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Question No: 01

Answer:

Side effects of Therapeutic Radiology:-

Two types of Side effects are Common,

(i) Acute Side effects
(ii) Late Side effects

Acute Side Effects:- The following are some Acute Side effects of Therapeutic Radiology.

(i) Nausea and Vomiting
(ii) Damage To the epithelial Surfaces.
(iii) Mouth, Throut and Stomach Sores.
(iv) Intestinal Discomfort
(v) Swelling
(vi) Infertility.

Late Side effects :- The following are Some Common late Side effects of Therapeutic Radiology.

(i) Fibrosis
(ii) Epilation
(iii) Dryness
(iv) Lymphedema
(v) Cancer

(vi) heart diseases
(vii) Cognitive diseases
(viii) Radiation Protitis
(ix) Cumulative Side effects
(x) Effects On Reproduction
(xi) Effects on Pituitary System.

Q 2:-

Linear accelerators :-

The high-energy radiation is delivered to tumors by means of a linear accelerator. A beam of electron is generated through a waveguide that increase their energy to the KeV to mev range. these electrons strike a tungsten target and produced x-rays. x-ray generated in the 10-30 KeV to mev range. These electrons strike a tungsten target and produce x-rays. whereas the energy range for superficial unit is about 30-125 KeV orthorvoltage units generate x-ray from 125-500 KeV.

How does linear accelerator works

The linear accelerator uses microwave technology (similar to that used for radar) to accelerate electrons in a part of the accelerator called the "wave guide" Then allows these electrons to collide with a heavy metal target to produce high-energy x-rays. These high energy x-rays are shaped as they exit the machine to confirm to the shape of the patient's tumor and the customized beam is directed to the patient tumor's. The beam is usually shaped by a multileaf collimator that is incorporated into the head of the machine. The patient lies on a movable treatment couch and lasers are used to make sure the patient is in the proper position. The treatment couch can move in many directions including up, down, right, left, and out. The beam comes out of a part of the accelerator called a gantry, which can be rotated around the patient. Radiation can be delivered to the tumor from many angles by rotating the gantry and moving the treatment couch.

Question No: 03

Answer,

Three interaction describe Photon absorption in tissue.

(i) Photoelectric effect

(ii) Compton effect

(iii) Pair production.

Photoelectric Effects:- In this process, an incoming photon undergoes a collection with a tightly bound electron. The proton transfers practically all of its energy to the ~~ee~~ electron and ceases to exist. The electron departs with most of energy ~~to the electron~~ from the photon and begins to ionize surrounding molecules. This interaction depends on the energy of the incoming photon, as well as atomic number of the tissue, the lower the energy and the higher the atomic number,

the more likely that a photoelectric effect will take place.
An example of this interaction in practice can be seen on a diagnostic x-ray film. Since the atomic number of the bone is higher than the soft tissue, bone is seen with much more contrast and details than the soft tissue.

Compton effect:-

The Compton effect is the most important photon tissue interaction for the treatment of cancer. In this case a photon collides with a "free electron" i.e, one that is not tightly bound to the atom, unlike the photoelectric effect in the Compton interaction both the photon and electron are scattered. The photon can then continue to undergo additional interaction, albeit with a lower energy. The electron begins to ionize with the energy given to it by a photon,
The probability of a Compton interaction is inversely proportional to the energy of the incoming photon and is dependent of the atom's number of the material. when take

an image of the tissue using photons in the energy range in which the Compton effect dominates, bone and soft tissue interfaces are barely distinguishible. this is a result of the atomic number independence.

The Common effect is the most Common interaction Occurring Clinically, as most radiation treatment are Performed at energy level of 6-20 MeV Port films are films taken with Such high energy photons On the treatment machine and are used to check the precision and accuracy of the beam.

X ——— X

Q 4:-

Brachytherapy :-

Brachytherapy is the treatment of cancer especially prostate cancer, by the insertion of radioactive implants directly into the tissue.

Types of brachytherapy

- low-dose rate Implants,
- high-dose rate Implants,
- permanent Implants.

- Brachytherapy (internal therapy) is delived by placing radiation source (S) Inside or next to the area requiring treatment.

- Brachytherapy is commonly used as an effective treatment for cervical, postate, breast, and skin cancer and can also used to treat tumors In many other body sites.

- As with Stereotatic radiation, Brachytherapy treatments are often known by their brand names.

- for example, brand names for breast cancer

~~for~~ brachytherapy treatment include SAVI mammosite and contura.

- Brand names for prostate cancer include proxelan, Theraseed, and I-seed.

- In Brachytherapy, radiation sources are precisely placed directly at the site of the cancerous tumour.

- This means that the irradiation only effects a much localized area - exposure to radiation of healthy tissue further away from the sources is reduced.

- These characteristics of brachytherapy provided advantages over external beam radiation therapy - the tumor can be treated with very high dose of localized radiation, whilst reducing the probability of unnecessary damage to surrounding healthy tissues.

- As one example of the localized nature of breast brachytherapy the SAVI device delivers the radiation dose through multiple catheter, each of which can be a individually controlled.

Q 5 :→

Volumetric modulated arc therapy (VMAT).

- Volumetric modulated arc therapy (VMAT) is a new radiation technique which can achieve highly conformal dose distributions on target volume coverage and sparing of normal tissues.
- The specificity of this technique is to modify the three parameters during the treatment. VMAT delivers radiation by rotating ganty (usually 360° rotating fields with one or more arcs,) changing speed and shape of the beam with a multileaf collimator (MLC) ("sliding window" system of moving) and fluence output rate (dose rate) of the medical linear accelerator.
- VMAT also has the protential to gives additional advantages IN the patient treatment, such as reduced delivery time of radiation, compared with conventional static field Intensity modulated radiotherapy (IMRT).

Work of VMAT in Cancer:

Work of Volumetric Modulated arc Therapy (VMAT) is a noval radiation Therapy technique that delivers the radiation dose continously as a Treatment machines rotates. This Technique accurately shapes the radiation dose to the tumour while minimising the dose ~~of~~ to the Organs surrounding the tumour.