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The dependence of the radiation dose on the angle and the field size for radiation beam with energy 18 MV.

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INTRODUCTION

In our daily living, we are exposed on electromagnetic radiation, if its energy is enough high to cause the ionization then we have damaged of organism. Interactions of radiation with living material may result in damage at the molecular or cellular levels. The human body has nearly 10^{13} cells. Each somatic cell contains 23 pairs of chromosomes. Each cell contains a nucleus that houses these chromosomes. The total chromosomal content of a cell involves approximately 10^5 genes in a specialized macromolecule of deoxyribonucleic acid (DNA). A number of direct and indirect radiation interaction pathways can produce damage to the DNA of irradiated cells. [1] DNA damage occurs by direct or indirect action of the iobization. Cells depend on their DNA for coding information to make various classes of proteins that include enzymes, certain hormones, transport proteins and structural proteins that support life. Direct macromolecule damage by radiation involves partial or complete energy transfer to one or more electrons on the molecule. Each electron that is given enough energy to overcome the attractive forces of nucleus escapes from DNA or other macromolecule and leaves if in the form of charged ions, this process called ionization, is the source of the term ionizing radiation. Ionizing radiation is present everywhere as part of natyral enviroment. X rays are electromagnetic wave just like visible light, but more energetic. They come from X-ray machine, particle accelerators and their equipment that produce high-voltage electron beams. [2] All these devices produce X- ray when high spreed electrons strike a metal target. Gamma rays are also electromagnetic waves that come from many but not all radioactive substances. Gamma rays are highly penetrating and can pass through the human body.

Many types of accelerator have been built for basic research in nuclear physics and high energy physics. Most of these accelerators have been modified for least some limited use in radiotherapy. Medical linac are cyclic accelerators that accelerate electrons to kinetic energies from 4 to 25 MeV using radiofrequency fields. [3]

Electron linear accelerators today constitute the care of the equipment of a modern radiation therapy department. Nowadays, the majority of the patients referred to a radiation therapy department are treated with a linear accelerator for at least part of their treatment. It is likely that this will remain true for the foreseeable future. Linear accelerators thus play and will keep plying a significant role in tumour management in general and are responsible for the therapeutic sucees obtained in many tumour treatment. [4]

The figure below present an accelerator that used in radiotherapy to treat tumours. The accelerators produce photons beam with high energy by the electron beam which is accelerate in a electromagnetic field and strike the metal target in head of accelerator.

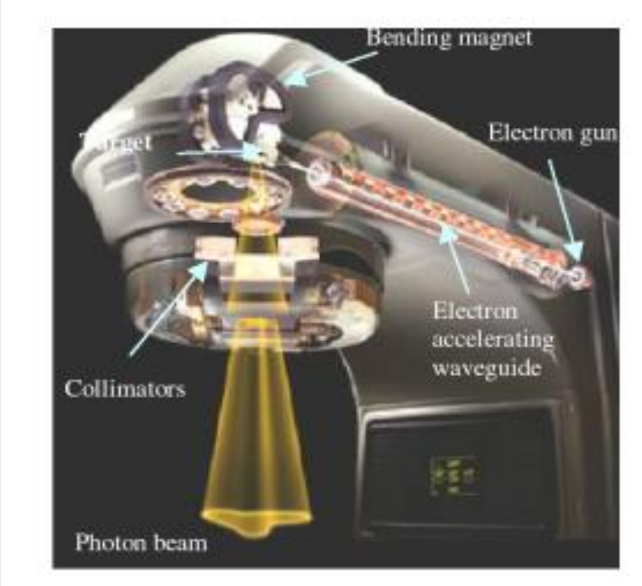

Figure 1: MV Linear Acceletator [5].

METHODS AND MATERIAL

The X-ray accelerators produce radiation beams with different energies, in our case we have used an accelerator with 18 MV energy of type Elekta synergy Platform. So, in a 8.7 cm depth, we have put the ionization chamber under five acrilic plates in 98.7 cm distance by source of radiation beam. The tables below shown the results that are obtained for 90 degree and 270 degree angles , also we have used radiation beam with different field size such as 3×3 cm^2, 5×5cm^2, 10×10 cm^2 ect. In table 1 below presented the results of radiation dose in nano coulomb unit for two different angle and field size 3×3 cm^2.

Energy	Angle	Dose (nc)			Field size
18 Mv	90^0	54.42	54.44	54.42	3x3cm^2
	270^0	54.57	54.56	54.47	3x3cm^2

Table 1

In table 2 below presented the results of radiation dose in nano coulomb unit for two different angle and field size 5x5cm^2.

Energy	Angle	Dose (nc)			Field size
18 Mv	90^0	54.02	53.99	54.01	5x5cm^2
	270^0	54.45	54.46	54.45	5x5cm^2

Table 2

In table 3 below presented the results of radiation dose in nano coulomb unit for two different angle and field size 10x10cm^2.

Energy	Angle	Dose (nc)			Field size
18 Mv	90^0	52.28	52.30	52.29	10x10c m^2
	270^0	52.35	52.37	52.36	10x10c m^2

Table 3

In table 4 below presented the results of radiation dose in nano coulomb unit for two different angle and field size 15x15 cm^2.

Energy	Angle	Dose (nc)			Field size
18 Mv	90^0	51.35	51.33	51.33	15x15cm 2
	270^0	51.41	51.39	51.40	15x15cm 2

Table 4

In table 5 below presented the results of radiation dose in nano coulomb unit for two different angle and field size 20x20 cm^2.

Energy	Angle	Dose (nc)			Field size
18 Mv	90^0	50.05	50.09	50.06	20x20c m^2
	270^0	50.31	50.34	50.33	20x20c m^2

Table 5

CONCLUSIONS

The results shown that with increase of field size we have decrease of values radiation dose compared with cases when field size is smaller. The radiation dose per different angle has approximtly same values, it is important to have more chances in treatment of tumours in different parts of human body. Based on results and dates for different field size we have different distrubution dose so we choose the fit field size and angle of accelerator head according position of tumour in human body.

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