

## Mammograms



### What is a mammogram?

A mammogram is an x-ray picture of the breast.

Mammograms can be used to check for breast cancer in women who have no signs or symptoms of the disease. This type of mammogram is called a screening mammogram. Screening mammograms usually involve two or more x-ray pictures, or images, of each breast. The x-ray images often make it possible to detect tumors that cannot be felt. Screening mammograms can also find microcalcifications (tiny deposits of calcium) that sometimes indicate the presence of breast cancer.

Mammograms can also be used to check for breast cancer after a lump or other sign or symptom of the disease has been found. This type of mammogram is called a diagnostic mammogram. Besides a lump, signs of breast cancer can include breast pain, thickening of the skin of the breast, nipple discharge, or a change in breast size or shape; however, these signs may also be signs of benign conditions. A diagnostic mammogram can also be used to evaluate changes found during a screening mammogram or to view breast tissue when it is difficult to obtain

a screening mammogram because of special circumstances, such as the presence of breast implants.

### How are screening and diagnostic mammograms different?

The same machines are used for both types of mammograms. However, diagnostic mammography takes longer to perform than screening mammography and the total dose of radiation is higher because more x-ray images are needed to obtain views of the breast from several angles. The technologist may magnify a suspicious area to produce a detailed picture that can help the doctor make an accurate diagnosis.

### What are the benefits and potential harms of screening mammograms?

Early detection of breast cancer with screening mammography means that treatment can be started earlier in the course of the disease, possibly before it has spread. Results from randomized clinical trials and other studies show that screening mammography can help reduce the number of deaths from breast cancer among women ages 40 to 74, especially for those over age 50

(1). However, studies to date have not shown a benefit from regular screening mammography in women under age 40 or from baseline screening mammograms (mammograms used for comparison) taken before age 40.

The benefits of screening mammography need to be balanced against its harms, which include:

- Detection may not affect outcome
- False-negative results
- False-positive results
- Overdiagnosis and overtreatment
- Radiation exposure

### What is the best method of screening for breast cancer?

Regular high-quality screening mammograms and clinical breast exams are the most sensitive ways to screen for breast cancer.

Regular breast self-exam, or BSE—that is, checking one's own breasts for lumps or other unusual changes—is not specifically recommended for breast cancer screening. In clinical trials, BSE alone was not found to help reduce the number of deaths from breast cancer.

However, many women choose to examine their own breasts. Women



who do so should remember that breast changes can occur because of pregnancy, aging, or menopause; during menstrual cycles; or when taking birth control pills or other hormones. It is normal for breasts to feel a little lumpy and uneven. Also, it is common for breasts to be swollen and tender right before or during a menstrual period. Whenever a woman notices any unusual changes in her breasts, she should contact her health care provider.

### **What is digital mammography? How is it different from conventional (film) mammography?**

In the United States, digital mammography has replaced conventional mammography. Digital and conventional mammography both use x-rays to produce an image of the breast; however, in conventional mammography, the image is stored directly on film, whereas, in digital mammography, an electronic image of the breast is stored as a computer file. This digital information can be enhanced, magnified, or manipulated for further evaluation more easily than information stored on film. Digital images can also be shared electronically, making virtual (remote) consultations between radiologists and breast surgeons easier.

Digital mammography can be done only in facilities that are certified to practice conventional mammography and have received FDA approval to offer digital mammography. The procedure for having a mammogram with

a digital system is the same as with conventional mammography.

### **What is 3D mammography (also known as tomosynthesis mammography)?**

Three-dimensional (3D) mammography, also known as digital breast tomosynthesis (DBT), is a type of digital mammography in which x-ray machines are used to take pictures of thin “slices” of the breast from different angles and computer software is used to reconstruct an image. This process is similar to how a computed tomography (CT) scanner produces images of structures inside of the body. 3D mammography uses very low dose x-rays, but, because it is generally performed at the same time as standard two-dimensional (2D) digital mammography, the radiation dose is higher than that of standard mammography. Newer tomosynthesis strategies allow DBT to be done alone, potentially reducing the radiation dose to a level closer to that of standard mammography.

Although many women are offered DBT, it has not yet been determined conclusively whether it is superior to 2D mammography at identifying early cancers and avoiding false-positive results.

A large-scale randomized breast screening trial expected to open in mid-2017 will compare the diagnostic accuracy of 3D mammography with that of 2D mammography. The Tomosynthesis Mammography Imaging Screening Trial (TMIST)

will compare the number of advanced and aggressive cancers detected in women screened for 4 years with DBT with that detected in women screened with standard digital mammography.

### **What other technologies or strategies are being developed for breast cancer screening?**

Efforts to improve conventional mammography include digital mammography, magnetic resonance imaging (MRI), positron emission tomography (PET) scanning, and diffuse optical tomography, which uses light instead of x-rays to create pictures of the breast.

The Women Informed to Screen Depending on Measures of Risk (WISDOM) study is a randomized trial that is testing a personalized approach to breast cancer screening. This 5-year study, which will involve about 100,000 women in California and the Midwest, aims to determine if risk-based screening—that is, screening at intervals that are based on each woman’s risk as determined by her genetic makeup, family history, and other risk factors—is as safe, effective, and accepted as annual screening.

#### **Selected References**

1. Mandelblatt JS, Cronin KA, Bailey S, et al. Effects of mammography screening under different screening schedules: model estimates of potential benefits and harms. *Annals of Internal Medicine* 2009;151(10):738-747.

**Source:** National Cancer Institute. ■