

The Challenging of Chemotherapy among the Cancer Treatments: The Fact and Meth of the Alternative

Asst. Prof. Dr. Chateen I. Ali Pambuk¹, Fatma Mustafa Muhammad², Nihad AbdulJabbar Jalal³

^{1,2,3} College of Dentistry / University of Tikrit

ABSTRACT

Chemotherapy refers to the role of drugs in trying to destroy or stop the development and spread of cancer cells in the body. Although it is one of the common types of treatment for cancer patients, not all patients need chemotherapy as part of their treatment, as it depends on their specific diagnosis, and sometimes chemotherapy is given only to reduce the size of cancer cells before surgery. Chemotherapy at the Specialized Hospital aims to: Treat cancer diseases and prevent their recurrence.

Controlling cancerous disease by reducing the size of tumors or preventing them from growing and spreading to other parts of the body and relieving symptoms in patients who have cancer spread in their bodies to improve their quality of life and their treatment of cancer

ARTICLE DETAILS

Published On:
31 August 2023

Available on:
<https://ijmscr.org/>

RADIOTHERAPY

The hypothesis of radiation induction suggests that the low levels of ionic radiation have an induction in its action for cellular biological processes such as the stimulation of DNA repair systems, which benefits many of the repair genes (Oliver, et al. 2004; Hickson, 2006) and also for the effectiveness of detoxifying enzymes by destruction the harmful ionic roots resulted from the radiation (Loken & Fenel, 1993). In addition to these benefits, there are side effects of treatment such as decomposition of stem cells parenchymal tissue, intestinal and lung fibrosis as well as hair loss (Suit & Todorok, 1995). The more innovative Radiological sensors techniques by utilizing Misiodazole and Nitroimidazole, came to be a very useful in the treatment of some cancers, which cause cell toxicity As a result of decreased blood flow in the capillaries feeding the tumor (Fertile and Malaie, 1995).

CHEMOTHERAPY

It includes three types of chemicals with the important therapeutic role of cancer:

1 - To inhibit the activation of primary carcinogens to intermediate carcinogens, such as antioxidants (1996, et al Kornhauser), which include vitamins dissolved in water, fats, mineral elements and plant - derived chemicals.

2- Inhibitors of cancer initiation factors or factors that prevent cancer from interacting with vital centers in the cell (Siess, et al 1992)

3- Inhibitors : factors that inhibit the late stages of the progress of cancer and include more than 1000 compound classified into 25 plant-derived compounds (Federal Register, 1993; Dragsted et al., 1993)

Types of chemotherapy

There are many types of drugs that can be included in the chemotherapy group, the most prominent of which are the following:

1. Alkylating agents

This type of drug works to destroy the DNA inside cancer cells while they are in the resting phase of cell. There are several of them:

Mustard gas derivatives

It is used in most types of tumors, which include: Cyclophosphamide, Chlorambucil, Melphalan and Ifosfamide.

Alkylsulfonates

Used in the treatment of leukemia in particular, such as: Busulfan.

Nitrosureas

Which is unique and distinguished from most other types of chemotherapy in its ability to cross the blood-brain barrier, so it is used in the treatment of brain tumors, such as: Carmustine, Lomustine, and Streptozocin.

Metal salts

The Challenging of Chemotherapy among the Cancer Treatments: The Fact and Meth of the Alternative

Which are used in the treatment of bladder, testicular, ovarian, and other cancers, such as: Carboplatin, Cisplatin, and Oxaliplatin.

2. Plant alkaloids

This group is extracted from some types of plants:

Vinca alkaloids

This group is extracted from the so-called sea snail, such as: Vincristine, Vinblastine, and Vinorelbine.

Taxanes

It is extracted from the yew plant of the coniferous family. This group is used to treat breast and uterine cancer, such as: Paclitaxel and Docetaxel.

These two groups are inhibitors of cell tubules that transport proteins and organelles and play an important role in cell division and proliferation, which leads to cell paralysis and prevents its proliferation when using one of these two groups drugs.

Podophyllotoxins

It is extracted from the leprosy plant. It is used as an antiviral in viral warts. It has properties that disrupt the stability of cell microtubules, disrupting their work and increasing the decomposition of their genetic material by inactivating the enzyme topoisomerase II inhibitors that enter the work of DNA, such as: Etoposide and teniposide (Teniposide).

3. Antitumor antibiotics

This group is so named because it is extracted from a family of bacteria similar to Streptomyces. This group affects cells during certain phases of their cycle via free radicals that break down the cell's DNA.

Despite its serious side effects, such as its effect on the heart, kidneys, and lungs, it is one of the most effective chemical treatments to date. Examples include the following:

Anthracyclines, such as: Daunorubicin and Doxorubicin, used in most types of solid tumors, leukemia and lymphoma. Dactinomycin, which is used in pediatric tumors. Bleomycin, commonly used in testicular cancer.

4. Antimetabolites

The action of this group is based on its symmetry or similarity with basic substances that enter into the formation of the cell's DNA, replacing them to nullify its work, which leads to the inhibition of the DNA and thus prevents the proliferation of cancer cells.

Among these basic substances are folic acid, purines, and pyrimidines, which are replaced by the following drugs:

Methotrexate.

-5Fluorouracil, used in the treatment of colon cancer, and as an ointment for the treatment of basal cell carcinoma.

Azathioprine, which is converted in the body to 6-mercaptopurine, used to treat leukemia.

Chemotherapy properties

The main characteristics of chemotherapy are as follows:

1. It is used to reduce or destroy the growth of carcinogenic cells

The most prominent uses of chemotherapy are in destroying cancer cells, but unfortunately it also destroys healthy cells, especially cells that divide more quickly than other cells, such as: hair follicles and blood cells.

2. Chemotherapy drugs differ in how they work

Chemotherapy is not a single drug, the effect of each of these drugs on cancer cells is separate from the effect of others, and its effect on a particular tumor differs from its effect on another tumor.

Even the side effects of one chemotherapy drug are different from the side effects of other drugs.

4. Not all tumors respond to chemotherapy

Some of them respond greatly, close to complete recovery, some respond to a lesser extent, and some of the cancerous tumors do not respond at all, depending on the type, classification and degree of the tumor.

Also, sometimes chemotherapy is used only to reduce symptoms or to try to prolong the patient's life.

5. Chemotherapy is used alone or as a supplement

Chemotherapy is used in conjunction with radiotherapy or surgery. Chemotherapy is either used before radiotherapy or surgery to reduce the size of the tumor before the operation (Neoadjuvant), or after surgical removal to eliminate the remaining small-sized cancer cells (Adjuvant).

6. The mechanism of chemotherapy varies from one drug to another

The chemotherapy protocol governs the use of more than one drug of different duration of action and the goal is to reduce the resistance of cancer cells.

Some treatment protocols have introduced the use of modern methods that may improve the therapeutic outcome, such as electro-chemo-therapy or thermal-chemo-therapy.

So that a certain amount of high-voltage electrical pulses is applied to the tumor or a certain amount of heat increases the amount of chemotherapy passing through the membranes of cancer cells, and thus chemotherapy achieves higher effectiveness on the one hand, but on the practical level, these methods did not show any differences in the lifespan of patients.

IMMUNOTHERAPY

Immunodeficiency is one of the leading causes of cancer the proliferation of natural and cancerous cells depend on molecules produced from immune cells known as immunokines e.g Cytokines, Interleukins and Interferons . (Rosenberg, 1997)

The Challenging of Chemotherapy among the Cancer Treatments: The Fact and Meth of the Alternative

The immunosuppressant and anti-inflammatory prednisone, which may act on programmed cell death, is used as part of chemotherapy rather than alone.

Monoclonal antibodies, which are used in the treatment of cancer, are directed against the enzyme tyrosine kinase, which is the key to opening and closing biological processes in the cell and is linked to the formation of oncogenes that prevent the formation of antibodies.

Trastuzumab is an antibody that blocks the action of tyrosine kinase (HER-2), whose overtranslation in the body leads to breast cancer.

Rituximab is an antibody to the immune receptor used in the treatment of lymphoma.

HORMONAL THERAPY

It involves the use of a drug that replaces or interferes with endocrine functions that leads to tumor inhibition of induced or non-induced mammary glands (Oklsborne et al., 2000; Weisch, et al., 1998).

Act as inhibitors for biosynthesis of estrogens and other classes acting as inhibitors or inducers of the biosynthesis of milk hormone like Bromo cryptine (Weisch, et al 1990 ; Weisch & DeHoog, 1993)

It is usually used alongside chemotherapy in certain cases of tumors, as some tumors use hormones to grow in the body. If the percentage of hormone increases, the tumor grows with it, and if its percentage decreases, the tumor shrinks, and here lies the role of hormonal therapy, such as breast cancer, endometrial cancer, and cancer Testicular, prostate cancer, ovarian cancer and others.

Prostate cancer in men is associated with a high level of testosterone, so it may be used as direct and indirect inhibitors of male hormones, including Leuprorelin, Goserelin, and others.

As for breast cancer, its growth may be sensitive to the level of the female hormone estrogen or progesterone, or both.

One of the most popular hormonal drug treatments for estrogen-sensitive breast tumors is tamoxifen, which blocks estrogen binding in the breast and is also approved as a preventative treatment for breast cancer.

There are many other drug treatments that reduce estrogen by inhibiting the enzyme that converts part of the fat into hormones, and there is also something that works to reduce the secretion of hormones from the source of control, which is the pituitary gland in the brain.

OZONE THERAPY

Ozone stimulates the effectiveness of antioxidant enzymes and stimulates the secretion of interferon and tumor necrosis factor TNF (Pryor and Lightsey, 2003; Kennedg et al, 1999) , but with Some negative aspects as it inhibits enzyme inhibitors (Cycloxygenase) necessary for bio-synthesis of

prostaglandins which leads carcinogenic increase (Schelye, et al 1997).

SURGICAL THERAPY

This technique is the one for treating solid tumors and involves the removal of Carcinogenic tissue. (bourgaize , al et 2000), including blood vessels feeding tissue and lymphatic glands. This technique is considered effective for treating various cancers as prostate and uterine cancers and breast cancer.

Plant ingredients have been known to be the effective source of many diseases, as most of the medicines currently known and used are plant constituents (Craig, 1999,) . And that many of these components are important in the treatment and reduction of cancer (Gheri , et al 2005), and that one of these compounds is proteoglycan isolated from a plant it works to inhibit the growth of cancer tumors in rats Lewis lung strain by up to 77% of the weight of the tumor (Meng , et al 2002) , and the lycobetaine is a calcoidal compound found in the grass, *Lycaris radiate*, which has the ability to treat cervical, ovarian and stomach cancer. Soybeans also contain high concentrations of Genistein, a flavonoid, and there is evidence that this substance Depresses a number of cancers such as stomach, pancreas and stomach cancer and also liver and Prostate by preventing the growth of new blood vessels in tumors (Duke , 1993).

REFERENCES

- I. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2016. *CA Cancer J Clin.* 2016; 66: 7-30.
- II. Verdecchia A, De Angelis G, Capocaccia R. Estimation and projections of cancer prevalence from cancer registry data. *Stat Med.* 2002; 21: 3511-3526.
- III. DeSantis CE, Lin CC, Mariotto AB, et al. Cancer treatment and survivorship statistics, 2014. *CA Cancer J Clin.* 2014; 64: 252-271.
- IV. Siegel R, DeSantis C, Virgo K, et al. Cancer treatment and survivorship statistics, 2012. *CA Cancer J Clin.* 2012; 62: 220-241.
- V. Surveillance Research Program, National Cancer Institute. *SEER*Stat software, version 8.2.1.* Bethesda, MD: National Cancer Institute; 2015.
- VI. Bhargava A, Du XL. Racial and socioeconomic disparities in adjuvant chemotherapy for older women with lymph node-positive, operable breast cancer. *Cancer.* 2009; 115: 2999-3008.
- VII. Lawenda BD, Mondry TE, Johnstone PA. Lymphedema: a primer on the identification and management of a chronic condition in oncologic treatment. *CA Cancer J Clin.* 2009; 59: 8-24.
- VIII. Schover LR, van der Kaaij M, van Dorst E, Creutzberg C, Huyghe E, Kiserud CE. Sexual

The Challenging of Chemotherapy among the Cancer Treatments: The Fact and Meth of the Alternative

- dysfunction and infertility as late effects of cancer treatment. *EJC Suppl.* 2014; 12: 41-53.
- IX. Bleyer A. Young adult oncology: the patients and their survival challenges. *CA Cancer J Clin.* 2007; 57: 242-255.
- X. Albritton K, Barr R, Bleyer A. The adolescence of young adult oncology. *Semin Oncol.* 2009; 36: 478-488.
- XI. Hudson MM, Ness KK, Gurney JG, et al. Clinical ascertainment of health outcomes among adults treated for childhood cancer. *JAMA.* 2013; 309: 2371-2381.
- XII. Ferdinand R, Mitchell SA, Batson S, Tumor I. Treatments for chronic myeloid leukemia: a qualitative systematic review. *J Blood Med.* 2012; 3: 51-76.
- XIII. Faderl S, Jeha S, Kantarjian HM. The biology and therapy of adult acute lymphoblastic leukemia. *Cancer.* 2003; 98: 1337-1354.
- XIV. Shankland KR, Armitage JO, Hancock BW. Non-Hodgkin lymphoma. *Lancet.* 2012; 380: 848-857.
- XV. Karimkhani C, Gonzalez R, Dellavalle RP. A review of novel therapies for melanoma. *Am J Clin Dermatol.* 2014; 15: 323-337.