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Stereotactic Large-Core Breast Biopsy

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Surgical excisional biopsy is currently the most common type of breast biopsy performed to determine the benign or malignant nature of mammographically detected abnormalities. Approximately 80% to 85% of these lesions prove to be benign by open surgical biopsy. Fine needle aspiration biopsy (FNAB) of breast lesions has been advocated to reduce the number of unnecessary surgical procedures. The drawbacks of FNAB include insufficient tissue for diagnosis in 6% to 47% of cases, 1% to 31% false negative results, limited ability to make a definite benign diagnosis and difficulty in precise classification of malignant disease. Stereotactic large core biopsy of nonpalpable breast lesions overcomes many of the drawbacks of FNAB. The accuracy of stereotactic large core biopsy is comparable to open surgical biopsy. The advantages of stereotactic core biopsy over surgical biopsy are that it is less invasive, takes less time and costs less.

This article describes the technique of stereotactic large core biopsy of breast lesions and our experience with more than 100 patients.

Key words: Breast biopsy, nonpalpable breast lesions, large core needle, biopsy gun.

With more women participating in screening programs, an ever increasing number of abnormalities are detected on mammograms. Despite advances in mammographic technique, it remains difficult to predict correctly the benign or malignant nature of mammographically detected breast lesions, and, therefore, a biopsy is frequently required. Surgical excisional biopsy is currently the most common type of breast biopsy and is considered the gold standard for breast disease diagnosis. Nationally, approximately one million women per year undergo surgical breast biopsy. Only 10% to 15% of mamographically detected suspicious breast lesions prove to be malignant by open surgical biopsy. Consequently, nine out of 10 women undergo surgical biopsy for benign disease.

Surgical biopsies can be performed on an in-patient or out-

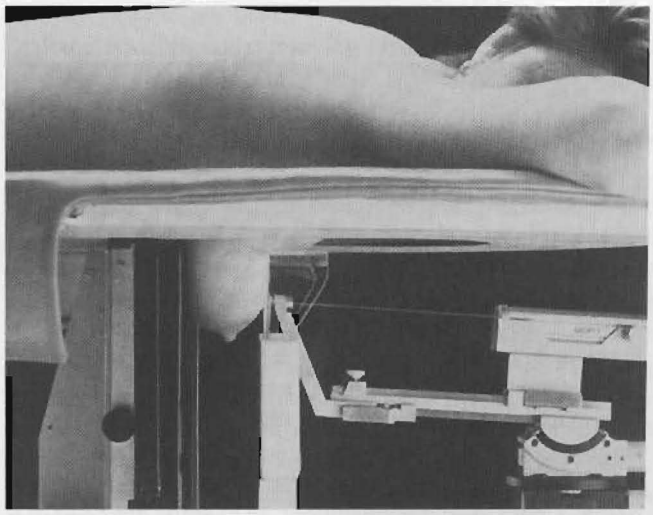

Figure 1. Stereotactic core biopsy device with patient prone on the table. The breast protrudes through an opening in the table. The biopsy device is located under the table, out of signt of the patient.

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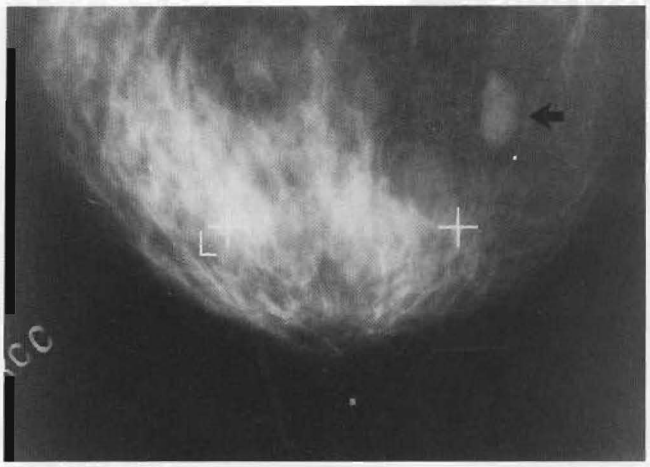

Figure 2A. 53-year-old female with a mass detected in the right breast by routine mammography. Both stereotactic core biopsy and subsequently open surgical biopsy revealed fibroadenoma. Mammogram in the craniocaudad view obtained prior to stereotactic core biopsy shows the mass in the outer quadrant (arrow).

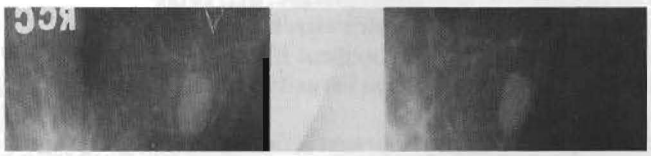

Figure 2B. Side-by-side stero views of the breast mass for calculation of the coordinates.

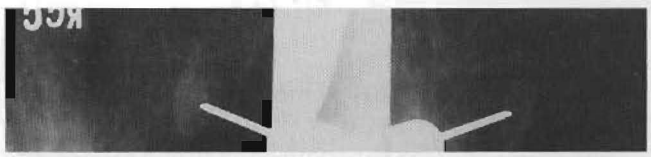

Figure 2C. Pre-fire stereo view. The needle is in the center of the lesion.

Figure 2D. Post-fire stereo view. The needle has traversed the lesion.

patient basis and under either general or local anesthesia. Surgical biopsy for non-palpable, mammographically detected abnormalities requires a pre-operative needle localization under mammographic or ultrasound guidance. The surgeon uses the needle or wire as a guide to locate the lesion in the breast which is then removed with the surrounding tissue. Under ideal circumstances, an average diameter of 6 cm of tissue is removed; however, in many cases, more than 25 cm is removed. Under local anesthesia this can still result in as high as 20% lesion miss rate.

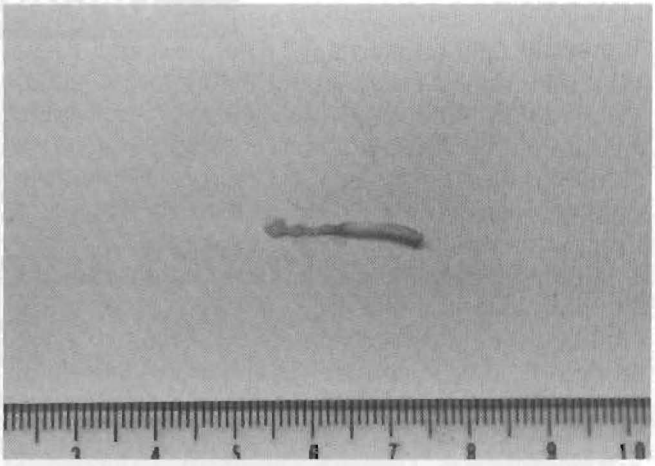

Figure 2E. Core specimen measuring 2.2 x 0.2 cm.

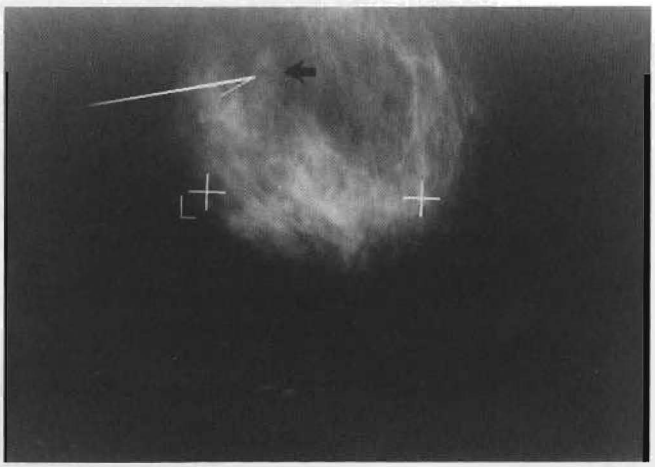

Figure 2F. Wire localization of the lesion (arrow) prior to surgical biopsy.

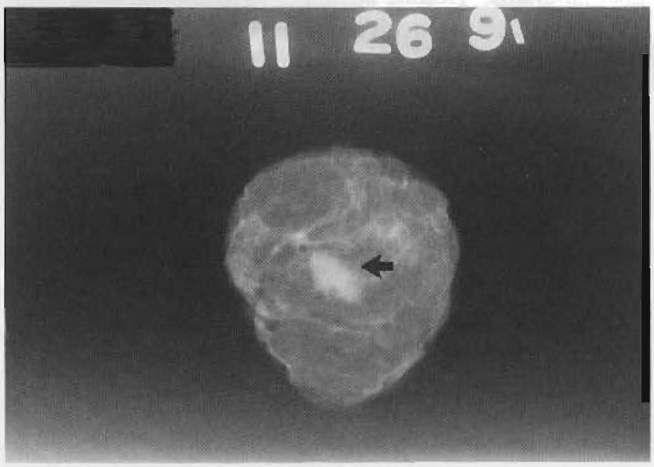

Figure 2G. Surgical specimen radiograph includes the lesion (arrow).

Fine needle aspiration biopsy (FNAB) of breast lesions has been advocated to reduce the number of unnecessary surgical procedures. Patients whose FNAB reveals no

evidence of malignancy might be followed closely rather than subjected to surgical excisional biopsy. Aspiration breast biopsy is usually performed with a 21-23 gauge needle to which a syringe can be attached. After the needle is placed in the area of interest, a vacuum is created, and multiple up and down needle motions are performed. Three or more passes are usually made. Smears are then made on glass slides, and the specimen is fixed and stained. A highly skilled and trained cytopathologist is needed for interpretation. There are, however, drawbacks of FNAB of the breast. These include insufficient tissue for diagnosis in a substantial number of cases (6% to 47%), significant percentage of false negative results (1% to 31%), occasional false positive results (1%), the limited ability to make a definite benign diagnosis and the difficulty in precise classification of the malignancy present. For these reasons, many patients require surgical excisional biopsy as well, thus adding to the cost of breast cancer diagnosis.

Stereotactic large-core biopsy of non-palpable breast lesions overcomes many of the drawbacks of FNAB. The use of a 14 gauge biopsy needle allows a sufficient volume of tissue for a definitive pathologic diagnosis. There are no false positive diagnoses. Since core tissue allows for histologic analysis, definitive benign diagnoses can be made. Additionally, exact classification of a malignancy can be accomplished with histological evaluation of core tissue which allows for better surgical management of the patients. The technique of stereotactic core biopsy was first developed in Sweden and is now increasingly used for diagnosis of non-palpable breast abnormalities in the U.S.A. Recent studies comparing stereotactic core biopsy with excisional surgical biopsy of the breast have shown that the accuracy of core biopsy is comparable to surgical biopsy. Stereotactic core biopsy, however, has definite advantages over open surgical biopsy. The procedure takes less time to perform. There is no incision or scar, no anesthesia is required, the potential for complications is minimal, and the cost is 25% to 50% less than surgical biopsy. Patients with very small breasts (compression < 2 cm) or with diffused calcification are not suitable candidates for core biopsy. Deep lesions close to the chest wall may not be accessible with this technique.

Technique

Stereotactic large core biopsy ideally requires a dedicated stereotactic device (Figure 1). The patient lies face down on a padded table with the breast protruding through an opening in the table. The compression plate, x-ray tube, and the stereotactic biopsy apparatus are located under the table, out of sight of the patient. The first step in the stereotactic core biopsy sequence is to obtain a mammographic localizing view to ensure that the lesion is located within the aperture of thecompression place. Stereo views are then obtained by swinging the x-ray tube 15 degrees off center in each direction. The two stereo images are exposed adjacent to each other on the same film. The stereo views are used to

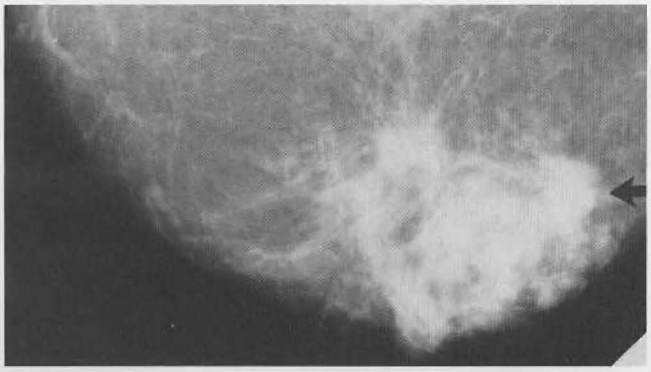

Figure 3A. 61-year-old suspicious abnormality on mammogram. Lesion was missed on two consecutive surgical biopsies performed six months apart. Stereotactic core biopsies revealed intraducial carcinoma. Mammogram shows a one cm irregular mass in the upper outer quadrant (arrow).

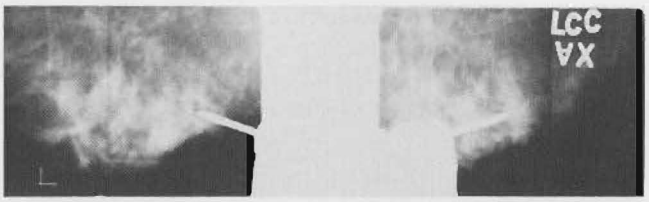

Figure 3B. Pre-fire stereo view shows the needle in the center of the mass.

calculate the coordinates in each stereo view. The digitizer prints out the horizontal, vertical and depth coordinates.

The biopsy gun is then locked into the dedicated housing and the coordinates are dialed into the main unit. The gun and needle align automatically on the proper trajectory. The skin over the puncture site is anesthetized with 1% lidocaine, and a small skin nick is made through which a 14- gauge biopsy needle can pass. The needle is advanced to the calculated depth, and stereoviews are obtained to confirm the position of the needle in relation to the lesion. The gun is then fired by pushing the button, and the biopsy is performed with split second sampling. A final set of stereo views are obtained to confirm that the needle has traversed the lesion. The needle is removed and the core tissue obtained is placed in sterile saline. Five or more passes are made in measured increments from the center of the lesion, depending on the nature and size of the lesion. All biopsy passes traverse the same skin nick. The biopsy gun has a two phase action. At a very high speed, the inner trocar, with the 16 mm-long sampling chamber, is thrust forward a distance of 23 mm. This is followed almost immediately by a similar 23 mm forward thrust of the outer needle, cutting off the tissue core. The rapid fire nature of the device allows penetration of a very firm and/or fiberoptic lesion before it can slip out of the needle path. The biopsy cores are well defined and measure approximately 1.5 cm to 2.5 cm in length and 2 mm in diameter. The procedure is painless and well tolerated. The

woman can resume her daily activity following the procedure. There are no major complications and no premedication or sedatives are needed.

Core biopsy of breast lesion can also be performed with ultrasound guidance. The advantages of ultrasound guided core biopsy are that it is faster, requires no radiation, and the breast is not compressed. However, breast lesions which are not visible by ultrasound, such as those which consist of calcification only, cannot be biopsied with this technique.

Lij Experience

Since May 1991, stereotactic core biopsy was performed in 111 patients with mammographically suspicious, non-palpable breast lesions. Fifty-seven of these patients were participants of an on-going study comparing the results of large core breast biopsy with open surgical biopsy under a protocol approved by the institutional review board and after informed consent was obtained. Mammographic abnormalities of this group consisted of a mass in 28, calcification in 19 and both masses and calcification in 10. After the needle core biopsy and the localization wire placement, these 57 patients underwent surgical biopsy.

The core biopsies were performed using a Mammotest Stereotactic System (Fischer Imaging, Denver, CO), Biopsy Gun (Bard Urological) and 14 gauge core biopsy needle. The histo-pathologic findings from needle core biopsy and surgical excisional biopsy were reported by different pathologists. Tissue sufficient for histologic analysis was obtained from the stereotactic large core biopsy and excisional biopsy in 55 cases (96%). There was partial agreement in two cases. One case was diagnosed as atypical ductal hyperplasia by core biopsy, and the pathologists advised surgical biopsy. The mammographic abnormality was a small cluster of microcalcifications. This case was in the early part of the study and only three cores were obtained. Surgical biopsy revealed intraductal carcinoma. In the second case, the mammographically detected abnormality was diagnosed to be a fibroadenoma both by core biopsy and surgical biopsy. However, there was a 0.4 x 0.5 cm infiltrating duct carcinoma in the specimen close to the surgical margin which did not produce any mammographic abnormality. Of the group who were referred for core biopsy only, two patients had lesions that were missed on previous surgical biopsies. Stereotactic core biopsy successfully yielded a definitive diagnosis in these two patients. Our results are similar to those of Parker et al. who reported a series of 102 patients with an agreement rate of 96% between core biopsy and surgical biopsy.

As a result of these studies, we believe that stereotactic automated large core biopsy on non-palpable breast lesions is an accurate and viable alternative to surgical excisional biopsy in appropriate cases. The advantages of stereotactic core biopsy over open surgical biopsy include elimination of the potential for complications and disfigurement, decreased time required for performing the procedure and decreased cost (25% to 50%). However, to ensure maximum benefit for the patient, a strict and proper protocol should be followed, and a team approach between the radiologist, pathologist and the surgeon should be utilized for stereotactic core biopsy.

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