



What is Chronic Lymphocytic Leukemia (CLL)?

Chronic lymphocytic leukemia (CLL), a cancer of the blood, is the second most common type of leukemia. It is caused by the overproduction of immature blood cells in the marrow (the spongy inner mass of bone). These immature cells crowd out healthy cells needed to fight infection and deliver oxygen to the body. CLL progresses slowly, and it may take years for symptoms to appear or for treatment to be needed.

CLL forms because of genetic mutations in lymphocytes, a kind of white blood cell that fights infection. Lymphocytes are found in the blood, and in a clear fluid called lymph that flows through the body and collects in lymph nodes. In people with CLL, lymphocytes are not as good at fighting infection. Over time, they crowd the bone marrow, allowing less room for the cells that make red blood cells, white blood cells, and platelets.

CLL is one of four types of leukemia. Like chronic myelogenous leukemia (CML), CLL progresses slowly. Acute lymphocytic leukemia (ALL) affects the same lymphocytes, but progresses more quickly. Acute myelogenous leukemia (AML) also progresses quickly.

CLL is often found only in the blood and bone marrow. It may involve the lymph nodes, causing swelling in the neck, under the arms, or in the groin, called lymphadenopathy. As CLL progresses the liver and spleen may enlarge. If the bone marrow space is filled up, there is not enough room for the normal marrow cells to form and levels of red cells and platelets fall. It is important for doctors to assess whether the disease is caused by problems with T-cell or with B-cell lymphocytes. The less-common T-cell type of CLL (5% of all cases of CLL) progresses more rapidly than the B-cell form of the disease (95%).

Older age can affect the risk of developing chronic lymphocytic leukemia.

Risk factors for CLL include the following:

- Being middle-aged or older, male, or white.
- A family history of CLL or cancer of the lymph system.
- Having relatives who are Russian Jews or Eastern European Jews.

Possible Signs of Chronic Lymphocytic Leukemia

Usually CLL does not cause any symptoms and is found during a routine blood test. Sometimes symptoms occur that may be caused by CLL or by other conditions. A doctor should be consulted if any of the following problems occur:

- Painless swelling of the lymph nodes in the neck, underarm, stomach, or groin.
- Tiredness that does not go away.
- Pain or fullness below the ribs.
- Fever and infection.
- Weight loss (unexplained).

Tests That are Used to Detect and Diagnose Chronic Lymphocytic Leukemia.

The following tests and procedures may be used:

- **Physical exam and history:** An exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seems unusual. A history of the patient's health habits and past illnesses and treatments will also be taken.
- **Complete blood count:** A procedure in which a sample of blood is drawn and checked for the following:
 - The number of red blood cells, white blood cells, and platelets.
 - The amount of hemoglobin (the protein that carries oxygen) in the red blood cells.
 - The portion of the sample made up of red blood cells.
- **Cytogenetic analysis:** A test in which a sample of blood or bone marrow is looked at under a microscope to find out if there are changes in the structure or number of chromosomes in the lymphocytes.
- **Immunophenotyping:** A test in which the cells in a sample of blood or bone marrow are looked at under a microscope to find out if malignant lymphocytes (cancer) began from the B lymphocytes or the T lymphocytes.
- **Bone marrow biopsy and aspiration:** The removal of a small piece of bone and bone marrow by inserting a needle into the hipbone or breastbone. A pathologist views the sample under a microscope to look for abnormal cells.

Treatment Options and Prognosis

Treatment options depend on:

- The stage of the disease.
- Red blood cell, white blood cell, and platelet blood counts.
- Whether there are symptoms, such as fever, chills, or weight loss.
- Whether the liver, spleen, or lymph nodes are larger than normal.
- The response to initial treatment.
- Whether the CLL has recurred (come back).

The prognosis (chance of recovery) depends on:

- Whether there is a change in the DNA and the type of change, if there is one.
- Whether lymphocytes are spread throughout the bone marrow.
- The stage of the disease.

- Whether the CLL gets better with treatment or has recurred (come back).
- Whether the CLL progresses to lymphoma or prolymphocytic leukemia.
- The patient's general health.

As we well know, there are many kinds of cancer; unfortunately they all come about because of the out-of-control growth of abnormal cells.

Healthy Cells vs. Cancer Cells

Healthy cells are like a cat. They need structure to determine the size of bones and shape of the body, tail and whiskers. The DNA in genes and chromosomes determine this. They need energy to play and prowl and sustain life. This is derived from chemicals in food. Cats need a system to deliver chemicals (food nutrients like amino acids, carbohydrates, fats, vitamins and minerals) to all parts of their body. These are the blood vessels. Growth factors take a kitten into a lazy old cat, all the while helping it to function normally.

The body and its cells are mostly made up of protein. The building blocks of proteins are substances called amino acids that in the form of enzymes and hormones literally control every chemical reaction within the cells. When these are modified, different messages are sent to a complex control system that can alter their function. There are twenty different kinds of amino acids that are essential to life. Twelve of these can be synthesized within the body however; eight must be supplied by the daily diet.

Structure	
Normal Cells	Cancer Cells
DNA in genes and chromosomes go about their business in a normal way.	Cancer cells develop a different DNA or gene structure or acquire abnormal numbers of chromosomes.
Cells divide in an orderly way to produce more cells only when the body needs them.	Cells continue to be created without control or order. If not needed, a mass of tissue is formed which is called a tumor.
Energy	
Normal Cells	Cancer Cells
Cells derive 70% of their energy from a system called the "Krebs Cycle."	Cells have a defective "Krebs Cycle" and derive little or no energy from it.
Cells derive only 20% of their energy from a system called "Glycolosis."	Cancer cells derive almost all their energy from "Glycolosis."
Cells derive most of their energy with the use of oxygen.	Cells derive most of their energy in the absence of oxygen.
Blood Vessels	
Normal Cells	Cancer Cells
Cells have a built-in blood vessel system.	Cells do not have a built-in blood vessel system. They require more of certain amino acids to grow.
Growth Factors	
Normal Cells	Cancer Cells
While similar to cancer cells, the amount of them is more in balance to produce a more	These cells have over produced, require more chemicals (food) and are over active.

normal level of activity.	
Functions	
Normal Cells	Cancer Cells
The enzymes and hormones go about business in a normal balanced manner.	The enzymes and hormones are either over active or under active.
Tumors are Different	
Benign	Malignant
Benign tumors are not cancerous. They do not invade nearby tissues nor spread to other parts of the body. They can be removed and are not a threat to life.	Malignant tumors are cancerous. They can invade and damage nearby tissues and organs and they can break away and enter the blood stream to form new tumors in other parts of the body. The spread of cancer is called metastasis.

After chronic lymphocytic leukemia has been diagnosed, tests are done to find out how far the cancer has spread in the blood and bone marrow.

Staging is the process used to find out how far the cancer has spread. It is important to know the stage of the disease in order to plan the best treatment. The following tests may be used in the staging process:

- **Bone marrow biopsy and aspiration:** The removal of a small piece of bone and bone marrow by inserting a needle into the hipbone or breastbone. A pathologist views the sample under a microscope to look for abnormal cells.
- **Chest x-ray:** An x-ray of the organs and bones inside the chest. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body, such as the lymph nodes.
- **MRI (magnetic resonance imaging):** A procedure that uses a magnet, radio waves, and a computer to make a series of detailed pictures of areas inside the body, such as the brain and spinal cord. This procedure is also called nuclear magnetic resonance imaging (NMRI).
- **CT scan (CAT scan):** A procedure that makes a series of detailed pictures of areas inside the body, taken from different angles. The pictures are made by a computer linked to an x-ray machine. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.
- **Blood chemistry studies:** A procedure in which a blood sample is checked to measure the amounts of certain substances released into the blood by organs and tissues in the body. An unusual (higher or lower than normal) amount of a substance can be a sign of disease in the organ or tissue that produces it.
- **Antiglobulin test:** A test in which a sample of blood is looked at under a microscope to find out if there are any antibodies on the surface of red blood cells or platelets. These antibodies may react with and destroy the red blood cells and platelets. This test is also called a Coomb's test.

4 Stages are used for Chronic Lymphocytic Leukemia

Stage 0

In **stage 0 chronic lymphocytic leukemia**, there are too many **lymphocytes** in the blood, but there are no other **symptoms** of **leukemia**. Stage 0 chronic lymphocytic leukemia is **indolent** (slow-growing).

Stage 0 Chronic Lymphocytic Leukemia

Treatment of stage 0 chronic lymphocytic leukemia is usually watchful waiting.

Stage I

In **stage I chronic lymphocytic leukemia**, there are too many lymphocytes in the blood and the lymph nodes are larger than normal.

Stage I Chronic Lymphocytic Leukemia

Treatment of stage I chronic lymphocytic leukemia may include the following:

- Watchful waiting when there are few or no symptoms.
- Chemotherapy with 1 or more drugs, with or without steroids.
- Low-dose external radiation therapy to areas of the body where cancer is found, such as the spleen or lymph nodes.
- A clinical trial of monoclonal antibodies.
- A clinical trial of chemotherapy with stem cell transplantation.

Stage II

In **stage II chronic lymphocytic leukemia**, there are too many lymphocytes in the blood, the liver or spleen is larger than normal, and the lymph nodes may be larger than normal.

Stage II Chronic Lymphocytic Leukemia

Treatment of stage II chronic lymphocytic leukemia may include the following:

- Watchful waiting when there are few or no symptoms.
- Chemotherapy with 1 or more drugs, with or without steroids.
- Low-dose external radiation therapy to areas of the body where cancer is found, such as the spleen or lymph nodes.
- Radiation therapy to the spleen as palliative therapy to relieve symptoms and improve quality of life.
- A clinical trial of monoclonal antibodies.
- A clinical trial of chemotherapy with stem cell transplantation.

Stage III

In stage III chronic lymphocytic leukemia, there are too many lymphocytes in the blood and there are too few red blood cells. The lymph nodes, liver, or spleen may be larger than normal.

Stage III Chronic Lymphocytic Leukemia

Treatment of stage III chronic lymphocytic leukemia may include the following:

- Watchful waiting when there are few or no symptoms.
- Chemotherapy with 1 or more drugs, with or without steroids.
- Splenectomy.
- Radiation therapy to the spleen as palliative therapy to relieve symptoms and improve quality of life.
- A clinical trial of monoclonal antibodies.
- A clinical trial of chemotherapy with stem cell transplantation.

Stage IV

In stage IV chronic lymphocytic leukemia, there are too many lymphocytes in the blood and too few platelets. The lymph nodes, liver, or spleen may be larger than normal and there may be too few red blood cells.

Stage IV Chronic Lymphocytic Leukemia

Treatment of stage IV chronic lymphocytic leukemia may include the following:

- Watchful waiting.
- Chemotherapy with 1 or more drugs, with or without steroids.
- Splenectomy.
- Radiation therapy to the spleen as palliative therapy to relieve symptoms and improve quality of life.
- A clinical trial of monoclonal antibodies.
- A clinical trial of chemotherapy with stem cell transplantation.

Types of Treatment for Chronic Lymphocytic Leukemia

Different types of treatment are available for patients with chronic lymphocytic leukemia. Some treatments are standard (the currently used treatment), and some are being tested in clinical trials. Before starting treatment, patients may want to think about taking part in a clinical trial. A treatment clinical trial is a research study meant to help improve current treatments or obtain information on new treatments for patients with cancer. When clinical trials show that a new treatment is better than the "standard" treatment, the new treatment may become the standard treatment.

1. Radiation therapy

Radiation therapy is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells. There are two types of radiation therapy. External radiation

therapy uses a machine outside the body to send radiation toward the cancer. Internal radiation therapy uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer. The way the radiation therapy is given depends on the type and stage of the cancer being treated.

2. Chemotherapy

Chemotherapy is a cancer treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping the cells from dividing. When chemotherapy is taken by mouth or injected into a vein or muscle, the drugs enter the bloodstream and can reach cancer cells throughout the body (systemic chemotherapy). When chemotherapy is placed directly in the spinal column, a body cavity such as the abdomen, or an organ, the drugs mainly affect cancer cells in those areas. The way the chemotherapy is given depends on the type and stage of the cancer being treated.

3. Surgery

Splenectomy is surgery to remove the spleen.

Source: A.P. John Institute for Cancer Research

When considering any type of complementary cancer treatment or alternative cancer treatment, always consult with your physician first, as possible interactions could reduce your treatment protocol's efficacy.