Lecture 5

Radiotherapy

By

Dr. Noor Al-Huda Talib Al-Aaraji

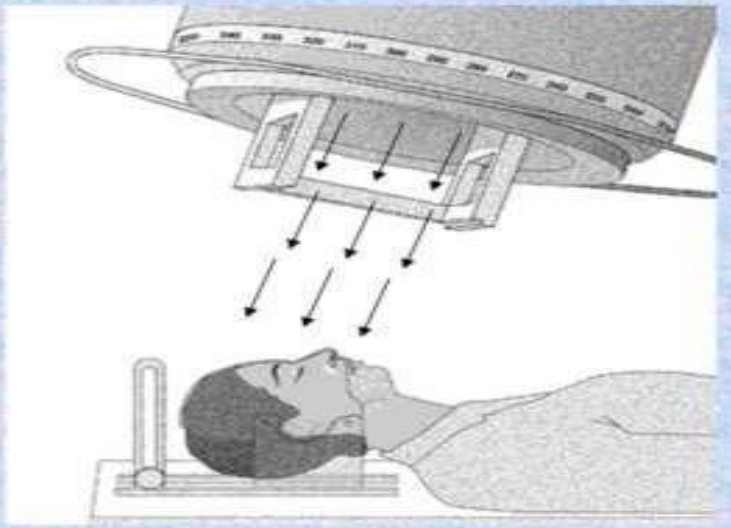
Radiotherapy

Radiotherapy: The treatment of disease with ionizing radiation. Also called radiation therapy. It is aim to deliver a precise dose of radiation to a defined tumor volume with as minimal damage as possible to surrounding normal tissues.

Radiotherapy Treatment

Irradiation Using High Energy Gamma Rays

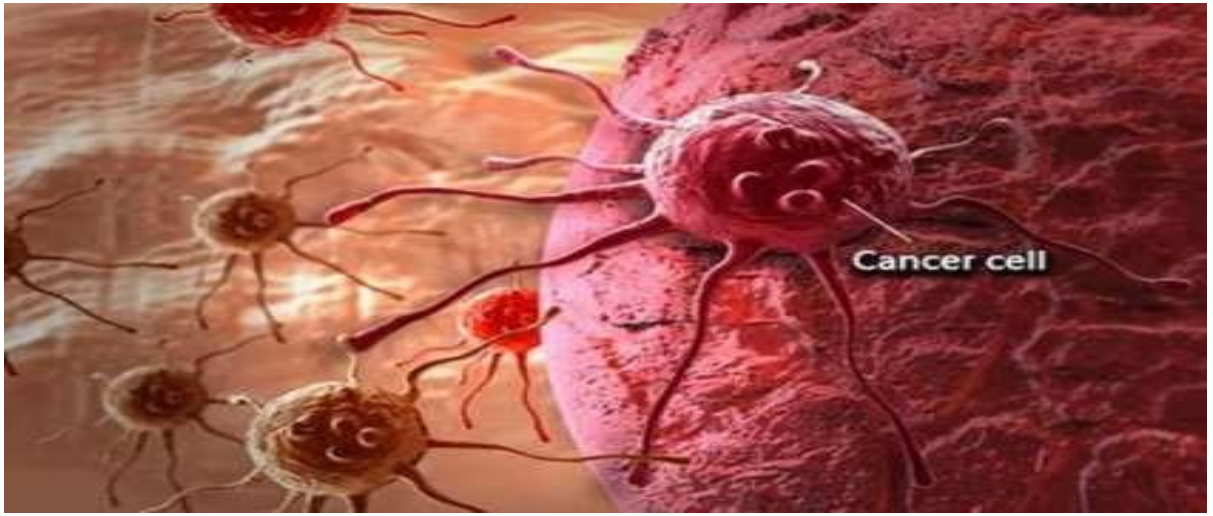
- Gamma rays are emitted from a cobalt-60 source – a radioactive form of cobalt.
- The cobalt source is kept within a thick, heavy metal container.
- This container has a slit in it to allow a narrow beam of gamma rays to emerge.



Radiotherapy

In radiotherapy, high-energy rays are often used to damage **cancer cells** and stop them from growing and dividing. A specialist in the radiation treatment of cancer is called a radiation oncologist.

In the most basic terms, cancer refers to cells that grow out-of-control and invade other tissues. Cells may become cancerous due to the accumulation of defects, or mutations, in their DNA.



Why Use Radiation Therapy?

- **To cure cancer:**

– Destroy tumors that have not spread to other body parts.

– Reduce the risk that cancer will return after surgery or chemotherapy.

– Shrink the cancer before surgery.

- **For palliation (to reduce symptoms):**

– Shrink tumors affecting quality of life, like a lung tumor that is causing shortness of breath.

– Alleviate pain or neurologic symptoms by reducing the size of a tumor.

When is radiation used?

• The best treatment plan for each patient is frequently determined by a team of doctors, including a radiation oncologist, a medical oncologist and a surgeon.

- Sometimes radiation therapy is the only treatment a patient needs.

The type of treatment used will depend on the location, size and type of cancer.

Tumor boards meet to discuss comprehensive patient treatment plans Other times, it is combined with other treatments, such as surgery and chemotherapy.

Calculation of Radiation Absorbed Dose

Absorbed Dose = Energy Absorbed Dose from Ionizing Radiation / Mass of Organ

- The organ that is the recipient of this radiate energy from the source organs is called a **target organ.**

-The energy deposited in specific organ is called the **self dose.**

-The fraction of the energy emitted by source and deposited in the target is called the **absorbed fraction**. This depends on

1- Type and energy of the radiation.

2- Size, shape and composition of the target.

3- Distance between source and target as well as the type of material separating them.

NOTE: Equivalent dose is used to assess how much biological damage is expected from the absorbed dose. (Different types of radiation have different damaging properties).

The difference between absorbed dose in tissue and equivalent

dose: 1- Absorbed dose tells us the energy deposit in a small volume of

tissue.

2- Equivalent dose addresses the impact that the type of radiation has on that tissue.

Because all radiation used in diagnostic medicine has the same low-harm potential, the absorbed dose and the equivalent dose are numerically the same. Only the units are different.

For diagnostic radiation: The equivalent dose in milliSievert (mSv) = the absorbed dose in mGy.

Effective dose is a calculated value, measured in mSv, that takes three factors into account:
1- the absorbed dose to all organs of the body,
2- the relative harm level of the radiation, and
3- the sensitivities of each organ to radiation.

Effective dose: The quantity of effective dose helps us take into account **sensitivity.** Different body parts have different sensitivities to radiation. For example, the head is less sensitive than the chest.
Effective dose relates to the overall long-term risk to a person from a procedure and is useful for comparing risks from different procedures.
The actual risk to a patient might be higher or lower, **depending on the size of the patient and the type of procedure.**