Review Article

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Leukemia and its Conventional Treatment: A Preliminary Review

Km Swati[1], Madhu[2], Simrat Kaur[3], SP Subashini[4]

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Author Affiliations: Dean, School of Nursing, Department of Medical Surgical Nursing, Galgotias University, Greater Noida, Uttar Pradesh 203201, India.
Correspondence Author: Simrat Kaur, School of Nursing, Department of Medical Surgical Nursing, Galgotias University, Greater Noida, Uttar Pradesh 203201, India.
E-mail: simrat.kaur@galgotiasuniversity.edu.in

Abstract

Leukemias are a group of life threatening malignant disorders of the blood and bone marrow. In the adolescent and young adult (AYA) population, the acute leukemias are most prevalent, with chronic myeloid leukemia being infrequently seen. Factors associated with more aggressive disease biology tend to increase in frequency with increasing age, whilst tolerability of treatment strategies decreases. There are also challenges regarding the effective delivery of therapy specific to the AYA group, consequences on the unique psychosocial needs of this age group, including compliance. This chapter reviews the current status of epidemiology, pathophysiology, treatment strategies and outcomes of AYA leukemia, with a focus on acute lymphoblastic leukemia and acute myeloid leukemia.

Keyword: Leukemia; Pathophysiology; Lymphoblastic; White blood cells.

Introduction

Leukemia is a term for cancers of the blood cells. Leukemia starts in blood forming tissues such as the bone marrow. Your bone marrow makes the cells which will develop into white blood cells, red blood cells, and platelets. Each type of cell has a different job: White blood cells help your body fight infection. Red blood cells deliver oxygen from your lungs to your tissues and organs. Platelets help form clots to stop bleeding.

When you have leukemia, your bone marrow makes large numbers of abnormal cells. This problem most often happens with white blood cells. These abnormal cells build up in your bone marrow and blood. They crowd out the healthy blood cells and make it hard for your cells and blood to do their work.

Classification of Leukemia

There are different types of leukemia. Which type of leukemia you have depends on the type of blood cell that becomes cancer and whether it grows quickly or slowly.

The type of blood cell could be:

- Lymphocytes, a type of white blood cell
- Myeloid cells, immature cells that become white blood cells, red blood cells, or platelets

The different types can grow quickly or slowly:

- Acute leukemia is fast growing. It usually gets worse quickly if it's not treated.
- Chronic leukemia is slow growing. It usually gets worse over a longer period of time.

The main types of leukemia are:

- Acute lymphocytic leukemia (ALL), which is the most common type of cancer in children. It can also affect adults.
- Acute myeloid leukemia (AML), which is more common in older adults but can also affect children.
- Chronic lymphocytic leukemia (CLL), which is one of the most common types of leukemia in adults. It often occurs during or after middle age.
- Chronic myeloid leukemia (CML), which usually occurs in adults during or after middle age.

Leukemia happens when there are changes in the genetic material (DNA) in bone marrow cells. The cause of these genetic changes is unknown.

Risk Factors

The specific types, there are different factors which can raise your risk of getting that type. Overall, your risk of leukemia goes up as you age. It is most common over age 60.

Clinical manifestations

Some of the symptoms of leukemia may include:

- Feeling tired
- Fever or night sweats
- Easy bruising or bleeding
- Weight loss or loss of appetite
- Petechiae, which are tiny red dots under the skin. They are caused by bleeding.
- Other leukemia symptoms can be different from type to type. Chromic leukemia may not cause symptoms at first.

Diagnosis

Your health care provider may use many tools to diagnose leukemia:Your health care provider may use many tools to diagnose leukemia.

- A physical exam
- A medical history
- Blood tests, such as a complete blood count (CBC)
- Bone marrow tests
- There are two main types - bone marrow aspiration and bone marrow biopsy
- Both tests involve removing a sample of bone marrow and bone. The samples are sent to a lab for testing.
- Genetic tests to look for gene and chromosome changes once the provider makes a diagnosis, there may be additional tests to see whether the cancer has spread. These include imaging tests and a lumbar puncture, which is a procedure to collect and test cerebrospinal fluid (CSF).

Treatment

The treatments for leukemia depend on which type you have, how severe the leukemia is, your age, your overall health, and other factors. Some possible treatments might include:

Chemotherapy

Chemotherapy is the use of drugs to destroy cancer cells, usually by keeping the cancer cells from growing, dividing, and making more cells. It may be given before surgery to shrink a large tumor, make surgery easier, and/or reduce the risk of recurrence, called neoadjuvant chemotherapy. It may also be given after surgery to reduce the risk of recurrence, called adjuvant chemotherapy.

A chemotherapy regimen, or schedule, usually consists of a combination of drugs given in a specific number of cycles over a set period of time. Chemotherapy may be given on many different schedules depending on what worked best in clinical trials for that specific type of regimen. It may be given once a week, once every 2 weeks, once every 3 weeks, or even once every 4 weeks. There are many types of chemotherapy used to treat breast cancer. Common drugs include:

- Docetaxel (Taxotere)
- Paclitaxel (Taxol)
- Doxorubicin (available as a generic drug)
- Epirubicin (Ellence)
- Pegylated liposomal doxorubicin (Doxil)
- Capecitabine (Xeloda)
- Carboplatin (available as a generic drug)
- Cisplatin (available as a generic drug)
- Cyclophosphamide (available as a generic drug)
- Eribulin (Halaven)
- Fluorouracil (5-FU)
- Gemcitabine (Gemzar)
- Ixabepilone (Ixempra)
- Methotrexate (Rheumatrex, Trexall)
- Protein-bound paclitaxel (Abraxane)
- Vinorelbine (Navelbine)

Radiation Therapy

Radiation therapy is the use of high-energy x-rays or other particles to destroy cancer cells. A doctor who specializes in giving radiation therapy to treat cancer is called a radiation oncologist. There are several different types of radiation therapy:

External-beam radiation therapy. This is the most common type of radiation treatment and is given from a machine outside the body. This includes whole breast radiation therapy and partial breast radiation therapy, as well as accelerated breast radiation therapy, which can be several days instead of several weeks.

Intra-operative radiation therapy. This is when radiation treatment is given using a probe in the operating room. Brachytherapy. This type of radiation therapy is given by placing radioactive sources into the tumor.

Although the research results are encouraging, intra-operative radiation therapy and brachytherapy are not widely used. Where available, they may be options for a patient with a small tumor that has not spread to the lymph nodes. A radiation therapy regimen, or schedule, usually consists of a specific number of treatments given over a set period of time, such as 5 days a week for 3 to 6 weeks. Radiation therapy often helps lower the risk of recurrence in the breast. In fact, with modern surgery and radiation therapy, recurrence rates in the breast are now less than 5% in the 10 years after treatment or 6% to 7% at 20 years. Survival is the same with lumpectomy or mastectomy.

If there is cancer in the lymph nodes under the arm, radiation therapy may also be given to the same side of the neck or underarm near the breast or chest wall.

Radiation therapy may be given after or before surgery: Adjuvant radiation therapy is given after surgery. Most commonly, it is given after a lumpectomy, and sometimes, chemotherapy. Patients who have a mastectomy may or may not need radiation therapy, depending on the features of the tumor. Radiation therapy may be recommended after mastectomy if a patient has a larger tumor, cancer in the lymph nodes, cancer cells outside of the capsule of the lymph node, or cancer that has grown into the skin or chest wall, as well as for other reasons.

Neoadjuvant radiation therapy is radiation therapy given before surgery to shrink a large tumor, which makes it easier to remove. This approach is uncommon and is usually only considered when a tumor cannot be removed with surgery.

Chemotherapy With Stem Cell Transplant

Stem cells are cells with the potential to develop into many different types of cells in the body. They serve as a repair system for the body. There are two main types of stem cells: embryonic stem cells and adult stem cells.

Stem cells are different from other cells in the body in three ways:

They can divide and renew themselves over a long time.

They are unspecialized, so they cannot do specific functions in the body.

They have the potential to become specialized cells, such as muscle cells, blood cells, and brain cells.

Doctors and scientists are excited about stem cells because they could help in many different areas of health and medical research. Studying stem cells may help explain how serious conditions such as birth defects and cancer come about. Stem cells may one day be used to make cells and tissues for therapy of many diseases. Examples in clude Parkinson's disease, Alzheimer's disease, spinal cord injury, heart disease, diabetes, and arthritis.

Targeted therapy, which uses drugs or other substances that attack specific cancer cells with less harm to normal cells.

Reference

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