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# Leukemia - Acute Lymphocytic - ALL - Diagnosis [1]

**This section has been reviewed and approved by the Cancer.Net Editorial Board [2], 08/2013**

**ON THIS PAGE**: You will find a list of the common tests, procedures, and scans that doctors can use to find out what?s wrong and identify the cause of the problem. To see other pages, use the menu on the side of your screen.

Doctors use many tests to diagnose cancer and learn more about the disease. Some tests may also determine which treatments may be the most effective. For most types of cancer, a biopsy is the only way to make a definitive diagnosis of cancer. If a biopsy is not possible, the doctor may suggest other tests that will help make a diagnosis. Imaging tests may also be used. This list describes options for diagnosing this type of cancer, and not all tests listed will be used for every person. Your doctor may consider these factors when choosing a diagnostic test:

- Age and medical condition
- Type of cancer suspected
- Signs and symptoms
- Previous test results

The following tests may be used to diagnose ALL:

**Blood tests [3].** If the doctor believes a person has ALL based on the symptoms, he or she will examine the levels of different types of cells in the patient?s blood through a test called a complete blood count (CBC). Low levels of red blood cells and platelets and high levels of white blood cells are common in people with ALL but can also be a sign of other medical problems. In addition, the blood may be examined under a microscope to find out if there are lymphoblasts or other abnormal cells in the blood.

**Bone marrow biopsy and aspiration** [4]. If the blood test shows abnormalities in the number or appearance of the white blood cells, a bone marrow biopsy and aspiration will be done. These two procedures are similar and often done at the same time. Bone marrow has both a solid and a liquid part. A bone marrow biopsy is the removal of a small amount of solid tissue using a needle. An aspiration removes a sample of fluid with a needle. The sample(s) are then analyzed by a pathologist (a doctor who specializes in interpreting laboratory tests and evaluating cells, tissues, and organs to diagnose disease). The sample is used to look for leukemia, and molecular testing and immunophenotyping (see below) may also be done. A common site for a bone marrow biopsy and aspiration is the pelvic bone, which is located in the lower back by the hip. The skin in

that area is usually numbed with medication beforehand, and other types of anesthesia (medication to block the awareness of pain) may be used.

**Molecular testing.** Your doctor may recommend running laboratory tests on the leukemia cells to identify specific genes, proteins, and other factors unique to the leukemia. Results of these tests will help decide whether your treatment options include a type of treatment called targeted therapy (see Treatment Options [5]).

- Flow cytometry and cytochemistry (immunophenotyping) are tests that use chemicals or dyes on the cancer cells to provide information about the leukemia and its subtype. ALL cells have distinctive markers on their surface called cell surface proteins. The pattern of these markers is called the immunophenotype. These tests are used to distinguish ALL from normal blood cells and from other types of leukemia, which can also involve lymphocytes. Both tests can be done from a blood sample.

- Karyotyping (or cytogenetics) is a test that is used to examine a cell?s chromosomes (long pieces of DNA that contain genes). People with ALL may have specific chromosomal changes, including the addition or loss of certain chromosomes, as well as translocations, which means that parts of one chromosome have been moved to another chromosome. These changes can be seen under a microscope using special methods.

About 20% to 30% of adults with ALL have a particular change in their chromosomes called the Philadelphia chromosome. The Philadelphia chromosome is an example of a translocation, which, in this instance, means that genetic material from chromosome 9 breaks off and attaches to chromosome 22 [t(9;22)]. In this way, two specific genes called *BCR* and *ABL* are brought together to make one gene called *BCR-ABL*. Some people may have other types of translocations. For example, many children with ALL have a translocation between chromosomes 12 and 21 [t(12;22)]. These genes are called *TEL* and *AML1*.

**Lumbar puncture (spinal tap).** A lumbar puncture is a procedure in which a doctor uses a needle to take a sample of cerebral spinal fluid (CSF) to look for cancer cells, blood, or tumor markers (substances found in higher than normal amounts in the blood, urine, or body tissues of people with certain kinds of cancer). Because ALL tends to spread to the CSF surrounding the brain, lumbar punctures are done regularly during ALL treatment, and chemotherapy (see Treatment Options [5]) may be given in the CSF. Doctors generally give an anesthetic to numb the lower back before the procedure.

**Imaging tests.** A computed tomography (CT or CAT) scan [6] (test that creates a three-dimensional picture of the inside of the body) or magnetic resonance imaging [7] (MRI, a test that uses magnetic fields, not x-rays, to produce detailed images of the body) may be used to learn more about the cause of symptoms or to help diagnose infections in patients with ALL. They are not regularly used for assigning a classification (see Classification [8]) to ALL since the disease has usually spread throughout the bone marrow and blood when it is diagnosed.

After these diagnostic tests are done, your doctor will review all of the results with you. If the diagnosis is ALL, these results also help the doctor describe the disease; this is called classification [8].

*The next section helps explain the different subtypes and classifications for this type of cancer. Use the menu on the side of your screen to select Subtypes and Clasification, or you can select*

*another section, to continue reading this guide.*

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**Links:**
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