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Leukemia

1. What is leukemia?

Leukemia is cancer of the blood-forming tissues, including the bone marrow and the lymphatic system. There are many types of leukemia. Some forms of leukemia are more common in children. Other forms of leukemia occur primarily in adults.

Leukemia usually involves white blood cells. Your white blood cells are potent infection fighters — they normally grow and divide in an orderly way, as your body needs them. But in people with leukemia, the bone marrow produces an excessive amount of abnormal white blood cells, which do not function properly.

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2. Symptoms

Leukemia symptoms vary, depending on the type of leukemia. Common signs and symptoms include:

- (1) Fever or chills
- (2) Persistent fatigue, weakness
- (3) Frequent or severe infections
- (4) Losing weight without trying
- (5) Swollen lymph nodes, enlarged liver or spleen
- (6) Easy bleeding or bruising
- (7) Recurrent nosebleeds
- (8) Tiny red spots in your skin (petechiae)
- (9) Excess sweating, especially at night
- (10) Bone pain or tenderness

3. Pathogenesis

In general, leukemia is believed to occur when some blood cells acquire changes (mutations) in their genetic material or DNA. A cell's DNA contains the instructions that tell a cell what to do. Normally, DNA tells the cell to grow at a set rate and die at a set time. In leukemia, mutations tell the blood cells to continue growing and dividing.

When this happens, blood cell production becomes out of control. Over time, these abnormal cells can crowd out healthy blood cells in the bone marrow, leading to fewer healthy white blood cells, red blood cells and platelets, causing signs and symptoms of leukemia.

4. Classification

Doctors classify leukemia according to its speed of progression and the type of cells involved.

The first type of classification is by how fast the leukemia progresses:

(1) Acute leukemia. In acute leukemia, abnormal blood cells are immature blood cells (blasts). They cannot carry out their normal functions, and they multiply rapidly, so the disease worsens quickly. Acute leukemia requires aggressive and timely treatment.

(2) Chronic leukemia. There are many types of chronic leukemia. Some produce too many cells and some cause too few cells to be produced. Chronic leukemia involves more-mature blood cells. These blood cells replicate or accumulate more slowly and can function normally for a period of time. Some forms of chronic leukemia initially do not produce early symptoms and can go unnoticed or undiagnosed for years.

The second type of classification is by type of white blood cell affected:

(1) Lymphocytic leukemia. This type of leukemia affects the lymphoid cells (lymphocytes), which form lymphoid or lymphatic tissue. Lymphatic tissue makes up your immune system.

(2) Myelogenous leukemia. This type of leukemia affects the myeloid cells. Myeloid cells give rise to red blood cells, white blood cells and platelet-producing cells.

5. Risk factors

Factors that may increase your risk of developing some types of leukemia include:

- (1) **Previous cancer treatment.** People who have had certain types of chemotherapy and radiation therapy for other cancers have an increased risk of developing certain types of leukemia.
- (2) **Genetic disorders.** Genetic abnormalities seem to play a role in the development of leukemia. Certain genetic disorders, such as Down syndrome, are associated with an increased risk of leukemia.
- (3) **Exposure to certain chemicals.** Exposure to certain chemicals, such as benzene — which is found in gasoline and is used in the chemical industry — is linked to an increased risk of some kinds of leukemia.
- (4) **Smoking.** Smoking increases the risk of acute myelogenous leukemia.
- (5) **Family history of leukemia.** If members of your family have been diagnosed with leukemia, your risk of the disease may increase.

However, most people with known risk factors do not have leukemia. And many people with leukemia do not have any of these risk factors.

6. Diagnosis

Doctors may find chronic leukemia on a routine blood test, before symptoms begin. If this happens, or if you have signs or symptoms that suggest leukemia, you may undergo the following diagnostic exams:

- (1) **Physical exam.** Your doctor will look for physical signs of leukemia, such as pale skin from anemia, swelling of the lymph nodes, and enlargement of your liver and spleen.

(2) Blood tests. By looking at a sample of your blood, your doctor can determine whether you have abnormal levels of red or white blood cells or platelets — which may suggest leukemia. A blood test may also show the presence of leukemia cells, although not all types of leukemia cause leukemia cells to circulate in the blood. Sometimes the leukemia cells stay in the bone marrow.

(3) Bone marrow test. Your doctor may recommend a procedure to remove a bone marrow from your hipbone. The bone marrow is removed using a long and thin needle. The sample is sent to a laboratory to look for leukemia cells. Specialized tests of your leukemia cells may reveal certain characteristics that are used to determine your treatment options.

7. Treatment

Treatment for your leukemia depends on many factors. Your doctor determines your leukemia treatment options based on your age and general health, the type of leukemia you have, and whether it has spread to other parts of your body, including the central nervous system. Common treatments used to fight leukemia include:

(1) Chemotherapy. Chemotherapy is the major form of treatment for leukemia. This drug treatment uses chemicals to kill leukemia cells.

- Depending on the type of leukemia you have, you may receive a single drug or a combination of drugs. These drugs may come in a pill form, or they may be injected directly into a vein.

(2) Targeted therapy. Targeted drug treatments focus on specific abnormalities present within cancer cells. By blocking these abnormalities, targeted drug treatments can cause cancer cells to die. Your leukemia cells will be tested to see if targeted therapy may be helpful for you.

(3) Radiation therapy. Radiation therapy uses X-rays or other high-energy beams to damage leukemia cells and stop their growth. During radiation therapy, you lie on a table while a large machine moves around you, directing the radiation to precise points on your body.

- You may receive radiation in one specific area of your body where there is a collection of leukemia cells, or you may receive radiation throughout your body. Radiation therapy may be used to prepare for a bone marrow transplant.

(4) Stem cell transplant. A stem cell transplant helps re-establish healthy stem cells by replacing unhealthy bone marrow with leukemia-free stem cells that will regenerate healthy bone marrow.

- Before a stem cell transplant, you receive very high doses of chemotherapy or radiation therapy to destroy your leukemia-producing bone marrow. Then you receive an infusion of blood-forming stem cells that help rebuild your bone marrow.
- You may receive stem cells from a donor or you may be able to use your own stem cells.

(5) Immunotherapy. Immunotherapy uses your immune system to fight cancer. The immune system may not attack your cancer because the cancer cells produce proteins that help them hide from the immune system cells. Immunotherapy works by interfering with that process.

(6) Clinical trials. Clinical trials are experiments to test new cancer treatments and new ways of using existing treatments. Although clinical trials give you or your child the opportunity to try the latest cancer treatment, treatment benefits and risks may be uncertain. Discuss the benefits and risks of clinical trials with your doctor.

8. Side effects that occur during chemotherapy treatment

Common side effects of chemotherapy drugs include:

- (1) Nausea
- (2) Vomiting
- (3) Diarrhea
- (4) Hair loss
- (5) Loss of appetite
- (6) Fatigue
- (7) Fever
- (8) Mouth sores
- (9) Pain
- (10) Constipation
- (11) Easy bruising
- (12) Bleeding

Many of these side effects can be prevented or treated. Most side effects subside after the treatment is over.

9. Conclusion

Today, advances in technologies such as chemotherapy, targeted therapy, and stem cell transplantation have gradually increased the chances of a patient being cured. Therefore, do not give up treatment easily. As long as you follow the treatment and have confidence, there is still a possibility to be cured. Let's fight against leukemia!

10. References

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<https://www.mayoclinic.org/diseases-conditions/leukemia/symptoms-causes/syc-20374373>

Let us take the quiz to make sure you understand.

1. Leukemia is a cancer that affects the blood-forming tissues, including the bone marrow and the lymphatic system.

Yes No Don't know

2. Exposure to benzene, a chemical found in gasoline, is linked to an increased risk of some types of leukemia.

Yes No Don't know

3. Acute leukemia involves more-mature blood cells that replicate or accumulate slowly.

Yes No Don't know

4. Chronic leukemia may go unnoticed or undiagnosed for years, especially in its early stages.

Yes No Don't know

5. Stem cell transplant involves replacing unhealthy bone marrow with leukemia-free stem cells.

Yes No Don't know