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Stereotactic breast biopsy: A less-invasive option

ABSTRACT

Until recently, a woman with a nonpalpable lesion detected on mammography had to undergo the emotional and physical trauma of surgical excision. However, a new technique, percutaneous core needle biopsy, guided by digital three-dimensional x-ray imaging, offers a reasonable alternative to standard surgical biopsy. This method produces no pseudolesions, subjects the patient to less physical and emotional trauma, is done on an outpatient basis with local anesthesia, and costs far less than the surgical method.

KEY POINTS

Recent results indicate stereotactic core needle biopsy is as accurate as surgical biopsy. It is particularly useful in the biopsy of microcalcifications.

Lesions shown to be benign by the stereotactic method do not require surgical excision.

Calcifications associated with benign findings may grow larger with time. The prudent approach is to recommend surgical excision if any suspicious change occurs.

Stereotactic breast biopsy is not a replacement for a thorough imaging evaluation. Appropriate classification of mammographic abnormalities is necessary to determine the need for any biopsy

UNTIL RECENTLY, the next step for a patient with a nonpalpable lesion detected by screening mammography was prebiopsy needle localization and surgical excision. But this standard approach to diagnosis and treatment has numerous disadvantages, including emotional and physical trauma to the patient, anesthetic risk, creation of mammographic pseudolesions, and the cost of surgical consultations.

Percutaneous stereotactic biopsy appears to be an effective alternative to the standard surgical approach, and represents a step forward in improving the effectiveness of breast cancer screening. It is less invasive and offers several advantages over surgical excision:

- It can distinguish benign nonpalpable lesions from malignant ones.
- It avoids the risks of general anesthesia.
- It reduces trauma and scarring.
- It costs substantially less.

SCREENING RECOMMENDATIONS

Experts agree that women age 50 and older should undergo mammography every year, and the American Cancer Society also advocates this for women age 40 to 49.

Several lines of evidence support the use of mammography as a screening test. Cancers detected by mammography carry a much better prognosis than those found by physical examination, as in general they are smaller and less likely to have produced lymph node metastases.¹ In fact, mammography can detect invasive cancers of 1 cm or less in diameter that are not even palpable; after treatment for such small tumors, more than 90% of patients enjoy long-term disease-free

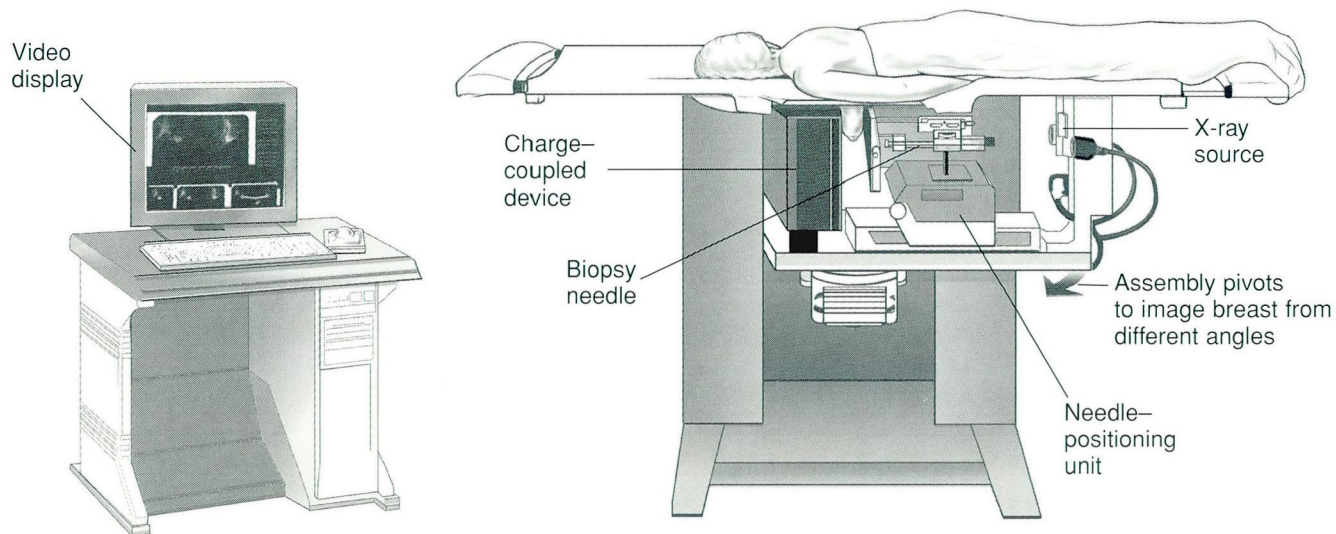


FIGURE 1. Prone stereotactic biopsy unit, using computerized triangulation to pinpoint and sample non-palpable breast abnormalities.

survival.² In randomized clinical trials, mammographic screening significantly reduced the rate of mortality due to breast cancer, even in women age 40 to 49.³

Low specificity of mammography

Yet, mammography has one glaring shortcoming: it is far more sensitive than specific. Although mammograms nearly always reveal any cancerous tumors that are present, they also uncover at least twice as many benign tumors as cancerous tumors.⁴ And there is no reliable way to distinguish the two, except to perform a biopsy procedure. Until recently, that has meant surgical excision.

■ DRAWBACKS OF SURGICAL EXCISION

Surgical excision has numerous disadvantages. It causes the patient psychological and physical trauma and poses anesthetic risk. Often, more tissue is removed than proves necessary after the lesion is found to be benign. Scarring from the surgery creates pseudolesions on subsequent mammograms. The procedure is also costly: surgical consultations and related biopsies account for the largest category of induced costs in breast cancer screening programs.⁵ In addition, although surgical excisional biopsy is generally assumed to be the gold standard for histologic diagnosis, it can fail to remove the mammographic lesion in a small percentage of cases.⁶⁻⁹

■ HOW PERCUTANEOUS STEREOTACTIC BIOPSY WORKS

The biopsy procedure is done on an outpatient basis with a small amount of local anesthesia and a small (1.5-cm) skin incision. Most women do very well afterwards and go home or back to work after the procedure.

New stereotactic imaging systems wed x-ray imaging with digital technology to allow physicians to take percutaneous needle biopsy specimens of nonpalpable breast abnormalities (FIGURE 1). Unlike older stereotactic biopsy systems, which used x-ray film to record the image, new systems use a charge-coupled device originally developed for the Hubble Space Telescope. To locate the lesion, the imaging system uses computerized triangulation in three dimensions.

In our experience, the digital imaging that this system offers has made percutaneous biopsy considerably easier to perform and considerably faster than previous stereotactic biopsy using conventional film imaging. The capability to view images in a few seconds, in near real-time (rather than keeping the patient on the table while waiting 5 to 10 minutes for film to be developed), is a dramatic improvement in terms of patient comfort. It also decreases the likelihood that the patient will move during the procedure, which in turn increases confidence in the biopsy results and perhaps improves accuracy.

Mammography is far more sensitive than specific

The quality of the digital images is good, and any deficiency can be overcome with the image enhancement techniques that digital imaging allows.

How accurate is stereotactic biopsy?

Reports suggest that stereotactic core needle biopsy is as accurate as surgical biopsy; the most accurate results are obtained with a 14-gauge core biopsy needle and an automated long-throw biopsy gun.¹⁰⁻¹³ Experienced operators of the stereotactic core biopsy method can remove a tissue sample suitable for histologic analysis from the area of concern 100% of the time, with a sensitivity of more than 95%.¹⁴ However, there is a learning curve involved with this procedure, and accuracy improves as operators gain experience. Moreover, it is critical that the procedure be performed by persons skilled in analyzing mammographic images, as evaluating stereotactic images and correlating them with mammographic images is often complex.

How stereotactic biopsy aids diagnosis

In many cases stereotactic biopsy can improve the diagnostic process and eliminate the need for a diagnostic surgical biopsy. For example, patients with mammographically detected lesions who ordinarily would undergo a surgical biopsy procedure will benefit from this new approach, as most of these lesions are benign and will be proved so with carefully performed stereotactic examination.

With standard surgical excision, a woman with a malignant lesion would undergo two surgical procedures—the biopsy procedure and cancer therapy. But the stereotactic biopsy provides a less invasive alternative to the initial diagnostic procedure.

Finally, in all cases the definitive diagnosis resulting from stereotactic biopsy allows the patient to be apprised of and give serious consideration to her treatment options before she ever has surgery. It also allows her to obtain more concrete second opinions for surgical treatment alternatives.

Complications and drawbacks

The potential complications of stereotactic breast biopsy are the same as can be expected from any percutaneous biopsy—primarily

bleeding, hematoma, and infection. If a patient is taking aspirin or anticoagulants, the biopsy should be delayed until the medication dosages are adjusted to the lowest acceptable levels. Minor bruising around the biopsy site is common but can be minimized by applying manual pressure and ice immediately after the procedure. In a multicenter study with stereotactic core biopsy, six complications (three infections and three hematomas) were reported in 3,765 cases, a complication rate of 0.2%.¹⁰ Core needle biopsy produces no long-term changes or deformities of the breast that are visible on follow-up mammograms.¹⁵

■ INDICATIONS FOR STEREOTACTIC BIOPSY

Stereotactic biopsy of microcalcifications

Stereotactic biopsy is valuable anytime the biopsy of a nonpalpable lesion is being considered. However, it is particularly useful in microcalcifications that palpation and ultrasound miss. Stereotaxis is the only technique that can reliably image such microcalcifications for biopsy, allowing the biopsy needle to be carefully targeted to the calcifications. Because there is always concern that the biopsy needle will miss the targeted calcifications, radiography of the specimen is now an integral part of the core biopsy of calcifications (whether or not the tissue was sampled by surgical excision or core needle biopsy).¹⁶ When calcifications are seen in the specimen radiograph, the diagnostician can be confident that targeted tissue was sampled, and the final pathological result is accurate. (FIGURE 2).

Follow-up of benign lesions

Lesions shown to be benign by the stereotactic approach do not need surgical excision. In patients with benign lesions, many experts obtain a unilateral mammogram at 6 months and bilateral mammograms at 12 and 24 months after biopsy. Some investigators omit the initial 6-month follow-up visit, believing that a diagnosis by biopsy carries enough diagnostic certainty to forgo this visit.¹⁴ Also, changes in a lesion will usually be more noticeable at 12 months than at 6.

During follow-up some benign lesions may enlarge. For example, benign masses such as fibroadenomas enlarge under hormonal

X-ray film has been replaced by a device developed for the Hubble Telescope



influence. In addition, benign lesions may develop more microcalcifications. These suspicious changes do not necessarily mean that the original diagnosis was wrong. However, the prudent approach is to recommend surgical excision if any suspicious change occurs.

Suspicious or definitely malignant lesions

Stereotactic biopsy can also benefit patients with highly suspicious or definitely malignant mammographic lesions who wish to be treated with a mastectomy, with or without primary reconstruction. Although a core needle biopsy is less invasive than surgical excision, if the diagnosis of cancer is made with core needle biopsy there is still enough tissue so that estrogen and progesterone receptor data can be obtained and flow cytometry and other studies can be performed if desired.

Multiple suspicious lesions

Patients with multiple suspect lesions in different quadrants of the breast are difficult to evaluate for breast conservation because of the possibility of multicentric cancer. These mammographic abnormalities can be assessed with needle biopsy instead of multiple, possibly deforming, surgical procedures. If multicentric cancer is found, the patient is not a candidate for breast conservation.

When is the stereotactic approach contraindicated?

Most suspicious breast lesions are suitable for stereotactic biopsy, but there are a few situations in which it is generally more difficult. Some lesions cannot be successfully targeted because of their position in the breast. For example, lesions located near the chest wall can be difficult to image satisfactorily with the stereotactic device, particularly the units that require the patient to lie in the prone position. In our experience, however, there are few lesions that cannot be reached. Women who cannot lie prone or undergo extended breast compression are not candidates for the procedure. Also, some very obese women may exceed the weight restrictions for the stereotactic machine's prone table. Additionally, if the breast is very small and compresses to less than 2 cm or the lesion is very superficial, stereotactic biopsy can be very difficult and

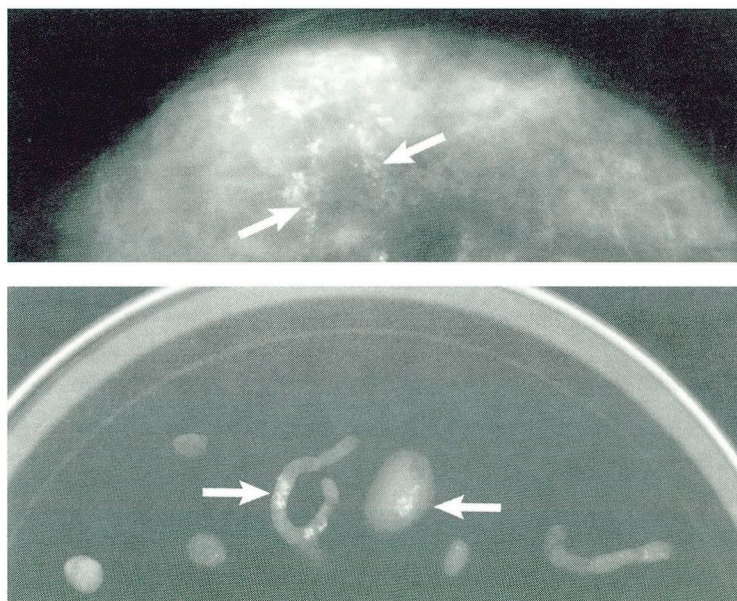


FIGURE 2. Top, a mammogram with multiple suspicious calcifications for stereotactic biopsy (arrows). Bottom, slightly magnified radiograph of core samples of a stereotactic breast biopsy. The arrows show multiple calcifications in the tissue samples.

surgical biopsy may be necessary.

■ STEREOTACTIC BIOPSY: CONTROVERSIES

To be cost-effective, stereotactic needle biopsy should shorten the diagnostic process, not add another procedure to it. This is indeed the case, since surgery can be avoided by identifying suspicious lesions as in fact benign.

But for some, the role of core biopsy for highly suspicious lesions is controversial if breast conservation is the treatment of choice. Some surgeons do not yet trust the procedure and express concern about the potential for false-negative biopsies. Others simply prefer needle localization and surgical biopsy as the first diagnostic and therapeutic maneuver.

On the other hand, many surgeons contend that a presurgical diagnosis of malignancy—which stereotactic biopsy provides—is valuable because it allows at least a preliminary discussion of treatment options before surgery and a better chance of obtaining adequate margins with a single surgical procedure.

These differences in treatment preference may be related to the surgical technique and

Scarring from surgical excision creates pseudolesions on subsequent mammograms



the volume of tissue removed during lumpectomy. At many institutions, lesions diagnosed as malignant with stereotactic biopsy are treated with a single surgical procedure. Some surgeons also feel that a presurgical diagnosis of malignancy allows women to make a more informed choice in their treatment options, giving the patient the option of seeking a second opinion based on the pathological findings obtained by stereotactic biopsy.

Even though stereotactic breast biopsy is less invasive than surgical excision, it is not a replacement for a thorough mammographic evaluation. Appropriate classification of mammographic abnormalities is necessary to determine the need for any biopsy, surgical or stereotactic. Many lesions should undergo periodic mammographic follow-up rather than biopsy. Nevertheless, in some circumstances the patient or physician may have considerable anxiety, and biopsy of such a lesion may be reasonable.¹⁷

Lesions located near the chest wall can be difficult to image

■ RELATIVE COST OF STEREOTACTIC BIOPSY

In most institutions, a stereotactic biopsy costs only one third to one fourth as much as surgical excision with prebiopsy needle localization, or a savings of \$1,500 to \$2,000 per biopsy. If it were to completely replace surgical excision biopsy, the stereotactic biopsy method could save the United States \$750 million to \$1 billion per year in health care costs.¹⁸ Moreover, some researchers have suggested that the use of the stereotactic rather than the surgical approach in a mammographic screening program could lower the marginal cost per year of life saved from \$20,770 to \$15,934 (a savings of about 23%).⁴ However, overuse of the procedure by those not skilled in mammographic evaluation and diagnosis could actually increase costs.

■ THE FUTURE OF STEREOTACTIC BIOPSY

Stereotactic breast biopsy is a relatively new method for imaging-guided biopsy of suspicious breast masses. It is as accurate as surgical excisional breast biopsy but is less traumatic. As stereotactic biopsy becomes more accepted, it has the potential to decrease the costs of detecting and treating breast cancer, and to increase the options available to women.

Women can be referred directly by their primary care physician for a stereotactic biopsy and, if the results are benign, returned to the care of that referring physician. Only if the results of the biopsy procedure are positive would the woman need to be referred to a breast cancer specialist.

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