Al-Mustaqbal University
Radiological Techniques
Department

Biological Radiation hazards

Fifth Lecture

Third Stage

By
Assistant lecturer

Sarab Jabbar Musa

Late effect of radiation exposure

Long-term effects of radiation are those which may manifest themselves years after the original exposure. The latent period, then, is much longer than that associated with the acute radiation syndrome. Delayed radiation effects may result from previous acute, high-dose exposures or from chronic low level exposure over a period of years.

Leukemia is a type of cancer of the blood or bone marrow characterized by an abnormal increase of immature white blood cells called "blasts". It is one of the most frequently observed radiation-induced cancers. It accounts for one sixth of the mortality associated with radio carcinogenesis, with equal numbers of cancers of the lung, breast, and gastrointestinal tract. Leukemia may be acute or chronic and may take a lymphocytic or myeloid form. Increases in all forms of leukemia have been detected in humans exposed to radiation and in irradiated laboratory animals

Characteristic chromosomal aberrations and alterations in gene expression induced by radiation have been identified in patients with a variety of leukemias.

Leukemia first appeared in the atomic bomb survivors 2 to 3 years after the nuclear detonations and reached a peak incidence 10 to 15 years after irradiation. The average latency period for leukemia is thought to be 2 to 20 years.

Thorotrast exposure has also been linked to leukemia induction. Thorotrast is a contrast medium, that contains thorium-22 and decays by alpha particle emission. It was used in diagnostic radiological procedures between until 1955. An increased incidence of leukemia and liver cancer was observed in patients in

whom thorium had concentrated in the liver and bone. So, alpha particle exposure, like neutron and gamma radiation exposure, can also induce leukemia.

The incidence of radiation leukemia is influenced by age at the time of exposure. The youngest person at the time of exposure, the shorter the latency and the risk period for developing leukemia. The incidence of leukemia decreases with increasing age at the time of exposure; however, the increased risk of the older individual is for a greater period of time. Difference in the incidences of leukemia in females and males at any age or at any dose.

When leukemia develops, the body produces large numbers of abnormal blood cells

In most types of leukemia, the abnormal cells are white blood cells. There are several types of leukemia. They are grouped in two ways. One way is by how quickly the disease develops and gets worse. The other way is by the type of blood cell that is affected. In acute leukemia, the abnormal blood cells remain very immature and cannot carry out their normal functions. In chronic leukemia, some immature cells are present, but in general, these cells are more mature and can carry out some of their normal functions.

Leukemia can arise in either of the two main types of white blood cells. When leukemia affects lymphoid cells, it is called lymphocytic leukemia. When myeloid cells are affected, the disease is called myeloid or myelogenous leukemia.

These are the most common types of leukemia:

1. **Acute lymphocytic leukemia (ALL)** is the most common type of leukemia in young children. This disease also affects adults, especially those age 65 and older.
2. **Acute myeloid leukemia (AML)** occurs in both adults and children. This type of leukemia is sometimes called acute nonlymphocytic leukemia (ANLL).
3. **Chronic lymphocytic leukemia (CLL)** most often affects adults over the age of 55. It sometimes occurs in younger adults, but it almost never affects children.
4. **Chronic myeloid leukemia (CML)** occurs mainly in adults. A very small number of children also develop this disease

Symptoms of leukemia

Acute leukemia symptoms appear and get worse quickly. Chronic leukemia symptoms may not appear for a long time; when leukemia symptoms appear, they generally are mild at first and get worse gradually.

The abnormal cells may collect in the brain or spinal cord (also called the central nervous system or CNS). The result may be headaches, vomiting, confusion, loss of muscle control, and seizures. Leukemia cells also can collect in the testicles and cause swelling. Also, some patients develop sores in the eyes or on the skin. Leukemia also can affect the digestive tract, kidneys, lungs, or other parts of the body.

- Fever, chills, and other flu-like symptoms
- Weakness and fatigue
- Frequent infections
- Loss of appetite and/or weight
- Swollen or tender lymph nodes, liver, or Spleen
- Easy bleeding or bruising
- Tiny red spots (called petechiae) under the skin
- Swollen or bleeding gums
- Sweating, especially at night
- Bone or joint pain