Printed October 7, 2015 from http://www.cancer.net/navigating-cancer-care/diagnosing-cancer/reports-and-results/after-biopsy-making-diagnosis

After a Biopsy: Making the Diagnosis [1]

This section has been reviewed and approved by the Cancer.Net Editorial Board [2], 04/2015

Key Messages:

- A biopsy is the removal of a small amount of tissue. It is an important way doctors diagnose many different types of cancer.
- The sample removed during the biopsy needs to be processed and analyzed before the doctor can make a diagnosis.
- To make a diagnosis, the doctor views the sample under a microscope and may perform other tests.

After a biopsy, your health care team completes several steps before the pathologist makes a diagnosis. A pathologist is a doctor who specializes in interpreting laboratory tests and evaluating cells, tissues, and organs to diagnose disease.

Looking at the tissue sample

The tissue sample removed during a biopsy is called a specimen. The medical staff who performed your biopsy place the specimen in a container with a fluid that preserves it. The container is labeled with your name and other details. A pathologist then describes how it looks to the naked eye, including the color, size, and other features. This is called a gross or macroscopic examination. The gross description includes the following information:

- The label by the doctor who took the specimen
- Visual features
- Size
- What was done to the specimen

The sample may be needed for other tests based on the suspected diagnosis. Molecular tests find genes that might be active, changed, or missing. Other gene or protein tests may be needed to identify which treatments will work. The pathologist or a technician will prepare a part of the specimen for these tests.

Making a slide

Before examining the tissue with a microscope, the pathologist or a technician prepares a slide. During this process, the specimen is cut into thin slices, called histologic sections, and stained with various dyes. These dyes show the parts of the cells. The pathologist or technician places the sections on a glass slide. Then, he or she places a thin cover called a cover slip on top to hold the specimen in place. The pathologist then views the sections under a microscope.

Read below for more detailed information on making a slide:

- **Permanent section.** To create a permanent section, the technician places the specimen in a fixative for several hours. The length of time the specimen stays in the fixative depends on its size. Formalin is the fixative used most often. It causes the proteins in the cells to become hard and ?fixed,? meaning they won't change.

  Then, the technician places the fixed specimen in a machine that removes water from the tissue and replaces it with paraffin wax. Afterwards, the technician will embed the specimen in a larger block of paraffin. Paraffin blocks are durable and can be stored indefinitely. Once the paraffin block hardens, a technician cuts the specimen into extremely thin slices using a machine called a microtome. He or she then floats the thin slices in water so that they can be scooped up onto the slide.

  After the slice is on the slide, the paraffin is dissolved from the tissue and water is added back. Then, a technician uses dyes to stain parts of the cell. The center of a cell where the genes are found, called the nucleus, is stained a dark blue. The contents of a cell between the nucleus and the cell membrane, called the cytoplasm, is stained pink or orange.

- **Frozen section.** To create a frozen section, the specimen is quickly frozen after the surgeon removes it from the patient's body. A technician can then cut the specimen into thin layers using a special cutting device called a cryostat. These slices are placed on the slide and stained using the same method used for a permanent section. The quality of a frozen section is often not quite as good as a permanent section. However, the process is faster. It takes just a few minutes for the doctor to tell whether the tissue is cancerous. This helps the doctor know if a patient needs more surgery right away.

- **Smear.** If the specimen is a liquid or if small pieces of tissue are in a liquid, a slide is prepared differently. The doctor smears the specimen on a microscope slide and lets it air dry. Then, a fixative is sprayed on it or it is placed in liquid to fix it. The fixed cells are then stained and viewed under a microscope.

Viewing the slides with a microscope

The pathologist views the slides with the sections of the specimen under a microscope. The pathologist creates a pathology report [3] based on what he or she sees under the microscope. The report is very technical, using terms that are meaningful to other pathologists and doctors. Generally, the pathologist describes the features of the specimen:

- The types of cells
- How the cells are arranged
- Whether the cells are abnormal
- Other features important for a diagnosis

Sometimes, the pathologist may want to see more tissue before making a diagnosis. He or she will note this in the report.

Making a diagnosis

In addition to the descriptions mentioned above, the pathology report includes a description of the diagnosis. The diagnosis is often short. It is based on the combined results of the biopsy, gross examination, processing, and microscopic examination. There is a general format for diagnoses:

- The organ or tissue biopsied
- Specific part of the organ the sample came from
- The biopsy procedure
- Specific findings in the tissue
- Other important results
- Whether other tests are needed

Diagnostic terms

Patients can review their pathology reports with their doctors. It helps to have some basic information of the technical terms in the report.

- Atypical: Referring to cells that are not normal but are not cancerous. Atypical cells could become a cancer over time or may increase a person's risk of cancer.
- Carcinoma: Cancer cells that started from cells that line organs, called epithelial cells
- Sarcoma: Cancer cells that started in cells other than epithelial cells
- Lymphoma: Cancer cells that started in the lymph system
- Leukemia: Cancer cells that started in the blood or bone marrow
- Hyperplasia: An abnormal increase of cells in a tissue or organ. Hyperplasia may increase the risk of developing some types of cancer. It can also be the body's response to various types of diseases.
- Dysplasia: An increase in the number of abnormal or atypical cells in an organ. Dysplasia is a response to a viral infection or a state in between normal cells and cancer cells.
- Neoplasia: uncontrolled cell growth. The cells can be benign, meaning noncancerous, or malignant, meaning cancerous.

Molecular or genetic tests for diagnosis

Sometimes, other tests help the doctor further classify the tumor. For example, to diagnose some types of leukemia, the pathologist looks for specific genetic changes in the cancerous blood cells. *BCR-ABL* is one such modified gene, found in chronic myelogenous leukemia. The pathologist lists the results of these tests in pathology report or in separate reports.

Molecular tests to plan treatment

After the doctor makes a diagnosis, other tests can help the doctor plan the best treatment options. Tumor markers may help predict how well treatment will work for a specific cancer. Tumor markers are substances found at higher than normal levels in the blood, urine, or body tissues of some people with cancer. These may be identified through testing of a specific gene or protein. For example, tests for the HER2 protein and *HER2* gene are often recommended for breast cancer. The results help the doctor find out if trastuzumab (Herceptin) is a treatment option.

More Information

Biopsy [4]

Tumor Marker Tests [5]

What is Personalized Cancer Medicine? [6]

Additional Resources

College of American Pathologists: How to Read Your Pathology Report [7]

Links:
[1] http://www.cancer.net/navigating-cancer-care/diagnosing-cancer/reports-and-results/after-biopsy-making-diagnosis
[2] http://www.cancer.net/about-us
[3] http://www.cancer.net/node/24715
[4] http://www.cancer.net/node/24406
[5] http://www.cancer.net/node/24730
[6] http://www.cancer.net/node/24522
[7] http://www.cap.org/apps/docs/reference/myBiopsy/pathology_report.html