Your Breast Pathology Report: Breast Cancer

Biopsy samples taken from your breast are studied by a doctor with special training, called a **pathologist**. After testing the samples, the pathologist creates a report on what was found. Your doctors will use this report to help manage your care.

surgery[2]called a lumpectomy.

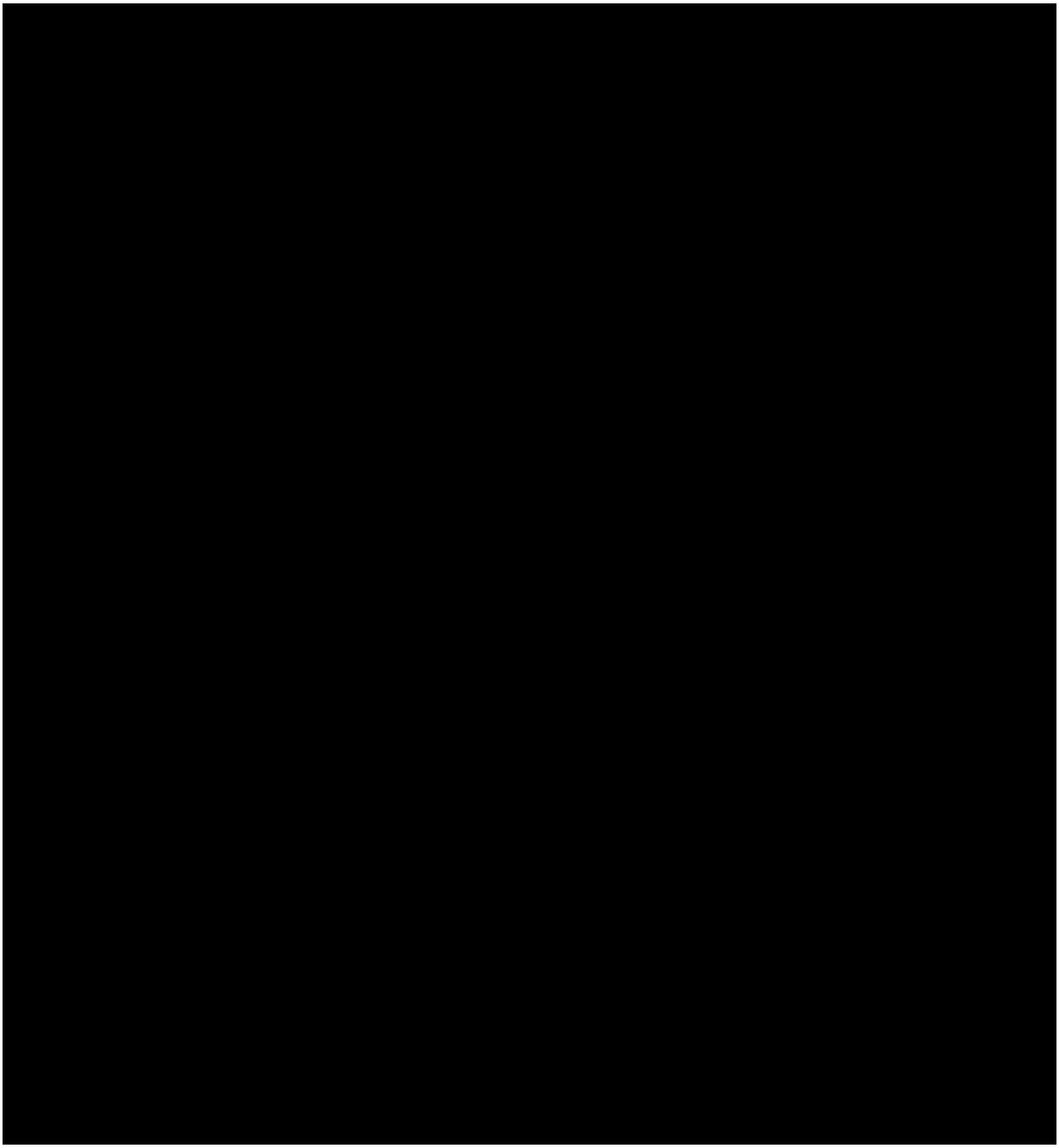
Terms you might see if cancer is found in the breast biopsy samples

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 of these are a type of carcinoma that starts in glandular tissue, which is called an**adenocarcinoma**.

Infiltrating or invasive carcinoma

These terms mean that the cancer has grown (invaded) beyond the lining layer of cells in which it started, so it is a true cancer and not a pre-cancer (carcinoma in situ).



Thenormal breastis made of tiny tubes (ducts) that end in a group of sacs (lobules), which is where milk is made. Most breast cancers start in the cells lining the ducts or lobules.

As long as the carcinoma (cancer) cells are still confined to the breast ducts or lobules, without breaking out and growing into surrounding tissue, this is considered an**in-situ carcinoma**(also known as**carcinoma in situ**, or **CIS**). For more on CIS, see Your

contains. A needle biopsy doesn't give enough information to guide treatment.

Vascular, lymphovascular, or angiolymphatic invasion

If cancer cells are seen in small blood vessels or lymph vessels (lymphatics) within the tumor, 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 doesn't mention this type of invasion, it means it isn't there. Even if it is there, it doesn't always mean that your cancer has spread. How this finding might affect your treatment is best discussed with your doctor.

Breast cancer grade

When breast cancer is found, 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
- If the cells form tubules (gland formation)
- How much the cells look like normal breast cells (nuclear grade)
- How many of the cancer cells are dividing (mitotic count)

These features taken together determine the **grade** of the cancer. This can be expressed in different ways.

If the cancer is described as well differentiated, moderately differentiated, or poorly differentiated…

These terms are used to describe how closely the cancer cells and their arrangements look like those of normal, mature breast cells.

- **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 to have a better prognosis (outlook).
- **Moderately differentiated carcinomas**have cells and growth patterns that look a little more abnormal.
- **Poorly differentiated carcinomas**lack normal features. They tend to grow and spread faster and to have a worse prognosis.

Histologic grade, Nottingham grade, or Elston grade

This is another way to express how normal or abnormal the cancer cells and their growth patterns appear. Different features (gland formation, nuclear grade, and mitotic count) are given numbers based on how they look, and then these are added to assign the grade.

- If the numbers add up to 3 to 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)**.

The**M category**(M0, M1) is usually based on the results of lab and imaging tests, and is not normally 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).

If the cancer is staged after it is removed by surgery and reviewed by the pathologist, the letter p (for pathological) may appear before the T and N letters – for example, pT1, pN0, etc.

Once the T, N, and M categories, the tumor grade, and ER, PR, and HER2 status 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) to stage IV (the most advanced). Non-invasive cancer (carcinoma in situ) is listed as stage 0.

Detailed information on staging can be found in[Stages of Breast Cancer][10]

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 for breast cancer. It is a way to check for the spread of cancer to underarm lymph nodes without needing to remove as many of them.

Once the sentinel lymph node is removed, it is 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 further treatment such as surgery to remove more underarm lymph nodes or radiation therapy to the underarm region. You should discuss this with your doctor.

If the report mentions isolated tumor cells in a lymph node…

This means there are only small numbers of cancer cells in the lymph node, which are either seen with a routine microscopic exam or with special tests. Isolated tumor cells do not affect your stage or change your treatment.

If the report mentions pN0(i+) or pN0(mol+)…

pN0(i+) means that isolated tumor cells were found in a lymph node using routine or special stains.

pN0(mol+) means that isolated tumor cells could only be detected in a lymph node by using very sensitive molecular tests.

If the report mentions micrometastases in a lymph node…

This means that there are more cancer cells in the lymph node than with isolated tumor cells, but these groups are still smaller than regular cancer deposits.

If micrometastases are present, the N category is listed as **pN1mi**. This can affect the stage of your cancer, so it might change what treatments you need. Talk to your doctor about what this finding might mean for you.

Estrogen receptor (ER) or progesterone receptor (PR) status

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

An important step in evaluating breast cancer is to test cancer cells removed during the biopsy (or surgery) to see if they have estrogen and progesterone receptors[13]. Cancer cells may contain neither, one, or both of these receptors. Breast cancers that have estrogen receptors are referred to as**ER-positive**(or **ER+**) cancers, while those with progesterone receptors are called**PR-positive**(or **PR+**) cancers. Hormone receptor-positive cancers tend to have a better prognosis (outlook) and are much more likely to respond tohormone therapy[14]than cancers without these receptors.

All breast cancers and ductal carcinoma in situ (DCIS), but notlobular carcinoma in situ (LCIS), should be tested for these hormone receptors.

Results for ER and PR are reported separately, and they might be reported in different ways:

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

How the results of these tests might affect your treatment choices is best discussed with your doctor.

HER2/neu or HER2 status

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

In HER2-positive breast cancers, the cancer cells have too many copies of the*HER2*gene, resulting in higher than normal amounts of the HER2 protein. These cancers tend to grow and spread more quickly than other breast cancers, but they are also more likely to respond to drugs that target the HER2 protein[15].

The biopsy or surgery sample is usually tested for HER2 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 they have higher levels of HER2 protein. This color change can be seen under a microscope. The test results are reported as 0, 1+, 2+, or 3+.

- **Fluorescence in situ hybridization (FISH):**This test uses fluorescent pieces of DNA that specifically stick to copies of the*HER2*gene in cells, which can then be counted under a special microscope.

While the FISH test is thought to be more accurate than IHC, it is more expensive, and it takes longer to get the results. Often the IHC test is used first:

If the IHC result is 0, the cancer is considered **HER2-negative**. These cancers do not respond to treatment with drugs that target HER2.

- If the IHC result is 1+, the cancer is also considered **HER2-negative**. While these cancers do not usually respond to treatment with drugs that target HER2, newer research shows that certain HER2 drugs might help in some cases (see below). If the IHC result is 2+, the HER2 status of the tumor is not clear and is called "**equivocal**

Your Breast Pathology Report: Atypical Hyperplasia[19].

Microcalcifications or calcifications

Microcalcifications or calcifications are small 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 can be found in areas containing cancer, their presence on a mammogram may lead to a biopsy of the area. Once the biopsy is done, the pathologist looks at the removed tissue 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 on the mammogram).

Margins or ink

When an entire tumor (and some surrounding normal breast tissue) 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. This helps the pathologist know which edge of the tumor they're looking at.

The pathologist looks at slides of the tumor to see how close the cancer cells are 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 might 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 asductal carcinoma in situ (DCIS).

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

Other lab tests that might be done on breast (or lymph node) biopsy samples

E-cadherin

E-cadherin is a test that might be used 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 doesn't mention E-cadherin, it means that this test wasn't needed to tell what type of cancer you have.

D2-40 (podoplanin) or CD34

D2-40 and **CD34** are special tests that might be used to help identify the different types of vascular invasion in a tumor (see above). These tests are not always needed.

Ki-67

Ki-67[20] is a way to measure how fast the cancer cells are growing and dividing. Higher values for Ki-67 (typically over 30%) mean that many cells are dividing, so the cancer is likely to grow and spread more quickly.

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 might be used to help diagnose invasive breast cancer or to identify cancer in lymph nodes. Not all biopsies need these tests. Whether or not your report mentions these tests has no bearing on the accuracy of your diagnosis.

What if my doctor asks that a special molecular test be done on my biopsy sample?

Molecular tests[21](also known as **gene expression profiling** or **genomic tests**) are special tests that look at the activity of many different genes at once. Examples of these tests include:

- Oncotype DX
- MammaPrint
- Prosigna
- Breast Cancer Index (BCI)

These tests might be done in some situations to help predict the prognosis (outlook) for people with breast cancer or to determine if certain treatments are likely to be helpful, but not everyone needs these tests.

If one of these tests is done on your biopsy specimen, ask your doctor to explain what the results mean. The results will not affect your diagnosis, but they might affect your treatment options.

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18. www.cancer.org/cancer/diagnosis-staging/tests/biopsy-and-cytology-tests/understanding-your-pathology-report/breast-pathology/lobular-carcinoma-in-situ.html
www.cancer.org/cancer/diagnosis-staging/tests/biopsy-and-cytology-tests/understanding-your-pathology-report/breast-pathology/atypical-hyperplarsmcogy-