INTERVENTIONAL BREAST ULTRASONOGRAPHY

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Introduction

One of the most important applications of breast sonography is to guide interventional procedures. These procedures include fine needle aspiration of fluid-filled and solid lesions, core biopsy, and presurgical localization. Concomitant with the use of mammography for breast cancer screening, there is increased concern for the positive predictive value of mammographic interpretations. A reduction in the number of surgical procedures for benign lesions is desirable, and imaging-guided percutaneous procedures have become important in nonsurgical differentiation of benign and malignant processes.

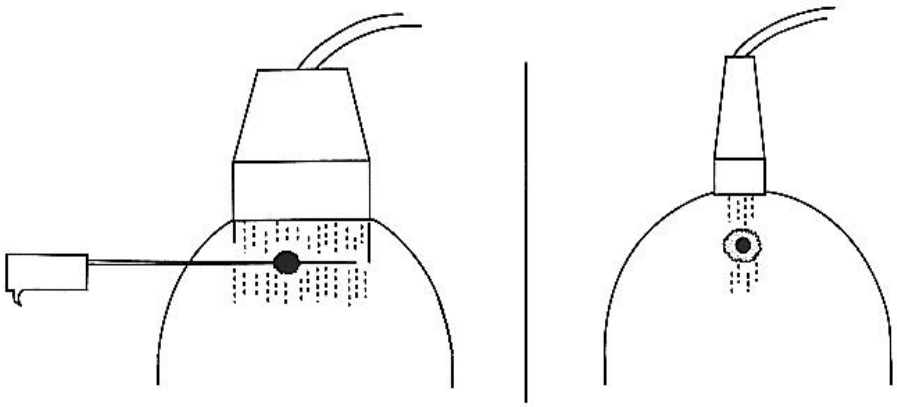
Of the imaging techniques available for guiding interventional procedures, ultrasound is the most direct.[1,2,3,4] Compared with stereotactic mammographic guidance, even with a digital assist to speed the procedure, sonographic guidance of fine needle aspiration of fluid-filled and solid masses, core biopsy, and presurgical localization is rapidly accomplished. Using free-hand technique, the positioning, adjustment, and final placement of the needle tip can be observed in real time.

Indications and applications for sonographically-guided procedures, patient preparation, equipment selection, procedural performance, advantages and disadvantages, and suggestions for success are discussed.

Method of Freehand US-Guided Needle Procedures

There is no single correct method for performing ultrasound-guided procedures, and free-hand sonographically-directed needle placement utilizes the same principles for fine needle aspiration of cysts and solid lesions, presurgical localization, and core biopsy. Selection of a technique to guide the procedure should reflect the location, the nature of the lesion, and the particular procedure being performed. A deeply situated small mass in a large, fatty breast may be aspirated, biopsied, or localized more easily using mammographic (fenestrated compression plate or stereotactic) guidance than with ultrasound.

For all core biopsies and for safe sampling of lesions near the chest wall or adjacent to the implant shell of an augmented breast, the needle shaft must be visualized during the entire procedure. Under direct ultrasound visualization of the mass, the needle is directed into it. The more horizontal the plane of entry, the better the needle shaft will be seen, and it is important that the needle remains perpendicular to the acoustic beam. If the needle angles to the right or to the left rather than remaining mid plane, the tip will no longer be seen (Figure 1) [4].



A **B**

Figure 1

Figure 1. Technique for free hand ultrasound-guided procedures.

A. Diagram shows needle path perpendicular to the acoustic beam. The needle entry is nearly horizontal, the optimal geometry for visualizing the needle shaft and tip.

B. View of needle entering from the short axis of the transducer. Only the hub is seen, the needle remaining in alignment with the acoustic beam, not veering to the right or left.

Needle guides are available for some transducers. Fixed angles of entry restrict their use, and we have not found them to facilitate US-guided breast procedures significantly.

Difficulties with needle tip visualization have led to the development of coated, pitted, or scored needle tips to increase the echogenicity. Theoretically, larger caliber needles should be more easily seen, but needles of any gauge are visible if they are perpendicular to the ultrasound beam as they pass through tissue. With color flow imaging, the moving needle will be seen without difficulty as a linear flash of color. The location of the needle tip cannot be identified reliably, however. The moving needle itself will be seen as an artifact with color flow imaging.[5]

Personnel

Interventional procedures may be performed by one person who is both scanning and performing the procedure. Assistants may be helpful in holding the probes. The face of the transducer should be kept flat against the breast tissue and not tilted up or down or from side to side. If an assistant scans, the person who performs the procedure has both hands available for use. To stabilize the probe, it should be held near the base. If even, manual

pressure is exerted on the lesion, it is less likely to roll out of the field. As the lesion is kept in view, one hand can be placed against the breast as an additional stabilizer for the lesion. The needle can then be guided into the lesion. One of the most important requirements for success in these procedures is immobilizing the lesion under the transducer.

Preparing the Patient and the Equipment

Informed consent is obtained from the patient before these procedures are performed. The procedure and its purpose should be described, the complications mentioned, and the patient should indicate her understanding of what will follow.

Complications of Fine Needle Aspiration and Core Biopsies[4]

Allergic Reactions:	Obtain history of allergies (e.g., to lidocaine or latex) and current medications.
Bleeding:	Obtain history of anticoagulation, aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) use, or blood dyscrasias; discuss brief interruption of medication with referring physician. Ordinarily, preprocedural coagulation profiles and bleeding times are unnecessary.
Infection:	A potential complication that has been reported very rarely with breast interventional procedures.[6]
Localized pain:	Tenderness, and ecchymosis (self-limited and important to communicate to the patient; aspirin or Tylenol).
Pneumothorax:	Avoid steep approaches in the medial aspect of the breast near the chest wall where the pleura is only a short distance from the aspirating needle.

Once the patient assumes the appropriate position for the procedure, the breast should be cleaned with povidone iodine and alcohol, and the probe should be disinfected with the solution suggested by the manufacturer. It is not necessary to sheath the transducer as long as it is carefully cleansed.[7] The operator and assistants must wear gloves at all times, primarily for their own protection.

If it is known prior to scanning that a procedure will be performed, it will save time if these preliminary preparations can be done in advance. The patient's breast can be cleansed and the operator's and assistant's hands gloved. It is also helpful to have all of the necessary materials available in the ultrasound room or on a supply cart that is always ready. Procedures are most easily incorporated in a busy schedule if the staff and equipment are in a state of preparedness.

The above are suggestions for assuring success in all of these procedures, which can be performed utilizing the same techniques. Following are some specifics regarding cyst aspiration, fine needle aspiration biopsy of solid lesions, core biopsy, and presurgical localization.

Breast Cysts

Breast cysts are common in the perimenopausal years and may persist or develop in postmenopausal women receiving hormone replacement therapy. Breast sonography can allow the diagnosis of a simple cyst to be made if four criteria are fulfilled:[8]

1. Oval or round shape.
2. Anechogenicity.
3. Sharply defined margins, particularly the posterior wall.
4. Posterior acoustic enhancement.

Indications for Sonographically-Guided Aspiration[8,9,10]

1. Masses that do not fulfill the sonographic criteria for cysts.
   a. Internal echoes, particularly if all of the technical factors such as gain and power settings and focal zone placement have been adjusted and there are other cysts in the breast that appear anechoic.
   b. Irregular or thickened margins.
   c. Lack of posterior acoustic enhancement despite positional maneuvers to change the relationship between the transducer and the breast (if the mass is directly above the pectoral muscle, enhancement is difficult to demonstrate).
2. Nonpalpable cysts that are symptomatic in causing local tenderness.
3. Palpable cysts where it might be important to document evacuation or any residual fluid.
4. Palpable or nonpalpable cysts where imaging guidance would help avoid complications (e.g., breast implants or lesions near chest wall).

The area of the cyst should be fixed manually so that the needle will penetrate the wall of the lesion rather than push it out of the scan plane. Choice of needles, the aspirating apparatus, use of assistants, and other details may vary. A needle of small caliber may be selected initially, and if the cyst contents is of low viscosity, evacuation of the cyst will be rapid and successful. If a tough, fibrous rind encases the cyst, the needle may be deflected, and if the cyst contains viscous material, the lesion may empty slowly or not at all. A stiffer, larger bore needle will then be required to enter thick-walled lesions that resist needle penetration. If the first attempt to aspirate with a 21-gauge needle proves unsuccessful, the second attempt is made with an 18-gauge needle. Alternatively, 19-gauge or 18-gauge needles may be used at the outset. To avoid a second needle stick, an 18-gauge needle is used for cyst aspiration in our practice.

If the cyst is near the very sensitive areola, an attempt will be made to move the areolar skin out of the way, stretching the skin. If it is necessary to pass the needle through or near the areola, lidocaine is injected with a tuberculin syringe. In most other instances, although we offer lidocaine to patients, aspirations are performed without local anesthesia.

For cyst aspiration, contents of a cyst of 2.0-3.0 cm or less can be accommodated with a 10 ml syringe. If the cyst is very large, use of a 20 ml syringe and connecting tubing is efficient in cyst evacuation. For smaller cysts, a hypodermic needle and syringe or an aspirating gun work well. For small hands in tight places, negative pressure can be

maintained with less exertion using an aspirating gun for cysts and fine needle aspirations than with a syringe alone. Several lightweight aspirating guns are currently being marketed.

Our practice is to aspirate while scanning. Sonograms are obtained before and immediately following the procedure, usually with the needle still in place. The postprocedural sonogram may be useful for comparison in follow-up studies of the area of aspiration. A postaspiration lateral mammogram is obtained to show concordance with mammographic and sonographic abnormalities.

Practice patterns vary with regard to disposition of cyst fluid. Some facilities submit all cyst aspirates for cytologic evaluation, and other radiologists and surgeons discard yellow or serous aspirates and greenish fluids suggestive of fibrocystic change. Any bloody or other unusual cyst aspirate should be analyzed cytologically. If the aspirate is purulent appearing, microbiologic study (culture and sensitivity) should be requested in addition to cytology.

Is there a place for pneumocystography? In one report, the use of pneumocystography is proposed as a means of sclerosing the cyst and preventing reaccumulation of fluid.[9,11] The physiological explanation is somewhat obscure, and there has been no subsequent documentation of the effectiveness of pneumocystography in preventing reaccumulation in a large group of women. A mural excrescence should be evident sonographically using high resolution, high frequency transducers.

One application of pneumocystography or injection of air, however, is to place a marker within the breast so that if localization or aspiration is desired at a later time, the air can be used as such a marker. Pneumocystography is performed by injection of slightly less air than the amount of fluid obtained.[9] The syringe with fluid is removed while the needle remains in the breast, and another syringe preset to deliver the appropriate amount of air is attached. After the air has been introduced, orthogonal craniocaudal and 90° lateral views are obtained. Although the air injected has been resorbed, breast markings, fibroglandular patterns, and vascular structures can be used as a regional map to direct a planned localization or other procedure.

Indications and Applications For Procedures On Solid Masses:

Fine needle aspiration or percutaneous core biopsy is performed:

1. On a mass thought to be malignant to confirm the diagnosis so that a one-stage surgical procedure can be performed.
2. On more than one mass where the possibility of multifocal (one quadrant) or multicentric (two or more different quadrants) malignant disease exists, again so that treatment planning is facilitated.
3. Where the patient, radiologist, and/or referring physician are unwilling to manage probably benign lesions such as fibroadenomas with short internal follow-up.
4. Where a hypoechoic nodule is seen whose features are not that of a simple cyst. Although many of these masses are cysts, others are fibroadenomas, papillomas, or circumscribed carcinomas.[1,8] If a hypoechoic mass is new, it should be aspirated or sampled rather than followed-up. If no fluid is obtained

during the aspiration procedure, a slide should be made of the needle contents for cytopathologic evaluation. If the cytologic preparation is inadequate or the interpretation not definitive, a new solid mass should be evaluated histologically (percutaneous large needle core biopsy or surgical excision).

Sonographically-guided fine needle aspiration or large needle core biopsy will be successful when all of the following requirements are met:

1. Familiarity with ultrasonographic appearances of many breast lesions.
2. Experience with using ultrasound to guide procedures.
3. Establishing that the needle has entered the periphery, the center, or any other area of the lesion targeted.
4. Effective aspiration technique to obtain sufficient cellular material unadulterated by blood.
5. Immediate preparation of slides according to the preferences of the cytopathologist. If a cytopathologist or cytotechnologist is present, sufficiency of the samples can be confirmed prior to concluding the procedure.
6. Experience of the cytopathologist in evaluating breast lesions should at least match that of the radiologist doing the procedure.
7. Fixation of core biopsy samples in formalin . Cores that contain microcalcifications should be radographed no matter what imaging guidance is used for the procedure.

Technique for Fine Needle Aspiration Cytology

Short excursions into the lesion should be made with direct sonographic guidance using a 21-gauge to 23-gauge needle and syringe with negative pressure applied. These brief, but numerous, up and down excursions should allow material from the mass to enter the needle. If blood is seen, the pass should be concluded, and the slide made. In withdrawing the needle, gentle release of negative pressure will allow the syringe plunger to return to a neutral position and the aspirated material will not be drawn into the syringe itself. To prepare the slide, the syringe should be disengaged from the needle and air drawn in. The syringe then should be reattached to the needle, and the contents of the needle expelled onto a slide and fixed as directed by the cytopathologist. For some stains, immediate fixation is desirable. A few cytopathologists ask for the slides to be air dried.

A variation of technique involves the use of an aspirating gun. Several models are available, some of them quite light and easy to manipulate. Many of these guns take 10 ml syringes, are easy to manipulate and allow even the smallest hand to exert good negative pressure for collection of the aspirate.

Another method involves use of a 23-gauge or 25-gauge needle, without a syringe. The same short excursions are made into the lesion. By capillary action, cells will enter the needle.[1] A syringe containing a few ml of air should be attached to the needle and the contents of the needle expelled onto a slide.

Still another technique would be to use a coaxial needle apparatus with placement of a 19-gauge outer cannula at the edge of the lesion. A smaller (21-gauge) aspirating

needle is then introduced. With use of a coaxial system, only one puncture need be made. Coaxial systems can also be used for core biopsies.

Fine needle aspiration cytology performed by an experienced mammographer or sonologist and interpreted by seasoned cytopathologists should provide reliable diagnoses of malignancy with zero false positives. Frequently, a direct or inferential identification of a fibroadenoma can be made through "naked nuclei" or epithelial cells consistent with a fibroadenoma. More difficult because of sampling error are cytologic diagnoses of fibrosis, fat necrosis, and infiltrating lobular carcinoma. In infiltrating lobular carcinoma, tumor cells do not ordinarily have a spherical pattern of growth but advance in single file through the stroma.

Core Biopsy

Imaging-guided core biopsy has become the most important breast diagnostic procedure in the nineties. Because of the variability of cytopathologic expertise in the United States, with insufficient samples reported in up to 25 percent of cases in some series, nonsurgical tissue sampling to provide cores for histologic analysis have become a reliable alternative.[9] Both stereotactic mammography and ultrasound have proved to be accurate in guiding needle placement, and there are advantages to each. Core biopsies are done with spring-activated guns (several manufacturers including Bard-Bip and Manan-MD Tech, most often) using a 14-gauge needle. Vacuum-assisted contiguous, circumferential sampling (e.g., Mammotome™ and MIB™ devices) can be used with ultrasound after but are more often guided stereotactically. Fourteen and 11 gauge probes (needles) are used. These larger needles provide tissue samples of greater cohesiveness for reliable histopathologic analysis than breast specimens obtained with 18-gauge needles. Pathologic interpretations have been definitive in most cases.[2,12]

Indications for core biopsy are essentially the same as those for fine needle aspiration biopsy (as listed previously) with the addition of widespread or multifocal calcifications, and if the biopsy of more than one region would affect and determine treatment options (for example, if two widely separated areas show ductal carcinoma in situ, modified radical mastectomy might be selected in preference to breast conservation). The location of the lesion, its visibility with ultrasound, and the radiologist's comfort level and experience with the various techniques will determine the approach selected. For some stereotactic equipment, the posterior breast near the chest wall is inaccessible, and the conical retroareolar area may not occupy enough of the window of the stereotactic compression plate for a good biopsy. In these instances, a mass or occasionally widespread microcalcifications, some of which may be demonstrated sonographically, are appropriate targets for sonographically-guided core biopsy.

The advantages of sonographically-guided procedures apply also to biopsy. There is choice in positioning of the patient. A supine or supine-oblique position for the procedure may be more comfortable for the patient than the prone or seated positions required for stereotactic mammographic core biopsies. Real time observation of needle passage and its entry into the lesion cannot be achieved with stereotactic methods. Even with a digital

assist, ultrasound procedures are accomplished more quickly than stereotactically-guided biopsies.

US-Guided Core Biopsy Technique

The general technique is that as diagrammed in Figure 1. For greatest safety, the needle shaft should be visualized completely as it remains within the narrow acoustic beam, the more horizontal the entry, the better the needle shaft and tip will be seen. The danger of penetration of the chest wall or an implant is minimized.

For local anesthesia, approximately 5 ml of one percent lidocaine is used. A small amount of sodium bicarbonate mixed with the lidocaine may prevent the burning sensation associated with the local anesthetic. A skin wheal is made with a 25-gauge needle. Most of the nerve endings in the breast are in the skin and superficial tissues, and even when using a 14-gauge needle, it is unnecessary to infiltrate more deeply. Frequently with sonography, the delivery of lidocaine can be observed. A small mass can be obscured or displaced by the lidocaine. A small skin incision is made, wide enough so that a 14 or 11-gauge needle can be passed easily without catching it at the skin. The needle can then be directed under sonographic guidance to sample a different area of the mass at each pass.

If using spring-activated devices, the needle should be directed toward the lesion wit US visualization of needle passage. The gun should be fired at a distance from the mass that takes into account the size of the lesion, the location of the collecting chamber of the needle 0.4 cm back from the tip of the needle, the 1.7 to 1.9 cm length of this collecting portion of the needle, and the thrust of the needle when the gun is fired (2.2 to 2.3 cm with the "long throw" needles currently preferred) (Fig. 2).[12,13]

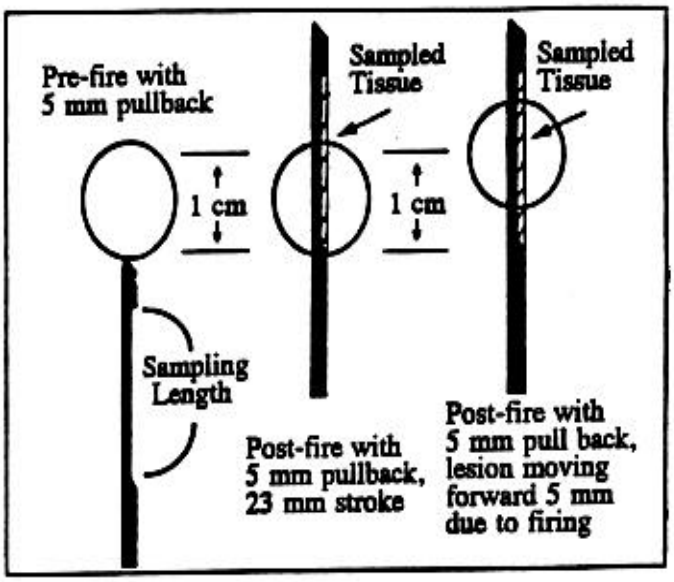


Figure 2[13]

The cores should be inspected, and a "good core" can easily be differentiated from a fatty sample or fragmented specimen. If the abnormality contains calcifications, radiography of the cores will help to confirm their presence in the sample. Specimens are placed into a jar of formalin fixative.

In our practice, with sonographic guidance, we are ordinarily making five passes into different areas of a mass and sampling the interface of the lesion with the normal surrounding tissue.

In the patients upon whom we have performed core biopsy with either sonographic or with stereotactic guidance, there has been little pain or discomfort during the procedures. The use of local anesthesia effectively blocks pain sensation at the skin, and the rapid propulsion of the needles using the spring-activated guns may also help in reducing both discomfort and anxiety.

Review of cytologic or histologic findings is important in assessing the successfulness of your procedures and in selecting fine needle or core biopsy. In choosing between fine needle and large needle core biopsy, preferences and expertise of the pathologist in your facility must be considered. Malignant masses will often prove positive with either technique. For more difficult cytologic diagnoses, including fibrosis, fat necrosis, and infiltrating lobular carcinoma, core biopsy appears to provide better specimens for analysis.

Quality Assurance and Self Audit

For imaging-guided needle biopsies, the mammographic and ultrasound findings should be analyzed for concordance with the cytologic or histologic report. Frequent review—for example, a weekly or monthly conference depending on volume—can help determine management plans for patients that might include follow-up or rebiopsy. Preprocedure assessments should be compared with pathology results for positive predictive values of imaging interpretations. False negatives should be tabulated and explained.

Presurgical Localization

One more procedure that can be done with sonographic guidance is needle hookwire localization.[3] There are several advantages to using sonographic guidance rather than a fenestrated mammographic plate. The patient is often in supine-oblique or supine position as for surgery, and frequently the approach is that of the shortest distance from the skin to the lesion, ordinarily preferred by the surgeons. The approach may or may not be parallel to the chest wall as is essentially required for safety in alphanumeric grid, fenestrated plate mammographic localizations. The method described in Figure 1 can be used.

Indications for US-Guidance of Presurgical Localizations:

1. Any mass or other lesion that can be identified ultrasonographically can be localized with US;
2. Lesions inaccessible to mammographic grid localizations, such as masses high in the axillary tail of the breast or far posteriorly situated.

The patient need not be supine or in an oblique position for localization. The patient may be seated or standing if the lesion is best approached in these positions. If the lesion to be localized is well-circumscribed and hypoechoic, and it may represent an atypical cyst, it is better to remove the hookwire from the needle before it is placed. If fluid emerges from the hub of the needle, a syringe can be attached, the lesion evacuated, and the surgical biopsy canceled.

If you are certain that the needle has been correctly placed, the hookwire can be deployed in the tissue. Alternatively, mammographic confirmation of the needle's location can be obtained prior to hooking the wire.

If the wire is hooked at sonography, obtain craniocaudal and lateral mammograms showing the location of the hookwire. Whether or not the lesion has been seen mammographically, surgeons are more accustomed to looking at mammograms than sonograms, and these fully labeled views should be sent to the operating room for use in planning the surgical approach.

As with all nonpalpable lesions localized prior to surgery, specimen images are essential and the standard of care. A mammographic localization requires a specimen radiograph, and with sonography, there is the option of obtaining the specimen images with mammography or US. If sonography is the only technique in which the lesion was seen, a specimen sonogram may be selected. We immerse the specimen in a small basin of saline, scan through the saline, and record the image on film. The specimen is then delivered to the pathology department.

Even if the lesion were not seen mammographically, specimen radiography may be helpful. With the better compression and magnification that is possible for a tissue specimen than in vivo, it is possible to see an abnormality that was not perceptible on preoperative mammograms. In any case, both sonographic and mammographic localizations require that a specimen be sent for imaging correlation with results reported to the surgeon in the operating room prior to closure of the incision.

Conclusion

Familiarity with US-guidance of breast interventional procedures as well as mammographic and stereotactic procedures allows flexibility and versatility in choosing among the nonsurgical alternatives for breast diagnosis and management. An expected result should be to improve the quality, efficiency, and economy of patient care.[14]

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MAMMOGRAPHY-GUIDED BIOPSY

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The ability of mammography to detect breast cancer before it grows large enough to be palpable has created the need for precise preoperative localization, to guide the surgeon to the area of interest so that biopsy will sample the correct tissues. Since mammography often is the only means by which nonpalpable lesions can be identified, it must be used for localization as well. Over the years, many techniques have been devised to achieve successful localization. The most effective of these involve positioning a needle within the breast under mammographic control, so the that needle passes close to, if not through, the suspicious mammographic finding. The needle then is either left in place, or more commonly it is exchanged for a surrogate marker such as vital blue dye or a hooked or curved wire that anchors to the site of needle placement. A variety of needle positioning approaches have been described, which can be used with the growing number of commercially available needle-and-wire combinations. Selection of a specific localization technique usually is a matter of personal preference, affected in some circumstances by the demands of referring surgeons.

Several important features are common to all successful localization techniques. (*a*) Do not attempt to localize a lesion until it has been established to be parenchymal in location (tangential view often required), and until the possibility has been excluded that the lesion represents superimposition of normal breast structures (lesion must be seen on two projections, preferably orthogonal views). (*b*) Do not accept needle placement as satisfactory unless it is sufficiently close to the suspicious mammographic lesion, usually within 5 mm of it. Closer than usual placement is preferable for small lesions, small breasts, lesions seen only on views less than 90 degrees apart, and for surgeons who prefer to excise very small amounts of tissue. (*c*) Do not consider a localization to be complete until specimen radiography documents removal of the suspicious mammographic lesion. To best achieve satisfactory results insist that all biopsy specimens are radiographed before they are bivalved or cut into several smaller pieces, and perform all specimen radiography with firm compression, especially if the mammographic lesion is a noncalcified poorly-defined mass.

Much more than non-invasive breast imaging procedures, lesion localization should be a team effort. The radiologist, surgeon, and pathologist must work together to guarantee that the suspicious mammographic lesion indeed has been excised and examined histologically. If it is unclear whether the lesion has truly been excised, specimen radiography should be repeated using a different plane of compression. Once the lesion is identified on a specimen x-ray, if there still is uncertainty that it has been examined under the microscope, then remaining unsectioned tissue blocks can be radiographed to search for the lesion. As a last resort, additional mammograms of the biopsied breast also can be obtained, to determine whether the lesion actually was excised; this can be done as soon as postoperative tenderness has subsided, usually within a month of biopsy. Repeat localization and biopsy can be done immediately thereafter, if necessary.

Most clinical series reporting results of lesion localizations indicate a small percentage of cases in which the procedure fails. All such initial failures should be corrected within a short period of time.

In the late 1970's, mammographic equipment was adapted to permit stereotactic localization of nonpalpable breast lesions. This results in more precise needle placement, usually within (rather than adjacent to) a lesion, allowing one to obtain cytologic material by percutaneous fine-needle aspiration or histologic material by percutaneous core biopsy. The principal advantages of such percutaneous procedures are less morbidity and lower cost. If performed diligently by skilled operators, these procedures will permit a reduction in the number of mammographically-prompted surgical biopsies for benign lesions, by obtaining a pre-operative pathological diagnosis of benignity. It also is possible to obtain a confirmed tissue diagnosis of malignancy for some cancers prior to any surgical intervention, thereby (in selected cases) permitting one-step rather than two-step surgical treatment.

Stereotactic mammographic equipment gained widespread use in the 1990's. There are both prone-table (dedicated) and upright (add-on) stereotactic units, all of which are reported to have needle placement accuracy of ± 2 mm. The major advantages of the prone-table units are increased patient comfort, shortened procedure time, and reduced frequency of vasovagal reactions during tissue sampling. The major advantages of the add-on units are lower cost, smaller footprint, and the ability to use the underlying x-ray equipment for conventional mammography when stereotactic procedures are not being performed.

It is important to note that precise (and even more rapid) localization of nonpalpable breast lesions can be performed using real-time ultrasonography, for those lesions that are readily seen on sonograms. As practitioners gain hands-on experience using ultrasonography for nonpalpable breast lesions, both standard localization procedures and percutaneous biopsies are being performed with increasing frequency via ultrasound guidance rather than via mammographic guidance.

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ADVANCED BREAST BIOPSY INSTRUMENTATION
- NEW TECHNOLOGY IN THE DIAGNOSIS OF BREAST DISEASES

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It is expected the number of breast biopsies will increase, especially for non-palpable lesions with increasing screening mammography for early detection of breast cancer. Needle localization and excisional biopsy of the breast mass is the most commonly used standard technic for the mammographically detected breast lesion. Recently stereotactic core biopsy technic has been advocated as an alternative to open biopsies. Advanced Breast Biopsy Instrumentation (ABBI) procedure is a one step procedure which melds traditional needle localization techniques with the newer stereotactic core biopsy. The procedure is performed by the ABBI system cannula using stereotactic digital mammographic table. The ABBI system cannula (size of diameter is 5, 10, 15, and 20 mm) is used to definitely excise the lesion, removing total lesion as a single oriented diagnostic specimen. The procedure is performed as a single step using local anesthesia in less than one hour. Its advantages are minimally invasive, accurate, rapid and cosmetic.

In Samsung Medical Center of Korea ABBI system installed since December, 1997. We have studied 159 cases who were in evaluation for non-palpable breast diseases. Fifty nine cases of them received stereotactic core needle biopsy, whereas 100 cases of them received excision by use of ABBI. Their mammographic findings were mass(24.5%), microcalcification(65.4%) and mass with microcalcification(65.4%).

After cutting a lesion off, we have taken their postexcisional mamography and specimen mammography in order to confirm the evidence of complete excision. Pathologisists examined the permanent specimen and in case of malignacy, total mastectomy or reexcision was performed to secure negative resection margin pathologically.

We observed malignant lesions in 23 cases of 159 patients. And duct carcinoma in situ(DCIS) was found in 17 cases among malignancies. Postoperative pathologic reports showed DCIS in 11 and infiltrating ductal carcinoma in 2 out of 13 malignancies proven by stereotactic core biopsy. Among 10 malignancies proven by ABBI system, there were DCIS in 6, lobular carcinoma in situ in 1, infiltrating ductal carcinoma in 1 and mucinous carcinoma in 2. In addition, needle localization was performed in 7 cases which were

suspected as malignancy in mammography but not in stereotactic core biopsy , and 4 cases of them revealed as DCIS.

ABBI system is more reliable and rapid method to evaluate breast lesions compared with stereotactic core biopsy, which could be achieved under local anesthesia minimizing deformity of remnant breast. Therefore ABBI system can be used as a substitute for conventional needle localization and excisional biopsy.

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