

External Beam Radiation Therapy Treatments

The goal of radiation therapy is to get a high enough dose of radiation into the body to kill the cancer cells while sparing the surrounding healthy tissue from damage. Several different radiation therapy techniques have been developed to accomplish this. Depending on the location, size and type of your tumor or tumors, you may receive one or a combination of these techniques. Your cancer treatment team will work with you to determine which treatment and how much radiation is best for you.

During external beam radiation therapy, a beam of radiation is directed through the skin to a tumor and the immediate surrounding area in order to destroy the main tumor and any nearby cancer cells. To minimize side effects, the treatments are typically given every day for a number of weeks.

The radiation beam comes from a machine located outside of your body that does not touch your skin or the tumor. Receiving external beam radiation is similar to having an X-ray taken. It is a painless, bloodless procedure. The most common type of machine used to deliver external beam radiation therapy is called a linear accelerator, sometimes called a linac. It produces a beam of high-energy X-rays or electrons. Using sophisticated treatment planning software, your radiation oncology treatment team plans the size and shape of the beam, as well as how it is directed at your body, to effectively treat your tumor while sparing the normal tissue surrounding the cancer cells.

Several special types of external beam therapy are discussed below. These are used for particular types of cancer, and your radiation oncologist will recommend one of these treatments if he or she believes it will help you.

Three-Dimensional Conformal Radiation Therapy (3D-CRT)

Tumors usually have an irregular shape. Three-dimensional conformal radiation therapy (3D-CRT) uses sophisticated computers and computer assisted tomography scans (CT or CAT scans) and/or magnetic resonance imaging scans (MR or MRI scans) to create detailed, three-dimensional representations of the tumor and surrounding organs. Your radiation oncologist can then shape the radiation beams exactly to the size and shape of your tumor. The tools used to shape the radiation beams are multileaf collimators or blocks. Because the radiation beams are very precisely directed, nearby normal tissue receives less radiation exposure.

Intensity Modulated Radiation Therapy (IMRT)

Intensity modulated radiation therapy (IMRT) is a specialized form of 3D-CRT that allows radiation to be more exactly shaped to fit your tumor. With IMRT, the radiation beam can be broken up into many beamlets, and the intensity of each beamlet can be adjusted individually. Using IMRT, it may be possible to further limit the exact amount of radiation that is received by normal tissues that are near the tumor. In some situations, this may also allow a higher dose of radiation to be delivered to the tumor, increasing the chance of a cure.

Proton Beam Therapy

Similar to external beam therapy, proton beam therapy is a form of radiation treatment that uses protons rather than X-rays to treat certain types of cancer and other diseases. The physical characteristics of the proton therapy beam allow doctors to better focus the dose on the tumor with the potential to reduce the dose to nearby healthy tissues.

Neutron Beam Therapy

Like proton therapy, neutron beam therapy is a specialized form of radiation therapy that can be used to treat certain tumors that are radioresistant, meaning that they are very difficult to kill using conventional radiation therapy. Neutron therapy can also be used to treat certain inoperable tumors.

Stereotactic Radiotherapy

Stereotactic radiotherapy is a technique that allows your radiation oncologist to precisely focus beams of radiation to destroy certain types of tumors. Since the beam is so precise, your radiation oncologist may be able to spare more normal tissue than with conventional external beam therapy. This additional precision is achieved through rigid immobilization, such as with a head frame as is used in the treatment of brain tumors. Although often performed in a single treatment, fractionated radiotherapy, where patients receive up to five treatments, is sometimes necessary. Stereotactic radiotherapy may be the only treatment if a very small area is affected. In addition to treating tumors, it can also be used to treat malformations in the brain's blood vessels and certain noncancerous (benign) brain tumors.

Image-Guided Radiation Therapy (IGRT)

In some facilities, radiation oncologists are using image-guided radiation therapy (IGRT) to help them better

deliver the radiation dose to the cancer. Normal structures and tumors can move between treatments due to differences in organ filling or movements while breathing. IGRT is conformal radiation treatment guided by imaging equipment, such as CT, ultrasound or stereoscopic X-rays, taken in the treatment room just before the patient is given the radiation treatment. All patients first undergo a CT scan as part of the planning process. The digital information from the CT scan is then transmitted to console in the treatment room to allow doctors to compare the earlier image with the images taken just before treatment. During IGRT, doctors fuse these images to see if the treatment needs to be changed. This allows doctors to better target the cancer while avoiding nearby healthy tissue. In some cases, doctors will implant a tiny piece of material called a fiducial marker near or in the tumor to help them localize the tumor during IGRT.