

The issue of whether displacement of tumor at the time of needling has any clinical significance is difficult to assess. However, in a study by Berg and Robbins[44] that assessed the long-term outcome of women with palpable, stage-matched breast cancers, 15-year survival did not differ between women diagnosed with or without aspiration biopsy.

**Accreditation of Biopsy Facilities**

The full potential of stereotactic core biopsy to improve the quality of care available to women and to decrease the cost of breast cancer diagnosis will only be realized if facilities with appropriately trained staff make this procedure available to the community.[45] As with the delivery of mammography services in the United States, it is expected that stereotactic core biopsy may be regulated by the FDA under the Mammography Quality Assurance Act, which establishes federal control of all breast procedures done with x-ray imaging.

An accreditation program for stereotactic breast biopsy has been established by the American College of Radiology and joined by the American College of Surgeons.[46] This program sets criteria for the training, experience, and continuing medical education of physicians, technicians, and physicists involved in the performance of stereotactic core biopsy and equipment maintenance. Other components of the program include standards for radiation exposure, quality-control
Stereotactic breast biopsy: indications and results

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Summary

Stereotactic core biopsy makes it possible to diagnose many mammographically evident breast lesions with greater speed, less cosmetic deformity, and less expense than traditional surgical biopsy. Performance of stereotactic core biopsy in any individual case may be limited by equipment availability, breast size, and coexisting medical conditions. Small lesions can be accurately targeted, but caution should be exercised before fully removing these lesions unless a localizing clip can be placed or an adjacent landmark identifies the site.

Major complications of stereotactic biopsy, including hemorrhage and infection, are rare, occurring in well below 1% of cases. Minor complications of ecchymosis, pain, and anxiety are common. The accuracy of stereotactic core biopsy diagnosis is high, but biopsy results must be interpreted in light of the probable imaging diagnosis. A benign histopathology for a very suspicious imaging pattern suggests that the lesion targeted for biopsy may have been missed and that a repeat biopsy may be needed.

Because of the histologic heterogeneity of some lesions, sampling with stereotactic core biopsy may only remove areas from the less aggressive components of the lesion. A stereotactic core biopsy diagnosis of atypical ductal hyperplasia raises the possibility of coexistent carcinoma, usually DCIS, and should prompt surgical excision of the lesion. A radial scar should be managed in the same fashion. Other, less common histologies may also require surgical excision in order to establish a definitive diagnosis.

Diagnosis of DCIS by stereotactic core biopsy may also represent understaging of the lesion, as areas of invasion will be found at surgical excision in some of these cases. Therefore, it may not be possible to plan for axillary lymph node dissection preoperatively in some of these women.

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