New Connections
HELPING YOU FIND YOUR WAY THROUGH TREATMENT

American Cancer Society

Issue 21

Advances in radiation therapy

are making treatment safer and more effective.

Most of us are familiar with the term radiation and are aware that radiation is used as a treatment for cancer and other diseases, either alone or in combination with surgery and even chemotherapy.

What you may not know is that there are some new ways of delivering radiation. Some of these are already in use, while others are receiving further study before gaining widespread use.

How radiation therapy works.

Whether cancerous or healthy, all cells grow and divide to form new cells. But cancer cells grow and divide more quickly than many of the normal cells around them.

Radiation therapy uses special equipment to deliver doses of radiation to cancerous cells, killing or damaging them so they cannot grow or spread. Radiation therapy uses x-rays, gamma rays, electrons, or protons to destroy or damage cancer cells. Although some normal cells may be affected by radiation, most recover fully from the effects of the treatment.

Unlike chemotherapy, which exposes the entire body to cancer-fighting drugs, radiation therapy is considered a localized treatment. It affects only the part of the body being treated.

Radiation therapy is one of the most common treatments for cancer. If your doctor is recommending radiation therapy, it is because he or she feels that the benefits you may get from it are likely to outweigh the possible side effects.

Some of the newer forms of External Radiation Therapy.

Today, scientists have developed newer, more precise ways of giving external radiation therapy. These approaches allow doctors to focus the radiation more directly on the tumors.

These newer forms of radiation do less damage to normal tissues, and this allows doctors to use higher doses directed only at the tumors. However, these methods are still fairly new, and their long-term effects are still being studied.

While the following techniques are most commonly used for brain and spinal cord tumors, researchers are looking for ways to use them with other types of cancer as well.

Three-dimensional Conformal Radiation Therapy (3D-CRT).

This therapy uses CT images and special computers to very precisely map the location of a cancer in three dimensions. The patient is fitted with a plastic mold or cast to keep the body part that is being treated still. Doctors can conform the shape of the radiation beams to match the shape of the tumor and deliver the beams to the tumor from several directions.

This spreads out the entry and exit routes of the radiation to reduce the amount of radiation that goes through any one patch

of normal tissue. By aiming the radiation more precisely, it may be possible to better fight the cancer and yet reduce radiation damage to normal tissues. Many medical centers now use 3D-CRT to treat different kinds of cancer.

Intensity Modulated Radiation Therapy (IMRT)

This is another advanced form of external radiation therapy using photons. As with the 3D-CRT, computer programs are used to precisely map out the tumor in three dimensions. But in addition to aiming photon beams from several directions, the intensity or strength of the beams can be adjusted. This provides even more control in reducing the radiation reaching normal tissue while delivering a higher dose to the cancer. Because of the radiation therapy's precision, it is even more important that a person remain perfectly still during treatment. This usually requires a special cast or mold to be made before treatment to keep the body in place. IMRT is available mainly in major cancer centers.

Helical Tomotherapy

This is an even newer form of IMRT. It uses a linear accelerator inside a large "donut" that spirals around the body while the patient lies on the treatment table. It can deliver radiation from many different angles around the body, allowing for even more precisely focused radiation.

Conformal Proton Beam Radiation Therapy

A related technique to those previously mentioned therapies, conformal proton beam radiation therapy uses proton beams instead of x-rays. Protons are parts of atoms that cause little damage to tissues they pass through, but are very good at killing cells at the end of their path. This means that proton beam radiation may be able to deliver more radiation to the cancer while reducing side effects on nearby normal tissues.

Protons come only from a special machine called a cyclotron or synchrotron. Such a machine costs millions of dollars and requires expert staff. Because of this, proton beam therapy can be expensive and few medical centers have it. As of late 2007, fewer than a half-dozen treatment centers in the United States had such therapy, although new proton machines are scheduled to be in place in 2008 and 2009. More studies are needed to compare outcomes between proton and photon treatment so that each is used for the cancer type on which it works best.

Intraoperative Radiation Therapy (IORT)

This therapy delivers radiation directly to the tumor or tumors during surgery. While the patient is under anesthesia, the surgeon locates the cancer. Normal tissues can be moved out of the way and protected during surgery, so IORT reduces the amount of tissue that is exposed to radiation. This allows a higher dose of radiation to reach the cancer.

Stereotactic Radiosurgery

This type of therapy delivers a large, precise radiation dose to a small tumor area. The term "surgery" may be confusing since no cutting is involved. This technique is most commonly used for brain tumors and other tumors inside the head.

A box-shaped head frame is attached to the skull to hold it still and allow for precise aiming of radiation beams. Once the exact location of the tumor is mapped (using CT or MRI scans), radiation beams from a machine called a Gamma Knife are focused at the tumor from hundreds of different angles for a short period of time. The process may be repeated if needed.

A similar approach uses a movable linear accelerator that is controlled by a computer. Instead of delivering many beams at once, the linear accelerator moves around to deliver radiation to the tumor from different angles. Several machines, work in this way, with names such as X-Knife, CyberKnife, and Clinac, work in this way.

Clinical trials are under way to study how well stereotactic radiosurgery and radiotherapy work alone and when used with other types of radiation therapy.

Some other exciting areas being explored.

Radiosensitizers

These are substances that make cancer cells more sensitive to radiation. Some chemotherapy drugs already in use are known to be radiosensitizers. Researchers are trying to find new substances that will make the tumor more sensitive to radiation without affecting normal tissues.

Radioprotectors

These are substances that protect normal cells from radiation. These types of drugs are useful in areas where it is

hard not to expose important normal tissues to radiation when treating a tumor, such as the head and neck region. Some radioprotectors, such as amifostine, are already in use, while others are being studied in clinical trials.