Using Radiation in Cancer Treatment

There are **two major applications** of ionizing radiation in cancer care:

TREATMENT OF CANCER

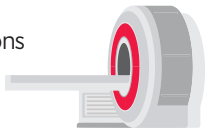
Radiotherapy, or radiation therapy, uses high-energy radiation to control and eliminate the disease.

DETECTION OF CANCER

Radiology largely uses low-energy radiation to image tissues to diagnose the disease.

TYPES OF RADIOTHERAPY

External beam radiotherapy
Delivers radiation, usually photons (X-rays) or electrons, to the tumor from outside the body; it is the most common form of radiotherapy. There are several types of external beam radiotherapy:



- **Conventional external beam radiation therapy** delivers a high-energy X-ray beam from one or more directions and is primarily used when high precision is not required.
- **Three-dimensional conformational radiotherapy (3DCRT)** delivers high-energy X-rays via multiple beams that, with the help of computed tomography and/or magnetic resonance imaging, more precisely target the shape and size of the tumor.
- **Intensity-modulated radiotherapy**—a refinement of 3DCRT—delivers radiation by dividing each beam into many "beamlets," each of which can have a different intensity.
- **Intraoperative radiation therapy** delivers electron beam (superficial) radiation directly on tumors that have been exposed during surgical procedures.
- **Stereotactic radiotherapy** delivers radiation to very well-defined smaller tumors, typically using more than eight beams with the help of a highly sophisticated imaging system. It is used in both stereotactic surgery (to treat tumors of the brain and central nervous system) and stereotactic body radiotherapy (to treat small tumors within larger organs of the body).

Particle therapy
Delivers higher doses of protons or carbon ions, instead of X-rays, to the tumor and causes less damage to surrounding tissue because the heavier particles used deposit most of their energy in the target. Although of great interest, proton facilities are much more expensive than traditional facilities, and the overall benefit to selected patients is still being determined.

Brachytherapy
Delivers radiation by placing small radioactive sources in or next to the tumor either temporarily or permanently.

Radioisotope therapy
Delivers radiation to the tumors via systemic ingestion or infusion of radioisotopes.

USES OF RADIOTHERAPY

Curative radiotherapy
Used to eliminate cancers, particularly small and locally advanced cancers; it is often used in combination with systemic therapy.

Neoadjuvant radiotherapy
Used to shrink a tumor so that it can be subsequently treated by a different method such as surgery.

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

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

Salvage radiotherapy
Used to treat cancer after the cancer has not responded to other treatments.