

BREAST CANCER

Breast cancer starts when cells in the breast begin to grow out of control. These cells usually form a tumor that can often be seen on an x-ray or felt as a lump. The tumor is malignant (cancerous) if the cells can grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. Breast cancer occurs almost entirely in women, but men can get it, too.

Many types of breast cancer can cause a lump in the breast, not all do. There are other symptoms of breast cancer you should watch out for and report to a health care provider.

It's also important to understand that most breast lumps are not cancer, they are benign. Benign breast tumors are abnormal growths, but they do not spread outside of the breast and they are not life threatening. But some benign breast lumps can increase a woman's risk of getting breast cancer. Any breast lump or change needs to be checked by a health care provider to determine whether it is benign or cancer, and whether it might impact your future cancer risk.

The main factors that influence your breast cancer risk are being a woman and getting older. Simply being a woman is the main risk factor for breast cancer. Men can have breast cancer, too, but this disease is about 100 times more common in women than in men.

Other risk factors include—

- Changes in breast cancer-related genes (BRCA1 or BRCA2).
- Having your first menstrual period before age 12.
- Never giving birth, or being older when your first child is born.
- Starting menopause after age 55.
- Taking hormones to replace missing estrogen and progesterone in menopause for more than five years.
- Taking oral contraceptives (birth control pills).
- A personal history of breast cancer, dense breasts, or some other breast problems.
- A family history of breast cancer (parent, sibling, or child).
- Getting radiation therapy to the breast or chest.
- Being overweight, especially after menopause.

Symptoms

The most common symptom of breast cancer is a new lump or mass. A painless, hard mass that has irregular edges is more likely to be cancerous, but breast cancers can be tender, soft, or rounded. They can even be painful. For this reason, it is important to have any new breast mass or lump or breast change checked by a health care professional experienced in diagnosing breast diseases.

Other possible symptoms of breast cancer include:

- Swelling of all or part of a breast (even if no distinct lump is felt)
- Skin irritation or dimpling
- Breast or nipple pain
- Nipple retraction (turning inward)
- Redness, scaliness, or thickening of the nipple or breast skin
- Nipple discharge (other than breast milk)

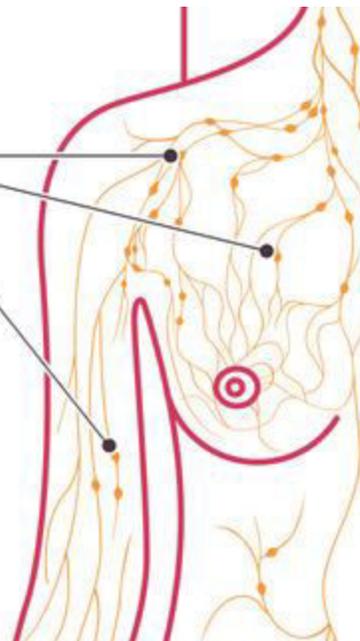
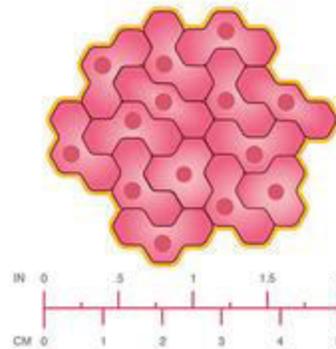
Breast cancer can **spread** through the lymph system which includes lymph nodes, lymph vessels and lymph fluid found throughout the body. Lymph contains tissue fluid and waste products, as well as immune system cells. Breast cancer cells can enter lymph vessels and begin to grow in lymph nodes.

Most of the lymph vessels of the breast drain into:

- Lymph nodes under the arm (**axillary nodes**).
- Lymph nodes around the collar bone (**supraclavicular** and **infraclavicular lymph nodes**)
- Lymph nodes inside the chest near the breast bone (**internal mammary lymph nodes**)

INVASIVE

Lymph Nodes



If cancer cells have spread to your lymph nodes, there is a higher chance that the cells could have spread (metastasized) to other sites in your body. The more lymph nodes with breast cancer cells, the more likely it is that the cancer may be found in other organs as well. Because of this, finding cancer in one or more lymph nodes often affects your treatment plan. Usually, surgery to remove one or more lymph nodes will be needed to know whether the cancer has spread there.

- Still, not all women with cancer cells in their lymph nodes develop metastases, and some women can have no cancer cells in their lymph nodes and later develop metastases.

Breast cancer is sometimes found after symptoms appear, but many women with early breast cancer have no symptoms. This is why getting the recommended screening tests before any symptoms develop is so important. If something suspicious is found during a screening exam, or if you have any of the symptoms of breast cancer described in the previous section, your doctor will use one or more methods to find out if the disease is present. If cancer is found, other tests will be done to determine the stage (extent) of the cancer.

If you think you have any signs or symptoms that might mean breast cancer, be sure to see your doctor as soon as possible. Your doctor will ask you questions about your symptoms, any other health problems, and possible risk factors for benign breast conditions or breast cancer.

Your breasts will be thoroughly examined for any lumps or suspicious areas and to feel their texture, size, and relationship to the skin and chest muscles. Any

changes in the nipples or the skin of your breasts will be noted. The lymph nodes in your armpit and above your collarbones may be palpated (felt), because enlargement or firmness of these lymph nodes might indicate spread of breast cancer. Your doctor will also do a complete physical exam to judge your general health and whether there is any evidence of cancer that may have spread.

If breast symptoms and/or the results of your physical exam suggest breast cancer might be present, more tests will probably be done. These might include imaging tests, looking at samples of nipple discharge, or doing biopsies of suspicious areas.

An imaging test is a way to see what's going on inside your body. The pictures can show normal body structures and functions, as well as abnormal ones caused by diseases like cancer.

These are some of the more common imaging tests used to look for or learn more about breast changes and breast cancer:

Mammograms

A mammogram is an x-ray of the breast. Screening mammograms are used to look for breast changes in women who have no signs or symptoms of a breast problem. Screening mammograms usually take 2 views (x-ray pictures taken from different angles) of each breast. Diagnostic mammograms are used to get a closer look of a change seen on a screening mammogram. More pictures are taken of the area that may be cancer.

Breast ultrasound

Ultrasound, also known as *sonography*, uses sound waves to outline a part of the body. It's useful for looking at some breast changes, such as those that can be felt but not seen on a mammogram. It also helps tell the difference between fluid-filled cysts and solid masses.

Magnetic resonance imaging (MRI) of the breast

MRIs 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 body tissue and by certain diseases. A computer translates the pattern into a very detailed picture. For breast MRI to look for cancer, a contrast liquid

called *gadolinium* is injected into a vein before or during the scan to show details better.

MAMMOGRAPHY

Age Group	Mammography Screening Recommendation	Interval
39 years and under	Screening with mammography is not recommended	
40 to 49 years	The balance of benefits and risks is not great enough to recommend routine screening. Consider woman's preference whether to start screening	For those choosing to be screened, the optimal interval is considered to be one year
50 to 74 years	Screening recommended	Screen every 2 years
75 years and older	Consider individual health factors and woman's preference to continue screening	

Biopsy procedures

A biopsy is done when mammograms, other imaging tests, or the physical exam shows a breast change that may be cancer. A biopsy is the only way to know for sure if it's cancer. For a biopsy, a sample (tiny piece) of the suspicious area is taken out and tested in the lab. The sample is called a biopsy specimen.

After you have a biopsy, the samples of breast tissue are looked at in the lab to determine whether breast cancer is present and if so, what type it is. Certain lab tests may be done that can help determine how quickly a cancer is likely to grow and (to some extent) what treatments are likely to be effective. Sometimes these tests aren't done until the entire tumor is removed by either breast-conserving surgery or mastectomy.

The tissue removed during the biopsy (or during surgery) is first looked at under a microscope to see if cancer is present and whether it is a carcinoma or some other type of cancer (like a sarcoma). If there is enough tissue, the pathologist may be able to determine if the cancer is in situ (not invasive) or invasive. The biopsy is also used to determine the cancer's type, such as invasive ductal carcinoma or invasive lobular carcinoma. With an FNA (fine needle aspiration) biopsy, not as many cells are removed and they often become separated from the rest of the breast tissue, so it is often only possible to say that cancer cells are present without being able to say if the cancer is in situ or invasive.

The most common types of breast cancer, invasive ductal and invasive lobular cancer, generally are treated in the same way.

Estrogen receptors (ER) and progesterone receptors (PR)

Receptors are proteins in or on certain cells that can attach to certain substances, such as hormones, that circulate in the blood. Normal breast cells and some breast cancer cells contain receptors that attach to estrogen and progesterone. These 2 hormones often fuel the growth of breast cancer cells.

HER2/neu testing

About 1 of 5 breast cancers have too much of a growth-promoting protein called HER2/neu (often just shortened to HER2). The *HER2/neu* gene instructs the cells to make this protein. Tumors with increased levels of HER2/neu are referred to as *HER2-positive*.

Doctors often divide invasive breast cancers into groups based on the presence of hormone receptors (ER and PR) and whether or not the cancer has too much HER2. These include:

Hormone receptor-positive: If the breast cancer cells contain either estrogen or progesterone receptors, they can be called hormone receptor-positive (or just hormone-positive). Breast cancers that are hormone receptor-positive can be treated with hormone therapy drugs that lower estrogen levels or block estrogen receptors. These cancers tend to grow more slowly than those that are hormone receptor-negative (and don't have either estrogen or progesterone receptors). Women with these cancers tend to have a better outlook in the short-term, but cancers that are hormone receptor-positive can sometimes come back many years after treatment. Hormone receptor-positive cancers are more common in women after menopause.

Hormone receptor-negative: If the breast cancer cells don't have either estrogen or progesterone receptors, they are said to be hormone receptor-negative (or just hormone-negative). Treatment with hormone therapy drugs is not helpful for these cancers. These cancers tend to grow more quickly than hormone receptor-positive cancers. If they return after treatment, it is more often in the first few years. Hormone receptor-negative cancers are more common in women who have not yet gone through menopause.

HER2 positive: Cancers that have too much HER2 protein or extra copies of the HER2 gene are called HER2 positive. These cancers can be treated with drugs that target HER2.

HER2 negative: Cancers that don't have excess HER2 are called HER2 negative. These cancers do not respond to treatment with drugs that target HER2.

Triple-negative: If the breast cancer cells don't have estrogen or progesterone receptors and don't have too much HER2, they are called triple-negative. These cancers tend to occur more often in younger women, grow and spread more quickly than most other types of breast cancer. Chemotherapy can still be useful, though.

Triple-positive: Cancers that are ER-positive, PR-positive, and have too much HER2. These cancers can be treated with hormone drugs as well as drugs that target HER2.

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 in the cells, they are said to be *diploid*. If the amount is abnormal, then the cells are described as *aneuploid*. Tests of ploidy may help determine prognosis, but they rarely change treatment and are considered optional. They are not usually recommended as part of a routine breast cancer work-up.

The *S-phase fraction* 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. If the S-phase fraction or Ki-67 labeling index is high, it means that the cancer cells are dividing more rapidly, which indicates a more aggressive cancer.

Tests of gene patterns

Two tests, which look at different sets of genes, are now available: the Oncotype DX® and the MammaPrint®

Oncotype DX®: The Oncotype DX test can be helpful when deciding whether additional (adjuvant) treatment with chemotherapy (after surgery) might be useful in women with early-stage breast cancers that are hormone receptor-positive. This test is most often used for tumors that are small (1 cm or less) and have not spread to lymph nodes, but it can be used for more advanced tumors.

MammaPrint®: This test can be used to help determine how likely breast cancers are to recur in a distant part of the body after initial treatment. The test looks at the activity of 70 different genes to determine if the cancer is low risk or high risk.

Tests for breast cancer spread

If you have been diagnosed with breast cancer, you might need more tests if your doctor thinks the cancer may have spread based on your symptoms, the results of your physical exam, or the size of your tumor.

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

Bone scan: This test can help show if the cancer has spread to your bones. It can show all of the bones of your body at the same time and can find small areas of cancer spread not seen on plain x-rays.

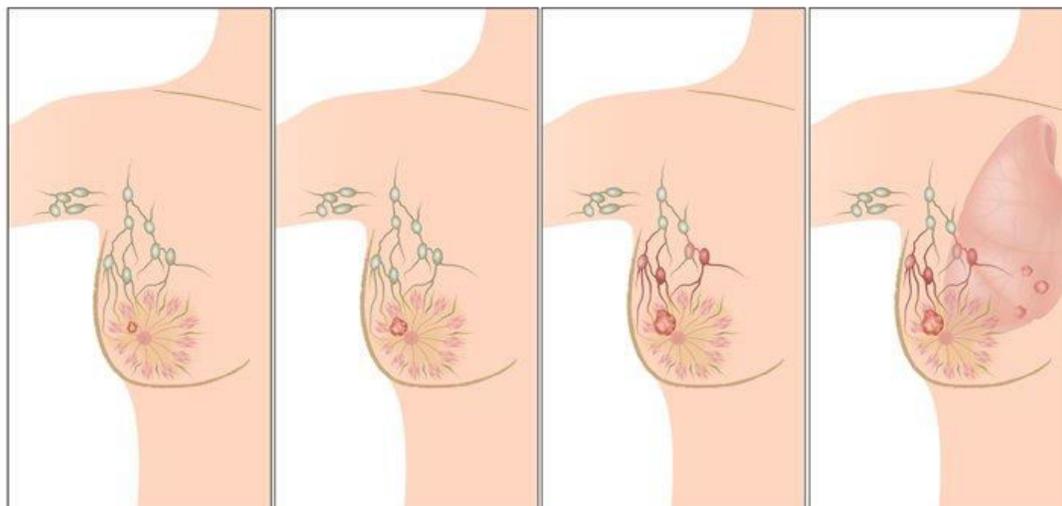
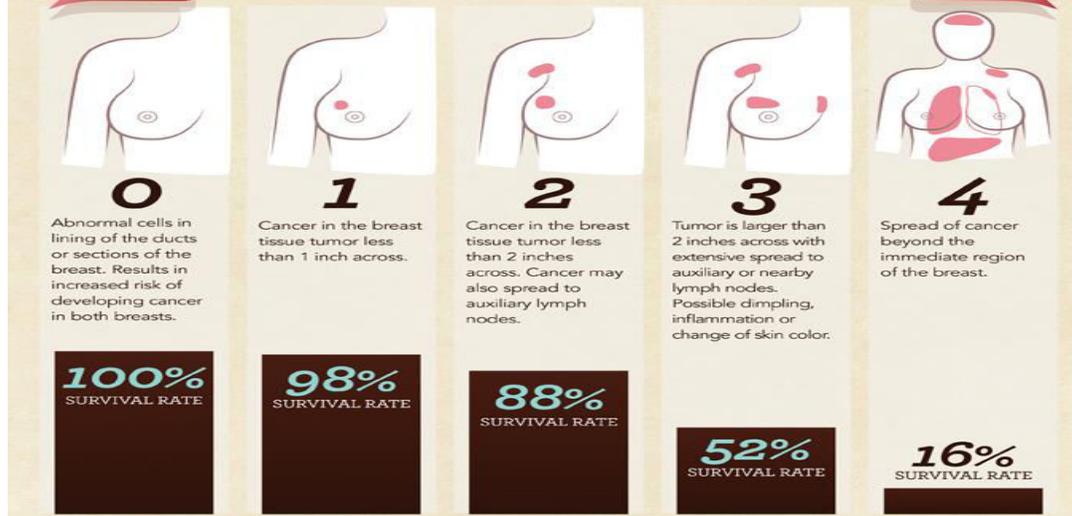
CT scan (computed tomography): A CT scan is a special type of x-ray. Pictures are taken from different angles and are combined by a computer to make detailed pictures of the organs. This test is most often used to look at the chest and/or belly (abdomen) to see if breast cancer has spread to other organs. It can also be used to guide a biopsy needle into an area of concern.

MRI (magnetic resonance imaging): An MRI scan takes pictures using radio waves and strong magnets instead of x-rays. This test can be helpful in looking at your brain and spinal cord. MRIs can be more uncomfortable than CT scans because they take longer and you need to lie in a narrow tube while the test is done.

Ultrasound: For this test, a wand that gives off sound waves is moved over the skin to take pictures of the inside of the body. A gel is often put on your skin first.

PET scan (positron emission tomography): This test uses a form of radioactive sugar. The sugar is put into a vein and travels throughout the body. Cancer cells absorb high amounts of this sugar. A special camera then takes pictures that show the areas where the sugar collected throughout the body.

Stages of Breast Cancer



Stage I

Stage II

Stage III

Stage IV



Tumor size	Tumor size < 2 cm	Tumor size 2-5 cm	Tumor size > 5 cm	Tumor extends to skin or chest wall
T	 T1	 T2	 T3	 T4
Lymph Nodes N	N0 No lymph node metastasis	N1 Metastasis to ipsilateral, movable, axillary LNs	N2 Metastasis to ipsilateral fixed axillary, or IM LNs	N3 Metastasis to infraclavicular/supraclavicular LN, or to axillary and IM LNs
Metastasis M	M0 No distant metastasis	M1 Distant metastasis		

Which treatments are used for breast cancer?

There are several ways to treat breast cancer, depending on its type and stage.

Local treatments: Some treatments are called *local therapies*, meaning they treat the tumor without affecting the rest of the body. Types of local therapy used for breast cancer include:

- Surgery
- Radiation therapy

These treatments are more likely to be useful for earlier stage (less advanced) cancers, although they might also be used in some other situations.

Systemic treatments: Breast cancer can also be treated using drugs, which can be given by mouth or directly into the bloodstream. These are called *systemic therapies* because they can reach cancer cells anywhere in the body.

Depending on the type of breast cancer, several different types of drugs might be used, including:

- Chemotherapy
- Hormone therapy
- Targeted therapy

Many women will get more than one type of treatment for their cancer.

Surgery for breast cancer

Most women with breast cancer have some type of surgery as part of their treatment. Depending on the situation, surgery may be done for different reasons. For example, surgery may be done to:

- Remove as much of the cancer as possible (breast-conserving surgery or mastectomy)
- Find out whether the cancer has spread to the lymph nodes under the arm (sentinel lymph node biopsy or axillary lymph node dissection)
- Restore the breast's shape after the cancer is removed (breast reconstruction)
- Relieve symptoms of advanced cancer

Surgery to remove breast cancer

There are two main types of surgery to remove breast cancer:

- **Breast-conserving surgery** (also called a *lumpectomy, quadrantectomy, partial mastectomy, or segmental mastectomy*) – in which only the part of the breast containing the cancer is removed. The goal is to remove the cancer as well as some surrounding normal tissue. How much of the breast is removed depends on the size and location of the tumor and other factors.

- **Mastectomy** – in which the entire breast is removed, including all of the breast tissue and sometimes other nearby tissues. There are several different types of mastectomies. Some women may also get a double mastectomy, in which both breasts are removed.

Choosing between breast-conserving surgery and mastectomy

Many women with early-stage cancers can choose between breast-conserving surgery (BCS) and mastectomy. The main advantage of BCS is that a woman keeps most of her breast. But in most cases she will also need radiation. Women who have mastectomy for early-stage cancers are less likely to need radiation.

Surgery to remove nearby lymph nodes

To find out if the breast cancer has spread to axillary (underarm) lymph nodes, one or more of these lymph nodes will be removed and looked at under the microscope. This is an important part of figuring out the stage (extent) of the

cancer. Lymph nodes can be removed either as part of the surgery to remove the breast cancer or in a separate operation.

Breast reconstruction after surgery

After having a mastectomy (or some breast-conserving surgeries), a woman might want to consider having the breast mound rebuilt to restore the breast's appearance after surgery. This is called breast reconstruction.

There are several types of reconstructive surgery, although your options may depend on your medical situation and personal preferences. You may have a choice between having breast reconstruction at the same time as the mastectomy (immediate reconstruction) or at a later time (delayed reconstruction).

If you are thinking about having reconstructive surgery, it's a good idea to discuss it before your mastectomy. This gives the surgical team time to plan out the treatment options that might be best for you, even if you wait and have the reconstructive surgery later.

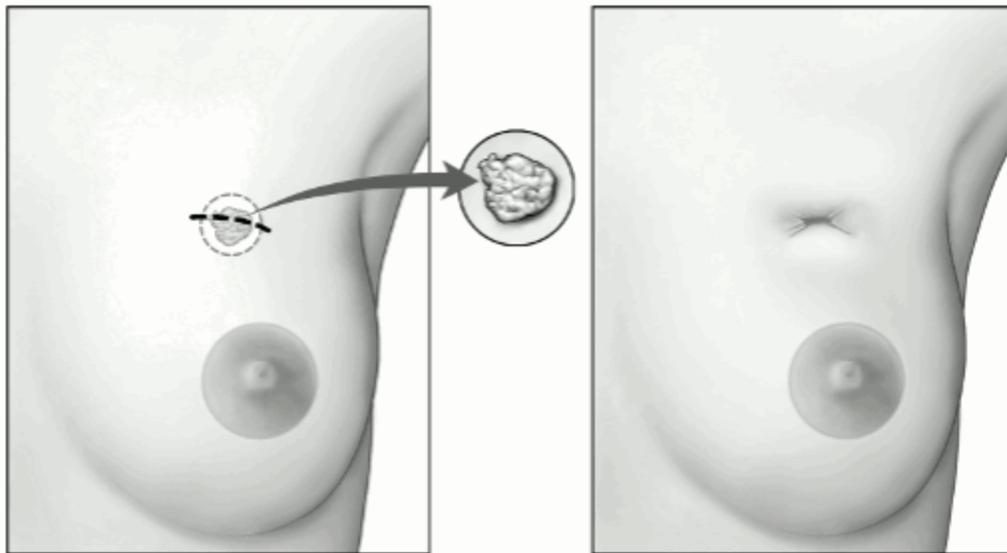
Surgery for advanced breast cancer

Although surgery is very unlikely to cure breast cancer that has spread to other parts of the body, it can still be helpful in some situations, either as a way to slow the spread of the cancer, or to help prevent or relieve symptoms from it. For example, surgery might be used:

- When the breast tumor is causing an open wound in the breast (or chest)
- To treat a small number of areas of cancer spread (metastases) in a certain part of the body, such as the brain
- When an area of cancer spread is pressing on the spinal cord
- To treat a blockage in the liver
- To provide relief of pain or other symptoms

Breast-conserving surgery (lumpectomy)

Breast-conserving surgery is sometimes called *lumpectomy*, *quadrantectomy*, *partial mastectomy*, or *segmental mastectomy*. In this surgery, only the part of the breast containing the cancer is removed. The goal is to remove the cancer as well as some surrounding normal tissue. How much of the breast is removed depends on the size and location of the tumor and other factors.



The tumor is removed with a rim of normal breast tissue.

Postoperative appearance depends on the amount of tissue removed, but there will be a small scar and often an indentation in the breast.

Mastectomy

Mastectomy is surgery to remove the entire breast. All of the breast tissue is removed, sometimes along with other nearby tissues.

There are several different types of mastectomies, based on how the surgery is done and how much additional tissue is removed.

Simple (or total) mastectomy

The surgeon removes the entire breast, including the nipple, but does not remove underarm lymph nodes or muscle tissue from beneath the breast.

Double mastectomy

If a mastectomy is done on both breasts, it is called a double (or bilateral) mastectomy. When this is done, it is often as preventive surgery for women at very high risk for getting cancer in the other breast, such as those with a *BRCAGene* mutation.

Skin-sparing mastectomy

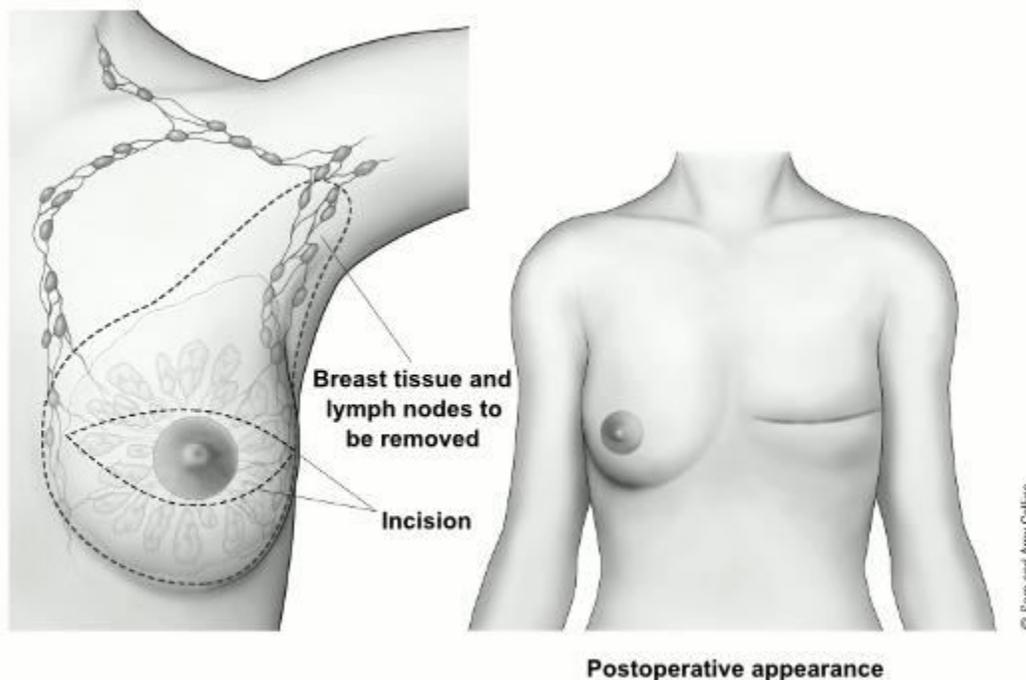
For some women considering immediate reconstruction, a skin-sparing mastectomy can be done. In this procedure, most of the skin over the breast (other than the nipple and areola) is left intact. This can work as well as a simple mastectomy. The amount of breast tissue removed is the same as with a simple

mastectomy. Implants or tissue from other parts of the body are used to reconstruct the breast.

Skin-sparing mastectomy may not be suitable for larger tumors or those that are close to the surface of the skin.

Modified radical mastectomy

A modified radical mastectomy combines a simple mastectomy with the removal of the lymph nodes under the arm (called an *axillary lymph node dissection*).



Modified radical mastectomy

Nipple-sparing mastectomy

Nipple-sparing mastectomy is a variation of the skin-sparing mastectomy. It is more often an option for women who have a small, early-stage cancer near the outer part of the breast, with no signs of cancer in the skin or near the nipple. In this procedure, the breast tissue is removed, but the breast skin and nipple are left in place. This is followed by breast reconstruction.

Radical mastectomy

In this extensive operation, the surgeon removes the entire breast, axillary (underarm) lymph nodes, and the pectoral (chest wall) muscles under the

breast. This surgery was once very common, but less extensive surgery (such as modified radical mastectomy) has been found to be just as effective and with fewer side effects, so this surgery is rarely done now. This operation may still be done for large tumors that are growing into the pectoral muscles.

Lymph node surgery for breast cancer

If you have been diagnosed with breast cancer, it's important to find out how far the cancer has spread. To help find out if the cancer has spread beyond the breast, one or more of the lymph nodes under the arm (axillary lymph nodes) are removed and checked under a microscope. This is an important part of staging. When the lymph nodes contain cancer cells, there is a higher chance that cancer cells have also spread to other parts of the body. Treatment decisions will often depend on whether cancer is found in the lymph nodes.

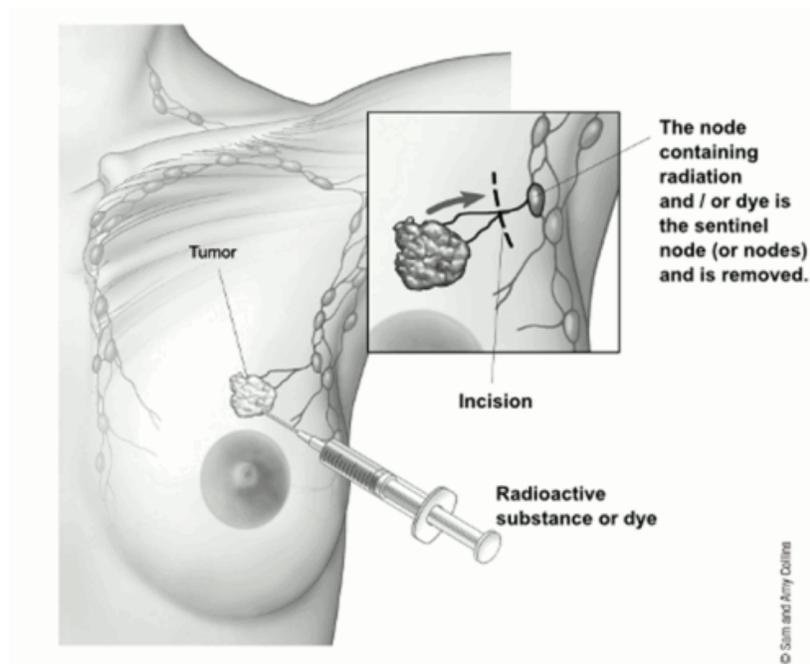
Types of lymph node surgery

Even if the nearby lymph nodes are not enlarged, they will still need to be checked for cancer. This can be done in two different ways. Sentinel lymph node biopsy is the most common and least invasive way, but in some cases a more extensive axillary lymph node dissection might be needed.

Lymph node surgery is often done as part of the main surgery to remove the breast cancer, but in some cases it might be done as a separate operation.

Sentinel lymph node biopsy (SLNB)

In a sentinel lymph node biopsy (SLNB), the surgeon finds and removes the first lymph node(s) to which a tumor is likely to spread (called the *sentinel nodes*). To do this, the surgeon injects a radioactive substance and/or a blue dye into the tumor, the area around it, or the area around the nipple. Lymphatic vessels will carry these substances along the same path that the cancer would be likely to take. The first lymph node(s) the dye or radioactive substance travels to will be the sentinel node(s).

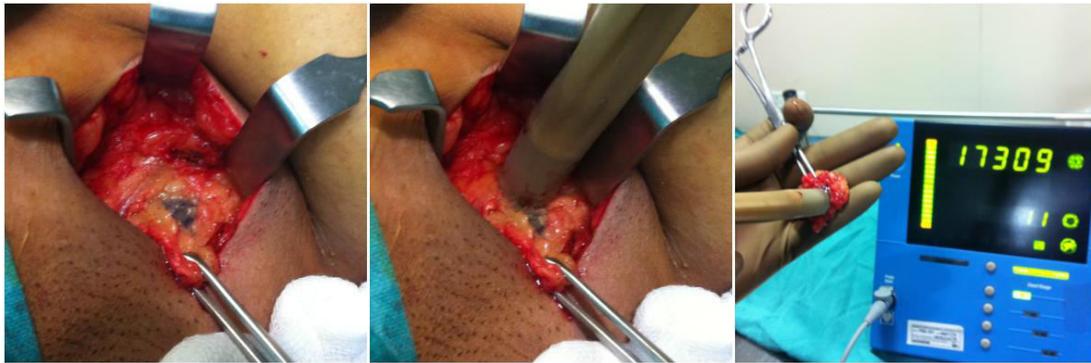


Sentinel lymph node biopsy

After the substance has been injected, the sentinel node(s) can be found either by using a special device to detect radioactivity in the nodes that the radioactive substance flows into, or by looking for lymph nodes that have turned blue. To double check, both methods are often used. The surgeon cuts the skin over the area and removes the node(s) containing the dye or radiation.

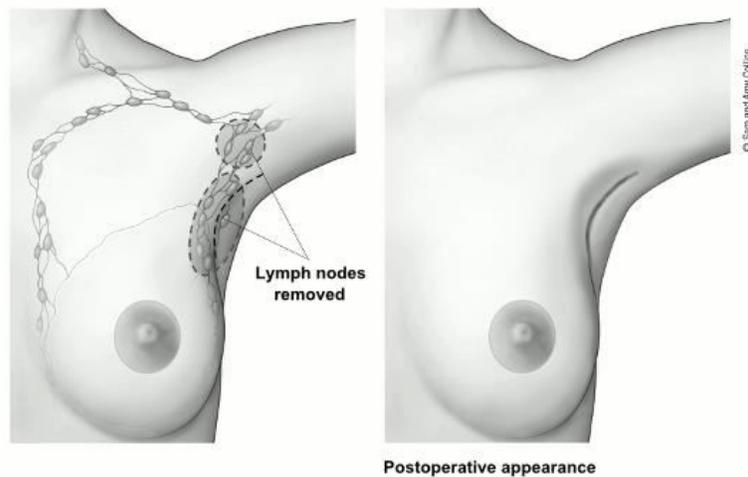
The removed lymph nodes (often 2 or 3 nodes) are then checked closely for cancer cells by a doctor called a *pathologist*. This is sometimes done during the surgery called **Frozen section**. This way, if cancer is found in the sentinel lymph node(s), the surgeon may do a full axillary dissection (ALND) to remove more lymph nodes. If no cancer cells are seen in the node(s) at the time of the surgery, or if the sentinel node(s) are not checked by a pathologist at the time of the surgery, they will be examined more closely over the next several days. If cancer is found in the sentinel node(s) later, the surgeon may recommend a full ALND at a later time to check more nodes for cancer.

SENTINEL LYMPHNODE BIOPSY AT OMEGA HOSPITALS



Axillary lymph node dissection (ALND)

In this procedure, anywhere from about 10 to 40 (though usually less than 20) lymph nodes are removed from the area under the arm (axilla) and checked for cancer spread. ALND is usually done at the same time as a mastectomy or breast-conserving surgery (BCS), but it can be done in a second operation. This was once the most common way to check to see if breast cancer had spread to nearby lymph nodes, and it is still sometimes needed. For example, an ALND may be done if a previous biopsy has shown one or more of the underarm lymph nodes have cancer cells.



Axillary lymph node dissection

Radiotherapy

Radiotherapy is a method of advanced cancer treatment in which the oncologist uses high energy radioactive rays most commonly X-rays. This method of treatment is painless and incision less and non-invasive. Recent refinements and advances in treatment delivery have made radiation treatments more comfortable to the patients.

The goal radiotherapy is to eliminate the tumors in the area which is targeted to receive radiation and at the same time protect the normal and critical areas in and around the tumor tissue. This is the vital part of radiation planning and at Omega Hospitals we take utmost care of the patient in the selection of treatment technique and execution of the treatment plan after passing rigorous quality checks.

Radiotherapy is broadly divided into two types:

1. Teletherapy
2. Brachytherapy

Teletherapy(ExternalRadiotherapy) consists of treating the patient from distance. This is one of the earliest forms of radiotherapy treatments. Technology innovations in the field of medicine for diagnosis, identification and imaging of tumors coupled with explosion of advancements in accelerator technology and tracking software's led to more precise and accurate delivery of treatment by External Radiotherapy (XRT).

Different types of delivery of XRT are:

1. 3-dimensional conformal radiotherapy(3-DCRT)
2. Intensity modulated radiotherapy(IMRT)
3. Volumetric modulated radiotherapy(VMAT)
4. Image Guided radiotherapy(IGRT)

Brachytherapy consists of treating the tumors from within by placing the radiation sources inside or near the tumor. There are different types of brachytherapy depending technique of delivery and dose rates. They are:-

1. Intracavitary
2. Interstitial
3. Surface or mould
4. Seed brachytherapy

Depending on the dose rate,

1. Low dose rate
2. Medium dose rate
3. High dose rate
4. Pulsed dose rate

Omega hospital is equipped with Microselectron HDR brachytherapy system coupled with Oncentra treatment planning. This aids in precise planning of different types of brachytherapy. With integrated brachytherapy suite, Omega hospital is capable of delivering the best of care for the brachytherapy patients.

Radiotherapy for Breast Cancer at Omega Hospital is planned with all the available sophisticated techniques and utmost care is taken to prevent doses to the critical organs. A typical schedule of

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