

Title:

The Impact of X-rays on Cancer Patients and Their Response to Radiation Therapy

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Abstract:

Since the discovery of X-rays and their use in diagnosis and treatment, there have been many advancements in the field of X-rays and their relation to radiation therapy for cancer patients. This study focused on the use of X-rays in treating cancer patients, determining the extent of their response, and the method for using radiation therapy to target only the organ being treated without affecting other surrounding tissues.

Keywords: X-rays; Cancer; Radiation therapy

Chapter 1:

The Problem of the Study and Its Dimensions

Introduction:

Radiation therapy has become an essential part of cancer treatment, as it has several uses. It can be used as the primary treatment for cancer, or it can be used in conjunction with surgery or chemotherapy, and also hormonal therapy. Moreover, there are other types of radiation therapy, with the most common being X-ray, electron, or proton therapy.

Radiation therapy is used to treat cancer by directing a high-energy radiation beam toward cancer cells in the body. While radiation therapy can be effective in killing cancer cells, it can also cause some side effects, such as nausea and fatigue. Radiation therapy is unique in that nearby healthy tissues often receive doses close to the maximum tolerable dose, making it challenging to limit damage to these tissues.

X-rays are a type of electromagnetic radiation that is used in many medical applications, including X-ray imaging and radiation therapy. X-rays are used to diagnose diseases and injuries in the body and to treat some diseases and malignancies.

Study Terminology:

X-rays:

X-rays were discovered by the scientist Roentgen by chance in 1895 while studying the electrical conductivity of gases inside partially evacuated tubes called Crookes tubes. X-rays can be obtained by bombarding a target with high-speed accelerated electrons, which occurs inside a tube called an X-ray tube (Abdullah, 2017, p. 2).

Cancer:

Cancer is defined as the uncontrolled growth of cells without adherence to the basic tissue system in terms of cell age or tissue growth direction (Masry, 2016, p. 41).

Radiation Therapy:

Radiation therapy is referred to as the use of ionizing radiation in cancer treatment. The radiation therapy team consists of oncologists, medical physicists, and radiation therapists. The presence of a medical physicist is important due to the need for accuracy verification and a variety of testing methods and data, and the need for standards and time constraints (Eljayli, 2017).

Study Problem:

- The need to determine the extent of the impact of X-rays on patients.
- To determine how patients respond to radiation therapy.

The significance of the study:

The significance of this study lies in its attempt to shed light on cancer patients and their response to radiation therapy, particularly in terms of the extent of their exposure to radiation and their responsiveness to treatment.

Study Questions:

The study aimed to address the following research questions:

1. What is the extent of the impact of X-ray radiation on cancer patients?
2. How does radiation therapy affect cancer patients?

Aims of the Study:

1. Determine the extent of the impact of X-rays on cancer patients.
2. Assess the effects of radiation therapy on cancer patients.

Limitations of the Study:

- **Human limitations:** Cancer patients.
- **Temporal limitations:** The study was conducted during the year 1444 AH - 2023 CE.
- **Spatial limitations:** The study was conducted in the Kingdom of Saudi Arabia - Makkah.

Chapter 2:

The Theoretical Framework of the Study

(Abu Aisha et al., 2018, p. 4) provided a definition of X-rays, stating that electromagnetic radiation consists of electromagnetic waves with short wavelengths and high frequencies, such as X-rays and gamma rays. These types of radiation have the ability to penetrate and ionize the materials they encounter, causing physical, chemical, and biological changes.

Types of X-rays:

Al-Jubouri (2017) stated that there are two types of X-rays:

1- White X-rays:

The term "white" here does not refer to the color white but rather to the inclusion of various X-rays with different frequencies and wavelengths in this spectrum. This means that we find in this spectrum all possible waves within a lower or higher limit of wavelength.

2- X-rays specific to each mineral:

These are composed of several lights, each with a single wavelength, that combine into several groups. The wavelength of each of these lights is related to the atomic number of the element that produced it.

Characteristics of X-rays:

(Al-Jubouri, 2017) summarized the main characteristics of X-rays as follows:

1. X-rays propagate in a straight line.
2. The speed of X-rays is equal to the speed of light.
3. X-rays are not affected by the presence of a magnetic or electric field.
4. X-rays do not carry an electric charge.
5. X-rays affect photographic films.
6. X-rays cause certain substances to fluoresce.
7. X-rays are capable of damaging or killing living cells.

The researcher concluded that X-rays have a high ability to impact and kill cancer cells.

What is radiation therapy?

Radiation therapy is one of the most widely used treatments for cancer. It involves the use of radiation in its various forms (X-rays, gamma rays, and particles) to damage and destroy tumors. It can be used alone or in combination with surgery or chemotherapy. Radiation therapy can be external (external beam radiation therapy) or internal (brachytherapy) (Al-Aswad & Abu Al-Saud, 2019).

Types of Radiation Therapy:

Radiation therapy is divided into three main categories, according to (Al-Houri et al., 2017):

- External Radiation Therapy: In this type the radiation source is located outside the patient's body.
- Internal Radiation Therapy: This is carried out using a sealed radioactive source placed inside the patient's body near the area to be treated.
- Radiation therapy using open sources that implant the radioactive material internally.

The researcher believes that radiation therapy is safe for patients if the dose is carefully measured and the radiation is focused only on the organ being treated without affecting other areas.

The Impact of Radiation Therapy:

According to (Al-Houri et al., 2017), radiation therapy may have various effects on the body, including but not limited to the following:

1. Hair loss, which may occur if the radiation dose is high.
2. Skin peeling and redness.
3. Ulcers in the mouth and throat, which may reduce the amount of saliva produced by the patient.
4. Changes in voice or loss of voice often occur if the radiation field is directed toward the mouth.

5. Effects on bone marrow and reproductive glands.
6. In some cases, radiation therapy may lead to genetic mutations.

The researcher concluded that radiation therapy could sometimes become dangerous for patients if the dose is not accurately measured and the targeted organ for treatment is not precisely identified, as it can affect the healthy tissues of the body. Therefore, it is necessary to calibrate the radiation dose used in radiation therapy with precision by the medical physicist and doctor.

Chapter Three:

Methodological Procedures of the Research

Research Methodology: The descriptive analytical method was utilized.

Research Sample: Cancer patients.

Chapter Four:

Research Findings

This chapter presents the mechanism of action of X-rays and their use in radiation therapy, as well as the different types of X-rays used to treat cancerous

tumors and their various characteristics. The chapter also discusses the different types of radiation therapy, including internal and external radiation therapy, and the effects of radiation therapy on patients. Additionally, the chapter highlights ways to alleviate the symptoms associated with radiation therapy.

Recommendations:

- Development of various techniques in the field of radiology.
- Raising awareness among patients and radiology workers about the risks of radiation exposure and methods of protection.
- Reinforcing the concepts of radiation therapy and its types.
- Raising patient awareness about the importance of radiation therapy.
- Utilizing the experiences of advanced countries in using radiation to treat tumors.
- Conducting further research on the importance of X-rays in treating tumors.

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