

# A Review of Detection Techniques of Breast Cancer

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## Abstract:

Breast cancer is sometimes found after symptoms appear, but many women with breast cancer have no symptoms. This is why regular breast cancer screening is so important. Finding breast cancer early and getting state-of-the-art cancer treatment are the most important strategies to prevent deaths from breast cancer. Breast cancer that's found early, when it's small and has not spread, is easier to treat successfully. Getting regular screening tests is the most reliable way to find breast cancer early. Early detection of breast cancer gives the best possible chance of survival. The earlier an abnormality is discovered, the greater the number of effective treatment options available. This ensures the best possible outcome. This paper describes various techniques of detecting the breast cancer as its necessary to detect it and only after that one can enhance or treat the same. It also gives the result that why screening is important to women for this.

## Keywords:

Breast Cancer, MRI, CBE, Mammogram, Biopsy

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## 1. Introduction

Breast cancer is a type of cancer that starts in the breast. Cancer starts when cells begin to grow out of control. Breast cancer cells usually form a tumor that can often be seen on an x-ray or felt as a lump. Breast cancer occurs almost entirely in women, but men can get breast cancer, too. Breast cancer is cancer that develops from breast tissue. Signs of breast cancer may include a lump in the breast, a change in breast shape, dimpling of the skin, fluid coming from the nipple, a newly-inverted nipple, or a red or scaly patch of skin. In those with distant spread of the disease, there may be bone pain, swollen lymph nodes, shortness of breath, or yellow skin. Risk factors for developing breast cancer include being female, obesity, lack of physical exercise, drinking alcohol, hormone replacement therapy during menopause, ionizing radiation, early age at first menstruation, having children late or not at all, older age, prior history of breast cancer, and family history. Breast cancer most commonly develops in cells from the lining of milk ducts and the lobules that supply the ducts with milk. Cancers developing from the ducts are known as ductal carcinomas, while those developing from lobules are known as lobular carcinomas. In addition, there are

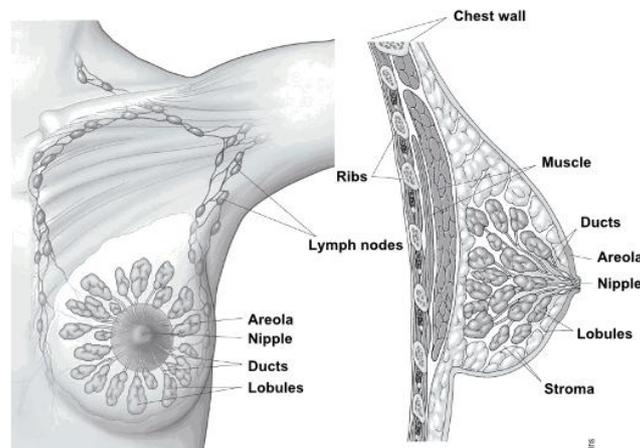
more than 18 other sub-types of breast cancer. Some cancers, such as ductal carcinoma in situ, develop from pre-invasive lesions. The diagnosis of breast cancer is confirmed by taking a biopsy of the concerning lump. Once the diagnosis is made, further tests are done to determine if the cancer has spread beyond the breast and which treatments are most likely to be effective.

It's important to understand that most breast lumps are benign and not cancer (malignant). Non-cancerous breast tumors are abnormal growths, but they do not spread outside of the breast. They are not life threatening, but some types of benign breast lumps can increase a woman's risk of getting breast cancer. Any breast lump or change needs to be checked by a health care professional to determine if it is benign or malignant (cancer) and if it might affect your future cancer risk.

### **1.1. Where Breast Cancer Starts**

Breast cancers can start from different parts of the breast.

- Most breast cancers begin in the ducts that carry milk to the nipple (ductal cancers)
- Some start in the glands that make breast milk (lobular cancers)
- There are also other types of breast cancer that are less common like phyllodes tumor and angiosarcoma
- A small number of cancers start in other tissues in the breast. These cancers are called sarcomas and lymphomas and are not really thought of as breast cancers.



**Normal breast tissue**

*Figure 1. Normal breast tissue.*

### **1.2. Types of Breast Cancer**

There are many different types of breast cancer and common ones include ductal carcinoma in situ (DCIS) and invasive carcinoma. Others, like phyllodes tumors and angiosarcoma are less common. Once a biopsy is done, breast cancer cells are tested for proteins called estrogen receptors, progesterone receptors and HER2. The tumor cells are also closely looked at in the lab to find out what grade it is. The specific proteins found and the tumor grade can help decide treatment options.

## **2. Detection and Screening Methods**

There are many ways breast cancer can be detected. These include:

- Through clinical examination
- Mammograms
- Magnetic Resonance Imaging (MRI)
- Ultrasound
- Biopsy

### 2.1. Clinical Examination

A clinical breast examination involves a thorough physical examination of your whole breast area done by a healthcare professional. This includes breasts, nipples, armpits and the collarbone. You will also be asked about your personal and family history of breast cancer, and if you have noticed any changes in your breasts.

A CLINICAL BREAST EXAM (CBE) is a physical exam done by a health care provider. It's often done during your regular medical check-up.

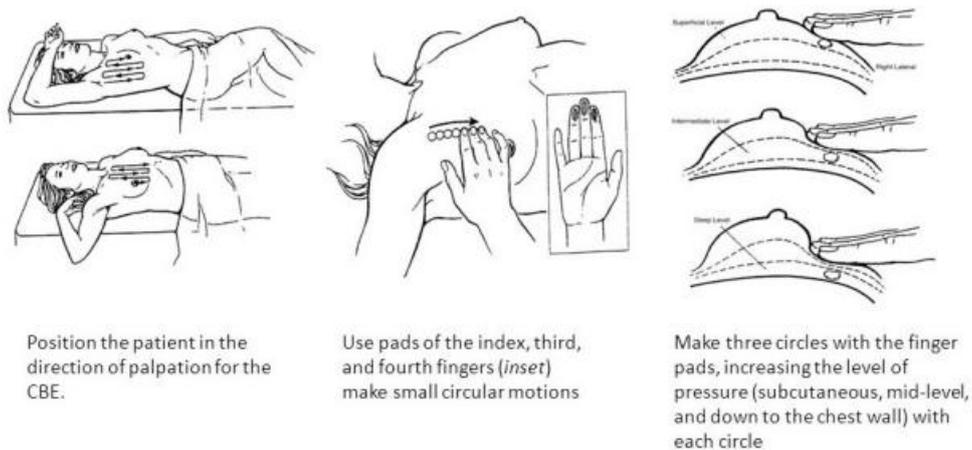
A CBE should be performed by a health care provider well-trained in the technique (this may be a physician, nurse practitioner or other medical staff). Not all providers have this training.

The National Comprehensive Cancer Network (NCCN) recommends a trained provider carefully feel your breasts, underarm and the area just below your clavicle (breast bone) for any changes or abnormalities (such as a lump).

The provider will visually check your breasts while you are sitting up and physically examine your breasts while you are lying down.

If a CBE is not offered at your check-up and you would like one, ask your provider if he or she can perform one.

#### ▪ Clinical Breast Exam:



*Figure 2. Clinical breast exam.*

### 2.2. Mammograms

A mammogram is an x-ray picture of the breast. It can be used to check for breast cancer in women who have no signs or symptoms of the disease. It can also be used if you have a lump or other sign of breast cancer.

Screening mammography is the type of mammogram that checks you when you have no symptoms. It can help reduce the number of deaths from breast cancer among

women ages 40 to 70. But it can also have drawbacks. Mammograms can sometimes find something that looks abnormal but isn't cancer. This leads to further testing and can cause you anxiety. Sometimes mammograms can miss cancer when it is there. It also exposes you to radiation. You should talk to your doctor about the benefits and drawbacks of mammograms. Together, you can decide when to start and how often to have a mammogram.

Mammograms are also recommended for younger women who have symptoms of breast cancer or who have a high risk of the disease.

When you have a mammogram, you stand in front of an x-ray machine. The person who takes the x-rays places your breast between two plastic plates. The plates press your breast and make it flat. This may be uncomfortable, but it helps get a clear picture. You should get a written report of your mammogram results within 30 days.

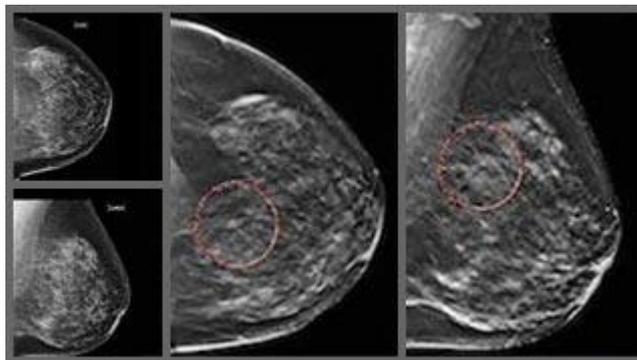
### **2.3. Types of Mammograms**

#### **2.3.1. Screening Mammograms**

A screening mammogram is used to look for signs of breast cancer in women who don't have any breast symptoms or problems. X-ray pictures of each breast are taken, typically from 2 different angles.

#### **2.3.2. Diagnostic Mammograms**

Mammograms can also be used to look at a woman's breast if she has breast symptoms or if a change is seen on a screening mammogram. When used in this way, they are called diagnostic mammograms. They may include extra views (images) of the breast that aren't part of screening mammograms. Sometimes diagnostic mammograms are used to screen women who were treated for breast cancer in the past.

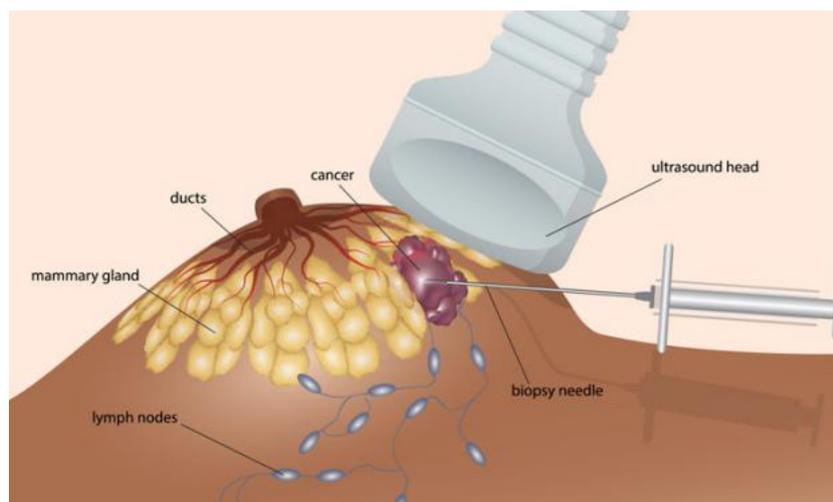


**Figure 3.** *Diagnostic mammograms.*

### **2.4. Biopsy**

A biopsy is the removal of a small sample of tissue from the breast or lymph nodes. The tissue is then examined by a pathologist (specialist doctor) under a microscope. This process helps to determine if the sampled tissue has any cancer cells. It also helps to determine the appropriate treatment plan.

While a biopsy may sound scary, it's important to remember that most are entirely pain-free and low-risk procedures. Depending on your situation, a piece of skin, tissue, organ, or suspected tumor will be surgically removed and sent to a lab for testing.



*Figure 4. Biopsy.*

## **2.5. Why a Biopsy is Done**

If you have been experiencing symptoms normally associated with cancer, and your doctor has located an area of concern, he or she may order a biopsy to help determine if that area is cancerous.

A biopsy is the only sure way to diagnosis most cancers. Imaging tests like CT scans and X-rays can help identify areas of concerns, but they can't differentiate between cancerous and noncancerous cells.

Biopsies are typically associated with cancer, but just because your doctor orders a biopsy, it doesn't mean that you have cancer. Doctors use biopsies to test whether abnormalities in your body are caused by cancer or by other conditions.

For example, if a woman has a lump in her breast, an imaging test would confirm the lump, but a biopsy is the only way to determine whether it's breast cancer or another noncancerous condition, such as polycystic fibrosis.

### **2.5.1. Types of Biopsies**

There are several different kinds of biopsies. Your doctor will choose the type to use based on your condition and the area of your body that needs closer review.

Whatever the type, you'll be given local anesthesia to numb the area where the incision is made.

### **2.5.2. Bone Marrow Biopsy**

Inside some of your larger bones, like the hip or the femur in your leg, blood cells are produced in a spongy material called marrow.

If your doctor suspects that there are problems with your blood, you may undergo a bone marrow biopsy. This test can single out both cancerous and noncancerous conditions like leukemia, anemia, infection, or lymphoma. The test is also used to check if cancer cells from another part of the body have spread to your bones.

Bone marrow is most easily accessed using a long needle inserted into your hipbone. This may be done in a hospital or doctor's office. The insides of your bones cannot be numbed, so some people feel a dull pain during this procedure. Others, however, only feel an initial sharp pain as the local anesthetic is injected.

### **2.5.3. Endoscopic Biopsy**

Endoscopic biopsies are used to reach tissue inside the body in order to gather samples from places like the bladder, colon, or lung.

During this procedure, your doctor uses a flexible thin tube called an endoscope. The endoscope has a tiny camera and a light at the end. A video monitor allows your doctor to view the images. Small surgical tools are also inserted into the endoscope. Using the video, your doctor can guide these to collect a sample.

The endoscope can be inserted through a small incision in your body, or through any opening in the body, including the mouth, nose, rectum, or urethra. Endoscopies normally take anywhere from five to 20 minutes.

This procedure can be done in a hospital or in a doctor's office. Afterward, you might feel mildly uncomfortable, or have bloating, gas, or a sore throat. These will all pass in time, but if you are concerned, you should contact your doctor.

### **2.5.4. Needle Biopsies**

Needle biopsies are used to collect skin samples, or for any tissue that is easily accessible under the skin. The different types of needle biopsies include the following:

Core needle biopsies use medium-sized needle to extract a column of tissue, in the same way that core samples are taken from the earth.

Fine needle biopsies use a thin needle that is attached to a syringe, allowing fluids and cells to be drawn out.

Image-guided biopsies are guided with imaging procedures — such as X-ray or CT scans — so your doctor can access specific areas, such as the lung, liver, or other organs.

Vacuum-assisted biopsies use suction from a vacuum to collect cells.

### **2.5.5. Skin Biopsy**

If you have a rash or lesion on your skin which is suspicious for a certain condition, does not respond to therapy prescribed by your doctor, or the cause of which is unknown, your doctor may perform or order a biopsy of the involved area of skin. This can be done by using local anesthesia and removing a small piece of the area with a razor blade, a scalpel, or a small, circular blade called a “punch.” The specimen will be sent to the lab to look for evidence of conditions such as infection, cancer, and inflammation of the skin structures or blood vessels.

### **2.5.6. Surgical Biopsy**

Sometimes a patient may have an area of concern that cannot be safely or effectively reached using the methods described above or the results of other biopsy specimens have been negative. An example would be a tumor in the abdomen near the aorta. In this case, a surgeon may need to get a specimen using a laparoscope or by making a traditional incision.

## **2.6. Magnetic Resonance Imaging (MRI)**

Breast MRI (magnetic resonance imaging) uses radio waves and strong magnets to make detailed pictures of the inside of the breast.

### **2.6.1. When is Breast MRI Used?**

To help determine the extent of breast cancer: Breast MRI is sometimes used in women who already have been diagnosed with breast cancer, to help measure the size of the cancer, look for other tumors in the breast, and to check for tumors in the opposite breast. But not every woman who has been diagnosed with breast cancer needs a breast MRI.

To screen for breast cancer: For certain women at high risk for breast cancer, a screening MRI is recommended along with a yearly mammogram. MRI is not recommended as a screening test by itself because it can miss some cancers that a mammogram would find.

Although MRI can find some cancers not seen on a mammogram, it's also more likely to find things that turn out not to be cancer (called a false positive). This can result in a woman getting tests and/or biopsies that end up not being needed. This is why MRI is not recommended as a screening test for women at average risk of breast cancer.

### **2.6.2. Points for Getting Ready for the Test**

Check with your insurance provider before getting an MRI: Breast MRI costs a lot, and it may need to be approved by your insurance company before the scan is done. Most private insurance plans that pay for mammogram screening also pay for MRI as a screening test if a woman can be shown to be at high risk. It might help to go to a center with a high-risk clinic, where the staff has experience getting approval for breast MRIs.

Follow all instructions: You don't usually need a special diet or preparation before an MRI, but follow any instructions you're given.

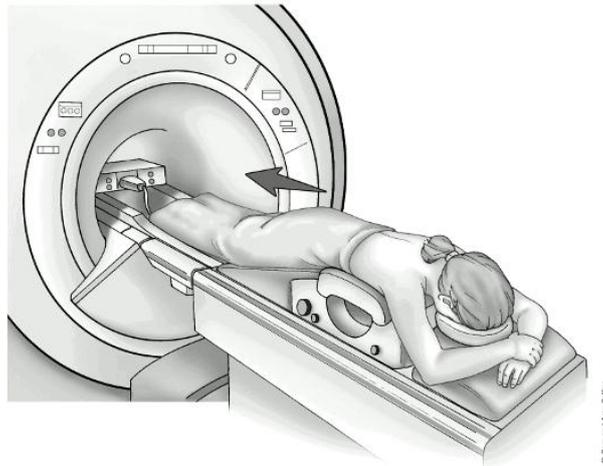
If you have trouble with enclosed spaces: Breast MRI is most often done while you are lying on your belly inside a long, narrow tube. If being in a tight space might be a problem for you (you have claustrophobia), you might need to take medicine to help you relax while in the scanner. Talking with the technologist or a patient counselor or getting a tour of the MRI machine before the test can also help. You'll be in the exam room alone, but you can talk to the MR technologist, who can see and hear what's going on.

Remove metal objects: Before the test, you'll be asked to undress and put on a gown or other clothes without zippers or metal. Be sure to remove any metal objects you can, like hair clips, jewelry, dental work, and body piercings.

If you have metal in your body: Before the scan, the technologist will ask you if you have any metal in your body. Some metallic objects will not cause problems, but others can.

If you have any of these types of medical implants, you should not even enter the MRI scanning area unless you're told it's OK to do so by a radiologist or technologist:

- An implanted defibrillator or pacemaker
- Clips used on a brain aneurysm
- A cochlear (ear) implant
- Metal coils inside blood vessels



**Breast MRI**

**Figure 5. Breast MRI.**

## **2.7. Ultrasound**

An ultrasound uses sound waves to outline a part of your body. A breast ultrasound is used to see whether a lump found in the breast is solid or filled with fluid. An ultrasound is often used to check abnormal results from a mammogram.

Doctors often use ultrasound as an early diagnostic tool to evaluate breast lumps.

Unlike CT scans and X-rays, an ultrasound does not use ionizing radiation. For this reason, doctors often recommend an ultrasound for individuals who are not candidates for radiation-based imaging techniques.

### **2.7.1. People Who Should Avoid Radiation Include Those Who**

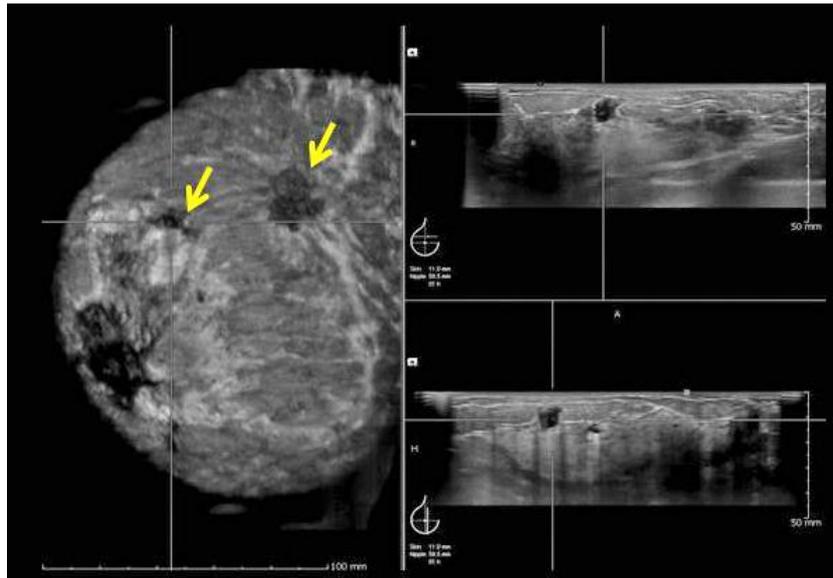
- are pregnant or breastfeeding
- are under the age of 25 years
- have breast implants

A doctor may also use an ultrasound to help guide a biopsy needle to collect tissue from a lump for testing. This procedure is called an ultrasound-guided biopsy.

A doctor may schedule a breast ultrasound after discovering a lump in the breast tissue during a routine physical examination or mammogram.

They may also request a breast ultrasound for:

- assessing unusual nipple discharge
- evaluating cases of mastitis, which is the inflammation of the mammary tissues
- monitoring breast implants
- assessing symptoms, such as breast pain, redness, and swelling
- examining skin changes, such as discoloration
- monitoring existing benign breast lumps
- verifying the results of other imaging tests, such as an MRI scan or a mammogram



*Figure 6. Breast ultrasound.*

### 3. Conclusion

Incidence of breast cancer is increasing, due to increase life expectancy, urbanization and more importantly, adoption to unhealthy lifestyle. The curability of breast cancer, therefore, lies deeply on our farsighted approach of the matter. A regular physical exam, our diet and lifestyle and awareness of health issues present in our lineage are significant factors in the prevention of the disease. A screening test tries to find a disease before there are any symptoms. With breast cancer, there's a misconception that if you feel fine, don't have a lump, and have no family history of breast cancer, you're okay. The truth is that three-quarters of the women in whom we find breast cancer have no risk factors. So screening is important for everyone.

### Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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