



# Breast Cancer Treatment

## 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.

## How is breast cancer typically treated?

Most women with breast cancer will have some type of surgery to remove the tumor. Depending on the type of breast cancer and how advanced it is, you may need other types of treatment as well, either before or after surgery, or sometimes both. Surgery is less likely to be a main part of the treatment for more advanced breast cancers.

Typical treatment plans are based on the type of breast cancer, its stage, and any special situations:

- [Invasive breast cancer \(stages I-IV\)](#)
- [Ductal carcinoma in situ \(DCIS\)](#)
- [Lobular carcinoma in situ \(LCIS\)](#)
- [Inflammatory breast cancer](#)
- [Breast cancer during pregnancy](#)

Your treatment plan will depend on other factors as well, including your overall health and personal preferences.

## Who treats breast cancer?

Doctors on your cancer treatment team might include:

- A breast surgeon: a doctor who uses surgery to treat breast cancer
- A radiation oncologist: a doctor who uses radiation to treat cancer
- A medical oncologist: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists might be part of your treatment team as well, including physician assistants, nurse practitioners, nurses, psychologists, social workers, nutritionists, and other health professionals. See [Health Professionals Associated With Cancer Care](#) for more on this.

## Making treatment decisions

It's important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. It's also very important to ask questions if there is anything you're not sure about. See [Questions to Ask Your Doctor About Breast Cancer](#) for ideas.

## Getting a second opinion

You may also want to [get a second opinion](#). This can give you more information and help you feel more certain about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help.

## Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service at 1-800-303-5691 for a list of studies that meet your medical needs, or see [Clinical Trials](#) to learn more.

## **Considering complementary and alternative methods**

You may hear about alternative or complementary methods to treat your cancer or relieve symptoms that your doctor hasn't mentioned. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

*Complementary methods* refer to treatments that are used *along with* your regular medical care. *Alternative treatments* are used *instead of* a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be dangerous.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision. See [Complementary and Alternative Medicine](#) to learn more.

## **Choosing to stop treatment or choosing no treatment at all**

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are things you can do to help maintain or improve your quality of life. Learn more in [If Cancer Treatments Are No Longer Working](#).

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons people might choose to not get cancer treatment, but it's important to talk to your doctors and make that decision. Remember that even if you choose not to treat the cancer, you can still get [supportive care](#) to help with pain or other symptoms.

## Help for getting through breast cancer treatment

Your cancer care team will be your first source of information and support, but there are many places where you can get more help when you need it. Hospital- or clinic-based support services are an important part of your care. These might include nurse or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has [programs and services](#) – including rides to treatment, lodging, support groups, and more – to help you get through treatment. Call us at 1-800-227-2345 and speak to one of our trained cancer information specialists who are on call 24 hours a day, every day.

## Surgery for Breast Cancer

Surgery is a common treatment for breast cancer, and its main purpose is to remove as much of the cancer as possible. There are different types of surgery. You may have a choice about which type to have. Or your doctor may recommend a certain operation based on your breast cancer type and your medical history. It's important to know about your options so you can talk about them with your doctor and make the choice that is right for you.

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.

For some women, mastectomy may clearly be a better option, because of the type of breast cancer, the large size of the tumor, previous treatment history, or certain other factors.

## 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 as a separate operation.

The two main types of surgery to remove lymph nodes are:

- **[Sentinel lymph node biopsy \(SLNB\)](#)** – in which the surgeon removes only the lymph node(s) under the arm to which the cancer would likely spread first. Removing only one or a few lymph nodes lowers the risk of side effects from the surgery.
- **[Axillary lymph node dissection \(ALND\)](#)** – in which the surgeon removes anywhere from about 10 to 40 (though usually less than 20) lymph nodes from under the arm. ALND is not done as often as it was in the past, but it might still be the best way to look at the lymph nodes in some situations.

To learn more about these procedures and when they might be done, see [Lymph node surgery for breast cancer](#).

## 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 with your breast surgeon and a plastic surgeon **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.

To learn about different breast reconstruction options, see our section on [breast reconstruction](#).

## 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

If your doctor recommends surgery for advanced breast cancer, it's important that you understand its goal—whether it's to try to cure the cancer or to prevent or treat symptoms.

- [References](#)

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and*

*Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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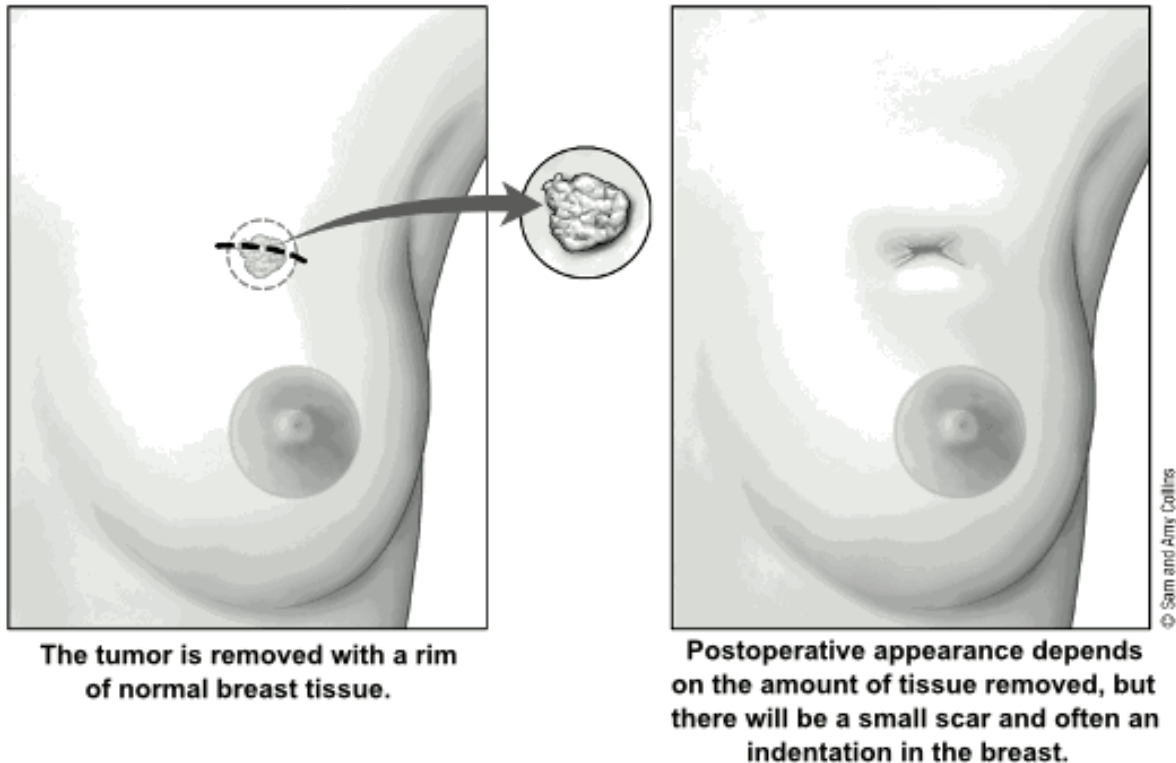
## Breast-conserving Surgery (Lumpectomy)

Breast-conserving surgery is an operation to remove the cancer while leaving as much of the breast intact as possible. Some surrounding healthy tissue and lymph nodes are usually also removed. It's often an option for a woman with early-stage cancer, and allows her to keep most of her breast.

- Breast-conserving surgery (BCS) allows a woman to keep most of her breast, but makes it likely she will also need radiation.
- Not all women with breast cancer are candidates for BCS. Talk to your doctor to find out whether BCS is an option for you.
- Studies show that choosing BCS (plus radiation) over mastectomy does not affect a woman's chances of long-term survival.
- If you think you may want breast reconstruction, talk to your doctor before your breast cancer surgery.
- After BCS, most women will have radiation therapy. Some women might get other treatments as well, such as hormone therapy or chemotherapy.
- Side effects of BCS may include pain and lymphedema, a type of swelling, in the arm.

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.



## Lumpectomy/partial mastectomy

### Who can get breast-conserving surgery?

Breast-conserving surgery (BCS) is a good option for many women with early-stage cancers. The main advantage is that a woman keeps most of her breast. However, she will in most cases also need radiation therapy. Women who have their entire breast removed (mastectomy) for early stage cancers are less likely to need radiation, but they may be referred to a doctor who specializes in radiation, called a *radiation oncologist*, for evaluation because each patient's cancer is unique.

Most women and their doctors prefer BCS and radiation therapy when it's a reasonable option. BCS might be a good option if you:

- Are very concerned about losing your breast
- Are willing to have radiation therapy and able to get to the appointments
- Have not already had the breast treated with radiation therapy or BCS



- Have only one area of cancer on the breast, or multiple areas that are close enough together to be removed without changing the look of the breast too much
- Have a small tumor (5 cm [2 inches] or smaller), which is also small relative to your breast size
- Are not pregnant or, if pregnant, will not need radiation therapy immediately (to avoid risking harm to the fetus)
- Do not have a genetic factor such as a *BRCA* mutation, which might increase your chance of a second cancer
- Do not have certain serious connective tissue diseases such as scleroderma or lupus, which may make you especially sensitive to the side effects of radiation therapy
- Do not have inflammatory breast cancer

Some women might be worried that having a less extensive surgery might raise their risk of the cancer coming back. But the fact is that in most cases, mastectomy does not give you any better chance of long-term survival or a better outcome from treatment. Studies following thousands of women for more than 20 years show that when BCS can be done, having mastectomy instead does not provide any better chance of survival.

## Will I need breast reconstruction surgery after breast-conserving surgery?

Before your surgery, talk to your breast surgeon about how breast-conserving surgery might change the look of your breast. The larger the portion of breast removed, the more likely it is that you will see a change in the shape of the breast afterward. If your breasts look very different after surgery, it may be possible to have some type of reconstructive surgery or to have the size of the unaffected breast reduced to make the breasts more symmetrical. It may even be possible to have this done during the initial surgery. It's very important to talk with your doctor (and possibly a plastic surgeon) **before** surgery to get an idea of how your breasts are likely to look afterward, and to learn what your options might be.

## Recovering from breast-conserving surgery: What to expect after surgery

This type of surgery is usually done in an outpatient surgery center, and an overnight stay in the hospital is usually not needed. Most women can return to their regular activities within 2 weeks.

Ask a member of your health care team how to care for your surgery site and arm. Usually, you and your caregivers will get written instructions about care after surgery. These instructions should cover:

- How to care for the surgery site and dressing
- How to care for your drain, if you have one (This is a plastic or rubber tube coming out of the surgery site that removes the fluid that collects during healing.)
- How to recognize signs of infection
- Bathing and showering after surgery
- When to call the doctor or nurse
- When to start using the arm again and how to do arm exercises to prevent stiffness
- When you can start wearing a bra again
- What to eat and not to eat
- Use of medicines, including pain medicines and possibly antibiotics
- Any restrictions on activity
- What to expect regarding sensations or numbness in the breast and arm
- What to expect regarding feelings about body image
- When to see your doctor for a follow-up appointment
- Referral to a Reach To Recovery volunteer. Through our Reach To Recovery program, a specially trained volunteer who has had breast cancer can provide information, comfort, and support.

## **How can the doctors be sure all of the cancer was removed?**

During the surgery, the surgeon will try to remove all of the cancer, plus some surrounding normal tissue.

After surgery is complete, a doctor called a pathologist will use a microscope to look at the tissue that was removed. If the pathologist finds no cancer cells at any of the edges of the removed tissue, it is said to have *negative* or *clear margins*. But if cancer cells are found at the edges of the tissue, it is said to have *positive margins*.

The presence of positive margins means that some cancer cells may have been left behind after surgery, so the surgeon may need to go back and remove more tissue. This operation is called a *re-excision*. If the surgeon can't remove enough breast tissue to get clear surgical margins, a mastectomy may be needed.

The distance from the tumor to the margin is also important. Even if the margins are

“clear,” they could be “close”—meaning the distance between the edge of the tumor and edge of the tissue removed is too small and more surgery may be needed. Surgeons sometimes disagree on what is an adequate (or good) margin.

## **Will more treatment be needed after breast-conserving surgery?**

Most women will need radiation therapy to the breast after breast-conserving surgery. Sometimes, to make it easier to aim the radiation, small metallic clips (which will show up on x-rays) may be placed inside the breast during surgery to mark the area.

Many women receive hormone therapy after surgery to help lower the risk of the cancer coming back. Some women might also need chemotherapy after surgery. If so, radiation therapy is usually delayed until the chemotherapy is completed.

## **Side effects of breast-conserving surgery**

Side effects of breast-conserving surgery can include:

- Pain or tenderness
- Temporary swelling
- Hard scar tissue that forms in the surgical site
- Change in the shape of the breast
- Nerve (neuropathic) pain in the chest wall, armpit, and/or arm that doesn't go away over time (called post-mastectomy pain syndrome or PMPS)

As with all operations, bleeding and infection at the surgery site are also possible. If axillary lymph nodes are also removed, other side effects such as lymphedema may occur.

- [References](#)

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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# Mastectomy

Mastectomy is a way of treating breast cancer by removing the entire breast through surgery. It's often done when a woman cannot be treated with breast-conserving surgery (lumpectomy), which spares most of the breast. It can also be done if a woman chooses mastectomy over breast-conserving surgery for personal reasons. Women at very high risk of getting a second cancer sometimes have a double mastectomy, the removal of both breasts.

## Types of mastectomies

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

### Simple (or total) mastectomy

Simple mastectomy is the most common type of mastectomy used to treat breast cancer. In this procedure, the surgeon removes the entire breast, including the nipple, but does not remove underarm lymph nodes or muscle tissue from beneath the breast. (Sometimes lymph nodes are removed in a different procedure during the same surgery.) Most women, if they are hospitalized, can go home the next day.

### 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 *BRCA* gene mutation.

### Skin-sparing mastectomy

For some women considering immediate breast 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 then 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. This approach has not been used for as long as the more standard type of mastectomy, but many women prefer it because it offers the advantage of less scar tissue and a reconstructed breast that seems more natural.

## **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. (Cancer cells are more likely to be hidden in the nipple if the breast tumor is larger or close to the nipple, which means there is a higher risk the cancer will come back if the nipple is not removed.)

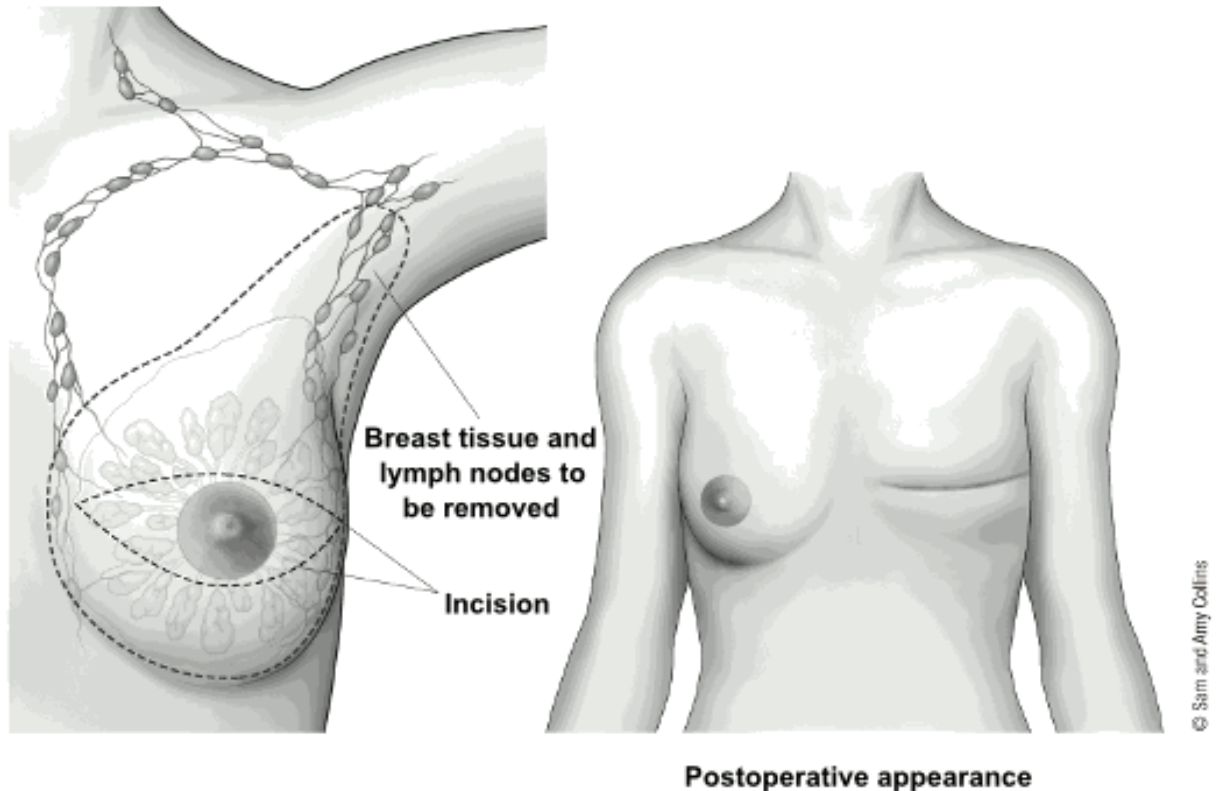
In this procedure, the breast tissue is removed, but the breast skin and nipple are left in place. This is followed by breast reconstruction. The surgeon often removes the breast tissue beneath the nipple (and areola) during the procedure to check for cancer cells. If cancer is found in this tissue, the nipple must be removed. Even when no cancer is found under the nipple, some doctors give the nipple tissue a dose of radiation during or after the surgery to try to reduce the risk of the cancer coming back.

There are still some issues with nipple-sparing surgeries. Afterward, the nipple does not have a good blood supply, so sometimes it can wither or become deformed. Because the nerves are also cut, there is little or no feeling left in the nipple. For women with larger breasts, the nipple may look out of place after the breast is reconstructed. As a result, many doctors feel that this surgery is best done in women with small to medium sized breasts. This procedure leaves less visible scars, but if it isn't done properly, it can leave behind more breast tissue than other forms of mastectomy. This could result in a higher risk of cancer developing than for a skin-sparing or simple mastectomy. This was more of a problem in the past, but improvements in technique have helped make this surgery safer. Still, many experts do not yet consider nipple-sparing procedures to be a standard treatment for breast cancer.

## **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

### 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.

### Who should get a mastectomy?

Many women with early-stage cancers can choose between breast-conserving surgery (BCS) and mastectomy. You may have an initial gut preference for mastectomy as a way to "take it all out as quickly as possible." But the fact is that in most cases, mastectomy does not give you any better chance of long-term survival or a better

outcome from treatment. Studies following thousands of women for more than 20 years show that when BCS can be done, doing a mastectomy instead does not provide any better chance of survival.

Although most women and their doctors prefer BCS (with radiation therapy) when it's a reasonable option, there are cases where mastectomy is likely to be the best choice. For example, mastectomy might be recommended if you:

- Are unable to have radiation therapy, or would prefer a more extensive surgery to having radiation therapy
- Have already had the breast treated with radiation therapy
- Have already had BCS along with re-excision(s) that did not completely removed the cancer
- Have two or more areas of cancer in the same breast that are not close enough together to be removed without changing the look of the breast too much
- Have a larger tumor (greater than 5 cm [2 inches] across), or a tumor that is large relative to your breast size
- Are pregnant and would need radiation therapy while still pregnant (risking harm to the fetus)
- Have a genetic factor such as a *BRCA* mutation, which might increase your chance of a second cancer
- Have a serious connective tissue disease such as scleroderma or lupus, which may make you especially sensitive to the side effects of radiation therapy
- Have inflammatory breast cancer

For women who are worried about breast cancer recurrence, it is important to understand that having a mastectomy instead of breast-conserving surgery plus radiation *only* lowers your risk of developing a second breast cancer in the same breast. It does not lower the chance of the cancer coming back in other parts of the body.

## **Should I have breast reconstruction surgery after mastectomy?**

After having a mastectomy a woman might want to consider having the breast mound rebuilt to restore the breast's appearance. This is called *breast reconstruction*. Although each case is different, most mastectomy patients can have reconstruction.

Reconstruction can be done at the same time as the mastectomy or sometime later.

If you are thinking about having reconstructive surgery, it's a good idea to discuss it with your surgeon and a plastic surgeon **before** your mastectomy. This allows the surgical

teams to plan the treatment that's best for you, even if you wait and have the reconstructive surgery later. Insurance companies typically cover breast reconstruction, but you should check with your insurance company so you know what is covered.

Some women choose not to have reconstructive surgery. Wearing a breast prosthesis (breast form) is an option for women who want to have the contour of a breast under their clothes without having surgery. Some women are also comfortable with just 'going flat', especially if both breasts were removed.

## **Recovering from a mastectomy: What to expect after surgery**

In general, women having a mastectomy stay in the hospital for 1 or 2 nights and then go home. However, some women may be placed in a 23-hour, short-stay observation unit before going home. How long it takes to recover from surgery depends on what procedures were done. Most women can return to their regular activities within about 4 weeks. Recovery time is longer if breast reconstruction was done as well, and it can take months to return to full activity after some procedures.

Ask a member of your health care team how to care for your surgery site and arm. Usually, you and your caregivers will get written instructions about care after surgery. These instructions should cover:

- How to care for the surgery site and dressing
- How to care for your drain, if you have one (this is a plastic or rubber tube to coming out of the surgery site that removes the fluid that collects during healing)
- How to recognize signs of infection
- Bathing and showering after surgery
- When to call the doctor or nurse
- When to start using the arm again and how to do arm exercises to prevent stiffness
- When you can start wearing a bra again
- When to begin using a prosthesis and what type to use
- What to eat and not to eat
- Use of medicines, including pain medicines and possibly antibiotics
- Any restrictions on activity
- What to expect regarding sensations or numbness in the breast and arm
- What to expect regarding feelings about body image
- When to see your doctor for a follow-up appointment
- Referral to a Reach To Recovery volunteer. Through our Reach To Recovery



program, a specially trained volunteer who has had breast cancer can provide information, comfort, and support.

## Will more treatment be needed after mastectomy?

Some women might get other treatments after a mastectomy, such as radiation therapy, hormone therapy, chemotherapy, or targeted therapy. Talk to your doctor about what to expect.

## Side effects of mastectomy

To some extent, the side effects of mastectomy can depend on the type of mastectomy you have (with more extensive surgeries tending to have more side effects). Side effects can include:

- Pain or tenderness
- Swelling at the surgery site
- Buildup of blood in the wound (hematoma)
- Buildup of clear fluid in the wound (seroma)
- Limited arm or shoulder movement
- Numbness in the chest or upper arm
- Nerve (neuropathic) pain in the chest wall, armpit, and/or arm that doesn't go away over time (called post-mastectomy pain syndrome or PMPS)

As with all operations, bleeding and infection at the surgery site are also possible. If axillary lymph nodes are also removed, other side effects such as lymphedema may occur.

- [References](#)

Chung AP, Sacchini V. Nipple-sparing mastectomy: where are we now? *Surg Oncol.* 2008;17:261-266.

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

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## Lymph Node Surgery for Breast Cancer

If breast cancer spreads, it often goes first to nearby [lymph nodes](#). Knowing whether the cancer has spread to your lymph nodes helps medical providers find the best way to treat your 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.

Lymph node removal can be done in different ways, depending on whether any lymph nodes are enlarged, how big the breast tumor is, and other factors.

### Biopsy of an enlarged lymph node

If any of the lymph nodes under the arm or around the collar bone are swollen, they may be checked for cancer spread directly with a needle [biopsy](#) (either a fine needle aspiration [FNA] or a core needle biopsy). Less often, the enlarged node is removed with surgery. If cancer is found in the lymph node, more nodes will need to be removed during an axillary lymph node dissection (described below).

### Types of lymph node surgery

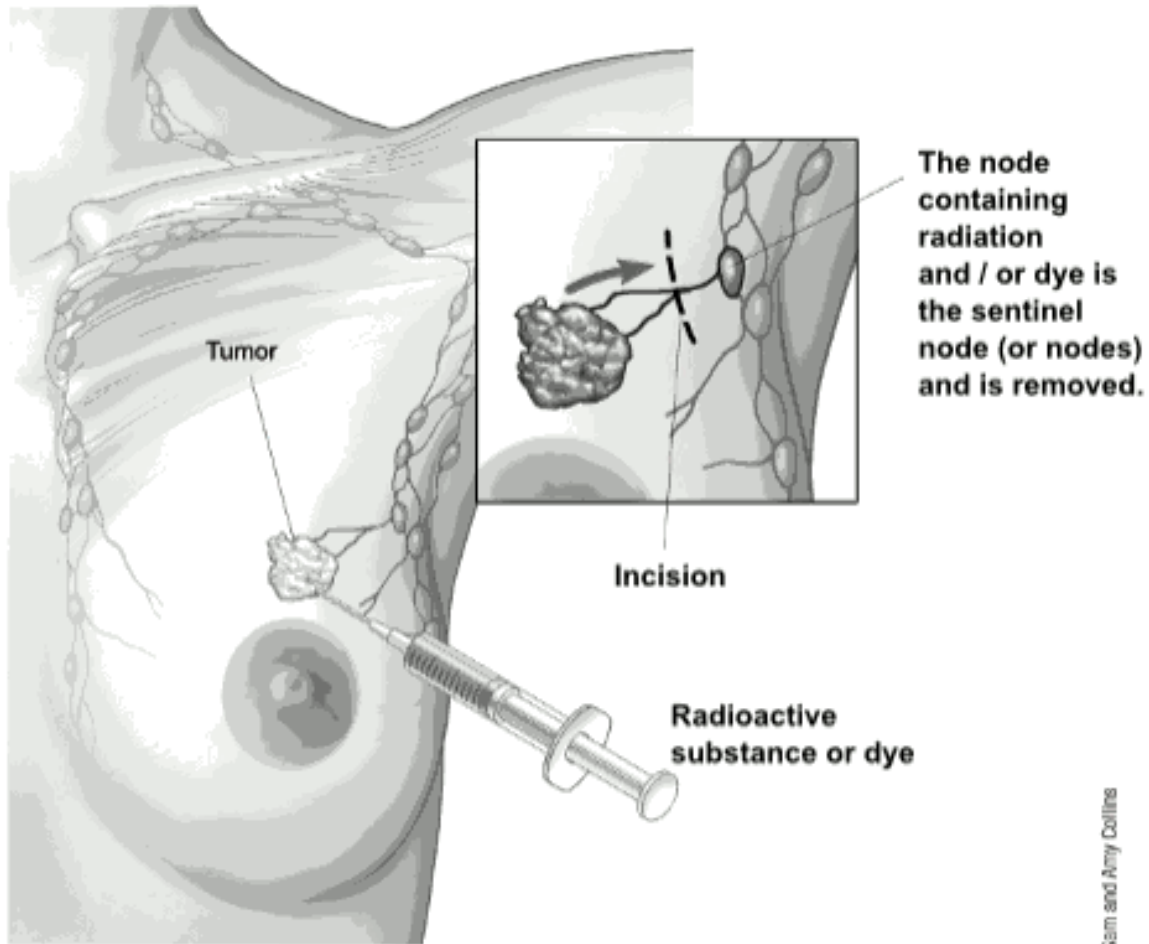
Even if the nearby lymph nodes are not enlarged, they will still need to be checked for cancer. This can be done in two different ways. Sentinel lymph node biopsy is the most common and least invasive way, but in some cases a more extensive axillary lymph

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).



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## 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, or by looking for 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. 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.

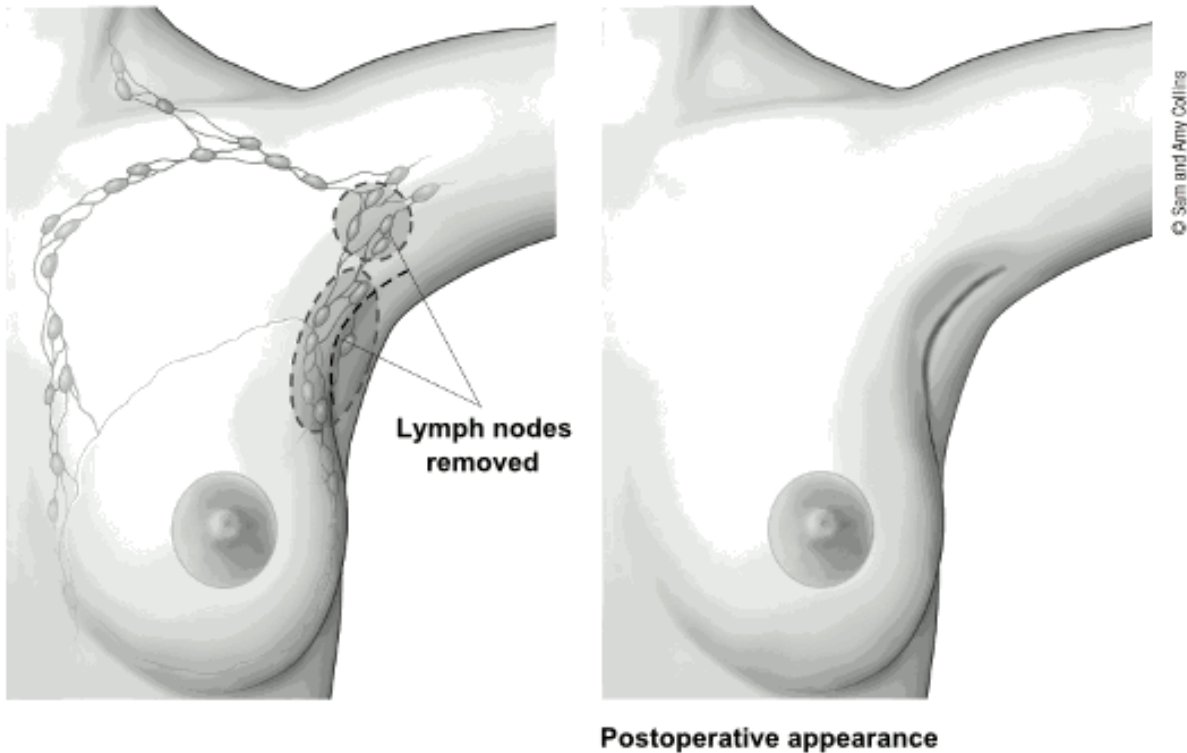
If cancer is found in the sentinel node(s) later, the surgeon may recommend a full ALND at a later time to check more nodes for cancer. Recently, however, studies have shown that in some cases it may be just as safe to leave the rest of the lymph nodes behind. This is based on certain factors, such as the size of the breast tumor, what type of surgery is used to remove the tumor, and what treatment is planned after surgery. Based on the studies that have looked at this, skipping the ALND may be an option for women with tumors 5 cm (2 inches) or smaller who are having breast-conserving surgery followed by radiation. Because this hasn't been studied well in women who have had mastectomy, it isn't clear that skipping the ALND would be safe for them.

If there is no cancer in the sentinel node(s), it's very unlikely that the cancer has spread to other lymph nodes, so no further lymph node surgery is needed.

Although SLNB has become a common procedure, it requires a great deal of skill. It should be done only by a surgeon who has experience with this technique. If you are thinking about having this type of biopsy, ask your health care team if they do them regularly.

### **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 for breast cancer 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.



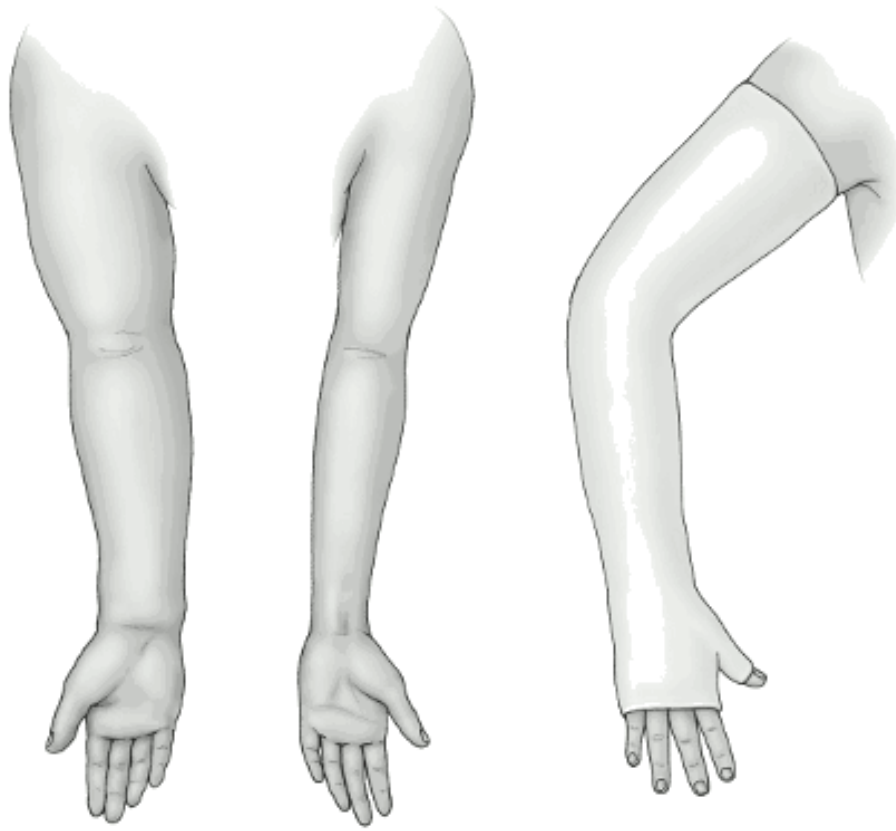
## Axillary lymph node dissection

### Side effects of lymph node surgery

As with any operation, **pain, swelling, bleeding, blood clots,** and **infection** are possible.

#### Lymphedema

A possible long-term effect of lymph node surgery is swelling in the arm or chest called [lymphedema](#). Because any excess fluid in the arms normally travels back into the bloodstream through the lymphatic system, removing the lymph nodes sometimes blocks drainage from the arm, causing this fluid to build up.



**Left, an arm showing lymphedema swelling beside an unaffected arm. Right, a compression garment used to help control lymphedema.**

© Sam and Amy Collins

This is less common after a sentinel lymph node biopsy (SLNB) than an axillary lymph node dissection (ALND).

Up to 30% of women who have ALND develop lymphedema. It also occurs in up to 3% of women who have SLNB. It may be more common if radiation is given after surgery. Sometimes the swelling lasts for only a few weeks and then goes away. But in some women, it lasts a long time. If your arm is swollen, tight, or painful after lymph node surgery, be sure to tell someone on your cancer care team right away.

### **Limited arm and shoulder movement**

You might also have **limited movement in your arm and shoulder** after surgery. This is more common after ALND than SLNB. Your doctor may advise exercises to help keep you from having permanent problems (a frozen shoulder).

Some women notice a rope-like structure that begins under the arm and can extend

down toward the elbow. This is sometimes called **axillary web syndrome** or **lymphatic cording**. It is more common after ALND than SLNB. Symptoms may not appear for weeks or even months after surgery. It can cause pain and limit movement of the arm and shoulder. This often goes away without treatment, although some women may find physical therapy helpful.

## Numbness

**Numbness** of the skin on the upper, inner arm is a common side effect because the nerve that controls sensation here travels through the lymph node area.

- [References](#)

Galimberti V, Cole BF, Zurrada S, et al. Axillary dissection versus no axillary dissection in patients with sentinel-node micrometastases (IBCSG 23-01): A phase 3 randomised controlled trial. *Lancet Oncol.* 2013;14:297-305.

Giuliano AE, Hunt KK, Ballman KV, et al. Axillary dissection vs no axillary dissection in women with invasive breast cancer and sentinel node metastasis. *JAMA.* 2011;305:569-575.

Lawenda BD, Mondry TE, Johnstone PA. Lymphedema: A primer on the identification and management of a chronic condition in oncologic treatment. *CA Cancer J Clin.* 2009; 59:8–24.

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

Moskovitz AH, Anderson BO, Yeung RS, et al. Axillary web syndrome after axillary dissection. *Am J Surg.* 2001;181:434-439.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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# Exercises After Breast Cancer Surgery

Many women with breast cancer have some kind of surgery, even though other kinds of treatment are done, too. You may have had a:

- Breast biopsy
- Lymph node biopsy or removal
- Breast conservation surgery (lumpectomy)
- Mastectomy
- Breast reconstruction

Any of these can affect how well you can move your shoulder and arm, take a deep breath, or do your daily activities, like dressing, bathing, and combing your hair. Pain and stiffness can cause weakness and limit movement of your arm and shoulder.

## Exercises can help restore movement.

No matter what type of surgery you have, it's important to do exercises afterward to get the arm and shoulder moving again. Exercises help to decrease side effects of your surgery and help you get back to your usual activities.

If you've had radiation therapy after surgery, exercises are even more important to help keep your arm and shoulder flexible. Radiation may affect your arm and shoulder long after treatment is finished. Because of this, it's important to develop a regular habit of doing exercises to maintain arm and shoulder mobility after radiation treatments for breast cancer.

It's very important to talk with your doctor before starting any exercises so that you can decide on a program that's right for you. Your doctor might suggest you see a physical therapist or occupational therapist, or a cancer exercise specialist certified by the American College of Sports Medicine. These health professionals are specially trained to design an exercise program just for you. You might need this kind of help if you do not have full use of your arm within 3 to 4 weeks of surgery.

Some exercises should not be done until drains and sutures (stitches) are removed. But some exercises can be done soon after surgery. The exercises that increase your shoulder and arm motion can usually be started in a few days. Exercises to help make your arm stronger are added later.

## The week after surgery

The tips and exercises listed below should be done for the first 3 to 7 days after surgery. **Do not do them until you get the OK from your doctor.**

- Use your affected arm (on the side where your surgery was) as you normally would when you comb your hair, bathe, get dressed, and eat.
- Lie down and raise your affected arm above the level of your heart for 45 minutes. Do this 2 or 3 times a day. Put your arm on pillows so that your hand is higher than your wrist and your elbow is a little higher than your shoulder. This will help decrease the swelling that may happen after surgery.
- Exercise your affected arm while it's raised above the level of your heart by opening and closing your hand 15 to 25 times. Next, bend and straighten your elbow. Repeat this 3 to 4 times a day. This exercise helps reduce swelling by pumping lymph fluid out of your arm.
- Practice deep breathing exercises (using your diaphragm) at least 6 times a day. Lie down on your back and take a slow, deep breath. Breathe in as much air as you can while trying to expand your chest and abdomen (push your belly button away from your spine). Relax and breathe out. Repeat this 4 or 5 times. This exercise will help maintain normal movement of your chest, making it easier for your lungs to work. Do deep breathing exercises often.
- Do not sleep on your affected arm or lie on that side.

## General guidelines for these exercises

The exercises described here can be done as soon as your doctor says it's OK. They're usually started a week or more after surgery. Be sure to talk to your doctor before trying any of them. Here are some things to keep in mind after breast surgery:

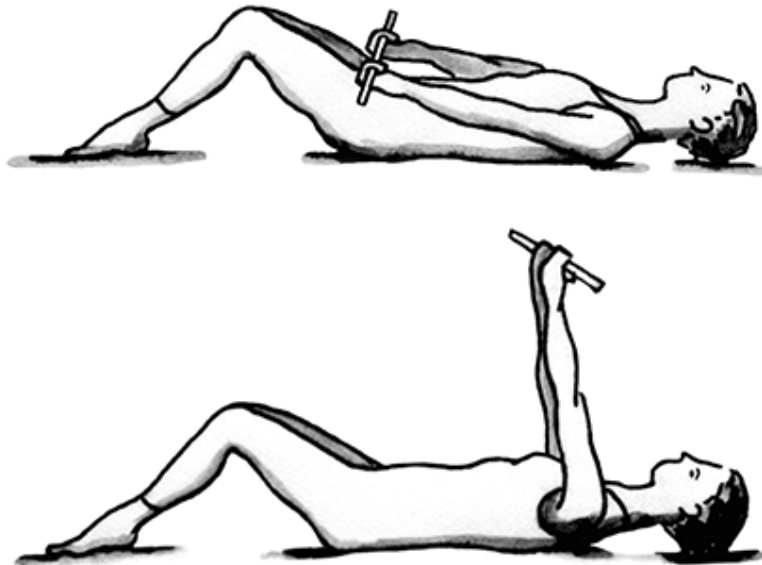
- You will feel some tightness in your chest and armpit after surgery. This is normal, and the tightness will decrease as you do your exercises.
- Many women have burning, tingling, numbness, or soreness on the back of the arm and/or on the chest wall. This is because the surgery can irritate some of your nerves. These feelings might increase a few weeks after surgery. But keep doing your exercises unless you notice unusual swelling or tenderness. (If this happens, let your doctor know about it right away.) Sometimes rubbing or stroking the area with your hand or a soft cloth can help make the area less sensitive.
- It may be helpful to do the exercises after a warm shower when muscles are warm

and relaxed.

- Wear comfortable, loose clothing when doing the exercises.
- Do the exercises slowly until you feel a gentle stretch. Hold each stretch at the end of the motion and slowly count to 5. It's normal to feel some pulling as you stretch the skin and muscles that have been shortened because of the surgery. Do not bounce or make any jerky movements when doing any of the exercises. You should not feel pain as you do them, only gentle stretching.
- Do each exercise 5 to 7 times. Try to do each exercise correctly. If you have trouble with the exercises, talk to your doctor. You may need to be referred to a physical or occupational therapist.
- Do the exercises twice a day until you get back your normal flexibility.
- Be sure to take deep breaths, in and out, as you do each exercise.
- The exercises are set up so that you start them lying down, move to sitting, and finish them standing up.

**Here are some of the more common exercises that women do after breast surgery. Talk to your doctor or therapist about which of these are right for you and when you should start doing them. Do not start any of these exercises without talking to your doctor first.**

## **Wand exercise**



This exercise helps increase your ability to move your shoulders forward. You will need

a broom handle, yardstick, or other stick-like object to use as the wand in this exercise. Do these exercises on a bed or the floor. Lie on your back with your knees bent and your feet flat.

- Hold the wand across your belly in both hands with your palms facing up.
- Lift the wand up over your head as far as you can. Use your unaffected arm to help lift the wand until you feel a stretch in your affected arm.
- Hold for 5 seconds.
- Lower arms and repeat 5 to 7 times.

### **Elbow winging**



This exercise helps increase the movement in the front of your chest and shoulder. It may take many weeks of regular exercise before your elbows will get close to the bed or floor. Do these exercises on a bed or the floor. Lie on your back with your knees bent and your feet flat.

- Clasp your hands behind your neck with your elbows pointing toward the ceiling.
- Move your elbows apart and down toward the bed or floor.
- Repeat 5 to 7 times.

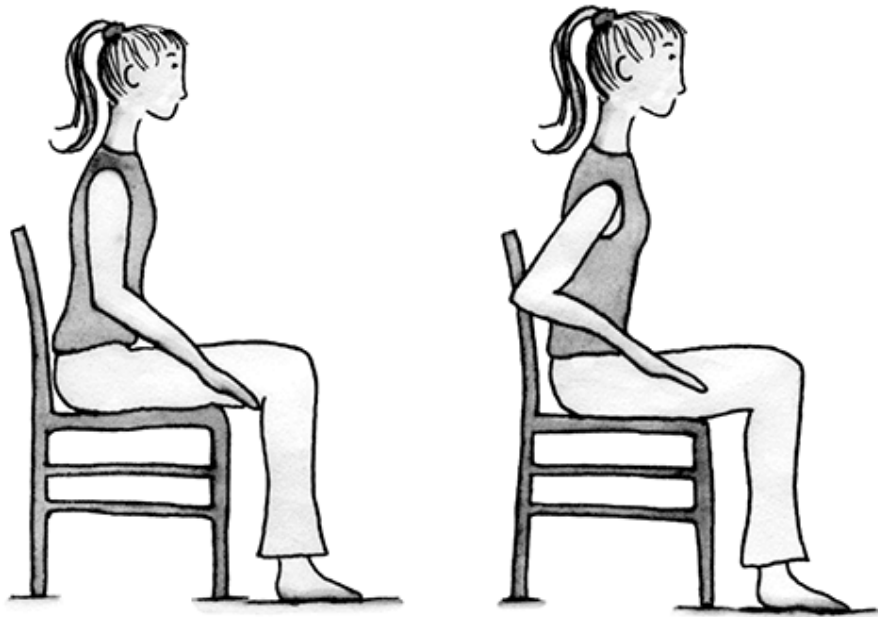
### **Shoulder blade stretch**



This exercise helps increase your shoulder blade movement.

- Sit in a chair very close to a table with your back against the back of the chair.
- Place the unaffected arm on the table with your elbow bent and palm down. Do not move this arm during the exercise.
- Place the affected arm on the table, palm down, with your elbow straight.
- Without moving your trunk, slide the affected arm forward, toward the opposite side of the table. You should feel your shoulder blade move as you do this.
- Relax your arm and repeat 5 to 7 times.

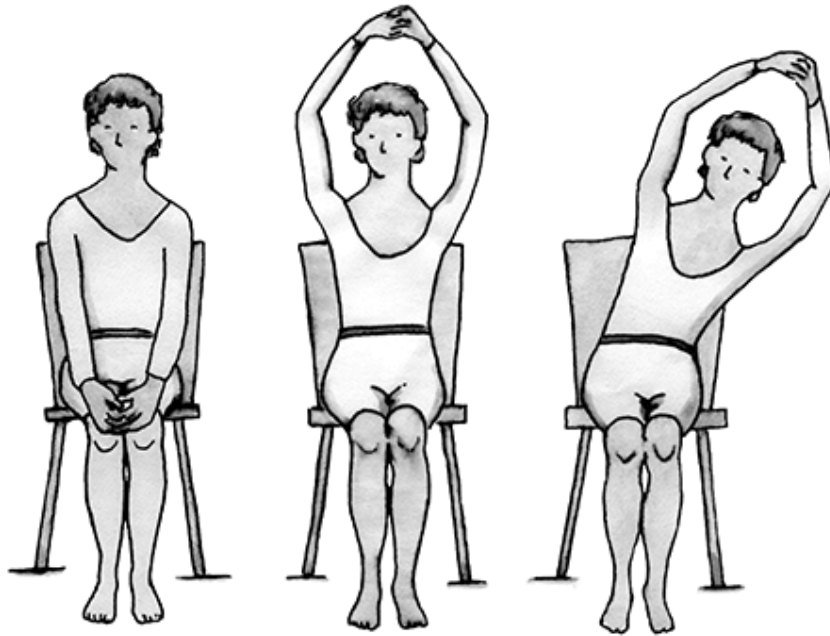
### **Shoulder blade squeeze**



This exercise also helps increase shoulder blade movement.

- Sit in a chair in front of a mirror. Face straight ahead. Do not rest against the back of the chair.
- Your arms should be at your sides with your elbows bent.
- Squeeze your shoulder blades together, bringing your elbows behind you. Keep your shoulders level as you do this. Do not lift your shoulders up toward your ears.
- Return to the starting position and repeat 5 to 7 times.

## **Side bends**



This exercise helps increase movement of your trunk and body.

- Sit in a chair and clasp your hands together in front of you. Lift your arms slowly over your head, straightening your arms.
- When your arms are over your head, bend your trunk to the right keeping your arms overhead.
- Return to the starting position and bend to the left.
- Repeat 5 to 7 times.

### **Chest wall stretch**

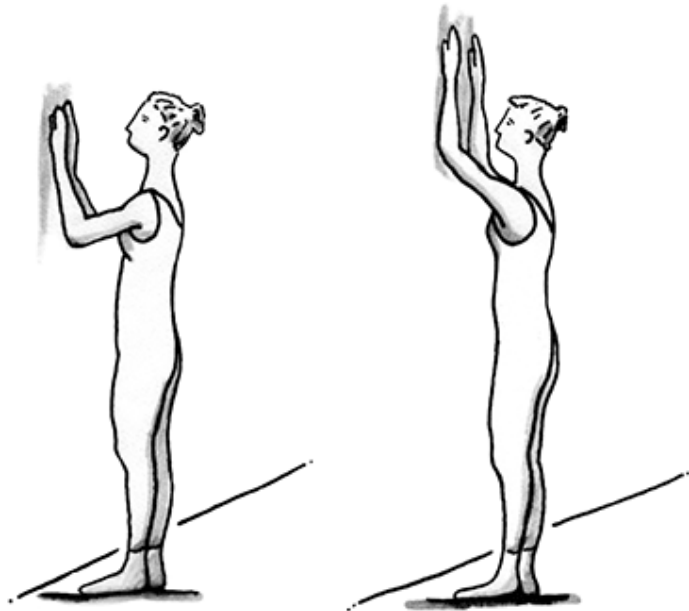


This exercise helps stretch your chest.

- Stand facing a corner with your toes about 8 to 10 inches from the corner.
- Bend your elbows and put your forearms on the wall, one on each side of the corner. Your elbows should be as close to shoulder height as possible.
- Keep your arms and feet in place and move your chest toward the corner. You will feel a stretch across your chest and shoulders.
- Return to the starting position and repeat 5 to 7 times.
- The picture shows stretching both sides at the same time, but you may find it more comfortable to stretch one arm at a time.
- Be sure you keep your shoulders dropped far away from your ears as you do this stretch.

## **Shoulder stretch**





This exercise helps increase your mobility in your shoulder.

- Stand facing the wall with your toes about 8 to 10 inches from the wall.
- Put your hands on the wall. Use your fingers to "climb the wall," reaching as high as you can until you feel a stretch.
- Return to the starting position and repeat 5 to 7 times.
- The picture shows both arms going up at the same time, but you might find it easier to raise one arm at a time.
- Be sure you keep your shoulders dropped far away from your ears as you raise your arms.

## **Things to keep in mind after breast surgery**

Start exercising slowly and increase as you are able. Stop exercising and talk to your doctor right away if you:

- Get weaker, start losing your balance, or start falling
- Have pain that gets worse
- Have new heaviness, aching, tightness, or other strange sensations in your arm
- Have unusual swelling or swelling gets worse
- Have headaches, dizziness, blurred vision, new numbness, or tingling in your arms or chest

It's important to exercise to keep your muscles working as well as possible, but it's also important to be safe. Talk with your doctor about the right kind of exercises for your condition, and then set goals for increasing your level of physical activity.

## Other kinds of exercise

Exercise to help improve aerobic (heart-lung) capacity is also important for women who have had breast cancer. There's evidence that fitness and weight loss may even help lower the risk that some types of cancer will come back after treatment. Ask your doctor about fitness exercises during and after breast cancer treatment.

Other exercises are designed to help reduce your risk of [lymphedema](#), or swelling in the arm on the side where you had surgery. The exercises shown here are mainly designed to help regain range of motion (flexibility) of the arm and shoulder. Ask your doctor about your lymphedema risk and if you should use exercises to help reduce that risk.

Strengthening exercises are now recommended as part of regular exercise programs to improve health. These are not started until 4 to 6 weeks after surgery, and must be tailored to your general health, medical condition, and fitness. Strength building starts by using small hand weights, and is increased slowly over time. Again, this is best addressed with your doctor or physical therapist. It's probably best to start a strengthening program in a supervised setting with a cancer exercise trainer or physical therapist to be sure you're doing the exercises properly.

**This information was developed with assistance from the Oncology Section of the American Physical Therapy Association.**

- [References](#)

Anderson RT, Kimmick GG, McCoy TP, et al. A randomized trial of exercise on well-being and function following breast cancer surgery: the RESTORE trial. *J Cancer Surviv.* 2012;6(2):172-181.

McNeely ML, Campbell K, Ospina M, et al. Exercise interventions for upper-limb dysfunction due to breast cancer treatment. *Cochrane Database Syst Rev.* 2010;(6):CD005211.

NLN Medical Advisory Committee. Position Statement of the National Lymphedema Network: Exercise. October 2013. Accessed at [www.lymphnet.org/resources/position-paper-exercise](http://www.lymphnet.org/resources/position-paper-exercise) on April 12, 2016.

Petito EL, Nazário AC, Martinelli SE, Facina G, De Gutiérrez MG. Application of a

domicile-based exercise program for shoulder rehabilitation after breast cancer surgery. *Rev Lat Am Enfermagem*. 2012;20(1):35-43.

Sagen A, Kaaresen R, Sandvik L, Thune I, Risberg MA. Upper limb physical function and adverse effects after breast cancer surgery: a prospective 2.5-year follow-up study and preoperative measures. *Arch Phys Med Rehabil*. 2014;95(5):875-881.

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## Radiation for Breast Cancer

Some women with breast cancer will need radiation, often in addition to other treatments. The need for radiation depends on what type of surgery you had, whether your cancer has spread to the lymph nodes or somewhere else in your body, and in some cases, your age. You may have just one type of radiation, or a combination of different types.

Radiation therapy is treatment with high-energy rays (such as x-rays) or particles that destroy cancer cells. There are 2 main types of radiation therapy that can be used to treat breast cancer:

- **External beam radiation:** This type of radiation comes from a machine outside the body.
- **Internal radiation (brachytherapy):** For this treatment, a radioactive source is put inside the body for a short time.

### When might radiation therapy be used?

Not all women with breast cancer need radiation therapy, but it may be used in several situations:

- After [breast-conserving surgery](#) (BCS), to help lower the chance that the cancer will come back in the breast or nearby lymph nodes
- After a [mastectomy](#), especially if the cancer was larger than 5 cm (about 2 inches), or if cancer is found in the lymph nodes
- If cancer has spread to other parts of the body, such as the bones or brain

## External beam radiation

This is the most common type of radiation therapy for women with breast cancer. The radiation is focused from a machine outside the body on the area affected by the cancer.

Which areas need radiation depends on whether mastectomy or breast-conserving surgery (BCS) was done and whether or not the cancer has reached nearby lymph nodes.

- If you had a mastectomy and no lymph nodes had cancer, radiation is targeted at the chest wall and the places where any drains exited the body after surgery.
- If you had BCS, you will most likely have radiation to the entire breast, and an extra boost of radiation to the area in the breast where the cancer was removed to help prevent it from coming back in that area. The boost is often given after the treatments to the whole breast have ended. It uses the same machine, but the beams are aimed at the place where the cancer was removed. Most women don't notice different side effects from boost radiation than from whole breast radiation.
- If cancer was found in the lymph nodes under the arm (axillary lymph nodes), radiation may be given to this area as well. In some cases, the area treated may also include the nodes above the collarbone (supraclavicular lymph nodes) and the nodes beneath the breast bone in the center of the chest (internal mammary lymph nodes).

## When will I get radiation therapy?

If you will need external radiation therapy after surgery, it is usually not started until the tissues have a chance to heal, which is often a month or longer. If you are getting chemotherapy as well, radiation treatments are usually delayed until chemotherapy is complete.

## Preparing for external beam radiation therapy

Before your treatments start, the radiation team will take careful measurements to figure out the correct angles for aiming the radiation beams and the proper dose of radiation. They will make some ink marks or small tattoos on your skin to be used as a guide to focus the radiation on the right area. Check with your health care team whether the marks they use will be permanent.

External radiation therapy is much like getting an x-ray, but the radiation is stronger. The procedure itself is painless. Each treatment lasts only a few minutes, but the setup time—getting you into place for treatment—usually takes longer.

## Types and schedules of external beam radiation

The traditional schedule for getting breast radiation has been 5 days a week (Monday through Friday) for about 5 to 6 weeks. But many doctors are now using *accelerated breast irradiation* to give larger doses over a shorter time. There are several different types of accelerated breast irradiation:

- **Hypofractionated radiation therapy:** In this approach, radiation is given in larger doses using fewer treatments – typically for only 3 weeks. In women treated with breast conserving surgery (BCS) and without cancer spread to underarm lymph nodes, this schedule has been shown to be just as good at keeping the cancer from coming back in the same breast as giving the radiation over 5 weeks. It might also lead to fewer short-term side effects. In a newer approach now being studied, larger doses of radiation are given each day, but the course of radiation is shortened to only 5 days.
- **Intraoperative radiation therapy (IORT):** In this approach, a single large dose of radiation is given in the operating room right after BCS (before the breast incision is closed). IORT requires special equipment and is not widely available.
- **3D-conformal radiotherapy:** In this technique, the radiation is given with special machines so that it is better aimed at the area where the tumor was. This allows more of the healthy breast to be spared. Treatments are given twice a day for 5 days. Because only part of the breast is treated, this is considered to be a form of accelerated *partial* breast irradiation. (Other forms of accelerated partial breast irradiation are described under “Brachytherapy.”)

Researchers hope these approaches will prove to be at least equal to the current, standard radiation therapy methods, but few studies have compared them directly to standard radiation therapy. It is not known if all of the newer methods will have the same long-term results as standard radiation, so not all doctors use them. Women who are interested in these approaches may want to ask their doctor about taking part in clinical trials of accelerated breast irradiation now going on.

## Possible side effects of external radiation

The main short-term side effects of external beam radiation therapy to the breast are:

- Swelling and heaviness in the breast
- Skin changes in the treated area
- Fatigue

Skin changes can range from mild redness to blistering and peeling. Your health care team may advise you to avoid exposing the treated skin to the sun because it may make the skin changes worse. Most skin changes get better within a few months. Changes to the breast tissue usually go away in 6 to 12 months, but it can take longer.

External beam radiation therapy can also cause side effects later on:

- Some women may find that radiation therapy causes the breast to become smaller and firmer.
- Radiation may affect your options for breast reconstruction later on. It can also raise the risk of problems if it's given after reconstruction, especially tissue flap procedures.
- Women who have had breast radiation may have problems breastfeeding later on.
- Radiation to the breast can sometimes damage some of the nerves to the arm. This is called *brachial plexopathy* and can lead to numbness, pain, and weakness in the shoulder, arm, and hand.
- Radiation to the underarm lymph nodes can cause lymphedema, a type of pain and swelling in the arm or chest.
- In rare cases, radiation therapy may weaken the ribs, which could lead to a fracture.
- In the past, parts of the lungs and heart were more likely to get some radiation, which could lead to long-term damage of these organs in some women. But modern radiation therapy equipment allows doctors to better focus the radiation beams, so these problems are rare today.
- A very rare complication of radiation to the breast is the development of another cancer called an *angiosarcoma*. These rare cancers can grow and spread quickly.

## Brachytherapy

Brachytherapy, also known as *internal radiation*, is another way to deliver radiation therapy. Instead of aiming radiation beams from outside the body, a device containing radioactive seeds or pellets is placed into the breast tissue for a short time in the area where the cancer had been.

For women who had breast-conserving surgery (BCS), brachytherapy can be used along with external beam radiation as a way to add an extra boost of radiation to the

tumor site. It may also be used by itself (instead of radiation to the whole breast) as a form of *accelerated partial breast irradiation*. Tumor size, location, and other factors may limit who can get brachytherapy.

## Types of brachytherapy

There are different types of brachytherapy:

- **Interstitial brachytherapy:** In this approach, several small, hollow tubes called *catheters* are inserted into the breast around the area where the cancer was removed and are left in place for several days. Radioactive pellets are inserted into the catheters for short periods of time each day and then removed. This method of brachytherapy has been around longer (and has more evidence to support it), but it is not used as much anymore.
- **Intracavitary brachytherapy:** This is the most common type of brachytherapy for women with breast cancer. A device is put into the space left from BCS and is left in place until treatment is complete. There are several different devices that can be used, including MammoSite, SAVI, Axxent, and Contura. They all go into the breast as a small catheter (tube). The end of the device inside the breast is then expanded so that it stays securely in place for the entire treatment. The other end of the catheter sticks out of the breast. For each treatment, one or more sources of radiation (often pellets) are placed down through the tube and into the device for a short time and then removed. Treatments are typically given twice a day for 5 days as an outpatient. After the last treatment, the device is collapsed down again and removed.

Early studies of intracavitary brachytherapy as the only radiation after BCS have had promising results, but they didn't directly compare this technique with standard whole breast external beam radiation.

One study that compared outcomes after BCS found that women treated with brachytherapy were more likely to go on to get a mastectomy of the treated breast (most likely because cancer was found again in that breast). The overall risk was still low, however, with about 4% of the women in the brachytherapy group needing mastectomy versus only 2% of the women in the whole breast radiation group. More studies comparing these approaches are now in progress.

## Possible side effects of intracavitary brachytherapy

As with external beam radiation, intracavitary brachytherapy can have side effects,

including:

- Redness
- Bruising
- Breast pain
- Infection
- Breakdown of an area of fat tissue in the breast
- Weakness and fracture of the ribs in rare cases
- [References](#)

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Shaitelman SF, Schlembach PJ, Arzu I, et al. Acute and short-term toxic effects of conventionally fractionated vs hypofractionated whole-breast irradiation: A randomized clinical trial. *JAMA Oncol*. 2015;1:931-941.

Smith GL, Xu Y, Buchholz TA, et al. Association between treatment with brachytherapy vs whole-breast irradiation and subsequent mastectomy, complications, and survival among older women with invasive breast cancer. *JAMA*. 2012;307:1827-1837.

Whelan T, MacKenzie R, Julian J, et al. Randomized trial of breast irradiation schedules after lumpectomy for women with lymph node-negative breast cancer. *J Natl Cancer Inst*. 2002;94:1143-1150.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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# Chemotherapy for Breast Cancer

Chemotherapy (*chemo*) is treatment with cancer-killing drugs that may be given intravenously (injected into a vein) or by mouth. The drugs travel through the bloodstream to reach cancer cells in most parts of the body.

## When is chemotherapy used?

Not all women with breast cancer will need chemo, but there are several situations in which chemo may be recommended:

- **After surgery (adjuvant chemotherapy):** Adjuvant chemo is used after surgery to try to kill any cancer cells that may have been left behind or spread but can't be seen, even on imaging tests. If these cells were allowed to grow, they could form new tumors in other places in the body. Adjuvant chemo can reduce the risk of breast cancer coming back.
- **Before surgery (neoadjuvant chemotherapy):** Neoadjuvant chemo is given before surgery. It can be used to try to shrink the tumor so that it can be removed with less extensive surgery. Because of this, neoadjuvant chemo is often used to treat cancers that are too big to be removed at the time of diagnosis (called *locally advanced* cancers). Also, by giving chemo before the tumor is removed, doctors can better see how the cancer responds to it. If the first set of chemo drugs doesn't shrink the tumor, your doctor will know that other drugs are needed.
- **For advanced breast cancer:** Chemo can be used as the main treatment for women whose cancer has spread outside the breast and underarm area, either when it is diagnosed or after initial treatments. The length of treatment depends on how well the chemo is working and how well you tolerate it.

## Which chemotherapy drugs are used for breast cancer?

In most cases (especially as adjuvant or neoadjuvant treatment), chemo is most effective when combinations of more than one drug are used. Today, doctors use many different combinations, and it's not clear that any single combination is clearly the best.

### The most common drugs used for adjuvant and neoadjuvant chemo

## **include:**

- Anthracyclines, such as doxorubicin (Adriamycin) and epirubicin (Ellence)
- Taxanes, such as paclitaxel (Taxol) and docetaxel (Taxotere)
- 5-fluorouracil (5-FU)
- Cyclophosphamide (Cytosan)
- Carboplatin (Paraplatin)

Most often, combinations of 2 or 3 of these drugs are used.

## **Chemotherapy for advanced breast cancer**

Chemo drugs useful in treating women with breast cancer that has spread include:

- Docetaxel
- Paclitaxel
- Platinum agents (cisplatin, carboplatin)
- Vinorelbine (Navelbine)
- Capecitabine (Xeloda)
- Liposomal doxorubicin (Doxil)
- Gemcitabine (Gemzar)
- Mitoxantrone (Novantrone)
- Ixabepilone (Ixempra)
- Albumin-bound paclitaxel (nab-paclitaxel or Abraxane)
- Eribulin (Halaven)

Although drug combinations are often used to treat early breast cancer, advanced breast cancer is more often treated with single chemo drugs. Still, some combinations, such as carboplatin or cisplatin plus gemcitabine, are commonly used to treat advanced breast cancer.

For cancers that are [HER2-positive](#), one or more drugs that target HER2 may be used with chemo. (See [Targeted therapy for breast cancer](#) for more information about these drugs.)

## **How is chemotherapy given?**

Chemo drugs for breast cancer are typically given into a vein (IV), either as an injection over a few minutes or as an infusion over a longer period of time. This can be done in a doctor's office, chemotherapy clinic, or in a hospital setting.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to give the body time to recover from the effects of the drugs. Cycles are most often 2 or 3 weeks long. The schedule varies depending on the drugs used. For example, with some drugs, the chemo is given only on the first day of the cycle. With others, it is given for a few days in a row, or once a week. Then, at the end of the cycle, the chemo schedule repeats to start the next cycle.

Adjuvant and neoadjuvant chemo is often given for a total of 3 to 6 months, depending on the drugs used. The length of treatment for advanced breast cancer is based on how well it is working and what side effects you have.

## **Dose-dense chemotherapy**

Doctors have found that giving the cycles of certain chemo drugs closer together can lower the chance that the cancer will come back and improve survival for some women. For example, a drug that would normally be given every 3 weeks might be given every 2 weeks. This approach can be used for neoadjuvant and adjuvant treatment. It can lead to more problems with low blood cell counts, so it's not an option for all women.

## **Possible side effects of chemo for breast cancer**

Chemo drugs can cause side effects. These depend on the type and dose of drugs given, and the length of treatment. Some of the most common possible side effects include:

- Hair loss
- Nail changes
- Mouth sores
- Loss of appetite or increased appetite
- Nausea and vomiting
- Diarrhea

Chemo can affect the blood-forming cells of the bone marrow, which can lead to:

- Increased chance of infections (from low white blood cell counts)
- Easy bruising or bleeding (from low blood platelet counts)
- Fatigue (from low red blood cell counts and other reasons)

These side effects usually go away after treatment is finished. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Other side effects are also possible. Some of these are more common with certain chemo drugs. Ask your cancer care team about the possible side effects of the specific drugs you are getting.

## **Nerve damage (neuropathy)**

Many drugs used to treat breast cancer, including the taxanes (docetaxel and paclitaxel), platinum agents (carboplatin, cisplatin), vinorelbine, eribulin, and ixabepilone, can damage nerves outside of the brain and spinal cord. This can sometimes lead to symptoms (mainly in the hands and feet) like numbness, pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. In most cases this goes away once treatment is stopped, but it might last a long time in some women. (See [Peripheral Neuropathy Caused By Chemotherapy](#).)

## **Hand-foot syndrome**

Certain chemo drugs, such as capecitabine and liposomal doxorubicin, can irritate the palms of the hands and the soles of the feet. This is called *hand-foot syndrome*. Early symptoms include numbness, tingling, and redness. If it gets worse, the hands and feet can become swollen and uncomfortable or even painful. The skin may blister, leading to peeling or even open sores. There is no specific treatment, although some creams may help. These symptoms gradually get better when the drug is stopped or the dose is lowered. The best way to prevent severe hand-foot syndrome is to tell your doctor when early symptoms come up, so that the drug dose can be changed.

## **Chemo brain**

Many women who are treated for breast cancer report a slight decrease in mental functioning. They may have some problems with concentration and memory, which may last a long time. Although many women have linked this to chemo, it also has been seen in women who did not get chemo as part of their treatment. Still, most women function well after treatment. In studies that have found chemo brain to be a side effect of treatment, the symptoms most often last for a few years. (See [Chemo Brain](#).)

## **Feeling unwell or tired (fatigue)**

Many women do not feel as healthy after chemo as they did before. There is often a residual feeling of body pain or achiness and a mild loss of physical functioning. These may be very subtle changes that happen slowly over time.

[Fatigue](#) is another common problem for women who have received chemo. This may last up to several years. It can often be helped, so it's important to let your doctor or nurse know about it. Exercise, naps, and conserving energy may be recommended. If you have sleep problems, they can be treated. Sometimes women become depressed, which may be helped by counseling and/or medicines. (See [Fatigue](#).)

## Heart damage

Doxorubicin, epirubicin, and some other chemo drugs may cause permanent heart damage (called *cardiomyopathy*). The risk is highest if the drug is used for a long time or in high doses.

Most doctors will check your heart function with a test like an echocardiogram (an ultrasound of the heart) or a MUGA scan before starting one of these drugs. They also carefully control the doses, watch for symptoms of heart problems, and may repeat the heart test during treatment. If the heart function begins to decline, treatment with these drugs will be stopped. Still, in some people, signs might not appear until months or years after treatment stops. Damage from these drugs happens more often if other drugs that can cause heart damage, such as drugs that target HER2, are used as well, so doctors are more cautious when these drugs are used together.

## Menstrual changes and fertility issues

For younger women, changes in menstrual periods are a common side effect of chemo. Premature menopause (not having any more menstrual periods) and [infertility](#) (not being able to become pregnant) may occur and may be permanent. Some chemo drugs are more likely to cause this than others. The older a woman is when she gets chemotherapy, the more likely it is that she will go through menopause or become infertile as a result. When this happens, there is an increased risk of bone loss and osteoporosis. There are medicines that can treat or help prevent problems with bone loss.

Even if your periods have stopped while you are on chemo, you may still be able to get pregnant. Getting pregnant while on chemo could lead to birth defects and interfere with treatment. If you are pre-menopausal before treatment and are sexually active, it's important to discuss using birth control with your doctor. For women with hormone receptor-positive breast cancer, some types of hormonal birth control (like birth control pills) are not a good idea, so it's important to talk with both your oncologist and your gynecologist (or family doctor) about what options would be best in your case. Women who have finished treatment (like chemo) can safely go on to have children, but it's not safe to get pregnant while on treatment.

If you are pregnant when you get breast cancer, you still can be treated. Certain chemo drugs can be taken safely during the last 2 trimesters of pregnancy. We have more details in our section on breast cancer during pregnancy.

If you think you might want to have children after being treated for breast cancer, talk with your doctor before you start treatment. Learn more from our section on fertility concerns for women with cancer.

## Increased risk of leukemia

Very rarely, certain chemo drugs can cause diseases of the bone marrow, such as myelodysplastic syndrome or even acute myeloid leukemia, a cancer of white blood cells. When this happens it is usually within 10 years after treatment. For most women, the benefits of chemo in helping prevent breast cancer from coming back or in extending life are likely to far exceed the risk of this rare but serious complication.

- [References](#)

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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# Hormone Therapy for Breast Cancer

Some types of breast cancer are affected by hormones in the blood. [ER-positive and PR-positive breast cancer](#) cells have receptors that attach to estrogen, which helps them grow. There are different ways to stop estrogen from attaching to these receptors.

Hormone therapy is a form of systemic therapy, meaning it reaches cancer cells

anywhere in the body and not just in the breast. It's recommended for women with hormone receptor-positive (ER-positive and/or PR-positive) breast cancers, but it does not help women whose tumors are hormone receptor-negative (both ER- and PR-negative).

## When might hormone therapy be used?

Hormone therapy is often used after surgery (as adjuvant therapy) to help reduce the risk of the cancer coming back. Sometimes it is started before surgery (as neoadjuvant therapy) as well. It is usually used for at least 5 years.

Hormone therapy can also be used to treat cancer that has come back after treatment or that has spread to other parts of the body.

## How does hormone therapy work?

About 2 out of 3 breast cancers are hormone receptor-positive. Their cells have receptors that attach to the hormones estrogen (ER-positive cancers) and/or progesterone (PR-positive cancers). For these cancers, high estrogen levels help the cancer cells grow and spread.

There are several different types of hormone therapy, which use different ways to keep estrogen from helping the cancer grow. Most types of hormone therapy for breast cancer either lower estrogen levels or stop estrogen from acting on breast cancer cells.

## Drugs that block estrogen receptors

These drugs work by stopping estrogen from affecting breast cancer cells.

### Tamoxifen

**This drug blocks estrogen receptors in breast cancer cells.** This stops estrogen from binding to the cancer cells and telling them to grow and divide. While tamoxifen acts like an anti-estrogen in breast cells, it acts like an estrogen in other tissues, like the uterus and the bones. Because of this, it is called a *selective estrogen receptor modulator* (SERM).

[Tamoxifen](#) can be used in several ways:

- For women with hormone receptor-positive breast cancer treated with surgery, tamoxifen can help lower the chances of the cancer coming back and raise the chances of living longer. It can also lower the risk of getting a new cancer in the other breast. Tamoxifen can be started either after surgery (adjuvant therapy) or before surgery (neoadjuvant therapy) and is usually taken for 5 to 10 years. For early stage breast cancer, this drug is mainly used for women who have not yet gone through menopause. (If you have gone through menopause, aromatase inhibitors are usually used instead.)
- For women who have been treated for ductal carcinoma in situ (DCIS) that is hormone receptor-positive, taking tamoxifen for 5 years lowers the chance of the DCIS coming back. It also lowers the chance of getting an invasive breast cancer.
- For women with hormone-positive breast cancer that has spread to other parts of the body, tamoxifen can often help slow or stop the growth of the cancer, and might even shrink some tumors.
- In women at high risk of breast cancer, tamoxifen can be used to help lower the risk of developing breast cancer.

**Toremifene (Fareston)** is another SERM that works in a similar way, but it is used less often and is only approved to treat metastatic breast cancer. It is not likely to work if tamoxifen has already been used and has stopped working.

These drugs are taken by mouth, most often as a pill.

The most common side effects of tamoxifen and toremifene are:

- Fatigue
- Hot flashes
- Vaginal dryness or discharge
- Mood swings

Some women with cancer spread to the bones may have a "**tumor flare**" with pain and swelling in the muscles and bones. This usually subsides quickly, but in some rare cases a woman may also develop a high calcium level in the blood that is hard to control. If this happens, the treatment may need to be stopped for a time.

Rare, but more serious side effects are also possible:

- These drugs can increase the risk of developing **cancers of the uterus** (endometrial cancer and uterine sarcoma) in women who have gone through menopause. Tell your doctor right away about any unusual vaginal bleeding (a common symptom of both of these cancers). Most uterine bleeding is not from



cancer, but this symptom always needs prompt attention.

- **Blood clots** are another possible serious side effect. They usually form in the legs (called *deep vein thrombosis* or DVT), but sometimes a piece of clot may break off and end up blocking an artery in the lungs (*pulmonary embolism* or PE). Call your doctor or nurse right away if you develop pain, redness, or swelling in your lower leg (calf), shortness of breath, or chest pain, because these can be symptoms of a DVT or PE.
- Rarely, tamoxifen has been associated with **strokes** in post-menopausal women, so tell your doctor if you have severe headaches, confusion, or trouble speaking or moving.
- These drugs might also increase the risk of a **heart attack**.

Depending on a woman's menopausal status, tamoxifen can have different effects on the bones. In pre-menopausal women, tamoxifen can cause some bone thinning, but in post-menopausal women it is often good for bone strength.

The benefits of taking these drugs outweigh the risks for almost all women with hormone receptor-positive breast cancer.

## **Fulvestrant (Faslodex)**

**Fulvestrant is a drug that blocks estrogen receptors and also eliminates them temporarily.** This drug is not a SERM – it acts like an anti-estrogen throughout the body.

Fulvestrant is used to treat metastatic breast cancer, most often after other hormone drugs (like tamoxifen and often an aromatase inhibitor) have stopped working.

It is given by injections into the buttocks. For the first month, the shots are given 2 weeks apart. After that, they are given once a month.

Common short-term side effects can include:

- Hot flashes
- Night sweats
- Mild nausea
- Fatigue

Because fulvestrant blocks estrogen, in theory it could cause weakened bones (osteoporosis) if taken for a long time.

Fulvestrant is currently approved only for use in post-menopausal women. It is sometimes used “off-label” in pre-menopausal women, often combined with a luteinizing-hormone releasing hormone (LHRH) agonist to turn off the ovaries (see the section on Ovarian Ablation below).

## Treatments that lower estrogen levels

Some hormone treatments work by lowering the estrogen levels in the body. Because estrogen encourages hormone receptor-positive breast cancers to grow, lowering the estrogen level can help slow the cancer’s growth or help prevent it from coming back.

### Aromatase inhibitors (AIs)

**Aromatase inhibitors (AIs) are drugs that stop estrogen production.** Before menopause, most estrogen is made by the ovaries. But for women whose ovaries aren’t working, either due to menopause or certain treatments, a small amount of estrogen is still made by an enzyme (called *aromatase*) in the fat tissue. AIs work by blocking aromatase from making estrogen.

These drugs are most useful in women who are past menopause, although they can also be used in premenopausal women if combined with ovarian ablation (see below).

There are three AIs that all seem to work about equally well in treating breast cancer:

- **Letrozole (Femara)**
- **Anastrozole (Arimidex)**
- **Exemestane (Aromasin)**

These drugs are pills taken daily.

**Use in adjuvant therapy:** After surgery, taking an AI, either alone or after tamoxifen, has been shown to work better than taking just tamoxifen for 5 years to reduce the risk of the cancer coming back later.

Schedules that are known to be helpful include:

- Tamoxifen for 2 to 3 years, followed by an AI to complete 5 years of treatment
- Tamoxifen for 5 years, followed by an AI for 5 years
- An AI for 5 years

For most post-menopausal women whose cancers are hormone receptor-positive, most

doctors recommend taking an AI at some point during adjuvant therapy. Right now, standard treatment is to take these drugs for about 5 years (or alternate with tamoxifen for a total of at least 5 years). Studies are now being done to see if taking an AI for more than 5 years would be more helpful.

If you have early-stage breast cancer and had not gone through menopause when you were first diagnosed, your doctor might recommend taking tamoxifen first, and then taking an AI later if you go through menopause during treatment. Another option is taking a drug called a luteinizing hormone-releasing hormone (LHRH) analog, which turns off the ovaries, along with an AI.

**Use in cancer that comes back or has spread:** AIs can also be used to treat more advanced hormone-positive breast cancers, especially in post-menopausal women. They are often continued for as long as they are helpful.

**Possible side effects:** The AIs tend to have fewer serious side effects than tamoxifen. They don't cause uterine cancers and very rarely cause blood clots. They can, however, cause **muscle pain and joint stiffness and/or pain**. The joint pain may be similar to a feeling of having arthritis in many different joints at one time. This side effect may improve by switching to a different AI, but it has led some women to stop treatment. If this happens, most doctors recommend using tamoxifen to complete 5 years of hormone treatment.

Because AIs remove all estrogens from women after menopause, they also cause **bone thinning**, sometimes leading to osteoporosis and even fractures. If you are taking an AI, you may also be given medicine to strengthen your bones, such as bisphosphonates or denosumab.

## Ovarian ablation

**For pre-menopausal women, removing or shutting down the ovaries (ovarian ablation), which are the main source of estrogens, effectively makes them post-menopausal. This may allow some other hormone therapies, such as AIs, to work better.** Ovarian ablation is most often done to treat metastatic breast cancer, but it can also be used in some women with early-stage disease.

There are several ways to remove or shut down the ovaries:

- **Oophorectomy:** Surgery is done to remove the ovaries. This is a form of permanent ovarian ablation.
- **Luteinizing hormone-releasing hormone (LHRH) analogs:** These drugs are

used more often than oophorectomy. They stop the signal that the body sends to ovaries to make estrogen, which causes temporary menopause. Common LHRH drugs include goserelin (Zoladex) and leuprolide (Lupron). They can be used alone or with other hormone drugs (tamoxifen, aromatase inhibitors, fulvestrant) as hormone therapy in pre-menopausal women.

- **Chemotherapy drugs:** Some chemo drugs can damage the ovaries of pre-menopausal women so they no longer make estrogen. For some women, ovarian function returns months or years later, but in others, the damage to the ovaries is permanent and leads to menopause. This side effect can sometimes be a helpful (if unintended) consequence of chemotherapy with regard to breast cancer treatment.

All of these methods can cause symptoms of menopause, including hot flashes, night sweats, vaginal dryness, and mood swings.

## Less common types of hormone therapy

Some other types of hormone therapy were used more often in the past, but are rarely given now. These include:

- Megestrol acetate (Megace), a progesterone-like drug
- Androgens (male hormones)
- High doses of estrogen

These might be an option if other forms of hormone therapy are no longer working, but they can often cause side effects.

- [References](#)

Davies C, Pan H, Godwin J, et al. Long-term effects of continuing adjuvant tamoxifen to 10 years versus stopping at 5 years after diagnosis of oestrogen receptor-positive breast cancer: ATLAS, a randomised trial. *Lancet*. 2013;381:805-816. Erratum in: *Lancet*. 2013 Mar 9;381(9869):804.

Gray RG, Rea D, Handley K, et al. Long-term effects of continuing adjuvant tamoxifen to 10 years versus stopping at 5 years in 6,953 women with early breast cancer. *J Clin Oncol* (Meeting Abstracts) June 2013 vol. 31 no. 18\_suppl 5.

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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## Targeted Therapy for Breast Cancer

As researchers have learned more about changes in cancer cells that cause them to grow out of control, they've developed new types of drugs that target some of these cell changes. These targeted drugs are designed to block the growth and spread of cancer cells. These drugs work differently from [chemotherapy drugs](#), which attack all cells that are growing quickly (including cancer cells).

Targeted drugs sometimes work even when chemo drugs do not. Some targeted drugs can help other types of treatment work better. Targeted drugs also tend to have different side effects than chemo.

### Targeted therapy for HER2-positive breast cancer

For about 1 in 5 women with breast cancer, the cancer cells have too much of a growth-promoting protein known as HER2/neu (or just HER2) on their surface. These cancers, known as [HER2-positive breast cancers](#), tend to grow and spread more aggressively. But a number of drugs have been developed that target this protein:

- **Trastuzumab (Herceptin):** This drug is a monoclonal antibody, which is a man-made version of a very specific immune system protein. It is often given along with chemo, but it might also be used by itself (especially if chemo alone has already been tried). Trastuzumab can be used to treat both early- and late-stage breast cancer. When started before or after surgery to treat early breast cancer, this drug is usually given for a total of a year. For advanced breast cancer, treatment is often given for as long as the drug is helpful. This drug is given into a vein (IV).
- **Pertuzumab (Perjeta):** This monoclonal antibody can be given with trastuzumab

and chemo, either before surgery to treat early-stage breast cancer, or to treat advanced breast cancer. This drug is given into a vein (IV).

- **Ado-trastuzumab emtansine (Kadcyla, also known as TDM-1):** This is a monoclonal antibody attached to a chemotherapy drug. It is used by itself to treat advanced breast cancer in women who have already been treated with trastuzumab and chemo. This drug is also given in a vein (IV).
- **Lapatinib (Tykerb):** This is a type of targeted drug known as a kinase inhibitor. It is a pill taken daily. Lapatinib is used to treat advanced breast cancer, most often when trastuzumab is no longer working. It is typically used along with certain chemo or hormone therapy drugs.
- **Neratinib (Nerlynx):** This is a type of targeted drug known as a kinase inhibitor. It is a pill that is taken daily. Neratinib is used to treat early-stage breast cancer after a woman has completed one year of trastuzumab and is usually given for one year.

## Side effects of targeted therapy for HER2-positive breast cancer

The side effects of these drugs are often mild, but some serious side effects are possible. Discuss what you can expect with your doctor.

Some women develop **heart damage** during or after treatment with the antibody drugs (trastuzumab, pertuzumab, and ado-trastuzumab emtansine). This can lead to congestive heart failure. For most (but not all) women, this effect lasts a short time and gets better when the drug is stopped. The risk of heart problems is higher when these drugs are given with certain chemo drugs that also can cause heart damage, such as doxorubicin (Adriamycin) and epirubicin (Ellence). Because these drugs can cause heart damage, doctors often check your heart function (with an echocardiogram or a MUGA scan) before treatment, and again while you are taking the drug. Let your doctor know if you develop symptoms such as **shortness of breath, leg swelling, and severe fatigue**.

Lapatinib and neratinib can cause **severe diarrhea**, so it's very important to let your health care team know about any changes in bowel habits as soon as they happen. Lapatinib can also cause **hand-foot syndrome**, in which the hands and feet become sore and red, and may blister and peel.

**If you are pregnant, you should not take these drugs.** They can harm and even cause death to the fetus. If you could become pregnant, talk to your doctor about using effective birth control while taking these drugs.

# Targeted therapy for hormone receptor-positive breast cancer

About 2 out of 3 breast cancers are hormone receptor-positive (ER-positive or PR-positive). For women with these cancers, treatment with [hormone therapy](#) is often helpful. Certain targeted therapy drugs can make hormone therapy even more effective, although these targeted drugs can also add to the side effects.

## CDK4/6 inhibitors

**Palbociclib (Ibrance)** and **ribociclib (Kisqali)** are drugs that block proteins in the cell called *cyclin-dependent kinases* (CDKs), particularly CDK4 and CDK6. Blocking these proteins in hormone receptor-positive breast cancer cells helps stop the cells from dividing. This can slow cancer growth.

These drugs are approved for women who have gone through menopause and have advanced hormone receptor-positive, HER2-negative breast cancer. They are used along with certain hormone therapy drugs called aromatase inhibitors, such as letrozole or fulvestrant.

These drugs are taken as pills, typically once a day for 3 weeks at a time, with a week off before starting again.

Side effects of these drugs tend to be mild and can include low blood cell counts, fatigue, nausea and vomiting, mouth sores, hair loss, diarrhea, and headache. Very low white blood cell counts can increase the risk of serious [infection](#).

## Everolimus (Afinitor)

Everolimus is approved for women who have gone through menopause and have advanced hormone receptor-positive, HER2-negative breast cancer. It is used along with the aromatase inhibitor exemestane (Aromasin) for women whose cancers have grown while being treated with either letrozole or anastrozole (or if the cancer started growing shortly after treatment with these drugs was stopped).

This targeted therapy drug blocks mTOR, a protein in cells that normally helps them grow and divide. Everolimus may also stop tumors from developing new blood vessels, which can help limit their growth. In treating breast cancer, this drug seems to help hormone therapy drugs work better.

Everolimus is a pill that is taken once a day.

Common side effects of everolimus include mouth sores, diarrhea, nausea, fatigue, feeling weak or tired, low blood counts, shortness of breath, and cough. Everolimus can also increase blood lipids (cholesterol and triglycerides) and blood sugars, so your doctor will check your blood work periodically while you are on this drug. It can also increase your risk of serious infections, so your doctor will watch you closely for infection.

Everolimus is also being studied for use for earlier stage breast cancer, with other hormone therapy drugs, and in combination with other treatments.

- [References](#)

Baselga J, Campone M, Piccart M, et al. Everolimus in postmenopausal hormone-receptor-positive advanced breast cancer. *N Engl J Med*. 2012;366:520529.

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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## Treatment of Breast Cancer by Stage

The stage (extent) of your breast cancer is an important factor in making decisions about your treatment options. In general, the more the breast cancer has spread, the more treatment you will likely need. But other factors can also be important, such as:



- If the cancer cells contain hormone receptors (that is, if the cancer is ER-positive or PR-positive)
- If the cancer cells have large amounts of the HER2 protein (that is, if the cancer is HER2-positive)
- Your overall health and personal preferences

Talk with your doctor about how these factors can affect your treatment options.

## Stage 0

The treatment approaches for these non-invasive breast tumors are often different from the treatment of invasive breast cancer. Stage 0 breast tumors include:

- [Lobular carcinoma in situ \(LCIS\)](#)
- [Ductal carcinoma in situ \(DCIS\)](#)

## Stages I to III

[Treatment for stages I to III](#) breast cancer usually includes surgery and radiation therapy, often along with chemo or other drug therapies either before or after surgery.

**Stage I:** These breast cancers are still relatively small and either have not spread to the lymph nodes or have only a tiny area of cancer spread in the sentinel lymph node (the first lymph node to which cancer is likely to spread).

**Stage II:** These breast cancers are larger than stage I cancers and/or have spread to a few nearby lymph nodes.

**Stage III:** In stage III breast cancer, the tumor is larger or is growing into nearby tissues (the skin over the breast or the muscle underneath), or the cancer has spread to many nearby lymph nodes.

## Stage IV (advanced breast cancer)

[Stage IV cancers](#) have spread beyond the breast and nearby lymph nodes to other parts of the body. Treatment for stage IV breast cancer usually consists of systemic (drug) therapies.

## Inflammatory breast cancer

Inflammatory breast cancer (IBC) can be either stage III or stage IV, depending on whether it has spread to other parts of the body. [Treatment for IBC](#) can include chemo or other systemic therapies, local therapies such as radiation, and surgery.

## Recurrent breast cancer

Cancer is called *recurrent* when it comes back after treatment. Recurrence can be local (in the same breast or in the mastectomy scar), regional (in nearby lymph nodes), or in a distant area. [Treatment for recurrent breast cancer](#) depends on where the cancer recurs and what treatments you've had before.

- [References](#)

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Breast Cancer. Version 2.2016. Accessed at [www.nccn.org](http://www.nccn.org) on June 1, 2016.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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## Treatment of Lobular Carcinoma in Situ (LCIS)

Lobular carcinoma in situ (LCIS) means abnormal cells are in the breast. LCIS is

sometimes grouped with ductal carcinoma in situ (DCIS) as a type of non-invasive breast cancer, but it differs from DCIS in that it's not a pre-cancer. The main difference is that LCIS cannot become an invasive cancer, even if it isn't treated.

## **Does LCIS need to be treated?**

Since LCIS is not a true cancer or pre-cancer, often no treatment is recommended. Sometimes if a needle biopsy result shows LCIS, the doctor might recommend that it be removed completely (with an excisional biopsy or some other type of breast-conserving surgery) to help make sure that LCIS was the only thing there. This is especially true if the LCIS is described as pleomorphic or if it has necrosis (areas of dead cells), in which case it might be more likely to grow quickly.

Having LCIS does increase your risk of developing invasive breast cancer later on, so close follow-up is very important. This usually includes a yearly mammogram and a breast exam. Close follow-up of both breasts is important because women with LCIS in one breast have the same increased risk of developing cancer in both breasts. There isn't enough evidence to recommend getting routine magnetic resonance imaging (MRI) in addition to mammograms for all women with LCIS, but it's reasonable for women with LCIS to talk with their doctors about their other risk factors and the benefits and limits of being screened yearly with MRI.

A certain kind of LCIS, called pleomorphic LCIS, may be more likely to turn into invasive cancer than most types of LCIS. Some doctors feel that this kind of LCIS needs to be removed completely with surgery.

## **Can you lower your risk of invasive breast cancer?**

If you have LCIS, you may want to consider taking a hormone medicine such as tamoxifen or raloxifene (Evista) to help reduce your risk of breast cancer. You might also want to consider taking part in a clinical trial for breast cancer prevention, or discussing other possible prevention strategies (such as getting to a healthy weight or starting an exercise program) with your doctor.

Because LCIS is linked to an increased risk of cancer in both breasts, some women with LCIS choose to have a bilateral simple mastectomy (removal of both breasts but not nearby lymph nodes) to lower this risk. This is more likely to be a reasonable option in women who also have other risk factors for breast cancer, such as a *BRCA* gene mutation or a strong family history. This may be followed by delayed breast reconstruction.

# Treatment of Ductal Carcinoma in Situ (DCIS)

Ductal carcinoma in situ (DCIS) means the cells that line the milk ducts of the breast have changed to look like cancer cells under a microscope, but they have not spread into surrounding breast tissue.

DCIS is considered non-invasive or pre-invasive breast cancer. DCIS can't spread outside the breast, but it still needs to be treated because it can sometimes go on to become invasive breast cancer.

In most cases, a woman with DCIS can choose between breast-conserving surgery (BCS) and simple mastectomy. But sometimes a mastectomy might be a better option.

## Breast-conserving surgery (BCS)

In breast-conserving surgery (BCS), the surgeon removes the tumor and a small amount of normal breast tissue around it. Lymph node removal is not always needed with BCS, but it may be done if the doctor thinks the area of DCIS might also contain invasive cancer. The risk of an area of DCIS containing invasive cancer goes up with tumor size and nuclear grade. If lymph nodes are removed, this is usually done as a sentinel lymph node biopsy (SLNB).

If BCS is done, it is usually followed by radiation therapy. This lowers the chance of the cancer coming back in the same breast (either as more DCIS or as an invasive cancer). BCS without radiation therapy is not a standard treatment, but it might be an option for certain women who had small areas of low-grade DCIS that were removed with large enough cancer-free surgical margins.

## Mastectomy

Simple mastectomy (removal of the entire breast) may be needed if the area of DCIS is very large, if the breast has several areas of DCIS, or if BCS cannot remove the DCIS completely (that is, the BCS specimen and re-excision specimens still have cancer cells in or near the surgical margins). Many doctors will do a SLNB along with the mastectomy. This is because if an area of invasive cancer is found in the tissue removed during a mastectomy, the doctor won't be able to go back and do the SLNB later, and so may have to do a full axillary lymph node dissection (ALND).

Women having a mastectomy for DCIS may choose to have breast reconstruction immediately or later.

## **Hormone therapy after surgery**

If the DCIS is hormone receptor-positive (ER-positive or PR-positive), adjuvant treatment with tamoxifen (for any woman) or an aromatase inhibitor (for women past menopause) for 5 years after surgery can lower the risk of another DCIS or invasive cancer developing in either breast. If you have hormone receptor-positive DCIS, discuss the pros and cons of hormone therapy with your doctors.

## **Treatment of Breast Cancer Stages I-III**

The stage (extent) of your breast cancer is an important factor in making decisions about your treatment.

Most women with breast cancer in stages I, II, or III are treated with surgery, often followed by radiation therapy. Many women also get some kind of drug therapy. In general, the more the breast cancer has spread, the more treatment you will likely need. But your treatment options are affected by your personal preferences and other information about your breast cancer, such as:

- If the cancer cells contain hormone receptors (that is, if the cancer is ER-positive or PR-positive)
- If the cancer cells have large amounts of the HER2 protein (that is, if the cancer is HER2-positive)
- Your overall health

Talk with your doctor about how these factors can affect your treatment options.

## **Treating stage I breast cancer**

These breast cancers are still relatively small and either have not spread to the lymph nodes or have spread to only a tiny area in the sentinel lymph node (the first lymph node to which cancer is likely to spread).

### **Surgery**

**Surgery is the main treatment for stage I breast cancer.** These cancers can be treated with either [breast-conserving surgery](#) (BCS; sometimes called lumpectomy or partial mastectomy) or [mastectomy](#). The nearby [lymph nodes](#) will also need to be checked, either with a sentinel lymph node biopsy (SLNB) or an axillary lymph node dissection (ALND).

In some cases, [breast reconstruction](#) can be done at the same time as the surgery to remove the cancer. But if you will need radiation therapy after surgery, it is often better to wait to get reconstruction until after the radiation is complete.

## **Radiation therapy**

If BCS is done, [radiation therapy](#) is usually given after surgery to lower the chance of the cancer coming back in the breast. Women who are at least 70 years old may consider BCS without radiation therapy if ALL of the following are true:

- The tumor was 2 cm (a little less than 1 inch) or less across and it has been removed completely.
- None of the lymph nodes removed contained cancer.
- The cancer is ER-positive or PR-positive, and hormone therapy is given.

Radiation after BCS still lowers the chance of the cancer coming back in women who meet these criteria, but it has not been shown to help them live longer.

Some women who do not meet these criteria may be tempted to avoid radiation, but studies have shown that not getting radiation increases the chances of the cancer coming back and can shorten their lives.

If mastectomy is done, radiation therapy is less likely to be needed, but it might be given depending on the details of your specific cancer. You should discuss if you need radiation treatment with your doctor. They may send you to a doctor who specializes in radiation, called a *radiation oncologist*, for evaluation.

## **Adjuvant systemic therapy (chemo and other drugs)**

For women who have a hormone receptor-positive (ER-positive or PR-positive) breast cancer, most doctors will recommend [hormone therapy](#) (tamoxifen or an aromatase inhibitor, or one followed by the other) as an adjuvant (additional) treatment, no matter how small the tumor is. Women with tumors larger than 0.5 cm (about ¼ inch) across may be more likely to benefit from it. Hormone therapy is typically given for at least 5 years.

If the tumor is larger than 1 cm (about ½ inch) across, adjuvant [chemotherapy](#) (chemo) is usually recommended. Some doctors may suggest chemo for smaller tumors as well, especially if they have any unfavorable features (such as being high-grade; hormone receptor-negative, HER2-positive; or having a high score on a gene panel such as Oncotype Dx).

For HER2-positive cancers, a year of adjuvant [trastuzumab](#) (Herceptin) is usually recommended as well.

## Treating stage II breast cancer

These breast cancers are larger than stage I cancers and/or have spread to a few nearby lymph nodes.

### Local therapy (surgery and radiation therapy)

**Stage II cancers are treated with either [breast-conserving surgery](#) (BCS; sometimes called lumpectomy or partial mastectomy) or [mastectomy](#).** The nearby [lymph nodes](#) will also need to be checked, either with a sentinel lymph node biopsy (SLNB) or an axillary lymph node dissection (ALND).

Women who have BCS are treated with [radiation therapy](#) after surgery. Women who have a mastectomy are typically treated with radiation if the cancer is found in the lymph nodes. Some patients who have a SLNB that shows cancer in a few lymph nodes may not have the rest of their lymph nodes removed (ALND) to check for more cancer. In these patients, radiation may be discussed as a treatment option after mastectomy.

If you were initially diagnosed with stage II breast cancer and were given treatment such as chemotherapy or hormone therapy before surgery, radiation therapy might be recommended if cancer is found in the lymph nodes at the time of the mastectomy. A doctor who specializes in radiation, called a *radiation oncologist*, may review your case to discuss whether radiation would be helpful to you.

If chemotherapy is also needed after surgery, the radiation is delayed until the chemo is done.

In some cases, breast reconstruction can be done during the surgery to remove the cancer. But if you will need radiation after surgery, it is often better to wait to get reconstruction until after the radiation is complete.

## Neoadjuvant and adjuvant systemic therapy (chemo and other drugs)

Systemic therapy is recommended for women with stage II breast cancer. Some systemic therapies are given before surgery (neoadjuvant therapy), and others are given after surgery (adjuvant therapy). Neoadjuvant treatments are often a good option for women with large tumors, because they can shrink the tumor before surgery, possibly enough to make BCS an option. But this doesn't improve survival more than getting these treatments after surgery. In some cases, systemic therapy will be started before surgery and then continued after surgery.

The drugs used will depend on the woman's age and the tumor's hormone-receptor status and HER2 status. They may include:

- **Chemotherapy:** Chemo can be given before or after surgery.
- **HER2 targeted drugs:** If the cancer is HER2-positive, HER2 targeted drugs are started along with chemo. Both trastuzumab (Herceptin) and pertuzumab (Perjeta) may be used as a part of neoadjuvant treatment. Then trastuzumab is continued after surgery for a total of one year of treatment.
- **Hormone therapy:** If the cancer is hormone receptor-positive, hormone therapy (tamoxifen, an aromatase inhibitor, or one followed by the other) is typically used. It can be started before surgery, but because it continues for at least 5 years, it needs to be given after surgery as well.

## Treating stage III breast cancer

In stage III breast cancer, the tumor is large (more than 5 cm or about 2 inches across) or growing into nearby tissues (the skin over the breast or the muscle underneath), or the cancer has spread to many nearby lymph nodes.

**If you have inflammatory breast cancer:** Stage III cancers also include some inflammatory breast cancers that have not spread beyond nearby lymph nodes. Treatment of these cancers can be slightly different from the treatment of other stage III breast cancers. You can find more details in our section about [treatment for inflammatory breast cancer](#).

There are two main approaches to treating stage III breast cancer:

### Starting with neoadjuvant therapy



**Most often, these cancers are treated with neoadjuvant [chemotherapy](#) (before surgery).** For HER2-positive tumors, the [targeted drug](#) trastuzumab (Herceptin) is given as well, sometimes along with pertuzumab (Perjeta). This may shrink the tumor enough to allow a woman to have [breast-conserving surgery](#) (BCS). If the tumor doesn't shrink enough, a [mastectomy](#) is done. Nearby [lymph nodes](#) will also need to be checked. A sentinel lymph node biopsy (SLNB) is often not an option for stage III cancers, so an axillary lymph node dissection (ALND) is usually done.

Often, [radiation therapy](#) is needed after surgery. If [breast reconstruction](#) is done, it is usually delayed until after radiation is complete. In some cases, additional (adjuvant) chemo is given after surgery as well. Women with HER2-positive cancers receive trastuzumab after surgery to complete a year of treatment with this drug. Women with hormone receptor-positive (ER-positive or PR-positive) breast cancers will also get adjuvant [hormone therapy](#).

## Starting with surgery

**Another option for stage III cancers is treatment with surgery first.** Because these tumors are fairly large and/or have grown into nearby tissues, this usually means getting a mastectomy. For women with fairly large breasts, BCS may be an option if the cancer hasn't grown into nearby tissues. SLNB may be an option for some patients, but most will need an ALND. Surgery is usually followed by adjuvant chemotherapy, and/or hormone therapy, and/or trastuzumab. Radiation is recommended after surgery.

## What type of drug treatment(s) might I get?

**Most women with breast cancer in stages I to III will get some kind of drug therapy** as part of their treatment. This may include:

- [Chemotherapy](#)
- [Hormone therapy](#) (tamoxifen, an aromatase inhibitor, or one followed by the other)
- [HER2 targeted drugs](#), such as trastuzumab (Herceptin) and pertuzumab (Perjeta)
- Some combination of these

The types of drugs that might work best depend on the tumor's hormone receptor status, HER2 status, and other factors.

## When is chemotherapy (chemo) used?

Chemo is usually recommended for all women with an invasive breast cancer whose

tumor is hormone receptor-negative (ER-negative and PR-negative). It's also typically recommended for women with hormone receptor-positive tumors who might benefit from getting chemo along with their hormone therapy, based on the stage and characteristics of their tumor.

Chemo, given either before surgery (neoadjuvant chemo) or after surgery (adjuvant chemo), can lower the risk of the cancer coming back, but it doesn't remove the risk entirely. Before deciding if it's right for you, talk to your doctor to make sure you understand the chance of your cancer returning both with or without getting chemo.

If you will be getting chemo, your doctor should discuss what specific drug regimens are best for you based on your cancer, its stage, your other health issues, and your preferences. The length of treatment usually ranges from 3 to 6 months.

## **When is hormone therapy used?**

Hormone therapy is recommended for all women with hormone receptor-positive (ER-positive or PR-positive) invasive breast cancer, regardless of the size of the tumor or the number of lymph nodes with cancer cells. Hormone therapy is not likely to be effective for women with hormone receptor-negative tumors.

**For post-menopausal women:** Women who have gone through menopause and who have hormone receptor-positive tumors will generally get adjuvant hormone therapy. This might consist of:

- An aromatase inhibitor, such as anastrozole (Arimidex), letrozole (Femara), or exemestane (Aromasin) for 5 years
- Tamoxifen for 2 to 5 years followed by an aromatase inhibitor for 3 to 5 more years
- Tamoxifen for 5 to 10 years (for women who can't take aromatase inhibitors)

Chemotherapy can sometimes slow or stop ovarian function for a time. Women who stopped having periods during or after chemo may need their hormone levels tested to check to see if they are truly in menopause. Many women whose periods stopped from chemo have not truly gone through menopause, and their periods will return.

**For pre-menopausal women:** For women who haven't gone through menopause, the most common treatment is tamoxifen, which is taken for 5 to 10 years. Another option is an aromatase inhibitor, along with ovarian ablation. Ablation can be done with a drug called a luteinizing hormone-releasing hormone (LHRH) analog, which temporarily stops the ovaries from functioning, or with surgical removal of the ovaries (oophorectomy).

Ovarian ablation might also be considered along with tamoxifen. Still, it's not clear that

removing the ovaries or stopping them from working helps tamoxifen work better for cancers that have been removed completely, so these treatments are not standard.

If you go through menopause while being treated with tamoxifen (either naturally or because your ovaries are removed), you may be switched from tamoxifen to an aromatase inhibitor. Still, women may stop having periods on tamoxifen without truly going through menopause, so blood tests of hormone levels are often needed to see if you are in menopause and can benefit from aromatase inhibitors.

**Hormone therapy and chemotherapy:** Hormone therapy might be started right away if you are not getting chemo. But getting hormone therapy and chemo together can make the chemo less effective, so hormone therapy is usually not started until after chemo is completed.

### **When are HER2 targeted drugs used?**

Women who have HER2-positive cancers are usually given trastuzumab (Herceptin) along with chemo as part of their treatment. If the treatment is given before surgery (called neoadjuvant therapy), pertuzumab (Perjeta) may be given as well. After the chemo is finished, the trastuzumab is continued to complete a year of treatment.

Because these drugs can lead to heart problems, heart function is watched closely during treatment with tests such as echocardiograms or MUGA scans.

### **Online tools to help make decisions**

To help decide if adjuvant therapy is right for you, you might want to visit the Mayo Clinic website at [www.mayoclinic.com](http://www.mayoclinic.com) and type "adjuvant therapy for breast cancer" into the search box. You will find a page that will help you to understand the possible benefits and limits of adjuvant therapy.

Other online guides, such as [www.adjuvantonline.com](http://www.adjuvantonline.com), are designed to be used by health care professionals. This website provides information about your risk of the cancer returning within the next 10 years and what benefits you might expect from hormone therapy and/or chemotherapy. You may want to ask your doctor if he or she uses this site.

## **Treatment of Stage IV (Advanced) Breast Cancer**

**Most women with stage IV breast cancer are treated with systemic therapy.** This may include hormone therapy, chemotherapy, targeted therapy, or some combination of these. Local treatments such as surgery or radiation might also be used sometimes to help prevent or treat symptoms.

Stage IV cancers have spread beyond the breast and nearby lymph nodes to other parts of the body. When breast cancer spreads, it most commonly goes to the bones, liver, and lungs. As the cancer progresses, it may also spread to the brain or other organs.

## Treatment options for stage IV breast cancer

For women with stage IV breast cancer, systemic (drug) therapies are the main treatments. These may include:

- [Hormone therapy](#)
- [Chemotherapy](#) (chemo)
- [Targeted drugs](#), such as trastuzumab (Herceptin) and pertuzumab (Perjeta)
- Some combination of these

Less often, [surgery](#) and/or [radiation therapy](#) may be useful in certain situations (see below).

Treatment can often shrink tumors (or slow their growth), improve symptoms, and help women live longer. But in general, these cancers are very hard to cure.

### Systemic (drug) treatments for stage IV breast cancer

The types of drugs used for stage IV breast cancer depend on the hormone receptor status and the HER2 status of the cancer:

- **Hormone receptor-positive cancers:** Women with hormone receptor-positive (ER-positive or PR-positive) cancers are often treated first with hormone therapy (tamoxifen or an aromatase inhibitor). Women who are post-menopausal are often treated first with an aromatase inhibitor. This may be combined with a targeted drug such as palbociclib (Ibrance), ribociclib (Kisqali), or everolimus (Afinitor). Women who haven't yet gone through menopause are often treated first with tamoxifen. But because hormone therapy can take months to work, chemo is often the first treatment for patients with serious problems from their cancer spread, such as problems breathing.

- **Hormone receptor-negative cancers:** Chemo is the main treatment for women with hormone receptor-negative (ER-negative and PR-negative) cancers, because hormone therapy isn't helpful for these cancers.
- **HER2-positive cancers:** Trastuzumab (Herceptin) may help women with HER2-positive cancers live longer if it's given along with chemo. Pertuzumab (Perjeta), another targeted drug, might be added as well. Another option is the targeted drug ado-trastuzumab emtansine (Kadcyla), which is given alone.

Treatment often continues until the cancer starts growing again or until side effects become unacceptable. If this happens, other drugs might be tried.

## Local or regional treatments for stage IV breast cancer

Although systemic drugs are the main treatment for stage IV breast cancer, local and regional treatments such as surgery, radiation therapy, or regional chemotherapy are sometimes used as well. These can help treat breast cancer in a specific part of the body, but they are very unlikely to get rid of all of the cancer. These treatments are more likely to be used to help prevent or treat symptoms or complications from the cancer.

Radiation therapy and/or surgery may also be used in certain situations, such as:

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

In some cases, regional chemo (where drugs are delivered directly into a certain area, such as into the fluid around the brain or into the liver) may be useful as well.

If your doctor recommends such local or regional treatments, it is important that you understand their goal—whether it is to try to cure the cancer or to prevent or treat symptoms.

## Relieving symptoms of advanced breast cancer

**Treatment to relieve symptoms depends on where the cancer has spread.** For example, pain from bone metastases may be treated with radiation therapy, drugs called bisphosphonates such as pamidronate (Aredia) or zoledronic acid (Zometa), or

the drug denosumab (Xgeva). For more, see our information about the treatment of bone metastases. .

## **Advanced cancer that progresses during treatment**

**Treatment for advanced breast cancer can often shrink the cancer or slow its growth** (often for many years), but after a time, it tends to stop working. Further treatment options at this point depend on several factors, including previous treatments, where the cancer is located, and a woman's age, general health, and desire to continue getting treatment.

### **Progression while on hormone therapy**

For hormone receptor-positive (ER-positive or PR-positive) cancers that were being treated with hormone therapy, switching to another type of hormone therapy sometimes helps. For example, if either letrozole (Femara) or anastrozole (Arimidex) were given, using exemestane, possibly with everolimus (Afinitor), may be an option. If the cancer is no longer responding to any hormone drugs, chemotherapy is usually the next step.

### **Progression while on chemotherapy**

If the cancer is no longer responding to one chemo regimen, trying another may be helpful. Many different drugs and combinations can be used to treat breast cancer. However, each time a cancer progresses during treatment, it becomes less likely that further treatment will have an effect.

### **Progression while getting HER2 drugs**

HER2-positive cancers that no longer respond to trastuzumab (Herceptin) might respond to lapatinib (Tykerb), another drug that attacks the HER2 protein. This drug is often given along with the chemo drug capecitabine (Xeloda), but it can be used with other chemo drugs, with trastuzumab, or even alone (without chemo). Other options for women with HER2-positive cancers include pertuzumab (Perjeta) with chemo and trastuzumab, or ado-trastuzumab emtansine (Kadcyla).

Because current treatments are very unlikely to cure advanced breast cancer, if you are in otherwise good health, you may want to think about taking part in a clinical trial testing a newer promising treatment.

# Treatment of Inflammatory Breast Cancer

Inflammatory breast cancer (IBC) is an uncommon type of invasive breast cancer that typically makes the skin on the breast look red and feel warm. It also may give the breast skin a thick, pitted appearance that looks a lot like an orange peel. These changes are caused by cancer cells blocking lymph vessels in the skin.

Because inflammatory breast cancer has reached these vessels and has caused changes in the skin, it is considered to be at least a stage III breast cancer. IBC that has spread to other parts of the body is considered stage IV. These cancers can grow quickly and can be challenging to treat.

## Treating stage III inflammatory breast cancer

IBC that has not spread outside the breast or nearby lymph nodes is stage IIIB or IIIC. Treatment usually starts with chemotherapy (chemo) to try to shrink the tumor. If the cancer is HER2-positive, targeted therapy is given along with the chemo. This is typically followed by surgery (mastectomy) to remove the cancer. Radiation therapy often follows surgery. In some cases, more chemo may be given after radiation. If the cancer is hormone receptor-positive (ER- or PR-positive), hormone therapy is given as well. Combining these treatments has improved survival significantly over the years.

### Chemotherapy (possibly along with targeted therapy)

Chemo drugs enter the bloodstream and circulate throughout the body to reach and destroy cancer cells wherever they are, so chemo is considered a type of systemic therapy. It treats both the main tumor as well as any cancer cells that have broken off and spread to lymph nodes or other parts of the body.

Using chemo before surgery is called *neoadjuvant* or *preoperative* treatment. Most women with IBC will receive two types of chemo drugs (although not necessarily at the same time):

- An anthracycline, such as doxorubicin (Adriamycin) or epirubicin (Ellence)
- A taxane, such as paclitaxel (Taxol) or docetaxel (Taxotere)

Other chemo drugs may be used as well.

If the cancer is HER2-positive (the cancer cells have too much of a protein called HER2), the targeted therapy drug trastuzumab (Herceptin) is given as well, sometimes along with another targeted drug, pertuzumab (Perjeta). These drugs can lead to heart problems when given with an anthracycline, so one option is to give the anthracycline first (without trastuzumab or pertuzumab), followed by treatment with a taxane and trastuzumab (with or without pertuzumab).

## **Surgery and further treatments**

If the cancer improves with chemo, surgery is typically the next step. The standard operation is a modified radical mastectomy, where the entire breast and the lymph nodes under the arm are removed. Because IBC affects so much of the breast and skin, breast-conserving surgery (partial mastectomy or lumpectomy) and skin-sparing mastectomy are not options. It isn't clear that sentinel lymph node biopsy (where only one or a few nodes are removed) is reliable in IBC, so it is also not an option.

If the cancer does not respond to chemo (and the breast is still very swollen and red), surgery cannot be done. Either other chemo drugs will be tried, or the breast may be treated with radiation. Then if the cancer responds (the breast shrinks and is no longer red), surgery may be an option.

If breast radiation isn't given before surgery, it is given after surgery, even if no cancer is thought to remain. This is called *adjuvant radiation*. It lowers the chance that the cancer will come back. Radiation is usually given 5 days a week for 6 weeks, but in some cases a more intense treatment (twice a day) can be used instead. Depending on how much tumor was found in the breast after surgery, radiation might be delayed until further chemo is given. If breast reconstruction is to be done, it is usually delayed until after the radiation therapy that most often follows surgery.

Treatment after surgery and radiation often includes additional systemic treatment. This is known as *adjuvant therapy* and can include chemo, hormone therapy (tamoxifen or an aromatase inhibitor) if the cancer cells contain hormone receptors, and/or trastuzumab if the cancer is HER2-positive.

## **Treating stage IV inflammatory breast cancer**

Patients with metastatic (stage IV) IBC are treated with systemic therapy. This may include:

- Chemotherapy



- Hormonal therapy (if the cancer is hormone receptor-positive)
- Targeted therapy with a drug that targets HER2 (if the cancer is HER2-positive)

One or more of these treatments might be used. For more on the treatment of stage IV cancers, see our page about treating stage IV breast cancer.

Regardless of the stage of the cancer, participation in a clinical trial of new treatments for IBC is also a good option because IBC is so rare, and these studies often allow access to drugs not available for standard treatment. More information about clinical trials can be found in our clinical trials section.

## Treatment of Recurrent Breast Cancer

For some women, breast cancer may come back after treatment – sometimes years later. This is called a *recurrence*. **Recurrence can be local (in the same breast or in the mastectomy scar), regional (in nearby lymph nodes), or in a distant area.** Cancer that is found in the opposite breast is not a recurrence—it is a new cancer that requires its own treatment.

### Treating local recurrence

For women whose breast cancer has recurred locally, treatment depends on their initial treatment.

- If you had breast-conserving surgery (lumpectomy), a local recurrence in the breast is usually treated with mastectomy.
- If the initial treatment was mastectomy, recurrence near the mastectomy site is treated by removing the tumor whenever possible. This is often followed by radiation therapy, but only if none had been given after the original surgery. (Radiation usually can't be given to the same area twice.)

In either case, hormone therapy, targeted therapy (like trastuzumab), chemotherapy, or some combination of these may be used after surgery and/or radiation therapy.

### Treating regional recurrence

When breast cancer comes back in nearby lymph nodes (such as those under the arm or around the collar bone), it is treated by removing those lymph nodes, if possible. This may be followed by radiation aimed at the area. Systemic treatment (such as chemo,

targeted therapy, or hormone therapy) may be considered after the local treatment as well.

## **Treating distant recurrence**

In general, women whose breast cancer comes back in other parts of the body, such as the bones, lungs, or brain, are treated the same way as those found to have stage IV breast cancer in these organs when they were first diagnosed (see Treating Stage IV (Advanced) Breast Cancer). The only difference is that treatment may be affected by previous treatments a woman has had.

Recurrent breast cancer can sometimes be hard to treat. If you are in otherwise good health, you may want to think about taking part in a clinical trial testing a newer promising treatment.

Should your cancer come back, see our section about cancer recurrence with more general information on how to manage and cope with this phase of your treatment.

## **Treating Breast Cancer During Pregnancy**

If you are diagnosed with breast cancer while pregnant, your treatment options will be more complicated because you will want to get the best care for your cancer while also protecting the baby. The type and timing of treatment will need to be planned carefully and coordinated among your cancer care team and your obstetrician.

The goal when treating a pregnant woman with breast cancer is the same as when treating a non-pregnant woman: to cure the cancer whenever possible, or to control it and keep it from spreading if it can't be cured. But the extra concern of protecting a growing fetus may make treatment more complicated.

### **Is it safe to treat breast cancer during pregnancy?**

Pregnant women can get treatment for breast cancer, although the types of treatment used and the timing of treatment might be affected by the pregnancy. If you are

pregnant and have been diagnosed with breast cancer, your treatment recommendations will depend on:

- The size of the tumor
- Where the tumor is
- If the cancer has spread and if it has, how far
- How far along your pregnancy is
- Your overall health
- Your personal preferences

[Surgery for breast cancer](#) is generally safe while you're pregnant. [Chemotherapy](#) seems to be safe for the baby if given later in pregnancy, but it isn't safe early on. Other breast cancer treatments, such as [hormone therapy](#), [targeted therapy](#), and [radiation therapy](#), would be more likely to harm the baby and are not usually used during pregnancy.

Treatment choices can become complicated if there is a conflict between the best known treatment for the mother and the well-being of the baby. For example, if a woman is found to have breast cancer early in her pregnancy and needs chemotherapy right away, she may be advised to think about ending the pregnancy. If you are pregnant and have breast cancer, you may have hard choices to make, so be sure you know all your options and get expert help. Your obstetrician will need to work with your cancer doctors and others involved in your care. A counselor or psychologist should also be part of your health care team, to help give you the emotional support you need.

Some older studies found that ending a pregnancy in order to have cancer treatment didn't improve a woman's prognosis (outlook). Even though there were flaws in these studies, ending the pregnancy is no longer routinely recommended when breast cancer is found. Still, this option may be discussed when looking at all the treatment choices available, especially for aggressive cancers that may need treatment right away, such as inflammatory breast cancer.

## **Breast cancer surgery during pregnancy**

Surgery to remove the cancer in the breast and nearby lymph nodes is a major part of treatment for any woman with early breast cancer, and is generally safe in pregnancy.

Options for breast cancer surgery might include:

- Removing the entire breast ([mastectomy](#))
- Removing just the part containing the cancer (lumpectomy or [breast-conserving surgery](#) [BCS])

Mastectomy is used more often for pregnant women with breast cancer because most women who have BCS need radiation therapy afterward. Radiation could affect the baby if it is given during pregnancy, so it can't be given until after delivery. But delaying radiation too long could increase the chance of the cancer coming back.

If the cancer is found in the third trimester, BCS might be an option because there might be little or no delay in radiation treatments, especially if chemotherapy is planned after surgery. (Radiation is normally given after chemotherapy treatments are complete.) But if the cancer is found early in the pregnancy, it may mean a longer delay in starting radiation. For women in this situation, mastectomy is likely a better option than BCS followed by radiation.

## **Checking the lymph nodes for cancer spread**

In addition to removing the tumor in the breast, one or more lymph nodes in the armpit also need to be removed to check for cancer spread. One way to do this is an axillary lymph node dissection (ALND). This removes many of the lymph nodes under the arm. Another procedure, called a sentinel lymph node biopsy (SLNB), might be an option depending on how far along you are in pregnancy and your cancer stage. This procedure uses slightly radioactive tracers and a blue dye to pinpoint the nodes most likely to contain cancer cells. SLNB allows the doctor to remove fewer nodes. But there are concerns about the effects the dye used for SLNB might have on the baby. Because of these concerns, some experts recommend that SLNB be used only later in pregnancy, and that the blue dye not be used during the procedure.

## **Is anesthesia safe during pregnancy?**

Surgery for breast cancer generally carries little risk to the baby. But there are certain times in pregnancy when anesthesia (the drugs used to make you sleep for surgery) may be riskier for the baby.

Your surgeon and anesthesiologist, along with a high-risk obstetrician, will need to work together to decide the best time during pregnancy to do surgery. If the surgery is done later in the pregnancy, the obstetrician may be there just in case there are any problems with the baby during surgery. Together, your doctors will decide which anesthesia drugs and techniques are the safest for both you and the baby.

## **Treatment after surgery**

Depending on the cancer's stage, you may need more treatment such as

chemotherapy, radiation therapy, hormone therapy, and/or targeted therapy after surgery to help lower the risk of the cancer coming back. This is called *adjuvant treatment*. In some cases, this treatment can be put off until after delivery.

## **Chemotherapy**

Chemotherapy (chemo) may be used after surgery (as adjuvant treatment) for some earlier stages of breast cancer. It also may be used by itself for more advanced cancers.

Chemo is not given during the first 3 months (first trimester) of pregnancy. Because most of the baby's internal organs develop during this time, the safety of chemo hasn't been studied in the first trimester. The risk of miscarriage (losing the baby) is also the greatest during this time.

For many years, it was thought that all chemo would harm an unborn baby no matter when it was given. But studies have shown that certain chemo drugs used during the second and third trimesters (months 4 through 9 of pregnancy) don't raise the risk of birth defects, stillbirths, or health problems shortly after birth, though they may increase the risk of early delivery. Researchers still don't know if these children will have any long-term effects.

If you have early breast cancer and you need chemo after surgery (adjuvant chemo), it will usually be delayed until at least the second trimester. If you are already in the third trimester when the cancer is found, the chemo may be delayed until after birth. The birth may be induced (brought on) a few weeks early in some cases. These same treatment plans may also be used for women with more advanced cancer.

Chemo is generally not recommended after 35 weeks of pregnancy or within 3 weeks of delivery because it can lower the mother's blood cell counts. This could cause bleeding and increase the chances of infection during birth. Holding off on chemo for the last few weeks before delivery allows the mother's blood counts to return to normal before childbirth.

## **Treatments that typically must wait until after delivery**

Some treatments for breast cancer can harm the baby and are not safe to get during pregnancy. If these treatments are needed, they are usually scheduled for after the baby is born.

**Radiation therapy:** Radiation therapy to the breast is often used after breast-

conserving surgery (lumpectomy) to help reduce the risk of the cancer coming back. The high doses of radiation used for this can harm the baby any time during pregnancy. This may cause miscarriage, birth defects, slow fetal growth, or a higher risk of childhood cancer. Because of this, doctors don't use radiation treatment during pregnancy.

For some women whose cancer is found later in the pregnancy, it may be possible to have a lumpectomy during pregnancy and then wait until after the baby is born to get radiation therapy. But this treatment approach has not been well-studied. Waiting too long to start radiation can increase the chance of the cancer coming back.

**Hormone therapy:** Hormone therapy is often used as adjuvant treatment after surgery or as treatment for advanced breast cancer in women with hormone receptor-positive (ER-positive or PR-positive) breast cancer. Hormone therapy drugs used for breast cancer include tamoxifen, anastrozole, letrozole, and exemestane.

Hormone therapy should not be used during pregnancy because it can affect the baby. It should be delayed until after the woman has given birth.

**Targeted therapy:** Drugs that target HER2, such as trastuzumab (Herceptin), pertuzumab (Perjeta), ado-trastuzumab emtansine (Kadcyla) and lapatinib (Tykerb), are an important part of the treatment of HER2-positive breast cancers. In women who aren't pregnant, trastuzumab is used as a part of adjuvant treatment after surgery, pertuzumab can be used with trastuzumab before surgery, and all of these drugs can be useful in treating advanced cancer. But based on animal studies and reports of women who were treated during pregnancy, none of these drugs are considered safe for the baby if taken during pregnancy.

Everolimus (Afinitor) and palbociclib (Ibrance) are also targeted drugs that can be used along with hormone therapy to treat advanced breast cancer. Again, these drugs are not thought to be safe to use during pregnancy.

## Can I breastfeed during cancer treatment?

Most doctors recommend that women who have just had babies and are about to be treated for breast cancer should stop (or not start) breastfeeding.

If breast surgery is planned, stopping breastfeeding will help reduce blood flow to the breasts and make them smaller. This can help with the operation. It also helps reduce the risk of infection in the breast and can help avoid having breast milk collect in biopsy or surgery areas.

Many chemo, hormone, and targeted therapy drugs can enter breast milk and be passed on to the baby. Breastfeeding isn't recommended if you are getting chemo, hormone, or targeted therapy.

If you have questions, such as when it might be safe to start breastfeeding, talk with your health care team. If you plan to start breastfeeding after you've stopped for a while, plan ahead. You may need extra help from breastfeeding experts.

## How does pregnancy affect survival rates for breast cancer?

Pregnancy can make it harder to find, diagnose, and treat breast cancer. Most studies have found that the outcomes among pregnant and non-pregnant women with breast cancer are about the same for cancers found at the same stage, but not all studies agree.

Some doctors believe that ending the pregnancy may help slow the course of more advanced breast cancers, and they may recommend that for some women with advanced breast cancer. It's hard to do research in this area, and good, unbiased studies don't exist. Ending the pregnancy makes treatment simpler, but older studies that looked at pregnant women did not find that ending the pregnancy improves a woman's overall survival or cancer outcome. Of note, there were some flaws that could have biased the outcomes of these studies. For example, the women who had more advanced disease were more likely to end their pregnancies. It's hard to know if outcomes would be different with more modern treatments.

Studies have not shown that the treatment delays that are sometimes needed during pregnancy have an effect on breast cancer outcome, either. But this, too, has proven to be a difficult area to study. Finally, there are no reports showing that breast cancer itself can harm the baby.

- [References](#)

Abdel-Hady el-S, Hemida RA, Gamal A, et al. Cancer during pregnancy: Perinatal outcome after in utero exposure to chemotherapy. *Arch Gynecol Obstet.* 2012;286:283-286.

Ali SA, Gupta S, Sehgal R, Vogel V. Survival outcomes in pregnancy associated breast cancer: A retrospective case control study. *Breast J.* 2012;18:139-144.

Amant F, von Minckwitz G, Han SN, et al. Prognosis of women with primary breast

cancer diagnosed during pregnancy: Results from an international collaborative study. *J Clin Oncol*. 2013;31:2532-2539.

Castillo JJ, Rizack T. Chapter 64: Special Issues in Pregnancy. In: Niederhuber JE, Armitage JO, Dorshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa. Elsevier: 2014.

Donnelly EH, Smith JM, Farfán EB, Ozcan I. Prenatal radiation exposure: Background material for counseling pregnant patients following exposure to radiation. *Disaster Med Public Health Prep*. 2011;5:62-68.

Guidroz JA, Scott-Conner CEH, Weigel RJ. Management of pregnant women with breast cancer. *J Surg Oncol*. 2011;103:337-340.

Filippakis GM, Zografos G. Contraindications of sentinel lymph node biopsy: Are there any really? *World J Surg Oncol*. 2007;5:10.

Loibl S, Han SN, von Minckwitz G, et al. Treatment of breast cancer during pregnancy: An observational study. *Lancet Oncol*. 2012;13:887-896.

Morrow M, Burstein HJ, Harris JR. Chapter 79: Malignant Tumors of the Breast. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

Murphy CG, Mallam D, Stein S, et al. Current or recent pregnancy is associated with adverse pathologic features but not impaired survival in early breast cancer. *Cancer*. 2012;118:3254-3259.

National Comprehensive Cancer Network: NCCN Clinical Guidelines in Oncology. Breast Cancer, V.2.2016. Accessed at [www.nccn.org/professionals/physician\\_gls/pdf/breast.pdf](http://www.nccn.org/professionals/physician_gls/pdf/breast.pdf) on June 1, 2016.

Petrek JA, Dukoff R, Rogatko A. Prognosis of pregnancy-associated breast cancer. *Cancer*. 1991, *Cancer*. 1991;67:869-872.

Wolff AC, Domchek SM, Davidson NE, Sacchini V, McCormick B. Chapter 91: Cancer of the Breast. In: Niederhuber JE, Armitage JO, Dorshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

Zagouri F, Psaltopoulou T, Dimitrakakis C, Bartsch R, Dimopoulos MA. Challenges in managing breast cancer during pregnancy. *J Thorac Dis*. 2013;5(Suppl 1):S62-67.



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