How Is Breast Cancer Diagnosed?

If screening tests or your signs and symptoms suggest breast cancer, your doctor will use one or more methods to determine if the disease is present and to evaluate the stage of the cancer.

Signs and Symptoms

Although widespread use of screening mammograms has increased the number of breast cancers found before they cause any symptoms, some breast cancers are not found by mammogram, either because the test was not done or because, even under ideal conditions, mammograms cannot find every breast cancer.

The most common sign of breast cancer is a new lump or mass. A painless, hard mass that has irregular edges is more likely to be cancerous, but some cancers are tender, soft, and rounded. For this reason, it is important that a health care professional experienced in diagnosing breast diseases check any new breast mass or lump.

Other signs of breast cancer include a generalized swelling of part of a breast (even if no distinct lump is felt), skin irritation or dimpling, nipple pain or retraction (turning inward), redness or scaliness of the nipple or breast skin, or a discharge other than breast milk. Sometimes a breast cancer can spread to underarm lymph nodes and cause swelling there even before the original tumor in the breast tissue is large enough to be felt.

Medical History and Physical Exam

The first step in evaluation of a woman with suspected breast cancer is a complete medical history and physical exam. Your doctor will ask questions about your symptoms, any other health problems, and risk factors for benign breast conditions and breast cancer (such as whether any of your relatives had benign breast conditions, breast cancer, ovarian cancer, or other cancers).

Your breast will be thoroughly examined to locate any lump or suspicious area and to feel its texture, size, and relationship to the skin and chest muscles. Any changes in the nipples or the skin of your breast will be noted. The lymph nodes under the armpit and above the collarbones may be palpated (felt), because enlargement or firmness of these lymph nodes might indicate spread of breast cancer. Your doctor will also perform a complete physical exam to judge your general health and whether there is any evidence the cancer has spread.

In addition to the medical history and physical exam, imaging tests and biopsies may be done.

Imaging Tests to Diagnose Breast Disease

Mammograms: Although mammograms are mostly used for screening, they can also be used to examine the breast of a woman who has a breast problem. This can be a breast mass, nipple discharge, or an abnormality that was found on a screening mammogram. In some cases, special images known as **cone views with magnification** are used to make a small area of altered breast tissue easier to evaluate.

A diagnostic mammogram may show that a **lesion** (area of abnormal tissue) has a high likelihood of being **benign** (not cancer). In these cases, it is common to ask the woman to come back sooner than usual for a recheck, usually in 4 to 6 months. On the other hand, a diagnostic mammogram may show that the abnormality is not worrisome at all, and the woman can then return to having routine yearly mammograms. Finally, the diagnostic work-up may suggest that a biopsy is needed to tell if the lesion is cancer. Even if the mammograms show no tumor, if you or your doctor can feel a lump, then usually a biopsy will be needed to make sure it isn't cancer. One exception would be if an ultrasound exam finds that the lump is a cyst.

The American Cancer Society believes the use of mammograms, clinical breast exam, and breast self exam, according to the recommendations previously outlined, offers women the best opportunity for reducing the breast

cancer death rate through early detection. This combined approach is clearly better than any one exam. Without question, a breast physical exam without a mammogram would miss the opportunity to detect many breast cancers that are too small for a woman or her doctor to feel but can be seen on mammograms. Although a mammogram is the most sensitive screening method, a small percentage of breast cancers do not show up on mammograms but can be felt by a woman or her doctors.

Breast ultrasound: Ultrasound has become a valuable tool to use with mammography because it is widely available and less expensive than other options, such as MRI. Usually, breast ultrasound is used to target a specific area of concern found on the mammogram. Ultrasound also helps distinguish between cysts and solid masses and between benign and cancerous tumors. Ultrasound may be most helpful in women with high breast density (thickness). The National Cancer Institute (NCI) is sponsoring a clinical trial to evaluate the benefits and risks of adding screening breast ultrasound to screening mammograms in women with dense breasts and a higher risk of breast cancer.

Ultrasound, also known as **sonography**, uses high-frequency sound waves to outline a part of the body. High-frequency sound waves are transmitted into the area of the body being studied and echoed back. These echoes are picked up by the ultrasound probe. A computer changes the sound waves into an image that is displayed on a screen. You are not exposed to radiation during this test.

Ductogram: This test, also called a **galactogram**, is sometimes helpful in determining the cause of bloody nipple discharge. In this test a fine plastic tube is placed into the opening of the duct at the nipple. A small amount of contrast medium is injected, which outlines the shape of the duct on an x-ray image, which will show if there is a mass inside the duct.

Full-field digital mammogram (FFDM): A full-field digital mammogram is similar to a standard mammogram in that x-rays are used to produce an image of your breast. The differences are in the way the image is recorded, viewed by the doctor, and stored. Standard mammograms are recorded on large sheets of photographic film. Digital mammograms are recorded and stored on a computer. After the exam, the doctor can view them on a computer screen and adjust the image size, brightness, or contrast to see certain areas more clearly. Digital images can also be sent electronically to another site for a remote consult with breast specialists. While many centers do not offer the digital option at this time, it is expected to become more widely available in the future.

Because digital mammograms cost more than standard mammograms, studies are now under way to determine which form of mammogram will benefit more women in the long run. Some studies have found that women who have a FFDM have to return less often for additional imaging tests because of inconclusive areas on the original mammogram. A recent large study from the National Cancer Institute found that a FFDM was more accurate in finding cancers in women younger than 50 and in women with dense breast tissue, although the rates of inconclusive results were similar between a FFDM and a film mammogram. It is important to remember that a standard film mammogram also is effective for these groups of women, and that they should not miss their regular mammogram if a digital mammogram is not available.

Computer-aided detection and diagnosis (CAD): Over the past 2 decades, computer-aided detection and diagnosis (CAD) has been developed to help radiologists detect suspicious changes on mammograms. This is done most commonly with screen-film mammograms and less often with digital mammograms. Generally, the computer device will scan the mammogram first. It can find tumors that the radiologist can't spot. The radiologist, knowing the results of the CAD, will then review the films to look for lesions the CAD missed. The radiologist will then decide the seriousness of the lesions the CAD found. Early research results suggest that CAD systems help radiologists diagnose more early stage cancers than mammograms alone.

Scintimammography: In scintimammography, a radioactive tracer is injected into a vein to detect breast cancer cells. The tracer attaches to breast cancers and is detected by a special camera. This is a very new technique and is still considered experimental. It may or may not be helpful in evaluating abnormal mammograms.

Tomosynthesis: This technology is an extension of a digital mammogram. Tomosynthesis allows the breast to be viewed as many thin slices and has the possibility of providing a more accurate and earlier diagnosis of breast cancer. This technology is still considered experimental and is not yet commercially available.

Magnetic resonance imaging (MRI): MRI scans use radio waves and strong magnets instead of x-rays. The

energy from the radio waves is absorbed and then released in a pattern formed by the type of tissue and by certain diseases. A computer translates the pattern of radio waves given off by the tissues into a very detailed image of parts of the body. A contrast material called **gadolinium** is often injected to better see details.

Patients have to lie inside a tube, which is confining and can upset people with claustrophobia (a fear of enclosed spaces). The machine also makes a thumping noise that you may find disturbing. Some places provide headphones with music to block this out. MRIs are very expensive, although insurance plans generally pay for them once cancer is diagnosed.

Although MRI machines are quite common, they need to be specially adapted to look at the breast. They can be used to better examine cancers found by mammogram or for screening women who have a high risk of developing breast cancer. A few recent studies have shown that MRI screening for women at increased risk finds more cancers than a standard mammogram. However, it is not yet known if the difference between MRI and mammograms in finding small cancers is great enough to save additional lives. And the MRI studies found many more abnormalities that were not cancers, which led to an increased number of biopsy procedures.

MRI is also used for women who have been diagnosed with breast cancer. It is used to better determine the actual size of the cancer and to look for any other cancers in the breast.

Other Tests

Nipple discharge exam: If you have spontaneous nipple discharge, some of the fluid may be collected and looked at under a microscope to see if any cancer cells are in it. Most nipple discharges or secretions are not cancer. In general, if the secretion appears clear green in color, or milky, cancer is very unlikely. If the discharge is red or red-brown, suggesting that it contains blood, it might possibly be caused by cancer, although an injury, infection, or benign tumor are more likely causes.

Even when no cancer cells are found in a nipple discharge, it is not possible to say for certain that a breast cancer is not present. If a patient has a suspicious mass, a biopsy is necessary, even if the nipple discharge does not contain cancer cells.

Ductal lavage and nipple aspiration: Ductal lavage is an experimental test developed for women who have no symptoms of breast cancer but are at very high risk for the disease. It is not a test to screen for or diagnose breast cancer, but it may help give a more accurate picture of a woman’s risk of developing it.

Ductal lavage can be done in a doctor’s office or an outpatient facility. An anesthetic cream is applied to numb the nipple area. Gentle suction is then used to help draw tiny amounts of fluid from the milk ducts up to the nipple surface. The fluid droplets that appear help locate the milk ducts’ natural openings on the surface of the nipple. A tiny tube (called a catheter) is then inserted into a milk duct opening on the nipple. A small amount of anesthetic is infused into the duct to numb the inside. Saline (salt water) is slowly delivered through the catheter to gently "rinse" the duct and collect cells. The ductal fluid is withdrawn through the catheter and placed into a collection vial. The vial is then sent to a lab, where the cells are viewed under a microscope.

Ductal lavage is not considered appropriate for women who aren’t at high risk for breast cancer. It is not clear whether it will ever be a useful tool. The test has not been shown to detect cancer early. It is much more useful as a test of cancer risk rather than as a screening test for cancer. More studies are needed to better define the usefulness of this test.

Nipple aspiration also looks for abnormal cells arising in the ducts, but is much simpler, in that nothing is inserted into the breast. The device for nipple aspiration uses small cups that are placed on the woman's breasts. The device warms the breasts, gently compresses them, and applies light suction to bring nipple fluid to the surface of the breast. The nipple fluid is then collected and sent to a lab for analysis. As with ductal lavage, the procedure may be useful as a test of cancer risk but is not appropriate as a screening test for cancer. The test has not been shown to detect cancer early.

Biopsy

A biopsy is done when mammograms, ultrasound, or the physical exam finds a breast change (or abnormality) that

is possibly cancer. A biopsy is the only way to tell if cancer is really present. All biopsy procedures remove a tissue sample for examination under a microscope. There are several types of biopsies, such as fine needle aspiration biopsy, core (large needle) biopsy, and surgical biopsy. Each type of biopsy has its own advantages and disadvantages.

The choice of which to use depends on your specific situation. Some of the factors your doctor will consider include how suspicious the lesion appears, how large it is, where in the breast it is located, how many lesions are present, other medical problems you may have, and your personal preferences. You might want to discuss the advantages and disadvantages of different biopsy types with your doctor.

Fine needle aspiration biopsy (FNAB): A thinner needle is used for FNAB than the ones used for blood tests. The needle can be guided into the area of the breast change while the doctor is feeling (palpating) the lump. The doctor can be a pathologist, radiologist, or surgeon. If the lump can't be felt easily, the doctor might use ultrasound or a method called **stereotactic needle biopsy** to guide the needle, although most of the time if a stereotactic device is used, a large needle (core) biopsy is done.

Ultrasound lets the doctor watch the needle on a screen as it moves toward and into the mass. For stereotactic needle biopsy, computers map the exact location of the mass using mammograms taken from 2 angles. Then a computer guides the needle to the right spot.

A local anesthetic (numbing medicine) may or may not be used. Because such a thin needle is used for the biopsy, the process of getting the anesthetic may actually be more uncomfortable than the biopsy itself.

Once the needle is in place, fluid is drawn out. If the fluid is clear, the lump is probably a benign cyst. Bloody or cloudy fluid can mean either a benign cyst or, very rarely, a cancer. If the lump is solid, small tissue fragments are drawn out. A pathologist (a doctor specializing in diagnosing disease from tissue samples) will examine the biopsy tissue or fluid to determine if it is cancerous.

Fine needle aspiration biopsies can sometimes miss a cancer and take benign cells from nearby the cancer. If it does not provide a clear diagnosis, or your doctor is still suspicious, a second biopsy or a different type of biopsy should be performed.

Stereotactic core needle biopsy: A core biopsy can sample breast changes felt by the doctor, as well as smaller ones pinpointed by ultrasound or mammogram. Depending on whether the abnormal area can be felt, about 3 to 5 cores are usually removed.

The needle used in core biopsies is larger than that used in FNAB. It removes a small cylinder of tissue (about 1/16- to 1/8-inch in diameter and ½-inch long) from a breast abnormality. The biopsy is done with local anesthesia in an outpatient setting.

Two new stereotactic biopsy methods can remove more tissue than a core biopsy. The **Mammotome**® is also known as **vacuum-assisted biopsy**. For this procedure the skin is numbed and a small incision (about ¼ inch) is made. A probe is inserted through the incision into the abnormal area of breast tissue. A cylinder of tissue is suctioned into the probe then a rotating knife within the probe cuts the tissue sample from the rest of the breast. The Mammotome procedure is done as an outpatient. No stitches are needed and there is minimal scarring. This method usually removes about twice as much tissue as core biopsies. The **ABBI** method (short for Advanced Breast Biopsy Instrument) uses a probe with a rotating circular knife and thin heated electrical wire to remove a large cylinder of abnormal tissue.

In some centers, the biopsy is guided by an MRI, which locates the tumors, plots its coordinates, and aims the stereotactic biopsy device into the tumor.

Surgical biopsy: Sometimes, a surgeon is needed to remove all or part of the lump for microscopic examination. An **excisional biopsy** removes an entire **lesion** (breast abnormality such as a mass or area containing calcifications), as well as a surrounding margin of normal-appearing breast tissue. In rare circumstances, this type of biopsy can be done in the doctor's office, but it is more commonly done in the hospital’s outpatient department under a local anesthesia (you are awake during the procedure, but your breast is numb). Intravenous sedation is often given to make you less aware of the procedure.

During an excisional breast biopsy the surgeon may use a procedure called **wire localization** if there is a small lump that is hard to locate by touch or if an area looks suspicious on the x-ray but cannot be felt. After the area is numbed with local anesthetic, a thin hollow needle is placed into the breast and x-ray views are used to guide the needle to the suspicious area. A thin wire is inserted through the center of the needle. A small hook at the end of the wire keeps it in place. The hollow needle is then removed, and the surgeon uses the wire to guide him to the abnormal area to be removed.

If a benign condition is diagnosed, no further treatment is needed. If the diagnosis is cancer, there is time for you to learn about the disease and to discuss all treatment options with your cancer care team, friends, and family. There is no need to rush into treatment. You may wish to obtain a second opinion before deciding on what treatment is best for you.

Imaging Tests to Detect Breast Cancer Spread

Chest x-ray: This test may be done to see whether the breast cancer has spread to your lungs.

Bone scan: This procedure helps show if a cancer has metastasized (spread) to your bones. The patient receives an injection of radioactive material called **technetium diphosphonate**. The amount of radioactivity used is very low and causes no long-term effects. The radioactive substance is attracted to diseased bone cells throughout the entire skeleton. Areas of diseased bone will be seen on the bone scan image as dense, gray to black areas, called "hot spots."

These areas may suggest metastatic cancer is present, but arthritis, infection, or other bone diseases can also cause a similar pattern. To distinguish among these conditions, the cancer care team may use other imaging tests or take bone biopsies. Bone scans can find metastases earlier than regular x-rays but sometimes, even when the cancer has spread to the bones, the bone scan won't show it. Other imaging studies such as CT or MRI will be needed.

Computed tomography (CT): The CT scan is an x-ray procedure that produces detailed cross-sectional images of your body. Instead of taking one picture, like a regular x-ray, a CT scanner takes many pictures as it rotates around you. A computer then combines these pictures into an image of a slice of your body. The machine creates several pictures of the part of your body that is being studied. This test can help tell if your cancer has spread into your liver or other organs. Often after the first set of pictures is taken you will receive an intravenous injection of a **contrast agent**, or "dye," that helps better outline structures in your body. A second set of pictures is then taken.

CT scans can also be used to precisely guide a biopsy needle into a suspected metastasis. For this procedure, called a **CT-guided needle biopsy**, you remain on the CT scanning table while a radiologist advances a biopsy needle toward the location of the mass. CT scans are repeated until the doctors are sure that the needle is within the mass. A fine needle biopsy sample (tiny fragment of tissue) or a core needle biopsy sample (a thin cylinder of tissue about ½-inch long and less than 1/8-inch in diameter) is removed and sent to be examined under a microscope.

CT scans take longer than regular x-rays. You need to lie still on a table, and the part of your body being examined is placed within the scanner, a doughnut-shaped machine that completely surrounds the table. The test is painless, but you may find it uncomfortable to hold still in certain positions for minutes at a time.

You will need an IV (intravenous) line through which the contrast dye is injected. The injection can also cause some flushing (redness and warm feeling). Some people are allergic and get hives or, rarely, more serious reactions like trouble breathing and low blood pressure can occur. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays. You may be asked to drink 1 to 2 pints of a solution of contrast material. This helps outline the intestine so that it is not mistaken for tumors.

Magnetic resonance imaging (MRI): This is described above as a way of looking for breast cancer as a supplement to mammograms. Traditionally, MRI scans have been used to look for cancer spread, just like CT scans. MRI scans are particularly helpful in examining the brain and spinal cord. MRI scans are a little more uncomfortable than CT scans. First, they take longer -- often up to an hour. Second, you have to lie inside a narrow tube, which is confining and can upset people with claustrophobia (a fear of enclosed spaces). The machine also

makes a thumping noise that you may find disturbing. Some centers provide headphones with music to block this out.

Positron emission tomography (PET): PET uses glucose (a form of sugar) that contains a radioactive atom, which is injected into a vein and travels throughout the body. A special camera can detect the radioactivity. Cancer cells of the body absorb large amounts of the radioactive sugar, because of the high amount of energy that they use. PET is useful when your doctor thinks the cancer has spread but doesn't know where. A PET scan can be used instead of several different x-rays because it scans your whole body. Some of the newer machines are able to perform both a PET and CT scan at the same time (PET/CT scan). This allows the radiologist to compare areas of higher radioactivity on the PET with the appearance of that area on the CT.

It is important to follow the eating, drinking, and activity directions you are given before the PET scan.

This test can be used as a diagnostic aid to a mammogram, especially in looking for cancer in axillary lymph nodes. So far, most studies show it isn't very sensitive in finding small deposits of cancer in lymph nodes, although it can find big ones.

Laboratory Examination of Breast Cancer Tissue

Types of breast cancer: The tissue removed during the biopsy is examined in the lab to see whether the cancer is in situ (not invasive) or invasive. The biopsy is also used to determine the cancer's type. The different types of breast cancer are defined in the section, ""What Is Breast Cancer?".

The most common types, invasive ductal and invasive lobular cancer, are treated in the same way. In some cases, breast cancer types that tend to have a more favorable prognosis (medullary, tubular, and mucinous cancers) are treated differently. For example, hormone therapy or chemotherapy may be recommended for small stage I cancers with unfavorable microscopic features, but not for small cancers of the types associated with a more favorable prognosis.

Grades of breast cancer: A pathologist looks at the tissue sample under a microscope and then assigns a grade to it. The **grade** helps predict the patient's prognosis because cancers that closely resemble normal breast tissue tend to grow and spread more slowly. In general, a lower grade number indicates a slower-growing cancer that is less likely to spread, while a higher number indicates a faster-growing cancer that is more likely to spread.

Histologic tumor grade (sometimes called its **Bloom-Richardson grade**, **Scarff- Bloom-Richardson grade**, or **Elston-Ellis grade**) is based on the arrangement of the cells in relation to each other: whether they form tubules; how closely they resemble normal breast cells (nuclear grade); and how many of the cancer cells are in the process of dividing (mitotic count). This system of grading is used for invasive cancers but not for in situ cancers.

- Grade 1 (well-differentiated) cancers have relatively normal-looking cells that do not appear to be growing rapidly and are arranged in small tubules.
- Grade 2 (moderately differentiated) cancers have features between grades 1 and 3.
- Grade 3 (poorly differentiated) cancers, the highest grade, lack normal features and tend to grow and spread more aggressively.

The tumor grade is most important in patients with small tumors without lymph node involvement. Patients with small, well-differentiated tumors may require no further treatment after the tumor is removed, while patients with moderately or poorly differentiated tumors usually receive additional hormonal or chemotherapy.

Ductal carcinoma in situ (DCIS) is sometimes given a **nuclear grade**, which describes how abnormal the cancer cells appear. The presence or absence of **necrosis** (areas of dead or degenerating cancer cells) is also noted.

Some researchers have suggested combining information about the nuclear grade and necrosis with information about the **surgical margin** (how close the cancer is to the edge of the lumpectomy specimen) and the size (amount of breast tissue affected by DCIS). In situ cancers with high nuclear grade, necrosis, cancer at or near the edge of the lumpectomy sample, and large areas of DCIS are more likely to come back after lumpectomy.

Estrogen and progesterone receptors: Receptors are parts of cells that can attach to certain substances, such as hormones, that circulate in the blood. Normal breast cells and some breast cancer cells have receptors that attach to estrogen and progesterone. These 2 hormones play an important role in the growth and treatment of breast cancer.

An important step in evaluating a breast cancer is to test a portion of the cancer removed during the biopsy or initial surgical treatment for the presence of these receptors. The tumor is tested for these receptors in a test called a hormone receptor assay. Breast cancers that contain estrogen and progesterone receptors are often referred to as ER-positive and PR-positive tumors, or simply hormone receptor positive. Women with these cancers tend to have a better prognosis and are much more likely to respond to hormone therapy than women with cancers without these receptors (see section, "How Is Breast Cancer Treated?"). All breast cancers, with the exception of lobular carcinoma in situ, should be tested for hormone receptors at the time of the breast biopsy or surgery. About two thirds of breast cancers contain estrogen receptors. This percent is higher in older women and lower in younger ones.

HER2/neu testing: About 15% to 25% of breast cancers have too much of a growth-promoting protein called HER2/neu. This protein is produced by the cell under the instruction of the HER2/neu gene. Normally, we all have 2 copies of the HER2/neu gene in every cell in our bodies (one copy per chromosome 17). Tumors with increased levels of HER-2/neu are referred to as “HER-2 positive.”

In women with HER2/neu positive breast cancers, there are too many copies of the HER2/neu gene being produced (more than 2 genes for every chromosome 17). This is referred to as gene amplification, or having a HER2 positive breast cancer. These cancers tend to grow and spread more aggressively than other breast cancers with a normal amount of the HER2/neu gene. They can be treated with a drug called trastuzumab (Herceptin) that prevents the HER2/neu protein from stimulating breast cancer cell growth. Recent studies have shown that trastuzumab, given after breast cancer surgery for HER-2 positive tumors, reduces the risk of recurrence when the tumor measures larger than 1 cm in diameter or when the cancer has spread to the lymph nodes. Studies also suggest that chemotherapy containing certain drugs (such as doxorubicin or epirubicin) may be especially effective against breast cancers that are HER-2 positive.

HER2/neu testing is done on thin slices of the biopsy sample that have been treated with special antibodies that identify the HER2/neu protein or with pieces of DNA that identify the HER2/neu gene. The test that uses antibodies to detect HER2/neu protein is called **immunohistochemistry**. The DNA test for extra copies of the HER2/neu gene is called **fluorescent in situ hybridization** (usually called FISH for short). Many breast cancer specialists feel the FISH test is more accurate than the immunohistochemistry test. HER2/neu testing should be performed on all newly diagnosed breast cancers.

Tests of ploidy and cell proliferation rate: The **ploidy** of cancer cells refers to the amount of DNA they contain. If there's a normal amount of DNA, the cells are said to be **diploid**. If the amount is abnormal, then the cells are described as **aneuploid**. Although they may help determine prognosis, these tests rarely change treatment and are considered optional. They are not recommended by the National Comprehensive Cancer Network (NCCN).

- **Flow cytometry** uses lasers and computers to measure the amount of DNA in cancer cells suspended in liquid as they flow past the laser beam.
- **Image cytometry** uses computers to analyze digital images of the cells from a microscope slide.

Flow cytometry can also measure the **S-phase fraction**, which is the percentage of cells in a sample that are replicating (copying) their DNA. DNA replication means that the cell is getting ready to divide into 2 new cells. The rate of cancer cell division can also be estimated by a **Ki-67** test, which identifies cells in the S-phase, as well as cells getting ready to replicate DNA, cells that have just completed DNA replication, and cells in the process of dividing. A high S-phase fraction or Ki-67 labeling index means that the cancer cells are dividing more rapidly, which indicates a more aggressive cancer.

Other tests to predict breast cancer prognosis: Many new prognostic factors, such as changes of the p53 tumor suppressor gene, the epidermal growth factor receptor, and microvessel density (number of small blood vessels that supply oxygen and nutrition to the cancer) are currently being studied (see section, "What's New In Breast Cancer Research and Treatment?").

Recurrence score: Researchers have developed a test that looks at 21 different genes in the cancer tissues. By measuring the amounts of each of these genes in the tissue they can predict whether or not the cancer is likely to come back. Some doctors are using this test in women who have small tumors without spread to lymph nodes. If the test shows a low likelihood of recurrence, then the doctors may not recommend chemotherapy. If it shows a high risk of relapse, then chemotherapy will be given after surgery. It isn't very valuable in situations where the tumor is large or has spread to nodes because chemotherapy will be always recommended in those instances.