

## Radiation Therapy in Different Types of Cancers

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### Commentary

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### DESCRIPTION

Radiation therapy is a cancer treatment that uses high energy X-ray beams to destroy the cancer tumour. Stage IV brain cancer is treated with radiation therapy alone or in conjunction with other cancer treatments including surgery or chemotherapy. Another method of treating cancer is Radio Therapy (RT), which involves exposing cancerous tissues to X-ray radiation from an outside source in order to kill the cells' DNA. However, a higher therapeutic dose might harm healthy tissue. Finding a novel approach to boost Radio Therapy (RT) effectiveness and deliver effective therapy at safe levels is therefore imperative. Due to its effective X-ray absorption, the Gd<sup>3+</sup> ion is the most often used lanthanide ion for RT enhancement.

These ultra-small Gd<sup>3+</sup>-based particles were effective as radio sensitizers at energy of 6 MeV, with doses composed of between 6 and 8 Gy, which may open a new door for a nanoparticle-assisted radiotherapy by using the irradiation systems that have already been used in clinic care. In 2016, additional Eu<sup>3+</sup>-/Gd<sup>3+</sup>-doped zinc oxide nanoparticles were introduced to optimize the limited energy absorption from X-ray traditional radiotherapy. According to the *in vitro* data, doped NPs at a concentration of 20 g/mL exposed to 2 Gy of X-ray radiations were just as effective on untreated cells as 6 Gy of X-ray radiations. Such Eu<sup>3+</sup>-/Gd<sup>3+</sup>-doped NPs, according to the scientists, radiation therapy may be utilized to reduce the activity of cancer cells. The newly synthesized material could be used as effective theranostic NPs for concurrent CT/MR imaging and cancer treatment because Gd<sup>3+</sup> can also be used as a CT/MRI contrast agent. The most intriguing clinical experiment was started in 2016 by Grenoble University Hospital researchers using Gd<sup>3+</sup>-based activation and guidance of X-ray irradiation NPs for radio sensitization of brain malignancies. This first-in-man phase I trial will unquestionably usher in a new era for the use of lanthanide-doped nano medicine to enhance patient quality of life because to its outstanding preclinical outcomes.

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### Breast

Adjuvant radiation is commonly used to treat early breast cancer, which is typically treated with surgery (lumpectomy or tumorectomy). This lowers the chance of local recurrence and increases long-term survival.

### Prostate

The effectiveness of surgery and radiotherapy is comparable, and the long-term results are great. Radiotherapy alone is frequently used to treat illness in its early stages. A link between androgen deprivation therapy and radiation is necessary for locally progressed malignancies.

### Lung

Treatment options for Locally Advanced Non-Small Cell Lung Cancer (LA-NSCLC) that is inoperable include concurrent or sequential radiotherapy and chemotherapy, or, in the case of frail patients who are not candidates for chemotherapy, radiotherapy alone. Additionally, stereotactic radiation is used as a curative treatment for early diseases that are not candidates for surgery.

### Head and neck

Surgery or radiotherapy is both effective treatments for early-stage illness. Primary surgery is frequently followed by postoperative radiation or concurrent chemo radiotherapy for locally advanced illness. When a patient is not a candidate for surgery, radiation is frequently administered along with chemotherapy or with EGFR inhibitors (e.g., cetuximab).

### Cervix

External beam radiotherapy followed by brachytherapy is frequently paired with chemotherapy with the goal of curing locally advanced illness.

### Lymphoma (Hodgkin and non-hodgkin)

Radiotherapy is administered after chemotherapy, resulting in lower radiation doses and smaller radiation-irradiated volumes than in the past.

### Oesophagus and rectum

As a preoperative modality in locally advanced stages, radiotherapy and chemotherapy are widely employed.

### Anal canal

Radiotherapy and chemotherapy are widely performed with the objective of treating.

### Brain tumours

The postoperative situation uses radiation therapy along with concurrent and/or subsequent chemotherapy.

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### Bladder

Surgery is a good option for early-stage bladder cancer, although organ-preserving (partial) bladder irradiation offers equivalent local control rates.

A wide range of malignancies, including those of the breast, prostate, lung, head and neck, cervix, lymphoma, esophagus, rectum, anal canal, brain, and bladder, have historically been treated with radiotherapy. Neoadjuvant, adjuvant, and exclusive/curative settings are the main goals.