

Stereotactic Breast Biopsy: A Review



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In 2011, close to 40 000 women died from breast cancer in the United States. Breast cancer is a devastating public health concern that is best addressed through early detection and treatment. Once a suspicious breast finding is detected, only a biopsy can determine whether it is benign or malignant. Stereotactic breast biopsy uses mammography, ultrasound and occasionally magnetic resonance imaging to guide the placement of a biopsy needle into the breast. A computer plots the coordinates, which help guide the needle to the precise location of a mass or suspicious finding to extract a tissue sample. Stereotactic breast biopsy has its limitations, but its benefits include decreased patient pain and anxiety, quick recovery time and cost-effectiveness. Most importantly, it can prevent women with benign findings from undergoing surgical biopsy.

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After completing this article, readers should be able to:

- List malignant breast diseases and understand common breast cancer terms.
- Discuss diagnostic issues and advantages of several modalities.
- Explain the risks and benefits of needle biopsy.
- Describe several principles of stereotactic breast biopsy.
- Explain advantages and disadvantages of prone vs upright positioning.
- Troubleshoot positioning problems with stereotactic breast biopsy.
- Clarify the role of the mammography technologist before, during and after stereotactic breast biopsy.

All women are at some risk for developing cancer, according to Susan G Komen for the Cure, a foundation providing the largest source of nonprofit funds to fight breast cancer worldwide.¹ Breast cancer is a devastating public health concern that often is curable. Early detection and treatment are key to breast cancer survival. Armed with radiologic screening and diagnostic modalities, the mammography technologist is on the frontlines of this effort.

Breast cancer is the second-most common kind of cancer in women; skin cancer is the only form of the disease that occurs more often.² Experts estimate 226 870 new cases of invasive breast cancer, 63 000 cases of breast carcinoma in situ and 39 510 deaths will occur in 2012.² Although men can have cancer of the breast, it is extremely rare (450 men were expected to die from the disease in 2011).³

Screening for and early detection of breast cancer are critical to decreasing mortality. When cancer is detected early and confined to the breast, the 5-year survival rate is 98%. Although breast

cancer rates have decreased in the United States in recent years, many risk factors lead to a 1 in 8 chance of a woman having invasive breast cancer at some time in her life and a 1 in 35 chance of dying from the disease (see Box).²

Breast cancer can spread to surrounding tissue in the breast or metastasize to other areas in the body. It is important to find and treat breast cancer before this occurs; mammography and other radiologic imaging modalities help detect breast abnormalities. When a radiologist detects an abnormality, only a biopsy can determine its status as benign or malignant.

Anatomy and Breast Cancer

Breasts are composed mostly of fatty and breast tissue, nerves, veins, arteries and connective tissue. The nonlactating breast weighs approximately 150 to 200 g. Breasts are located within the superficial fascia of the anterior chest wall. Approximately two-thirds of breast tissue rests on the fascia covering the pectoralis muscle, and the remainder rests on the fascia of the serratus anterior muscle.

Breast tissue comprises a network of lobules and mammary ducts often

compared to bunches of grapes on their stems. Lobules are shaped like spherical sacs and produce milk. Mammary ducts are channels that carry the milk from the lobules to the nipples when a woman breastfeeds. Women have between 5 and 10 ductal systems in each breast, and each converges at the nipple. Each breast contains as many as 1 million lobules. Breast cancer usually forms in the ducts and lobules.

Breast tissue changes over the course of a woman's life. During puberty, breasts increase in size because the ductal epithelium and periductal fibrous stroma grow rapidly. Upon maturity, true lobules and acinar structures develop. During pregnancy, the glandular elements of the breast proliferate. During menopause, the breast undergoes involution (regression) of the breast structures, which causes loss of glandular elements and subsequent breast atrophy.

The Lymphatic System

The lymphatic system is 1 body system through which breast cancer can spread. This system contains the lymph nodes, which consist of collections of immune system cells, and is connected by lymphatic vessels. The lymphatic vessels are similar to veins and carry the lymph fluid away from the breasts. Lymph fluid contains fluid from the tissue, waste and immune system cells. Breast cancer cells can enter the lymphatic vessels and grow in the lymph nodes, which connect in the axilla in the breast. Other lymphatic vessels connect to the supraclavicular or infraclavicular nodes.

If cancer cells spread to the lymph nodes, there is a higher chance that the cancer cells already have reached the blood and metastasized to other parts of the body. However, the presence of cancer cells in the lymph nodes does not guarantee that a woman will develop metastases. In contrast, a woman can have cancer-negative lymph nodes and later develop metastases.²

Benign Breast Disease

A lump in the breast does not necessarily indicate cancer, as there are several types of benign breast diseases. Such findings include benign breast lumps, such as fibroadenomas and intraductal papillomas, and fibrocystic changes. Fibrocystic changes are the formation of fibrous tissue or cysts that can cause swelling and pain, often during a woman's premenstrual cycle.

A phyllodes tumor is a rare lesion that develops in the stroma (connective tissue) of the breast, as opposed to carcinomas, which develop in the ducts or lobules. Typically, phyllodes tumors are benign and are treated

Box

Risk Factors for Breast Cancer²

- Personal history of breast cancer.
- Family history of breast, ovarian or prostate cancer.
- Ashkenazi Jewish heritage.
- Radiation exposure in youth.
- Menopause occurring at age 55 or older.
- Not having children or having children after age 35.
- Not breastfeeding after giving birth.
- High bone density, which indicates high levels of estrogen in the blood.
- Postmenopausal hormone use.
- Menstruation that starts before age 12.
- Use of birth control pills.
- Being overweight or sudden weight gain.
- Excessive alcohol consumption.
- Lack of exercise.

by excising the tumor and a portion of the normal surrounding breast tissue; they rarely can be cancerous.

Although these conditions are benign, it may be necessary to biopsy the breast because some benign breast conditions carry a higher risk of developing into breast cancer.²

Breast Cancers

Biopsy of any breast cancer finding is critical to the final diagnosis. To understand the types of breast cancer better, it is helpful to become familiar with terms commonly associated with the disease (see Table 1). The following is a review of malignant breast diseases that might be biopsied using stereotactic methods.

Ductal Carcinoma in Situ

Also called intraductal carcinoma, DCIS is the most common type of noninvasive breast cancer, affecting approximately 1 in 5 women with cancer.² In DCIS, cancer cells are located inside the ducts but not in surrounding breast tissue. Mammography is the most effective imaging modality for detecting DCIS. Most women diagnosed with this type of early-stage cancer can be cured. More aggressive forms of DCIS, called comedo-carcinoma, are characterized by areas of tumor necrosis.