

CONCEPT OF CHEMOTHERAPY. THE ROLE OF CHEMOTHERAPY IN MODERN MEDICINE

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Abstract. In this article, the concept of chemotherapy, its origin and its place in modern medicine are widely covered. The article provides detailed information about the role of chemotherapy in the treatment of cancer, the drugs used, their mechanism of action, and side effects affecting the patient's body. Based on modern researches, the efficiency of chemotherapy methods and future development prospects are also analyzed. The article is intended for medical professionals, students and a wide audience interested in healthcare.

Introduction. The main goal of modern medicine is the effective treatment of diseases and the restoration of human health. In recent years, cancer has been recognized as a serious problem worldwide, and innovative approaches to its treatment are being developed. One of these is chemotherapy, which is one of the main treatment options in the fight against malignant tumors. The concept of chemotherapy was originally used to treat bacterial and infectious diseases. Today, it is developing as a method based on limiting or completely eliminating the growth of cancer cells by using drugs. Also, in this article, the problems encountered in the chemotherapy process and how new technologies affect this method is talked about.

Main part. Chemotherapy is the use of chemical drugs to treat cancer, infections, and some other diseases. This treatment method is mainly aimed at stopping the growth of cancer cells or completely destroying them. The history of the initial use of chemotherapy dates back to the 1940s. The first chemotherapeutic drugs, in particular substances such as "mustard gas" (sulfalinas), were discovered as a result of studying the effects of chemical weapons. These were found to have the ability to damage cancer cells and chemotherapy became widely used in the treatment of cancer. The first use of small molecule drugs for the treatment of cancer was in the early 20th

century, although the specific chemicals used for the first time were not originally intended for this purpose. Mustard gas was used as a chemical warfare agent during World War I and has been found to be a powerful suppressor of hematopoiesis (blood production). A similar family of compounds, known as nitrogen mustards, was studied further at Yale Medical School during World War II. It has been hypothesized that an agent that damages rapidly growing white blood cells may have a similar effect on cancer.

Research results. In December 1942, several people with lymphoma (cancer of the lymphatic system and lymph nodes) were given the drug intravenously rather than by inhalation of the irritant gas. Their improvement, although temporary, was remarkable. At one point, during a World War II military operation, following a German air raid on the Italian port of Bari, several hundred people were accidentally exposed to mustard gas, which had been transported there by the Allied forces in preparation for possible retaliation in the event of an incident. Germany's use of chemical warfare. It was later found that the survivors had very low white blood cell counts. After World War II ended and the reports were declassified, the experiments came together, prompting researchers to look for other substances that might have similar effects against cancer. The first chemotherapy drug developed in this line of research was mustin. Since then, many other drugs have been developed to treat cancer, and drug development has become a multi-billion dollar industry, although the principles and limitations of chemotherapy discovered by the original researchers still apply.

Although the development of chemotherapy began in the mid-20th century, major scientific research into its effectiveness and side effects began in the 1970s. During this period, the development of special drugs for chemotherapy and research aimed at improving their effectiveness has developed significantly.

Basic mechanisms of chemotherapy. Chemotherapy is mainly based on the mechanism of stopping or disrupting the process of cell division. Materials needed for cell growth and division (such as DNA or RNA) are damaged by chemotherapeutic drugs. The chemicals target rapidly dividing cancer cells because cancer cells divide faster and more uncontrollably than normal cells.

Chemotherapy drugs affect cells through different mechanisms:

Blockage of DNA replication: Chemotherapy drugs damage a cell's DNA or stop it from replicating. This stops the growth of tumor cells.

Mitotic inhibitors: Some chemotherapy drugs stop cell division during mitosis, which prevents cancer cells from growing and spreading.

Effects on early stages of cellular diseases: Chemotherapy drugs, such as alkylating agents, damage the cell membrane and intracellular organelles, which impairs the activity of cancer cells.

Chemotherapy is mainly used in the following situations:

- before surgery in order to reduce the size of the tumor or limit its spread
- to destroy cancer cells left after surgery or radiation therapy
- it is used as an effective method of treatment when cancer has spread to other organs.

The advantages of chemotherapy include:

Provides high efficiency in the treatment of various stages of cancer.

Some types of cancer, such as leukemia, lymphoma, and autoimmune diseases, can be cured by chemotherapy.

Fast-acting: Chemotherapy drugs work quickly and bring the disease under control

Helps reduce cancer spread, symptoms and pain in late stages.

Disadvantages: Chemotherapy can cause a variety of side effects, including alopecia [hair loss], weakened immune system, intrathecal [reduced blood cell production], and respiratory problems.

Cell resistance: Some cancer cells can become resistant to chemotherapy drugs, making treatment less effective.

Also, the long duration of treatment is a negative aspect of chemotherapy.

Administration of chemotherapy:

1.Orally: Chemotherapy drugs are given to patients for treatment at home depending on the types and degrees of the disease, but they need to visit the hospital regularly for examination.

2. Through a vein: the drug is administered directly into a vein:

- injected intrathecally, into the space between the layers of tissue covering the brain and spinal cord

- as an intraperitoneal injection, directly into the intestines, stomach, and liver

- injected intrathecally into the artery leading to cancer.

Scientific advances in the field of chemotherapy are creating opportunities to make this method more effective. Based on genetic analysis and advances in biotechnology, chemotherapy drugs have become more specific, allowing them to affect only cancer cells. Nanotechnologies, such as nanoparticles, can deliver chemotherapy drugs directly to cancer cells, reducing side effects and increasing the effectiveness of treatment.

Conclusion. New methods such as immunotherapy and gene therapy can be used in combination with chemotherapy. These approaches are aimed at enhancing the immune system's ability to recognize and destroy cancer cells. Chemotherapy plays a key role in the treatment of cancer in modern medicine. Research on the development of this treatment method, its effectiveness and side effects is expected to open up new opportunities in this field in the future. In order for the chemotherapy method to be

fully effective, scientific research continues and is further improved with the help of new technologies.

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