



RADIATION THERAPY **FOR CANCER**

**Facts to Help Patients Make an
Informed Decision**



ASTRO

THE AMERICAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY

Targeting Cancer Care

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Being diagnosed with cancer can bring on a flood of feelings and concerns. Learning as much as possible about the disease and treatment options can seem overwhelming and confusing. However, as you make decisions and prepare for treatment, it will help to learn as much as possible about what you may experience.



This booklet provides information for patients and families who are exploring radiation therapy as a treatment option. Radiation, alone or in combination with other cancer treatments, can be used to successfully treat many different types of cancer. Modern technology allows radiation oncologists to treat tumors more powerfully and precisely while sparing much of the healthy tissue that surrounds the tumor.

This booklet describes how radiation therapy is used to treat cancer, the team of specialists that provide radiation therapy and what happens during treatment. Radiation therapy techniques and procedures may vary among different doctors, hospitals and treatment centers, so be sure to ask questions if you are concerned that the advice of your doctor is different from what you read here or in other publications.

Remember, your radiation oncologist and radiation oncology nurse are the best people to make recommendations and answer questions about your specific problems.

What Is Cancer?

Cancer is a group of diseases in which abnormal cells divide uncontrollably. As the cells divide, they form a **tumor**, which is an abnormal lump or mass of tissue. Cancerous tumors can invade and destroy healthy tissue. They can also spread to other parts of the body, forming new tumors or **metastases**.

Cancer specialists usually treat cancer with radiation therapy, surgery, chemotherapy, hormonal therapy and/or biologic therapy, either alone or in combination. As you cope with the disease and weigh your treatment options, it is important to remember that your cancer specialists are the best, most qualified people to help you determine the best treatment plan for your cancer.

If you have a type of cancer that can be treated with radiation, you will be referred to a **radiation oncologist** — a physician who specializes in treating patients with radiation therapy. Your radiation oncologist will work with your doctor and other cancer specialists, such as surgeons and medical oncologists, to oversee your care. He or she will discuss the details of your cancer with you, the role of radiation therapy in your overall treatment plan and what to expect from your treatment.



Did You Know?

Physicians have been treating patients with radiation therapy safely and effectively for more than 100 years. Nearly two-thirds of cancer patients are treated with radiation during their illness.

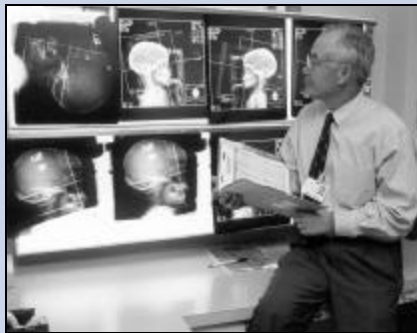
What Is Radiation Therapy?

Radiation therapy, sometimes called radiotherapy or irradiation, is the use of various forms of radiation to safely and effectively treat cancer and other diseases. Radiation oncologists may use radiation therapy to try to cure cancer, to control the growth of the cancer or to relieve symptoms, such as pain.

Radiation therapy works by damaging the DNA within cancer cells and destroying the ability of the cancer cells to reproduce. When these damaged cancer cells die, the body naturally eliminates them. Normal cells are also affected by radiation, but they are able to repair themselves in a way that cancer cells cannot.

Sometimes radiation therapy is the only treatment a patient needs, and other times it is only one part of a patient's treatment. For example, prostate and larynx cancer are often treated with radiation alone, but a woman with breast cancer may be treated with surgery, radiation therapy and chemotherapy.

Sometimes radiation therapy is used as adjuvant therapy to make your primary treatment more effective. For example, you can be treated with radiation therapy (the adjuvant treatment) before surgery (the primary treatment) to help shrink the cancer and allow less radical surgery than would otherwise be required, or you may be treated with radiation after surgery to destroy microscopic cells that may have been left behind.



Did You Know?

Because normal cells are also affected by radiation, radiation therapy can be used to treat many diseases other than cancer. For example, it can be used to treat noncancerous brain tumors, prevent the growth of scar

tissue in the coronary arteries of patients who have had angioplasty and reduce the chance that a patient's body will reject donor cells after a bone marrow or stem cell transplant.



Did You Know?

Before you receive radiation therapy, your radiation oncologist, dosimetrist and medical physicist work together using sophisticated computer software to calculate the best treatment for your body. This treatment planning ensures that the tumor site receives the maximum amount of radiation while avoiding exposure to healthy tissue and organs.

A radiation oncologist may choose to use radiation therapy in a number of different ways. Sometimes the goal is to cure the cancer. In this case, radiation therapy may be used to:

- Destroy tumors that have not spread to other parts of your body.
- Reduce the risk that cancer will return after you undergo surgery or chemotherapy by killing tiny cancer cells that may remain.

In other cases, the goal is to reduce the symptoms caused by growing tumors and to improve your quality of life. When radiation therapy is administered for this purpose, it is called **palliative care** or **palliation**. In this instance, radiation may be used to:

- Shrink tumors that are interfering with your quality of life, such as a lung tumor that is causing shortness of breath.
- Alleviate pain by reducing the size of your tumor.

It is important for you to discuss the goal of your treatment with your radiation oncologist.

Is Radiation Therapy Safe?



Some patients have concerns about the safety of radiation therapy. Radiation has been used successfully to treat patients for more than a century, and in that time, many advances have been made to ensure that radiation therapy is safe and effective.

Before you begin treatment, your radiation oncology team will carefully tailor the treatment plan to make sure that you receive safe and accurate treatment. Throughout your treatment, members of your team check and re-check your plan.

Sophisticated computers are also used to monitor and double-check the treatment machines to make sure that the proper treatment is given.

If you undergo external beam radiation treatment, you will not be radioactive following treatment because the radiation does not stay in your body. However, if you undergo brachytherapy, tiny radioactive sources will be implanted inside your body, in the tumor or in the tissue surrounding the tumor, either temporarily or permanently. Your radiation oncologist will explain any special precautions that you or your family and friends may need to take.



Did You Know?

Radiation therapy works by damaging the DNA within the cancer cells and destroying their ability to reproduce. When these cancer cells die, the body naturally eliminates them.

What Are the Different Kinds of Radiation?

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.

Radiation therapy can be delivered in two ways, externally and internally. During **external beam radiation therapy**, the radiation oncology team uses a machine to direct high-energy rays at the cancer. Internal radiation therapy, also called **brachytherapy**, involves placing radioactive sources (for example, radioactive seeds) inside the patient.

External Beam Radiation Therapy

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 in the following sections. 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, or 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, or 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. 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.

Brachytherapy

Also known as internal radiation, brachytherapy involves placing radioactive material into a tumor or its surrounding tissue. Because the radiation sources are placed so close to the tumor, your doctors can deliver a large dose of radiation directly to the cancer cells with minimal exposure to normal tissue.



The radioactive sources used in brachytherapy, such as thin wires, ribbons, capsules or seeds, come in small sealed containers. Some sources are placed permanently and are referred to as implants. These radioactive sources remain in the body after their radiation has been expended and the source is no longer radioactive. Other sources are placed temporarily inside the body, and the radioactive sources are removed after the prescribed dose of radiation has been delivered.

Other Treatment Options

Systemic Radiation Therapy

Using radioactive isotopes to treat certain cancers is called **systemic radiation therapy**. The radioactive isotopes may be swallowed, given intravenously or injected into the body. For example, radioactive iodine (I-131) capsules are given to patients to treat some types of thyroid cancer. Another example is the use of intravenous radioactive strontium to treat pain due to cancer that has spread to the bone.

Radioimmunotherapy

Recent research has focused on the use of radioactive **monoclonal antibodies**, also called **radiolabeled antibodies**, to deliver doses of radiation directly to a tumor. This process is known as **radioimmunotherapy**. Antibodies are made by the body in response to the presence of antigens (substances recognized as foreign by the immune system). Large quantities of particular types of antibodies, called monoclonal antibodies, can be made in the laboratory. These monoclonal antibodies can be attached to radioactive isotopes in a process called radiolabeling. When injected into the body, the radiolabeled antibodies circulate in the bloodstream until they locate and bind to the surface of cancer cells. The cancer cells are then destroyed by the radiation carried in the antibody.

Radiosensitizers and Radioprotectors

Two types of drugs are being studied for their effect on cells undergoing radiation. One type includes drugs designed to make tumors more sensitive to radiation. It is hoped that these **radiosensitizers** will help radiation better destroy tumors. Other types of drugs are being evaluated to better protect the normal tissues near the area being treated. These are called **radioprotectors**. An example of a radioprotector is a drug designed for head and neck cancer patients that helps decrease soreness some patients may feel during treatment and the dryness some patients may experience after treatment is completed.

Intraoperative Radiation Therapy

Radiation therapy given during surgery is called intraoperative radiation therapy. Intraoperative radiation therapy is helpful when vital normal organs are dangerously close to the tumor. During an operation, a surgeon temporarily moves the normal organs out of the way so radiation can be applied directly to the tumor. This allows your radiation oncologist to avoid exposing those organs to radiation. Intraoperative radiation can be given as external beam therapy or as brachytherapy.

Investigational Radiation Therapies

Several specialized types of radiation therapy are available in a limited number of facilities in the United States. These treatments are currently being studied to determine their best use. You can discuss with your radiation oncologist whether these therapies may benefit you.



Did You Know?

The treatment team uses sophisticated treatment planning software to map out how the radiation will treat the tumor while avoiding healthy tissue.

Who Are the Members of the Radiation Therapy Team?

A team of highly trained medical professionals will be involved in your care during radiation therapy. This team is led by a radiation oncologist, a doctor who specializes in using radiation to treat cancer.

Radiation Oncologists

Radiation oncologists are the doctors who will oversee your radiation therapy treatments. These physicians work with the other members of the radiation therapy team to develop and prescribe your treatment plan and make sure that each treatment is accurately given. Your radiation oncologist will also monitor your progress and adjust the treatment as necessary to make sure you get the best care throughout the course of treatment. Radiation oncologists help identify and treat any side effects that may occur due to radiation therapy. They work closely with other physicians, including medical oncologists and surgeons, and all members of the radiation oncology team.



Radiation oncologists have completed at least four years of college, four years of medical school, one year of general medical training, then four years of residency (specialty) training in radiation oncology. They have extensive training in cancer medicine and the safe use of radiation to treat disease. If they pass a special examination, they are certified by the American Board of Radiology. You should ask if your doctor is board certified.

Medical Radiation Physicists

Qualified medical physicists work directly with the radiation oncologist during treatment planning and delivery. They oversee the work of the dosimetrist and help ensure that complex treatments are properly tailored for each patient. Medical physicists are responsible for developing and directing quality control programs for equipment and procedures. Their responsibility also includes making sure the equipment works properly by taking precise measurements of the radiation beam and performing other safety tests on a regular basis.

Dosimetrists

Dosimetrists work with the radiation oncologist and medical physicist to carefully calculate the dose of radiation to make sure the tumor gets enough radiation. Using computers, they develop a number of treatment plans that can best destroy the tumor while sparing the normal tissues.

Radiation Therapists

Radiation therapists work with radiation oncologists to administer the daily radiation treatment under the doctor's prescription and supervision. They maintain daily records and regularly check the treatment machines to make sure they are working properly.

Radiation Oncology Nurses

Radiation oncology nurses work with radiation oncologists and radiation therapists to care for you and your family at the time of consultation, while you are receiving treatment and during your follow-up care. They will explain the possible side effects you may experience and will describe how you can manage them. They will assess how you are doing throughout treatment and will help you cope with the changes you are experiencing.



Other Healthcare Professionals

You may work with a number of other healthcare professionals while undergoing radiation therapy. These specialists ensure that all of your physical and psychological needs are met during your treatment.

Social Workers

Social workers are available to provide a variety of supportive services to you and your family. They can provide counseling to help you and your family cope with the diagnosis of cancer and with your treatment. They may also help arrange for home healthcare and other services.

Nutritionists

Nutritionists or dietitians work with patients to help them maintain their diet during their treatments. They will help you modify your eating plan if the side effects of treatment are affecting your appetite, will determine what you can eat, and can provide recipes, menu suggestions and information on ready-to-use nutritional supplements. They address dietary issues and current developments that may affect cancer treatment outcomes.

Physical Therapists

Physical therapists use therapeutic exercises to ensure that your body functions properly while you are undergoing treatment. These exercises are used to help manage side effects, alleviate pain and keep you healthy.

Dentists

Dentists may be involved in the care of patients who are receiving radiation for oral or head and neck cancers. They will help prevent the radiation from damaging the healthy areas of your mouth and oral cavity, and may recommend that you have preventive dental work prior to radiation. They will also help you manage oral complications of cancer therapy, such as dry mouth. A dental hygienist may also perform these services under the supervision of a dentist.

What Happens Before, During and After Treatment?

Before you can begin treatment, your doctors must first run tests to determine what type of cancer you have and if it has spread to other parts of the body. Once the diagnosis has been made, you will probably talk with your primary care physician along with several oncology specialists, such as a surgeon, a medical oncologist and a radiation oncologist, to discuss your treatment choices. Often, these specialists will work together to help recommend the best treatment for you.

In some cases, your cancer will need to be attacked by using more than one type of treatment. For example, if you have breast cancer, you might have surgery to remove the tumor (by a surgeon), then have radiation therapy to destroy any remaining cancer cells in or near your breast (by a radiation oncologist). You also might receive chemotherapy (by a medical oncologist) to destroy any remaining cancer cells that have traveled to other parts of the body.

Before Treatment

Consultation With a Radiation Oncologist

If you are considering radiation therapy, you must first schedule a visit with a radiation oncologist to see if radiation therapy is right for you. During your initial visit, the doctor will evaluate your need for radiation therapy and its likely results. This includes reviewing your current medical problems, past medical history, past surgical history, family history, medications, allergies and lifestyle. The doctor will also perform a physical examination to assess the extent of your disease and judge your general physical condition. Depending on where your radiation oncologist practices, you may also be seen by a medical student, a resident (radiation oncologist in training), a nurse practitioner, a physician assistant or a nurse.

After reviewing your medical tests, including CT scans, MR scans and positron emission tomography scans (**PET scans**), and completing a thorough examination, your radiation oncologist will fully discuss with you the potential benefits and risks of radiation therapy and answer your questions. For a list of questions that you may want to ask, please see the section *What Questions Should I Ask My Doctor?* on page 22.



Simulation and Treatment Planning

To be most effective, radiation therapy must be aimed precisely at the same target or targets each and every time treatment is given. The process of measuring your anatomy and marking your skin to help your team direct the beams of radiation safely and exactly to their intended locations is called **simulation**.



During simulation, your radiation oncologist and radiation therapist place you on the simulation machine in the exact position you will be in during the actual treatment. Your radiation therapist, under your doctor's supervision, then marks the area to be treated directly on your skin or on **immobilization devices**.

Immobilization devices are molds, casts, headrests or other devices that are constructed and placed on a certain part of your body to help you remain in the same position during the entire treatment. The radiation therapist marks your skin and/or the immobilization devices either with a bright, temporary paint or a set of small permanent tattoos.

Your radiation oncologist may request that special blocks or shields be made for you. These blocks or shields are put in the external beam therapy machine before each of your treatments and are used to shape the radiation to your tumor and keep the rays from hitting normal tissue. Some treatment machines have built-in blocks or shutters called **multi-leaf collimators**, which also help shape the radiation.

Although simulation is typically only one session, your physician may schedule more than one session depending on the type of cancer you have and the type of radiation therapy that is being used.

Once you have finished with the simulation, your radiation oncologist and other members of the treatment team review the information they obtained during simulation along with your previous medical tests to develop a **treatment plan**. Often, a special treatment planning **CT scan** is done to help with the simulation and treatment planning. This CT scan is in addition to your diagnostic CT scan. Frequently, sophisticated treatment-planning computer software is used to help design the best possible treatment plan. After reviewing all of this information, your doctor writes a prescription that outlines the exact course of your radiation therapy treatment.

During Treatment

Treatment Administration

External beam radiation therapy is administered differently from brachytherapy. You may receive one or both of these treatments. The following sections describe what you may experience during treatment administration.

External Beam Radiation Therapy Treatments

When you undergo external beam radiation therapy treatment, each session is painless, like getting an X-ray. The radiation is directed to your tumor from a machine located outside of your body. One of the benefits of radiation therapy is that it is usually given as a series of outpatient treatments and you may not need to miss work or experience the type of recuperation period that can follow other treatments.

Treatments are usually scheduled five days a week, every day except Saturday and Sunday, and continue for three to 10 weeks. Some patients receive **hyperfractionated radiation therapy**, in which radiation treatments are given more than once a day. Other times, only one or a few treatments are required, such as for the treatment of cancer that has spread to the bone. This is called **hypofractionated radiation therapy**. The number of radiation treatments you will need depends on the size, location and type of cancer you have, your general health and other medical treatments you may be receiving.

The radiation therapist will administer your external beam treatment following your radiation oncologist's instructions. It will take about five to 15 minutes for you to be positioned for treatment and for the equipment to be set up. If an immobilization device was made during simulation, it will be used during every treatment to make sure that you are in the exact same position every day.

Did You Know?

Each external beam radiation treatment is painless and takes only a few minutes. Treatments are scheduled five days a week, every day except Saturday and Sunday, and continue for three to 10 weeks.



Once you are positioned correctly, the therapist will leave the room and go into an adjoining control room to closely monitor you on a television screen while administering the radiation. There is a microphone in the treatment room so you can always talk with the therapist if you have any concerns. The machine can be stopped at any time if you are feeling ill or uncomfortable.



If you have any questions about your treatment, your radiation oncologist or radiation oncology nurse can help.

The radiation therapist may move the treatment machine and treatment table to target the radiation beam to the exact area of the tumor. The machine might make noises during treatment that sound like clicking or whirring. These noises are nothing to be afraid of, and the radiation therapist is in complete control of the machine at all times.

The radiation therapy team carefully aims the radiation to decrease the dose to the normal tissues surrounding the tumor. Still, radiation will affect some healthy cells. The time in between daily treatments allows your healthy cells to repair much of the radiation damage. Most patients are treated on an outpatient basis, and many can continue with normal daily activities.

Sometimes a course of treatment is interrupted for a day or more. This may happen if you develop side effects that require a break in treatment. These missed treatments may be made up by adding treatments at the end. Try to arrive on time and not miss any of your appointments.

Your radiation oncologist monitors your daily treatment and may alter your radiation dose based on these observations. Also, your doctor may order blood tests, X-ray examinations and other tests to see how your body is responding to treatment. If the tumor shrinks, another simulation may be done. This allows your radiation oncologist to change the treatment to destroy the rest of the tumor and spare even more normal tissue.

Brachytherapy Treatments

Brachytherapy is the placement of radioactive sources in or just next to a tumor. The radioactive sources may be left in place permanently or only temporarily, depending upon your cancer. To position the sources accurately, special catheters or applicators are used.

There are two main types of brachytherapy: **intracavity treatment** and **interstitial treatment**. With intracavity treatment, the radioactive sources are put into a space near where the tumor is located, such as the cervix, the vagina or the windpipe. With interstitial treatment, the radioactive sources are put directly into the tissues, such as the prostate.

Did You Know?

Brachytherapy is the placement of radioactive sources in or just next to a tumor. The radioactive sources may be left in place permanently or only temporarily, depending upon your cancer. To position the sources accurately, special catheters or applicators are used.



Often these procedures require anesthesia and brief hospitalization. Patients with permanent implants may have a few restrictions at first and then can quickly return to their normal activities. Temporary implants are left inside of your body for several hours or days. While the sources are in place, you will stay in a private room. Doctors, nurses and other medical staff will continue to take care of you, but they will need to take special precautions to limit their exposure to radiation.

Devices called **high dose rate remote afterloading machines** allow radiation oncologists to complete brachytherapy quickly, in about 10 to 20 minutes. Powerful radioactive sources

travel through small tubes called **catheters** to the tumor for the amount of time prescribed by your radiation oncologist. You may be able to go home shortly after the procedure. Depending on the area treated, you may receive several treatments over a number of days or weeks.

Most patients feel little discomfort during brachytherapy. If the radioactive source is held in place with an **applicator**, you may feel discomfort from the applicator. There are medications that can help this. If you feel weak or queasy from the anesthesia, your radiation oncologist can give you medication to make you feel better.

Weekly Status Checks

During radiation therapy, your radiation oncologist and nurse will see you regularly to follow your progress, evaluate whether you are having any side effects, recommend treatments for those side effects (such as medication) and address any concerns you may have. As treatment progresses, your doctor may make changes in the schedule or treatment plan depending on your response or reaction to the therapy.

Your radiation therapy team may gather on a regular basis with other healthcare professionals to review your case to ensure your treatment is proceeding as planned. During this session, all the members of the team discuss your progress as well as any concerns.



Did You Know?



Just as you would not expect to benefit from a medicine the instant you swallow a pill, the full effects of radiation therapy typically occur after a course of treatment is complete. It may take many weeks or months after your treatment to know how your tumor has responded.

Weekly Beam Films

During treatment, your team will routinely use the treatment machines to take special X-rays called beam or port films. Your treatment team routinely reviews these films to be sure that the treatment beams remain precisely aimed at the proper target. These X-rays are not used to evaluate your tumor.

After Treatment

Follow Up

After treatment is completed, follow-up appointments will be scheduled so that your radiation oncologist can make sure your recovery is proceeding normally and can continue to monitor your health status. Your radiation oncologist may also order additional diagnostic tests. Reports on your treatment can be sent to your other physicians.



As time goes on, the frequency of your visits will decrease. However, you should know that your radiation oncology team will always be available should you need to speak to someone about your treatment.

Are There Any Side Effects?

Patients often experience little or no side effects from the radiation therapy and are able to continue their normal routines. However, some patients do feel some discomfort from the treatment. Be sure to talk to a member of your radiation oncology treatment team about any problems you may have.

Many of the side effects of radiation therapy are related to the area that is being treated. For example, a breast cancer patient may notice skin irritation, like a mild to moderate sunburn, while a patient with cancer in the mouth may have soreness when swallowing. These side effects are usually temporary and can be treated by your doctor or other members of the treatment team.

Side effects usually begin by the second or third week of treatment, and they may last for several weeks after the final radiation treatment. In rare instances, serious side effects develop after radiation therapy is finished. Your radiation oncologist and radiation oncology nurse are the best people to advise you about the side effects you may experience. Talk with them about any side effects you are having. They can give you information about how to manage them and may prescribe medicines that can help relieve your symptoms.



The side effect most often reported by patients receiving radiation is fatigue. The fatigue patients experience is usually not very severe, and patients can often continue all or some of their normal daily activities with a reduced schedule. Many patients continue to work full time during radiation therapy.

Many patients are concerned that radiation therapy will cause another cancer. In fact, the risk of developing a second tumor because of radiation therapy is very low. For many patients, radiation therapy can cure your cancer. This benefit far outweighs the very small risk that the treatment could cause a later cancer. If you smoke, the most important thing you can do to reduce your risk of a second cancer is quit smoking.

How Should I Care for Myself During Radiation Therapy?

Get plenty of rest. Many patients experience fatigue during radiation therapy, so it is important to make sure you are well rested.

Eat a **balanced, nutritious diet**. A nutritionist, nurse or physician may work with you to ensure you are receiving the right calories, vitamins and minerals from the foods you eat and that you are eating the proper type of foods. With certain types of treatment, it may be necessary to modify your diet to minimize side effects. You should not attempt to lose weight during radiation therapy, since you require more calories due to your cancer and treatment.

Treat the skin that is exposed to radiation with extra care. The skin in the area receiving treatment may become red and sensitive. Your radiation oncology nurse will review specific instructions for caring for your skin with you. Some guidelines include:

- Cleanse the skin daily with warm water and a mild soap recommended by your nurse.
- Avoid using any lotions, perfumes, deodorants or powders in the treatment area unless approved by your doctor or nurse. Try not to use products containing alcohol and perfumes.
- Avoid putting anything hot or cold on the treated skin. This includes heating pads and ice packs.
- Protect the treated area from the sun by using a sunscreen with an SPF of at least 15. If possible, avoid exposing the treated area to the sun altogether.

Seek out **emotional support**. There are many emotional demands that you must cope with during your cancer diagnosis and treatment. It is common to feel anxious, depressed, afraid or hopeless. At times, it may help to talk about your feelings with a close friend, family member, nurse, social worker or psychologist. To find a support group in your area, ask your radiation oncology nurse.

Did You Know?



Your doctor may recommend that you meet with a nutritionist to address dietary issues that could affect your cancer treatment.

What Questions Should I Ask My Doctor?

It is important that you fully understand the potential benefits, side effects and goals of radiation therapy. Your radiation oncologist and radiation oncology nurses are available to answer any questions you may have during treatment. They are the best source of accurate information about your particular case.

Coping with a diagnosis of cancer and researching the various treatment options can be a stressful experience. To assist you in this process, below is a list of questions you may want to ask your radiation oncologist if you are considering radiation therapy.

- What type and stage of cancer do I have?
- What is the purpose of radiation treatment for my type of cancer?
- How will the radiation therapy be administered? Will it be external beam or brachytherapy? Will the treatments hurt?
- For how many weeks will I receive radiation? How many treatments will I receive per week?
- What are the chances that radiation therapy will work?
- What is the chance that the cancer will spread or come back if I do not have radiation therapy?
- Will I need chemotherapy, surgery or other treatments? If so, in what order will I receive these treatments, and how soon after radiation therapy can I start them?
- How can I expect to feel during treatment and in the weeks following radiation therapy?
- Can I drive myself to and from the treatment facility?
- Will I be able to continue my normal activities?
- What side effects may occur from the radiation and how are they managed?
- Will radiation therapy affect my sex life or my ability to have children?
- Do I need to take any special precautions, like staying out of the sun or avoiding people with infectious diseases?
- Do I need a special diet during or after my treatment?
- Can I exercise?
- Will side effects change my appearance? If so, will the changes be permanent or temporary? If temporary, how long will they last?
- How often do I need to return for checkups?
- How and when will you know if I am cured of cancer?
- What are the chances that the cancer will come back?
- How soon can I go back to my regular activities? Work? Sexual activity? Aerobic exercise?
- Do you take my insurance?
- How should I prepare for this financially?
- What are some of the support groups I can turn to during treatment?

What Are Clinical Trials?

The practice of radiation oncology is constantly improving as researchers continue to explore new ways to treat patients more effectively with radiation therapy. Cancer specialists regularly conduct studies to test new treatments. These studies are called **clinical trials**.

Some clinical studies try to determine if a therapeutic approach is safe and potentially effective. Many large clinical trials compare standard treatment to a treatment that cancer experts think might be better. Patients who participate in clinical trials help doctors find out whether a promising treatment is safe and effective. All patients who participate in clinical trials are carefully monitored to make sure they are getting quality care.

Only you can make the decision about whether or not to participate in a clinical trial. Before making your decision, it is important to learn as much as possible about your cancer and the clinical trials that may be available to you. Your radiation oncologist can answer many of your questions if you are considering taking part in a trial.

For more information on clinical trials, contact the following organizations:

Coalition of National Cancer Cooperative Groups
www.cancertrialshelp.org
1-877-520-4457

National Surgical Adjuvant Bowel and Breast Project
www.nsabp.pitt.edu
412-330-4600

National Cancer Institute
www.cancer.gov/clinicaltrials
1-800-4-CANCER

Radiation Therapy Oncology Group
www.rtog.org
1-800-227-5463

Then ...



Now ...



Today's standard treatments are a result of clinical trials that were done years ago.

Glossary

Adjuvant treatment: A treatment that is given in addition to the primary treatment to enhance its effectiveness and reduce the chance of the tumor recurring.

Applicator: A device used to hold a radioactive source in place during brachytherapy.

Beam films: Another term for port films, beam films are pictures of the position of the radiation beams used to treat cancer. They are used to verify the position of the beams and confirm that treatment is delivered to the right place.

Blocks: Pieces of metal alloy that can be used to shape the radiation beam.

Boost: An additional dose of radiation that is given after an initial course of radiation to enhance tumor control. A boost may be given to the tumor and areas to which the tumor may have spread.

Brachytherapy: Internal radiation therapy that involves placing radioactive sources inside or adjacent to the tumor.

Cancer: A group of diseases in which abnormal cells divide uncontrollably, forming a tumor or mass.

Catheter: A tube inserted into the body that can be used to deliver radiation during brachytherapy.

Clinical trials: Studies that test new cancer therapies.

CT or CAT scan: A computer assisted tomography scan is an X-ray procedure that uses a computer to produce detailed pictures of the body.

High dose rate remote afterloading machine: A medical device that allows radiation to be delivered into a patient's body through catheters during brachytherapy.

Hyperfractionated radiation therapy: A type of radiation therapy in which the radiation doses are divided into smaller amounts (hyperfractionation) and patients undergo radiation treatment more than once a day.

Hypofractionated radiation therapy: A type of radiation therapy in which patients undergo one or just a few treatments.

Immobilization device: A device that is used to help a patient remain in the same position during every treatment.

Implants: Another term for brachytherapy, internal radiation therapy that involves placing radioactive sources inside the patient close to or in the tumor.

Intensity modulated radiation therapy or IMRT: IMRT is a specialized form of external beam therapy that allows radiation to be shaped to fit your tumor.

Interstitial brachytherapy: A form of seed implant where the radioactive sources are placed directly into the tumor (such as the prostate).

Intracavity brachytherapy: A type of brachytherapy where the radioactive seeds are put into a space where the tumor is located, such as the cervix or windpipe.

Linear accelerator: The most common type of machine used to deliver external radiation therapy. Sometimes called a "linac."

Metastases: Cancer that has spread from one part of the body to another, such as from the breast to the lymph nodes or bones.

Monoclonal antibody: A type of antibody that is created in the laboratory.

MR or MRI scan: A magnetic resonance imaging scan is a procedure that uses a magnetic field to create detailed pictures of the body.

Multileaf collimator or MLC: A part of a linear accelerator that is used to shape the radiation beam.

Neutron beam therapy: A specialized type of external beam radiation therapy similar to proton therapy.

Palliative care/palliation: Treatment that is intended to relieve symptoms, but not cure disease.

PET scan: A positron emission tomography scan uses a small dose of a chemical called a radionuclide combined with a sugar, which is injected into the patient. The radionuclide emits positrons. The PET scanner detects the positron emissions given off by the radionuclide.

Proton beam therapy: An external beam therapy that uses protons rather than X-rays to treat tumors.

Did You Know?



State agencies and the federal government have regulations and standards to ensure the safety of patients treated with radiation. The American Society for Therapeutic Radiology and Oncology, the American College of Radiology, the American Society of Clinical Oncology and other cancer specialty organizations also have guidelines designed to provide the best patient care and ensure the safety of the patients and the public.

Radiation oncologist: A doctor who specializes in treating cancer and other diseases with radiation therapy.

Radiation oncology: The medical specialty that deals with treating cancer and other diseases with radiation.

Radiation therapy: The careful use of various forms of radiation to treat cancer and other diseases.

Radioimmunotherapy: The use of radiolabeled antibodies to deliver radiation directly to a tumor.

Radiolabeled antibodies: Monoclonal antibodies (antibodies produced in a laboratory) that have had a radioactive isotope attached to them in a process called radiolabeling.

Radioprotector: A type of drug that protects normal tissues in the area being treated.

Radioresistant: A term used to describe a tumor that does not respond well to radiation therapy.

Radiosensitizer: A type of drug that can make a tumor respond better to radiation therapy.

Simulation: The process of planning radiation therapy to allow the radiation to be delivered to the intended location.

Systemic radiation therapy: The use of radioactive isotopes that can travel throughout the body to treat certain cancers.

Treatment plan: A radiation oncologist's prescription describing how a patient should be treated with radiation therapy. The radiation oncology team uses sophisticated treatment planning software to maximize radiation to the tumor while sparing healthy tissue.

Tumor: An abnormal lump or mass of tissue.

If you have any questions about your diagnosis, treatment or side effects, please contact your doctor or other members of your treatment team. To locate a radiation oncologist in your area or for additional cancer treatment information, please visit www.astro.org/patient/.



The American Society for Therapeutic Radiology and Oncology is the largest radiation oncology society in the world, with more than 7,500 members who specialize in treating patients with radiation therapies. As the leading organization in radiation oncology, biology and physics, ASTRO's mission is to advance the practice of radiation oncology by promoting excellence in patient care, providing opportunities for educational and professional development, promoting research and disseminating research results, and representing radiation oncology in a rapidly evolving socioeconomic healthcare environment.

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