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## Understanding Your Pathology Report: Breast Cancer

When your breast was biopsied, the samples taken were studied under the microscope by a specialized doctor with many years of training called a *pathologist*. The pathologist sends your doctor a report that gives a diagnosis for each sample taken. Information in this report will be used to help manage your care. The questions and answers that follow are meant to help you understand medical language you might find in the pathology report from a [breast biopsy](#)<sup>1</sup>, such as a needle biopsy or an excision biopsy.

In a needle biopsy, a needle is used to remove a sample of an abnormal area. An excision biopsy removes the entire abnormal area, often with some of the surrounding normal tissue. An excision biopsy is much like a type of [breast-conserving surgery](#)<sup>2</sup> called a lumpectomy.

### What is carcinoma or adenocarcinoma?

Carcinoma is a term used to describe a cancer that begins in the lining layer (epithelial cells) of organs like the breast. Nearly all breast cancers are carcinomas. Most are the type of carcinoma that starts in glandular tissue, which are called *adenocarcinomas*.

### What if a carcinoma is infiltrating or invasive?

These words are used to mean that the cancer is not a pre-cancer (carcinoma in situ), but is a true cancer.

The [normal breast](#)<sup>3</sup> is made of tiny tubes (ducts) that end in a group of sacs (lobules). Cancer starts in the cells lining the ducts or lobules, when a normal cell becomes a carcinoma cell. As long as the carcinoma cells are still confined to the breast ducts or lobules, without breaking out and growing into surrounding tissue, it is considered *in-situ*

*carcinoma* (or *carcinoma in situ*).

Once the carcinoma cells have grown and broken out of the ducts or lobules, it is called *invasive* or *infiltrating carcinoma*. In an invasive carcinoma, the tumor cells can spread (metastasize) to other parts of your body.

### **What does it mean if my carcinoma is called invasive ductal carcinoma, invasive lobular carcinoma, or carcinoma with ductal and lobular features?**

Breast carcinomas are often divided into 2 main types: invasive ductal carcinoma and invasive lobular carcinoma, based on how they look under the microscope. In some cases, the tumor can have features of both and is called a mixed ductal and lobular carcinoma. Another term for invasive ductal carcinoma is *invasive mammary carcinoma of no special type*, because it is the most common type of breast carcinoma.

Both invasive ductal carcinomas and invasive lobular carcinomas arise from the cells lining the ducts and lobules in the breast. In general, invasive lobular and invasive ductal carcinomas of the breast aren't treated differently.

### **What does it mean if my report mentions E-cadherin?**

E-cadherin is a test that the pathologist might use to help determine if the tumor is ductal or lobular. (The cells in invasive lobular carcinomas are often negative for E-cadherin.) If your report does not mention E-cadherin, it means that this test was not needed to tell what type of cancer you have.

### **What does it mean if my carcinoma is well differentiated, moderately differentiated, or poorly differentiated?**

When looking at the cancer cells under the microscope, the pathologist looks for certain features that can help predict how likely the cancer is to grow and spread. These features include the arrangement of the cells in relation to each other, whether they form tubules (gland formation), how closely they resemble normal breast cells (nuclear grade), and how many of the cancer cells are in the process of dividing (mitotic count). These features taken together determine how differentiated the cancer is (and its grade – see below).

- **Well-differentiated carcinomas** have relatively normal-looking cells that do not appear to be growing rapidly and are arranged in small tubules for ductal cancer and cords for lobular cancer. These cancers tend to grow and spread slowly and have a better prognosis (outlook).

- **Poorly differentiated carcinomas** lack normal features, tend to grow and spread faster, and have a worse prognosis.
- **Moderately differentiated carcinomas** have features and a prognosis in between these two.

### What is histologic grade or Nottingham grade or Elston grade?

These grades are similar to what is described in the question above about differentiation. Numbers are assigned to different features (gland formation, nuclear grade, and mitotic count) seen under the microscope and then added up to assign the grade.

- If the numbers add up to 3-5, the cancer is grade 1 (well differentiated).
- If they add up to 6 or 7, it means the cancer is grade 2 (moderately differentiated).
- If they add up to 8 or 9, it means the cancer is grade 3 (poorly differentiated).

### What does it mean if Ki-67 is mentioned in my report?

Ki-67 is a way to measure how fast the cancer cells are growing and dividing. High values (over 30%) for Ki-67 mean that many cells are dividing, so the cancer is likely to grow and spread more quickly.

### What does it mean if my carcinoma has tubular, mucinous, cribriform, or micropapillary features?

These are [different types of invasive ductal carcinoma](#)<sup>4</sup> that can be identified under the microscope.

- **Tubular, mucinous, and cribriform carcinomas** are "special types" of well-differentiated cancers that often have a better prognosis than the more common type of invasive ductal carcinoma (or "invasive mammary carcinoma of no special type").
- **Micropapillary carcinoma** is a type of invasive breast carcinoma that often has a worse prognosis.

If your doctor knows that your tumor is made up of one of these special types of breast cancer, different treatment might be recommended.

Since some tumors are made up of more than one type, the entire tumor must be removed (by [lumpectomy](#)<sup>5</sup> or [mastectomy](#)<sup>6</sup>) in order to know what types your tumor contains. A needle biopsy doesn't give enough information to guide treatment.

### **What is vascular, lymphovascular, or angiolymphatic invasion? What if my report mentions D2-40 (podoplanin) or CD34?**

If cancer cells are seen in small blood vessels or lymph vessels (lymphatics) under the microscope, it is called *vascular, angiolymphatic, or lymphovascular invasion*. When cancer is growing in these vessels, there is an increased risk that it has spread outside the breast. If your report does not mention this type of invasion, it means it is not there. Even if it is there, it does not always mean that your cancer has spread. How this finding affects your treatment is best discussed with your doctor.

D2-40 and CD34 are special tests that the pathologist may use to help identify these types of vascular invasion. These tests are not needed in every case.

### **What is the significance of the reported size of the tumor?**

If the entire tumor or area of cancer is removed, the pathologist will say how big the area of cancer is by measuring how long it is across (in greatest dimension), either by looking at it under the microscope, or by gross examination (just looking at it with the naked eye) of the tissue removed during surgery. The size of the tumor in the breast is part of what determines the [stage](#)<sup>7</sup> (extent) of the cancer, which influences treatment and prognosis.

A needle biopsy only samples a part of the tumor, so measurements of the size of the cancer are often not given. Later, when the tumor is removed (by mastectomy or breast-conserving surgery), a more accurate measurement is obtained.

### **What is the significance of the stage of the tumor?**

The [stage](#)<sup>8</sup> of a cancer is a measurement of the extent of the tumor and its spread. The standard staging system for breast cancer uses a system known as TNM, where:

- **T** stands for the main (primary) **tumor**
- **N** stands for spread to nearby lymph **nodes**
- **M** stands for **metastasis** (spread to distant parts of the body)

If the stage is based on removal of the cancer with surgery and review by the

pathologist, the letter p (for pathologic) may appear before the T and N letters.

The **T category** (T0, Tis, T1, T2, T3, or T4) is based on the size of the tumor and whether or not it has spread to the skin over the breast or to the chest wall under the breast. Higher T numbers mean a larger tumor and/or wider spread to tissues near the breast. (Tis is carcinoma in situ.) Since the entire tumor must be removed to learn the T category, this information is not given for needle biopsies.

The **N category** (N0, N1, N2, or N3) indicates whether the cancer has spread to lymph nodes near the breast and, if so, how many lymph nodes are affected. Higher numbers after the N indicate more lymph node involvement by cancer. If no nearby lymph nodes were removed to be checked for cancer spread, the report may list the N category as NX, where the letter X is used to mean that the information is not available (also see next question).

The **M category** (M0, M1) is usually based on the results of lab and imaging tests, and is not part of the pathology report from breast cancer surgery. In a pathology report, the M category is often left off or listed as MX (again the letter X means that the information is not available).

Once the T, N, and M categories have been determined, this information is combined to give the cancer an overall stage. Stages are expressed in Roman numerals from stage I (the least advanced stage) to stage IV (the most advanced stage). Non-invasive cancer (carcinoma in situ) is listed as stage 0.

Detailed information on staging can be found in [Stages of Breast Cancer](#)<sup>9</sup>. Talk with your doctor about the stage of your cancer and what it means to you.

### What if my report mentions lymph nodes?

If breast cancer spreads, it often goes first to the nearby lymph nodes under the arm (called *axillary lymph nodes*). If any of your underarm [lymph nodes](#)<sup>10</sup> were enlarged (found either by physical exam or with an imaging test like ultrasound or mammogram), they may be biopsied at the same time as your breast tumor. One way to do this is by using a needle to get a sample of cells from the lymph node. The cells will be checked to see if they contain cancer and if so, whether the cancer is ductal or lobular carcinoma.

In surgery meant to treat breast cancer, lymph nodes under the arm may be removed. These lymph nodes will be examined under the microscope to see if they contain cancer cells. The results might be reported as the number of lymph nodes removed and how many of them contained cancer (for example, 2 of 15 lymph nodes contained

cancer).

Lymph node spread affects staging and prognosis (outlook). Your doctor can talk to you about what these results mean to you.

### **What if my report mentions sentinel lymph node?**

In a [sentinel lymph node biopsy](#)<sup>11</sup>, the surgeon finds and removes the first lymph node(s) to which a tumor drains. This lymph node, known as the *sentinel node*, is the one most likely to contain cancer cells if they have started to spread. This procedure may be done during surgery to remove a breast cancer. It is a way to check for the spread of cancer to underarm lymph nodes without removing as many of them.

The sentinel lymph node is then checked to see if it contains cancer cells. 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.

If a sentinel lymph node does contain cancer, your report will say that cancer was present in the lymph node. It may also say how large the deposit of cancer cells is. In some cases, if cancer is found in a sentinel lymph node, you may then also need additional treatment such as surgery to remove more underarm lymph nodes or radiation therapy to the underarm region. You should discuss this with your doctor.

### **What if my report mentions isolated tumor cells in a lymph node?**

This means there are scattered cancer cells in the lymph node that are either seen with a routine microscopic exam or with special tests. Isolated tumor cells do not affect your stage or change your treatment.

### **What if my report mentions pN0(i+)?**

This means that the isolated tumor cells were found in a lymph node using special stains.

### **What if my report mentions micrometastases in a lymph node?**

This means that there are cancer cells in the lymph nodes that are bigger than isolated tumor cells but smaller than regular cancer deposits. If micrometastases are present, the N category is described as pN1mi. This can affect the stage of your cancer, so it might change what treatments you may need. Talk to your doctor about what this finding may mean to you.

**What does it mean if my report mentions special tests such as high molecular weight cytokeratin (HMWCK), CK903, CK5/6, p63, muscle specific actin, smooth muscle myosin heavy chain, calponin, or keratin?**

These are special tests that the pathologist sometimes uses to help diagnose invasive breast cancer or to identify cancer in lymph nodes. Not all cases need these tests. Whether or not your report mentions these tests has no bearing on the accuracy of your diagnosis.

**What does it mean if my report also has any of the following terms: usual ductal hyperplasia, adenosis, sclerosing adenosis, radial scar, complex sclerosing lesion, papillomatosis, papilloma, apocrine metaplasia, cysts, columnar cell change, collagenous spherulosis, duct ectasia, fibrocystic changes, flat epithelial atypia, or columnar alteration with prominent apical snouts and secretions (CAPSS)?**

All of these are terms for [non-cancerous \(benign\) changes](#)<sup>12</sup> that the pathologist might see under the microscope. They are not important when seen on a biopsy where there is invasive breast cancer.

**What does it mean if my report mentions microcalcifications or calcifications?**

Microcalcifications or calcifications are calcium deposits that can be found in both non-cancerous and cancerous breast lesions. They can be seen both on mammograms and under the microscope. Because certain calcifications are found in areas containing cancer, their presence on a mammogram may lead to a biopsy of the area. Then, when the biopsy is done, the pathologist looks at the tissue removed to be sure that it contains calcifications. If the calcifications are there, the doctor knows that the biopsy sampled the correct area (the abnormal area with calcifications that was seen on the mammogram).

**What does it mean if, in addition to cancer, my report also mentions atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), ductal carcinoma in situ (DCIS), intraductal carcinoma, lobular carcinoma in situ (LCIS), or in-situ lobular carcinoma?**

These are terms for certain atypical or pre-cancer changes that can sometimes be seen on biopsy that aren't as serious as invasive cancer. If they are found in a needle biopsy that also shows invasive cancer, they are typically not important. They may, however, need to be removed completely as a part of treatment. If they are seen on an excisional biopsy at or near a margin (see the question below about margins), more tissue may

need to be removed (even if all of the invasive cancer was taken out).

### **What does it mean if my report mentions estrogen receptor (ER) or progesterone receptor (PR)?**

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

An important step in evaluating a breast cancer is to test a portion of the cancer removed during the biopsy (or surgery) to see if they have estrogen and progesterone receptors. Cancer cells may contain neither, one, or both of these receptors. Breast cancers that contain estrogen receptors are often referred to as *ER-positive* (or ER+) cancers, while those containing progesterone receptors are called *PR-positive* (or PR+) cancers. Women with hormone receptor-positive cancers tend to have a better prognosis and are much more likely to respond to [hormone therapy](#)<sup>13</sup> than women with cancers without these receptors.

All breast cancers and pre-cancers, with the exception of [lobular carcinoma in situ \(LCIS\)](#)<sup>14</sup>, should be tested for these hormone receptors when they have the breast biopsy or surgery.

Results for ER and PR are reported separately and can be reported in different ways:

- Negative, weakly positive, positive
- Percent positive
- Percent positive and whether the staining is weak, moderate, or strong.

How the results of your tests will affect your therapy is best discussed with your doctor.

### **What if my report mentions HER2/neu or HER2?**

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

The cells in HER2-positive breast cancers have too many copies of the *HER2/neu* gene, resulting in greater than normal amounts of the HER2 protein. These cancers tend to grow and spread more quickly than other breast cancers.



All newly diagnosed breast cancers should be tested for HER2, because women with HER2-positive cancers are much more likely to benefit from treatment with [drugs that target the HER2 protein](#),<sup>15</sup> such as trastuzumab (Herceptin), lapatinib (Tykerb), pertuzumab (Perjeta), and T-DM1 (Kadcyla).

Testing of the biopsy or surgery sample is usually done in 1 of 2 ways:

- **Immunohistochemistry (IHC):** In this test, special antibodies that will stick to the HER2 protein are applied to the sample, which cause cells to change color if many copies are present. This color change can be seen under a microscope. The test results are reported as 0, 1+, 2+, or 3+.
- **Fluorescent in situ hybridization (FISH):** This test uses fluorescent pieces of DNA that specifically stick to copies of the *HER2/neu* gene in cells, which can then be counted under a special microscope.

Many breast cancer specialists think that the FISH test is more accurate than IHC. However, it is more expensive and takes longer to get the results. Often the IHC test is used first:

- If the results are 0 or 1+, the cancer is considered HER2-negative. Women with HER2-negative tumors are not treated with drugs (like trastuzumab) that target HER2.
- If the test comes back 3+, the cancer is HER2-positive, so the person might benefit from treatment with drugs that target HER2.
- When the result is 2+, the HER2 status of the tumor is not clear and is called "equivocal." This means that the HER2 status needs to be tested with FISH to clarify the result.

A newer type of test, known as **chromogenic in situ hybridization (CISH)**, works similarly to FISH, by using small DNA probes to count the number of *HER2/neu* genes in breast cancer cells. This test looks for color changes (not fluorescence) and doesn't require a special microscope, which might make it less expensive than FISH. Right now, it is not being used as much as IHC and FISH.

If your cancer is HER2-positive, your doctor might add certain drugs to your treatment. How the results of your tests will affect your treatment is best discussed with your doctor.

### What if my report mentions margins or ink?

When an entire tumor is removed, the outside edges (or margins) of the specimen are coated with ink, sometimes even with different colors of ink on different sides of the specimen. The pathologist looks at slides of the tumor under the microscope to see how close the cancer cells get to the ink (the edges or margins of the specimen). If cancer cells are touching the ink (called *positive margins*), it can mean that some cancer was left behind, and more surgery or other treatments may be needed. Sometimes, though, the surgeon has already removed more tissue (at surgery) to help make sure that this isn't needed.

Sometimes, all of the invasive cancer is removed, but there may be pre-cancer or another serious condition at or near the margin, such as [ductal carcinoma in situ \(DCIS\)](#)<sup>16</sup> or [lobular carcinoma in situ \(LCIS\)](#)<sup>17</sup>.

If your pathology report shows positive margins, your doctor will talk to you about what treatment is best.

### **What does it mean if my doctor asks for a special molecular test to be performed on my specimen?**

[Molecular tests](#)<sup>18</sup> such as Oncotype DX® and MammaPrint® may help predict the prognosis of certain breast cancers, but not all cases need these tests. If one of these tests is done, the results should be discussed with your treating doctor. The results will not affect your diagnosis, but they might affect your treatment.

### **Hyperlinks**

1. [www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/breast-biopsy.html](http://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/breast-biopsy.html)
2. [www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/breast-conserving-surgery-lumpectomy.html](http://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/breast-conserving-surgery-lumpectomy.html)
3. [www.cancer.org/cancer/breast-cancer/about/what-is-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/about/what-is-breast-cancer.html)
4. [www.cancer.org/cancer/breast-cancer/about/types-of-breast-cancer/invasive-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/about/types-of-breast-cancer/invasive-breast-cancer.html)
5. [www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/breast-conserving-surgery-lumpectomy.html](http://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/breast-conserving-surgery-lumpectomy.html)
6. [www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/mastectomy.html](http://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/mastectomy.html)
7. [www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/stages-of-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/stages-of-breast-cancer.html)
8. [www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-](http://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-)

- [diagnosis/stages-of-breast-cancer.html](#)
9. [www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/stages-of-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/stages-of-breast-cancer.html)
  10. [www.cancer.org/treatment/understanding-your-diagnosis/lymph-nodes-and-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/lymph-nodes-and-cancer.html)
  11. [www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/lymph-node-surgery-for-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/lymph-node-surgery-for-breast-cancer.html)
  12. [www.cancer.org/cancer/breast-cancer/non-cancerous-breast-conditions.html](http://www.cancer.org/cancer/breast-cancer/non-cancerous-breast-conditions.html)
  13. [www.cancer.org/cancer/breast-cancer/treatment/hormone-therapy-for-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/treatment/hormone-therapy-for-breast-cancer.html)
  14. [www.cancer.org/cancer/breast-cancer/non-cancerous-breast-conditions/lobular-carcinoma-in-situ.html](http://www.cancer.org/cancer/breast-cancer/non-cancerous-breast-conditions/lobular-carcinoma-in-situ.html)
  15. [www.cancer.org/cancer/breast-cancer/treatment/targeted-therapy-for-breast-cancer.html](http://www.cancer.org/cancer/breast-cancer/treatment/targeted-therapy-for-breast-cancer.html)
  16. [www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/breast-pathology/ductal-carcinoma-in-situ.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/breast-pathology/ductal-carcinoma-in-situ.html)
  17. [www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/breast-pathology/lobular-carcinoma-in-situ.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/breast-pathology/lobular-carcinoma-in-situ.html)
  18. [www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-gene-expression.html](http://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-gene-expression.html)
  19. [www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/faq-initiative-understanding-your-pathology-report.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/faq-initiative-understanding-your-pathology-report.html)

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### Written by

This series of Frequently Asked Questions (FAQs) was developed by the Association of Directors of Anatomic and Surgical Pathology to help patients and their families better understand what their pathology report means. These FAQs have been endorsed by the College of American Pathologists (CAP) and reviewed by the American Cancer Society.

Learn more about the FAQ Initiative ([www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/faq-initiative-understanding-your-pathology-report.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/understanding-your-pathology-report/faq-initiative-understanding-your-pathology-report.html))<sup>19</sup>

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