What is a pathology report?

A pathologist is a medical doctor who specializes in diagnosing diseases. Pathologists look at tissue from the body that is removed during surgery or a biopsy. You will probably never meet the pathologist, but samples of your breast tissue and lymph nodes will be sent to them for review. The pathologist prepares a summary report of their findings, which is called the pathology report.

What will you find on a pathology report?

The report is broken down into a few sections, including:

- Some information about the patient, such as the clinical diagnosis (suspected or known).
- The procedure that was done to get the body tissue.
- A description of what the specimen looks like to the naked eye (called gross description).
- A description of what was seen under the microscope (microscopic description).
- A pathologic diagnosis (a diagnosis based on what the pathologist saw under the microscope).

In the case of breast cancer, the pathologist will describe:

- The type of cell the cancer comes from.
- The tumor size and grade.
- Whether the cancer cells have entered the lymph channels or blood vessels.
- Information about surgical resection margins.
- Hormone receptor and Her2 status.

Breast cancer pathology reports are one of the more complex pathology reports and can seem quite overwhelming at first. To help you better understand your report, let's break down each section by itself.

The Gross Description

For the most part, the gross description is not that important for your understanding of the report. It describes what the pathologist received and sees with the naked eye. In a biopsy, the specimen is likely a small, nondescript piece of tissue. The pathologist may describe the color, shape, feeling and size of the tissue. After a breast cancer surgery, large pieces of tissue and lymph nodes may be submitted and described in the report. This description might report the presence of “inked” margins or sutures, which the surgeon adds so the pathologist can tell “which end is up” once the tissue is removed from the body. There may be mention of surgical clips or wires that were used by the surgeon to be sure that the suspicious area was removed.

After a sentinel node biopsy, the gross description may say a lymph node is "hot," which refers to the radioactive tracer that is used by the surgeon to locate the sentinel node. A lymph node may also be called "blue," due to the presence of dye that can also be used to locate the node. The pathologist often then describes how the tissue was divided up for further analysis.

This section has told us the size of the tissue submitted, but not the size of the actual cancer. The gross description isn't helpful in determining the stage of the cancer or which treatment might be best, which is important to you. We will discuss these in the next sections.
Microscopic Diagnosis

This section may be called “microscopic diagnosis,” “description,” or just “diagnosis.” This part of the report contains the most useful information to you. Not every report goes through the microscopic diagnosis in the same order. Some use different terms to describe the same thing. In this section, we will discuss each part of the microscopic diagnosis section in detail. Sometimes the tests are performed in different laboratories or take different lengths of time to complete, which can mean you may not get all the results at once. It is important to wait for all the results to best understand your case.

Type of Breast Cancer

Almost all breast cancers arise from glandular tissue, making them adenocarcinomas (cancer of the glandular tissue). They are further named by where they start in the breast and how they appear under the microscope. To better understand this section, you need to have some knowledge of normal breast tissue. Breast tissue is composed of lobules, which produce milk; and ducts, which carry the milk to the nipple. Breast cancer starts in a duct or a lobule and this, along with how it looks under the microscope, determines the type of breast cancer it is. The type can help guide some of the treatment choices. In addition to the type, the cancer can be non-invasive, which means it does not spread beyond the lobule or duct, or invasive, which means it has spread beyond the lobule or duct.

Types of Non-Invasive Breast Cancer

Ductal Carcinoma In Situ (DCIS)

DCIS is the most common type of non-invasive breast cancer and is sometimes called intraductal carcinoma. It is malignant (cancerous), and as it grows, the center of the tumor starts to die because it outgrows its blood supply. This area of dead tissue, called necrosis, can calcify (harden), which can be seen on a mammogram. DCIS tumors are further identified by how the cells appear under the microscope, classifying them into subtypes. These subtypes are: comedo, papillary, micropapillary, solid, and cribriform. Many tumors will be a mix of two or more subtypes. In general, all types of DCIS are treated similarly.

Lobular Carcinoma in Situ (LCIS)

Cancer classified as LCIS doesn’t often have areas of necrosis or calcifications, so they are not easily seen on mammograms. LCIS is not considered a true cancer, rather an accumulation of abnormal cells in the lobule. It is considered a risk factor for developing breast cancer in the future in either breast. LCIS is often found incidentally by the pathologist in a tissue specimen that was removed for another reason.

Types of Invasive Breast Cancers

Infiltrating Ductal Carcinoma (IDC)

IDC is the most common type of invasive cancer, making up about 80% of cases. This tumor starts in the duct and spreads beyond the duct into normal breast tissue.

Infiltrating Lobular Carcinoma (ILC)

ILC is less common, making up about 10% of cases. This tumor starts in the lobule and extends beyond the lobule into normal tissue.

Medullary Carcinoma
Medullary carcinoma is rare, making up only 1-7% of all breast cancers. These cancers often have a well defined boundary between the cancer cells and the normal cells. Of note, this type of cancer will not be given a histological grade by the pathologist (discussed below).

**Inflammatory Breast Cancer (IBC)**

IBC is also rare, making up 1-5% of breast cancer cases. IBC presents differently than other types of breast cancer. Common symptoms include swelling or enlargement of one breast, reddened, warm to the touch, itchy and tender skin, and often without a lump. In some cases, the skin becomes thickened and dimpled, appearing like an orange peel, giving this sign the name "peau d'orange" (French for "skin of an orange"). IBC tends to be an aggressive form of breast cancer.

**Tubular Carcinoma (TC)**

TC is a rare type of invasive breast cancer, making up about 2% of cases. Its name comes from the pathologist seeing a "tubular pattern" in 75% or more of the specimen. TC does not often spread (metastasize) to other areas of the body.

**Mucinous Carcinoma (MC)**

MC may also be called "colloid carcinoma." MC is a slow-growing tumor. This tumor is also rare and is named for the mucin (protein and sugar compound) produced by and surrounding the tumor cells. These tumors rarely spread (metastasize) to other parts of the body.

**Other Rare Subtypes**

- Metaplastic - a rare type of IDC.
- Adenoid Cystic - rare type of tumor that more commonly occurs in the salivary gland.
- Papillary.
- Secretory.
- Paget's Disease: development of red, weeping or crusty lesions on the breast tissue or nipple. While not a cancer itself, this is linked to an underlying breast cancer.

**Histological Grade**

The histological grade is reported using the "Bloom Richardson Scale" or "Nottingham Score." It is a combination of nuclear grade, mitotic rate, and tubule formation, which describe what the tumor cells look like under a microscope. Histological grade predicts how aggressive the tumor cells are. This scoring system is very detailed and usually does not affect treatment decisions, so it is not especially helpful in the big picture. However, you will see it on the report and may be interested in what it means. In general, high grade tumors are more likely to recur (come back) when compared to low grade tumors.

- **Nuclear Grade:** a score is given from 1 to 3, based on what the nucleus of the cancer cells looks like compared to normal cells. In nuclear grade 1, the nucleus of the cancer cells looks more like normal cells, while in nuclear grade 3, it looks the least like normal cells.
- **Mitotic Rate:** describes how quickly the cancer cells are multiplying or dividing using a 1 to 3 scale: 1 being the slowest, 3 the quickest.
- **Tubule formation:** this score represents the percent of cancer cells that are formed into tubules.
  - A score of 1 means more than 75% of cells are in tubule formation.
  - A score of 2 is between 10 and 75%.
  - A score of 3 is used when less than 10% of cells are in tubule formation.

The three scores (Nuclear grade, mitotic rate, and tubule formation) are then combined for a total score between 3 (1+1+1) and 9 (3+3+3). This score makes up the histological grade. You may see the three values and total score, or just the final grade.

- **Score of 3,4 or 5:** Well differentiated or low grade (Grade 1).
- **Score of 6 or 7:** Moderately differentiated or intermediate grade (Grade 2).
- **Score of 8 or 9:** Poorly differentiated or high grade (Grade 3).
Tumor Size

The size of the tumor is reported in centimeters. One inch equals about 2 ½ centimeters. It is not uncommon for the pathologist to find additional tumor(s) in the specimen that you did not know were there. If multiple tumors are found, the size and location of each will be noted. Tumor locations are often given based on the quadrant it was found in. Imagine the breast is divided with a “+” sign into 4 parts or quadrants. They are named upper inner quadrant (UIQ), upper outer quadrant (UOQ), lower outer quadrant (LOQ), and lower inner quadrant (LIQ). The breast tissue that extends under the armpit is called the “axillary tail.”

Margins

Margins are the edges of the surgical specimen. The report will tell you how close the tumor comes to the edge. When performing a cancer surgery, the surgeon attempts to remove the entire tumor and some normal tissue surrounding it. This area of “normal tissue” is important because any stray cancer cells may be included in this. If the edge (or margin) contains tumor, there may have been cancer cells left behind. The goal of surgery is to make a "clear margin," that is, clear of any cancer cells. A "clean" or "clear" margin is defined as no tumor cells within 1-2 millimeters (depending on the pathologist) of the edge of the specimen. If the tumor cells are closer than this to the margin, more surgery or radiation may be needed.

Lymphovascular Invasion

When the pathologist examines the tumor and surrounding tissue in the specimen, they look at the tiny blood vessels and lymphatic drainage to see if there are any tumor cells in them. This is different from the lymph nodes and is reported as whether or not lymphatic or vascular invasion is seen. If there are tumor cells in the small blood vessels or in the lymphatic drainage, it may be a sign of a more aggressive tumor.

Lymph Nodes

The lymph system is essentially the “housekeeping system” of the body. It is a network of vessels (tubes) which connect lymph nodes. These nodes can vary in size, but are normally up to about 2 centimeters in width. They have cells that clear bacteria and other foreign debris from the body. Lymph is a watery liquid that flows between cells in the body, picking up foreign debris and taking it into the lymph node for filtering. This waste leaves the body through the liver.

Cancer cells use the lymph system as a first step to traveling to other areas of the body. During a breast cancer surgery, lymph nodes are removed and checked for the presence of cancer cells. This will be reported as the number of lymph nodes that contained cancer cells and how many were examined. For example, the report might state "ten benign lymph nodes (0/10)" (no cancer seen) or "tumor seen in ten of twelve lymph nodes (10/12)."

In some cases, sentinel lymph node biopsy may be used. During this procedure, a dye and/or radioactive tracer is injected into the area of the tumor, allowing it to naturally drain to the lymph nodes. The first 1 or 2 lymph nodes it travels to are called the sentinel node(s). The theory is that the cancer cells would travel the same path, so if cancer cells are not present in the sentinel node, it can be safely assumed that they did not spread into the lymph system. If the pathologist finds cancer cells in the sentinel node, a full axillary lymph node dissection is recommended.

Hormone Status

Hormone receptors for estrogen and progesterone are present in high numbers in some breast cancers. These tumors rely on hormones to grow. These tumors are referred to as hormone receptor positive, ER+/PR+, ER+/PR- or ER-/PR+. ER stands for “estrogen receptor” and PR stands for “progesterone receptor.” Estrogen and progesterone are both hormones. The receptors are present on the cancer cells and when the hormone attaches to the receptor, it allows the cancer cell to grow and divide. Hormone therapy can be used to interfere with theses receptors, slowing or stopping tumor growth or preventing recurrence.

There is no standard for reporting the receptor status, so you may see any of the following:

- A percentage of the cells that tested positive for receptors (from 0% to 100%).
- A number between 0 and 3, with 0 being no receptors and 3 being the most receptors.
- An “Allred score” is a combination of the percent positive and their intensity. The score is from 0-9, with 9 being the most
strongly receptor positive.

- Positive or negative.

In the case of just a positive or negative result, the percentage should be requested. This is because research has shown that even tumors with very low positivity can benefit from hormone therapy, yet some labs report low results (<10%) as negative. Therefore, the only true negative is a result that is zero percent of receptors positive.

**Her-2 Status**

The Her-2/neu gene revs up the production of a protein found on the surface of breast cancer cells that tells the cells to grow and divide. In about 10-20% of breast cancers, there are too many copies of the gene or the protein is over expressed on the cell surface. This causes the cancer to grow faster and be more aggressive. Breast tumors are often tested, by one of two available tests, to see if they have too many copies of the gene or over express the protein. The immunohistochemistry (IHC) test looks for over expression of the protein and is reported as a number from 0 to +3. Zero and +1 are considered Her 2 negative, +2 is borderline and +3 is considered Her 2 positive. The second test, called FISH (or fluorescent in situ hybridization), tests the tumor for extra copies of the Her 2 gene and is reported as positive or negative.

Patients with a +2 (borderline) result on IHC, should also have the FISH test done to clarify the borderline result as positive or negative. Her 2 positive tumors may be treated with medications, called monoclonal antibodies, targeting the Her 2 protein.

**Stage of the Tumor**

The staging system most commonly used for breast cancers is the American Joint Committee on Cancer (AJCC) staging system. This system utilizes the extent of the primary tumor (Tis-4), the absence or presence of cancer in the lymph nodes (N0-3), and the existence of metastasis (M0 or 1) to assign a TNM rating, which corresponds to a stage. See All About Breast Cancer for the full staging system.

**Putting it All Together**

Some pieces of the report are used to determine the stage of the cancer and most pieces play a role in deciding what treatment is needed. By understanding the basics of the report, you will be better able to discuss your treatment options with your healthcare team.

Read OncoLink's Overview of Breast Cancer.