

# Breast Specimen Imaging



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# Breast Specimen Imaging

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*Breast specimen imaging has long been used to document the successful removal of mammographically discovered breast abnormalities. This article discusses the biopsy procedures associated with breast specimens, as well as the techniques used for specimen imaging and their history.*

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## After completing this article, the reader should be able to:

- Describe the various biopsy types that require specimen imaging.
- List methods of guiding biopsy procedures.
- Explain the reasons behind breast specimen imaging.
- Describe various methods for imaging specimens.

**B**reast cancer is understandably a dreaded disease; the only cancer that kills more women is lung cancer. The American Cancer Society has estimated that 182 460 cases of invasive breast cancer and 67 6770 new cases of in situ breast cancer will be diagnosed in women in the United States in 2008. Approximately 85% of all in situ breast cases will be ductal carcinoma in situ (DCIS).

After steadily increasing for more than 20 years, breast cancer incidence rates dropped by 3.5% per year from 2001 to 2004, while in situ breast cancer rates remained relatively stable since the late 1990s. Experts speculate that decreased use of hormone replacement therapy and mammography may have contributed to the decline. The mammography rate for women 40 years and older dropped from 70.1% in 2000 to 66.4% in 2005.<sup>1</sup>

Mortality rates also have declined since 1990, largely because of earlier, more accurate diagnosis and more effective treatment. The widespread use of screening mammography has been vital to the early diagnosis of breast cancer. Mammography can identify lesions several years before they become physically apparent. On average, mammography will detect about 80% to 90% of breast cancers in women without symptoms.<sup>1</sup>

An essential tool to analyze occult lesions is the image-guided breast biopsy. Of the estimated 48 million screening mammograms performed each year, less than 1 million (2%-5%) will result in a breast biopsy.<sup>2</sup> Because 20% to 35% of these biopsies reveal a breast cancer, the need for accuracy during these procedures is obvious.<sup>3</sup>

One method used to increase the accuracy of breast biopsies is breast specimen imaging, which consists of imaging the excised tissue. This technique, introduced in 1966, has become standard practice to gauge the success of image-guided interventional breast procedures.<sup>4</sup> Its importance as a means of determining whether the questionable lesion has been removed cannot be overstated. Although a study found that only 1.8% of patients benefited from specimen mammography,<sup>5</sup> the practice is supported by the American College of Radiology (ACR), the American College of Surgeons and the American College of Pathologists.<sup>6</sup> Failure to perform specimen imaging can lead to medical malpractice issues. For example, one case determined that the radiologist, surgeon and pathologist are all liable if specimen imaging is not performed.<sup>7</sup>

## Types of Biopsies

Several types of image-guided inter-

ventional breast procedures produce a tissue specimen large enough for imaging. Two of these techniques – large-core needle biopsy (LCNB) and vacuum-assisted breast biopsy (VABB) – are minimally invasive percutaneous procedures that produce little or no scarring and can be performed in the imaging department.

During LCNB, a 12- or 14-gauge hollow needle is used to take samples of the questionable lesion. This needle is usually part of a specially designed gun-needle device consisting of an inner needle with a tissue-procuring chamber and a spring-loaded outer cutting needle. Because this mechanism must be removed from the breast each time it is deployed to retrieve the tissue or core from the chamber, the device must be inserted multiple times to obtain adequate specimens.

The VABB is a type of LCNB that uses suction to draw tissue into the acquisition chamber of an 8- to 14-gauge probe that is housed within an outer cutting needle. Most VABB systems allow the tissue cores to be removed while the probe is still positioned within the breast; because the probe and cutting chamber can be rotated 360°, most devices allow multiple cores to be obtained without repositioning the device. Both LCNB and VABB are incisional biopsies; they remove only a portion of the questionable lesion for diagnostic testing.<sup>8,9</sup> Radio frequency-assisted percutaneous biopsy systems also are available today. These devices usually obtain a single, intact specimen.<sup>10</sup>

Another type of biopsy, the large-core surgical biopsy, was only performed using the advanced breast biopsy instrumentation (ABBI) system. This procedure removes a tissue sample that is up to 2 cm in diameter. Originally, it was thought that the ABBI system could remove an entire lesion, eliminating the need for surgical excision, but studies showed that from 64% to 93% of positive breast specimens obtained using this method contained cancer cells that extended to the margins of the specimen.<sup>11-15</sup> Therefore, this system has never been approved as an excisional biopsy procedure during which the entire lesion, as well as a margin of normal tissue, is removed. Instead, ABBI has largely been abandoned in favor of the less invasive LCNB.<sup>16</sup>

The most invasive type of breast biopsy is the open surgical biopsy, which is usually carried out in an operating room under local or general anesthesia. Although it can be performed as an incisional biopsy, it is usually excisional. This was once the most common type of breast biopsy performed, usually as a diagnostic procedure, but with the growing use of the LCNB to obtain a primary diagnosis, the procedure has become part of

the therapy. When LCNB reveals breast cancer, ductal carcinoma in situ (DCIS), atypical hyperplasia or a radial scar, or when the biopsy results do not correlate with the mammographic findings, an excisional biopsy must be performed. Surgical biopsy as a diagnostic tool is used only for cases in which a less invasive method cannot be used, such as when a lesion is at the chest wall or when a patient cannot tolerate a LCNB.<sup>16-18</sup>

### Guidance Methods

Biopsies of clinically occult lesions must be conducted under the guidance of some imaging modality. The modalities used for image-guided breast biopsy include mammography (both film-screen and digital), ultrasound, computed tomography (CT) and magnetic resonance (MR) imaging. The modality used depends on the following factors:

- The modality's ability to demonstrate the abnormality.
- The location of the abnormality within the breast.
- The number of abnormalities.
- The patient's physical limitations.
- The patient's preferences within the scope of what is medically appropriate.

Usually the choice is based on both the type of biopsy and the imaging modality that are best for the patient.<sup>3,18</sup>

#### *Mammographic Guidance*

Mammographic guidance includes conventional mammography (including both film-screen and digital mammography) and stereotactic guidance. Film-screen mammography used to be the most common method for guiding interventional breast procedures. A description of its use to guide needle localizations was published in 1965, and this technique dominated the field of mammographically guided biopsies until the advent of digital spot mammography for stereotactic biopsy in 1992. Since then, the use of digital mammography has expanded to include diagnostic mammography and mammographically guided procedures.

The first full-field digital mammography (FFDM) unit was approved by the U.S. Food and Drug Administration (FDA) in 2000. In September 2005, results of the Digital Mammographic Imaging Screening Trial were reported online in the *New England Journal of Medicine*. This study, sponsored by the National Cancer Institute, and conducted by the American College of Radiology Imaging Network, concluded that digital mammography is superior to film-screen mammography for women with dense breasts, women younger than 50 and pre- and perimenopausal women regardless of age.<sup>19</sup>