

## Review Article

# The Medication Side Effects in the Treatment of Cancer: A Review

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## Abstract

The first definition of cancer refers to 1600 years before been used, eight patients with breast cancer were explained in papyrus that has been left of that time. Cancer means abnormal and uncontrollable growth of the cells of body and creates as a result of mutation in cells of body. Cancer has different types including Carcinomas, Sarcomas, Leukemia, Lymphomas and cancer of central nervous system. Conventional methods of treatment of cancer include surgery, radiotherapy, chemotherapy, hormone therapy, immunotherapy, hyperthermia, bone marrow graft (transplant) and laser therapy. Choosing the treatment of a cancer patient must be done based on accessible goals and operation for any kind of cancer. One of the treatment of cancer is using the anticancer drugs. These drugs in this article are used mainly in chemotherapy. these drugs lead to side effects in the body.

**Keywords:** Cancer; Chemotherapy; Drugs; Side effects; Treatment

## Introduction

We can remark that the history of cancer is as old as the history of human civilization. The first definition of cancer refers to 1600 years before been used, eight patients with breast cancer were explained in papyrus that has been left of that time. Egyptian doctors were burning the place of cancer with very hot drill. This method increased patient's life span but in left papyruses, it was written that cancer is incurable. Ancient Greek doctors were pioneers who identified the cancer as an illness. Hippocrates who was known as the father of medical science, was living during 460-370 years before Christ, he saw melanoma (skin cancer), nose cancer and breast cancer and resembled their appearances to crab. He used the word crab (karkinos-carcinoma) to name cancer [1]. Later Celsius, Roman practitioner, used Latin synonym of this word, Cancer. Muslim doctors used the synonym of this word: cancer (means crab). About 150 years after Christ (A.C), Gallon, Roman practitioner, used Oncos (in Greek it means swallow) to explain the tumors and nowadays his term is used as a part of Oncologist. Rudolph Virchow discovered the relation between inflammation and cancer for the first time in 1863 and his discovery caused to focus on cancer that still there was a doubt about its existence. First successful surgery was carried out on a patient with Larenx cancer by Theodore Billroth in 1873. The genetic basis of cancer was identified for the first time by German zoologist, Theodore Bowery in 1902. He found out chromosomes have an important role in cancer cells division and probably mutation in gen of these cells can cause the cancer. His success in this issue helps him to find out that x-rays, chemical and physical agents like toxins and wounds can cause "mutation" and then cancer. The cure of cancer was entered to a new stage by discovery of radium by Marie Curie and his husband. Not only the doctors cure the patients but also radiologists. During the second world war scientists found out soldiers have been touched Mustard gas, they underwent toxic changes in bone marrow and blood cells, and this was the beginning of new evolution in chemotherapy of cancers and Nitrogen Mustard got

the FDA certificate as the first chemical drug in treatment of cancer [2] and gradually and by discovery of new drugs [3,4], chemotherapy of cancer has been changed and by discovery of Monoclonal antibody in late 1990s, immunotherapy was added to cure cancer. The achieved progress in treatment and follow up the patients led to impressive changes in increasing longevity and survival and gained knowledge in last two decades about cancer was more than all human learning in past centuries.

Cancer means abnormal and uncontrollable growth of the cells of body and creates as a result of mutation in cells of body [1]. Mutated cells were proliferated more rapidly than healthy cells and got nutrients and oxygen out of reach for these cells. The additional cells produce a tissue mass called tumor. Cancer has different types including Carcinomas which begins from skin and internal organs of the body and includes 85% to 90% of the cancers, Sarcomas is created in bone, lipid, cartilage, etc. Leukemia is created in bone marrow and blood and creates abnormal white cells in blood, Lymphomas affects the immune system and it is created because of abnormal function of lymph nodes and spleen. In addition to these, cancer of central nervous system is created in brain and spinal cord, too. Conventional methods of treatment of cancer include surgery, radiotherapy which is a part of localized treatment and chemotherapy which is a part of systematic treatments. Other treatments include hormone therapy, immunotherapy, hyperthermia, bone marrow graft (transplant) and laser therapy. These methods are not necessarily efficient in all cancers and each of them causes its side effects and nowadays researchers are seeking another methods to counteract cancer. Choosing the treatment of a cancer patient must be done based on accessible goals and operation for any kind of cancer. Nowadays the treatment of cancer goes ahead to methods which have the least complications and the most effectiveness. These methods include making medicines with more certain purposes, targeted anticancer and improvement of surgery and radiotherapy methods. One of the treatment of cancer is using the anticancer drugs. Regarding to their

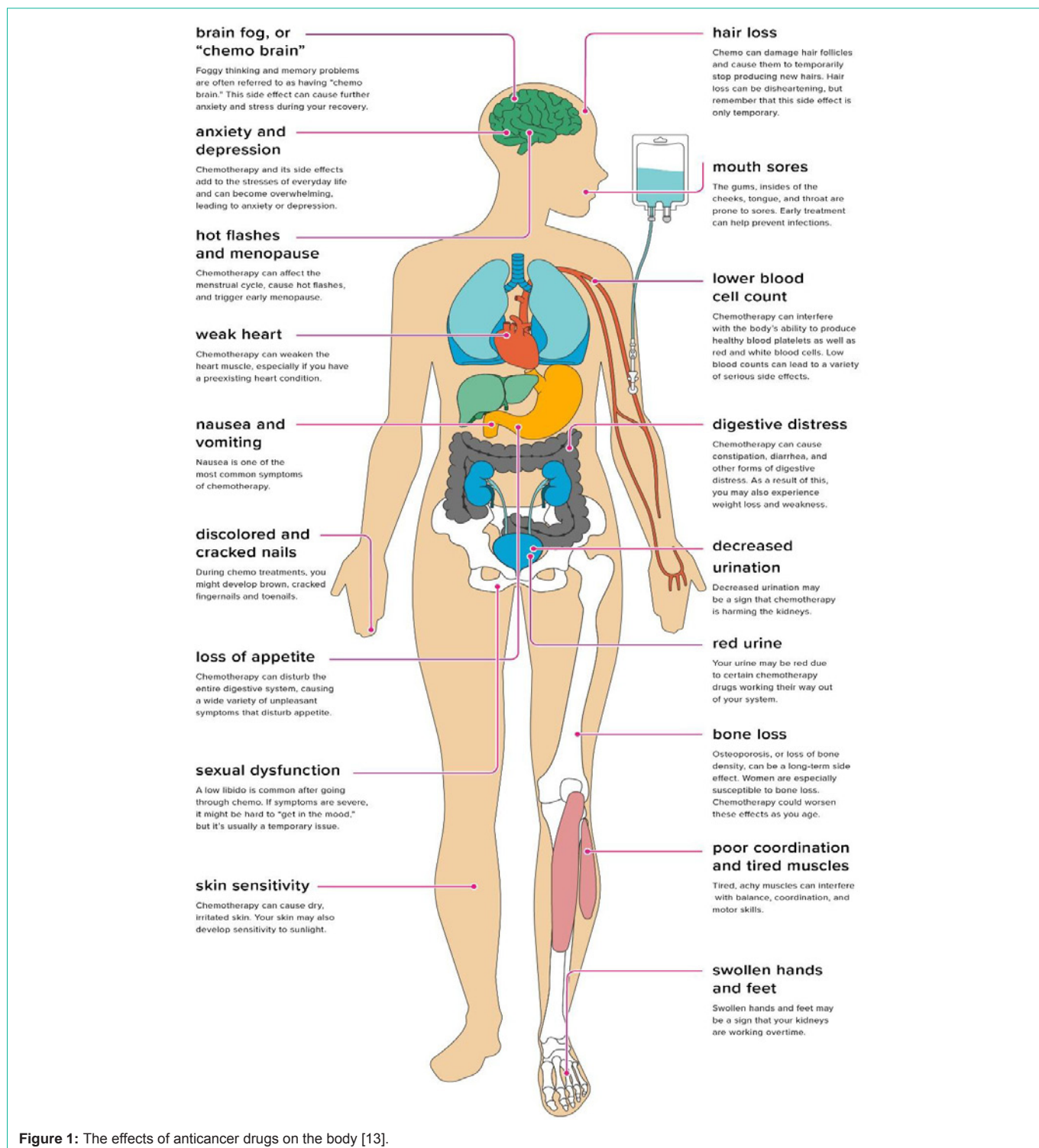


Figure 1: The effects of anticancer drugs on the body [13].

effect mechanism, the anticancer drugs can be categorized in some main groups which include alkalizations, toxic antibiotics for cells, antimetabolites, Vinca alkaloids, antagonists of hormones, some of the drugs have their own specific mechanisms and they aren't in these categorization. We'll mention some examples of the anticancer drugs in the following. These drugs regarding the type of usage, are used mainly in chemotherapy.

### Asparaginase

This drug is being used in treatment of acute lymphatic leukemia and acute myelocytic and myelomonocytic and also Hodgkin and non-Hodgkin lymphomas. In fact, this drug is an enzyme which causes decomposition of Asparagine into Asparic acid and Ammoniac. Some of the malignant cells unlike healthy cells of the body are not able to synthesize Asparagine. This drug has an important role in

synthesizing protein, RNA and DNA. The half-life of intramuscular injection of this drug is 39 to 49 hours and perfusion is 8 to 30 hours. Also the drug appears in blood 23 to 32 days after treatment discontinuance. In case of existence or recording of Pancreatitis, this drug must not be used. We can mention allergic reactions, reduction in plasma coagulation factors, hepatic toxicity (including changes in lipids), pancreatic inflammation, nausea and vomiting as side effects of this drug [5].

### **Cisplatin**

This drug is being used in treatment of bladder, ovary and testicle carcinoma. Also it is taken in adrenal gland, breast, digestive system, lung, prostate, head and neck carcinoma and germ cell tumors. The treatment process of this drug is as follows that like alkalization agents by making connection between DNA and RNA fibers, interfere with their functions. Half-life of this drug is about one hour and its expulsion is mainly through the kidney. Side effects of this drug are as follows: anemia, renal toxicity, increasing uric acid of blood and hearing toxicity [6,7].

### **Docetaxel**

This drug is being used in treatment of localized cancer or breast metastatic and localized cancer or lung metastatic (non-small cell type), in treatment of patients with ovarian cancer, in treatment of metastatic prostate cancer resistant to treatment and advanced localized cancer of head and neck of squamous cell type. Also it is used in treatment of bladder, soft tissue sarcoma and lung cancer of small cell type. This drug leads to breakdown of microtubule network which is necessary for mitosis division. This drug is rapidly released in all tissues of body and mainly is repulsed from the excretion (in the form of metabolites) and must be more cautiously used in patients with hepatic disorders. Its complications may be included anemia and common skin reactions and they may be severe, also weight gain can be one of side effects of this drug.

### **Fludarabine**

This drug is being used in treatment of lymphocytic leukemia, acute resistant leukemia, non- Hodgkin lymphoma and preparation diet of bone marrow graft. This drug is rapidly dephosphorized after intravenous injection and absorbed by lymphocytes. Its half-life is 20 hours and has renal expulsion. Taking this drug shouldn't be prescribed for patients with kidney disorders, also in case of existence of anemia in a patient and in case of detecting the weakening of bone marrow, taking this drug must be reduced. We can mention ague, cough, digestive distresses, neurological disorders, visual disorders and also agitation and coma as side effects of this drug.

### **Gemcitabine**

This drug is being used in treatment of bladder, breast, lung and pancreas tumors. This drug controls making of DNA and prescribing of this drug is intravenous injection and it's repulsed through urine. Taking this drug should be stopped if the symptoms of anemia is observed. Also it must be more cautiously used in patients with hepatic or renal disorder. Asthma, Acomia and Narcolepsy are common because of taking this drug.

### **Vindesine**

This drug is being used in treatment of acute leukemia, lymphomas and some of the carcinomas such as breast and lung carcinoma. This

drug stops the mitosis and by connecting to microtubules hinder their activities (hair loss) and ultimately the cell will die. This drug has three -stage half-life and its last half life is about 20 hours. Expulsion of this drug is through kidney. This drug shouldn't be taken if the patient has severe weakness, and it shouldn't be injected in cranium (skull). The side effects of this drug are anemia, weakening the activity of bone marrow and neurotoxicity.

### **Streptozocin**

This drug is being used in treatment of pancreas carcinomas and carcinoid tumors. The effect of this drug is applied by connecting to DNA fibers which control their making. The metabolism of this drug is renal. Its half-life is 35minutes for drug and 40 hours for its metabolites. Because of renal side effects, intravenous injection of this drug is not recommended. Expulsion of this drug is mainly through kidney or respiratory system. Renal disorder and toxicity and decreasing blood sugar are common side effects of this drug.

### **Bleomycin**

This drug is being used in treatment of cancer of squamous cells of head and neck, skin, kidney and throat (pharynx). It can be used in treatment of Hodgkin and non- Hodgkin lymphomas, too. This drug is an antibiotic which affects both dividing cells and growing cells and hinders the growth of cancer cell. This drug is metabolized in liver and kidney and it's repulsed through kidney. Long term consumption of this drug leads to renal toxicity and its main complications are creating wheal and wound in part of the body that the drug has been injected, and also calvities and fever may be observed in a patient [8].

### **Zoledronic acid**

This drug is applied for bone metastases of solid tumors and during treatment with this drug, no invasive dental action should be performed. Low blood pressure, tiredness, fever, headache, vertigo, insomnia, anxiety, depression, lower phosphor and potassium in blood, nausea, diarrhea, stomachache, loss of appetite, weight loss are complications of this drug. This drug must be cautiously taken in patients with asthma, patients with hepatic disorder and elderly people.

### **Rasburicase**

This drug is applied for treatment of high uric acid in blood of patients with leukemia, lymphoma, solid malign tumors. In addition taking this drug perhaps cause disruption in test of measuring uric acid in blood. And if allergic reactions appear, its consumption must be quickly and forever stopped. We can mention fever, nausea, vomiting, high phosphate in blood and anemia as complications of this drug.

It should be noted that these drugs lead to side effects in the body (Figure 1). for example, the effect on white blood cells (immune system) that consumption of anticancer drugs can lead to infection, because these drugs affect bone marrow so that white cells 'prevention from infection will be more difficult. The drugs that improve white cells can be taken therefore the risk of infection will be reduced. Reduction of hematoblasts (platelets) occurs because of consumption of anticancer drugs. Red blood cells are affected by these drugs and the amount of them will decrease. If the red blood cells aren't adequate for carrying oxygen, the person will get an anemia. The most common complications of cancer drugs are tiredness and lack

of energy and this tiredness is not resolved with taking a rest, this tiredness and exhaustion may be the result of illness, drugs, stress and pain. The anticancer drugs affect the mouth cells and cause oral sores. These drugs can be led to nausea and vomiting whose length and severity are different in each person and depend on the drug that person consumes. To control it, the anti-nausea drugs should be used. Also they perhaps cause the diarrhea in a person, so by eating hot food and eating the food slowly can prevent the diarrhea, also a doctor can prescribe anti-diarrhea drugs. Constipation is another complication of anti-cancer drugs and it perhaps occurs because of taking anti-nausea drugs, too. So, in this case activity of intestine will be reduced. By increasing fiber and liquids in diet, the possibility of constipation will be decreased. Some of the used drugs in cancer affect the hair and perhaps affect all hair of the body such as eyebrows. This effect is temporary and the hair will grow again. The Calvities starts after two or three weeks after the first treatment and takes one week. Skin is another organ that is affected by drugs. It may be get red, painful or suffer a wound, particularly in injection part. Also it is accompanied by urticarial (itch) or exfoliation and also permeation of anticancer drugs to surrounding tissues during injection can damage the tissues. Some of the drugs change the nervous system which can be permanent or temporary. These changes perhaps cause the neuralgia, too and these drugs also may cause the disorder in fertility so that in men these drugs perhaps lower the number of sperms and their mobilities. It also can cause the damage to chromosomes and a birth defect and in women these drugs affect the ovaries and lower the amount of hormones that they must produce. Some of the anticancer drugs increase uric acid in blood, these patients must drink adequate water. Because these drugs are repulsed through kidney and bladder, they may be damage their cells. Depression occurs in patients who take the anticancer drugs [9-12].

## Conclusion

Different medicines inflict various side-effects upon the body. It is often suggested to use an average dosage for rendering the side-effects tolerable. Therefore, instead of prescribing high dosage which cause acute side-effects of permanent duration, it is best to consider the potential chemical interactions between the medicines and proceed with prescription in accordance with such consideration. This assigns physicians with necessary examination of bio-chemical interactions among varying medicines.

The existing research in this field general seeks to provide such facilities as medicine carries with differing routes, new therapeutic goals such nutritious blood vein feeding tumor cells and developing new structures of targeted medicine. The utility of treatment directly depends upon its ability to perish cancerous cells in a way such that would not make a negative impact upon healthy cells of the body.

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