

USING RADIATION IN CANCER CARE

There are two major uses of ionizing radiation in the diagnosis and treatment of cancer:

Radiology largely uses lower-energy radiation to image tissues to diagnose disease or treat disease via the minimally invasive techniques used in interventional radiology.

Radiotherapy, or radiation therapy, uses high-energy radiation to control and eliminate cancer.



Radiotherapy

- Radiotherapy is the use of high-energy rays (e.g., gamma rays and X-rays) or particles (e.g., electrons, protons, and carbon nuclei) to control or eliminate cancer.



- Radiotherapy works chiefly by damaging DNA, leading to cell death.



Uses of Radiotherapy

Curative radiotherapy seeks to eliminate cancers, particularly small cancers, as well as locally advanced cancers as part of combination therapy.

Neoadjuvant radiotherapy is used to reduce or control a cancer so that it can be subsequently treated by a different method such as surgery.

Adjuvant radiotherapy seeks to eliminate any remaining cancer following prior treatment.

Palliative radiotherapy is used to reduce or control symptoms of disease when cure by another method is not possible.



Types of Radiotherapy



Particle therapy uses protons or carbon ions rather than X-rays as the source of energy. In contrast to X-rays that pass through the body, losing energy and causing damage to the noncancerous

tissues through which they pass, these heavier particles deposit most of their energy in the target. In this manner, particle therapy can deliver higher doses with less damage to surrounding tissue. Although of great interest, proton facilities are much more expensive than traditional facilities and the overall benefit to the patient is still being determined.

Brachytherapy places small radioactive sources in or next to the tumor either temporarily or permanently.



External beam radiotherapy encompasses several types of radiotherapy that direct radiation at the tumor from outside the body; it is the most common form of radiotherapy. Electrons and photons (X-rays) are the most common sources of radiation in external beam radiotherapy.



Radioisotope therapy involves systemic ingestion or infusion of radioisotopes, for example, iodine-131 to treat thyroid cancer or lutetium-177 dotatate (Lutathera) to treat gastroenteropancreatic neuroendocrine tumors (see **Targeting Radiotherapy to Neuroendocrine Tumors**).



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