Cancer Treatment

Radiation Therapy

Radiation therapy refers to the use of targeted radiation in the form of X-rays, gamma rays, electron beams, proton beams or radioactive substances to damage the DNA of rapidly dividing cancer cells, preventing them from growing and ultimately causing them to die. Radiation can shrink existing tumors and halt the spread of cancer. Normal cells affected by the radiation are typically better able to recover and survive.

Radiation is used to treat a wide variety of cancers, including skin cancer, prostate cancer, lung cancer, head and neck cancers, gynecologic cancers, bladder cancer, colorectal cancer and breast cancer. Radiation was first used to treat cancer in the early 20th century and today is among the most common cancer treatments.

Radiation therapy is administered by radiation oncologists in specific doses over a period of weeks or months. It is mostly commonly delivered via an X-ray or other machine (external beam radiation therapy). It can also be delivered via implants or pellets inserted near the cancer site (internal radiation therapy) or taken orally or injected intravenously (systemic radiation therapy). In addition to helping to cure cancer, radiation therapy can relieve pain by shrinking tumors in people with more advanced cancer, such as those with bone metastases.

External Beam

This form of radiation therapy delivers radiation produced by a machine and has several subtypes.

- Three-dimensional conformal radiation therapy relies on detailed pictures of the cancer taken by computed tomography (CT) or magnetic resonance imaging (MRI) technology.

- Intensity-modulated radiation therapy tailors dose size within the treatment area to increase effectiveness and reduce exposure to healthy tissues.

- Proton therapy employs proton beams rather than X-rays to attack and kill cancer cells. This relatively new form of radiation therapy largely spares surrounding tissue and is especially

beneficial in treating cancers located near vital organs—such as brain cancer, eye cancer, liver cancer, lung cancer and head and neck cancer.

- Image-guided radiation therapy involves the comparison of images of the treatment field to direct the stream of radiation precisely.

- Stereotactic radiation therapy administers a single dose of radiation to a tiny treatment field.

People who receive external-beam radiation therapy are not radioactive and can safely interact with friends and family.

Internal and Systemic Radiation

Internal radiation therapy (brachytherapy) delivers radiation by means of an implant surgically placed within cancerous tissue or surrounding tissue or in a body cavity, such as the uterus. Implants can be either permanent or temporary. Permanent implants may resemble very small steel rods or pellets, while temporary implants can take the form of needles or catheters. This type of therapy is most often used to treat head and neck cancers, breast cancer, cervical cancer, prostate cancer and eye cancer.

Systemic radiation therapy delivers radioactive drugs known as radiopharmaceuticals or radionuclides that have been engineered to target and kill cancer cells. They may be taken orally or injected into a vein. They may be able to target populations of cancer cells too small for traditional scanning technology to detect, and in clinical studies, they have been shown to reduce the likelihood of side effects. Specific types of systemic radiation therapy can be used to treat thyroid cancer (radioactive iodine), advanced prostate cancer and a rare kind of pancreatic cancer that causes what are known as gastroenteropancreatic neuroendocrine tumors.

In contrast to external-beam radiation therapy, people who receive internal or systemic radiation therapy should limit physical contact with children and pregnant women for a period of time.

Goals and Uses

Radiation therapy can be employed on its own or in combination with other treatments, such as surgery, chemotherapy and immunotherapy to treat cancer. Roughly half of all cancer treatment involves radiation therapy.

Radiation may be administered before surgery to shrink the tumor (preoperative therapy or neoadjuvant therapy) or after surgery to prevent recurrence (adjuvant therapy).

Radiation therapy differs depending on the stage and type of cancer and an individual’s treatment

plan, among other factors. The therapeutic goal may be to cure the cancer, to significantly shrink tumors or to prevent recurrence. For those with advanced cancer, radiation therapy may be used to offset physical discomfort; this is known as palliative radiation therapy, and it constitutes more than half of all radiation therapy administered.

Side Effects

Radiation therapy may increase your risk of developing cancer again because radiation damages the DNA of normal cells. However, the immediate benefits often outweigh the potential harms, so this possibility should not deter you from beginning radiation therapy if your doctor recommends it.

Radiation can also cause a wide range of side effects, including skin changes, such as dryness, itching, blistering, burning and peeling, as well as fatigue. Other side effects depend on the site at which the radiation is directed. If directed at the head and neck, radiation can cause nausea, tooth decay and difficulty swallowing. If directed at the chest, radiation can cause localized soreness, shortness of breath and sometimes lung scarring. If directed at the stomach and abdomen, radiation can cause nausea and vomiting, loss of appetite and severe cramping. If directed at the pelvis, it can cause incontinence and sexual and reproductive dysfunction in both men and women. Men, for example, may experience erectile dysfunction and a decline in sperm count, while women of childbearing years may stop menstruating and become infertile.

Radiation researchers are continuously refining existing radiation therapies to improve effectiveness while reducing side effects. Proton therapy and intensity-modulated radiation therapy, for example, are relatively recent innovations that minimize side effects. It is also important to note that no two people will react to radiation therapy in the same way. Be sure to report any symptoms to your care team so that they can be addressed.

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