Understanding Your Pathology Report: Breast Cancer

What is a pathology report?

A pathologist is a medical doctor who specializes in diagnosing diseases by examining tissue from the body. You will probably never meet the pathologist, but samples of your breast tissue and lymph nodes, removed during surgery or biopsy, will be sent to him or her for review. The pathologist prepares a summary report of his or her 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), procedure, 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), and a pathologic diagnosis. In the case of a 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, and hormone receptor and Her2 status. Breast cancer pathology reports are one of the more complex pathology reports and can seem quite overwhelming at first glance. To help you better understand your report, let's break down each section individually.

The Gross Description

This is generally not that important to you, the patient. It is a description of what the pathologist received and sees with the naked eye. In a biopsy, the specimen is likely a small, nondescript piece of tissue, in which case 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 disconnected 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, or that it is "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 treatment, which is what is important to you, so let's move on to the next section.

Microscopic Diagnosis

This section may be called microscopic diagnosis or description or just diagnosis. This is the meat of the report and contains the most useful information. Not every report goes through the microscopic diagnosis in the same order and some use different terms to describe the same thing. In this section we will discuss each part of the microscopic description 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 situation.

Type of Breast Cancer

It seems simple: we are talking about breast cancer, so that's what type it is. But it is not so simple. 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 its appearance under the microscope, determine the
type of breast cancer it is. The type can dictate some of the treatment choices, although many types are treated similarly. 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 has outgrown its blood supply. This area of dead tissue, called necrosis, can calcify, which can be detected 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 represent a combination of two or more subtypes. In general, all types of DCIS are treated similarly. (See diagram of DCIS below.)

**Lobular Carcinoma in Situ (LCIS)**

LCIS lesions rarely develop necrosis or calcifications, so are not often detected 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, accounting for 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, accounting for about 10% of cases. This tumor starts in the lobule and extends beyond the lobule into normal tissue.

**Medullary Carcinoma**

Medullary carcinoma is rare, accounting for only 1-7% of all breast cancers, and carries a very good prognosis. These cancers typically 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, accounting for 1-5% of breast cancer cases, and presents differently from other types of breast cancer. Common symptoms include swelling or enlargement of one breast, reddened, warm to the touch, itchy and tender skin, typically 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". IBC tends to be an aggressive form of breast cancer.

**Tubular Carcinoma (TC)**

TC is a rare type of invasive breast cancer, accounting for about 2% of cases. Its name comes from the pathologist seeing a "tubular pattern" in 75% or more of the specimen. TC does not typically spread to other areas of the body (called metastasize) and is associated with very good prognosis.
**Mucinous Carcinoma (MC)**

MC may also be called colloid carcinoma and 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 also rarely spread to other parts of the body (metastasize) and also carry a very good prognosis.

**Other Rare Subtypes**

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

**Histological Grade**

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 are characteristics of the tumor cells seen under a microscope that predict its aggressiveness. Now, this scoring system is very detailed and usually does not affect treatment decisions, so it is not particularly 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 when compared to low grade tumors.

- Nuclear Grade: a score is given from 1 to 3, based on the appearance of the nucleus of the cancer cells, with 1 being the closest to normal cells (better), 3 being the most variation (worse).
- Mitotic Rate: describes how quickly the cancer cells are multiplying or dividing using a 1 to 3 scale, 1 being the slowest, 3 the most rapid.
- Tubule formation: this score represents the percent of cancer cells that are in tubule formation. A score of 1 means greater than 75% of cells are in tubule formation (better), a score of 3 is used when less than 10% of cells are in tubule formation (worse), a score of 2 is in between 10 and 75%.

The three scores are then combined for a total score between 3 (1+1+1) and 9 (3+3+3). This score translates to a 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), lower inner quadrant (LIQ) and "axillary tail" is used to describe the breast tissue that extends under the armpit.

**Margins**

Your report will give some information about the margins. These are the edges of the surgical specimen and 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 achieve 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,
additional surgery or radiation may be needed.

**Lymphovascular Invasion**

When the pathologist examines the tumor and surrounding tissue available to them, they look at the tiny blood vessels and lymphatic drainage to see if any tumor cells have invaded them. This is different from the lymph nodes and would be reported as whether or not lymphatic or vascular invasion is seen. The presence of this 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 contain 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 and ultimately, elimination by 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. This procedure involves injecting a dye and/or radioactive tracer into the area of the tumor and 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, making the growth of these tumors reliant on hormones. These tumors are referred to as hormone receptor positive, ER+/PR+, ER+/PR- or ER-/PR+. 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 anyone of the following:

- A percentage of the cells that reacted 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 stimulates production of a protein found on the surface of breast cancer cells that tells the cells to grow and divide. In about 25-30% of breast cancers, there are too many copies of the gene or the protein is over expressed on the cell surface, causing the cancer to grow faster and be more aggressive. Breast tumors are routinely 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), examines 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 have the FISH test done in addition 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](http://www.oncolink.org) 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](http://www.oncolink.org).

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