

AMERICAN BRAIN TUMOR ASSOCIATION

# Conventional Radiation Therapy



American  
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## **ABOUT THE AMERICAN BRAIN TUMOR ASSOCIATION**

Founded in 1973, the American Brain Tumor Association (ABTA) was the first national nonprofit advocacy organization dedicated solely to brain tumor research. For over 45 years, the Chicago-based ABTA has been providing comprehensive resources that support the complex needs of brain tumor patients and caregivers, as well as the critical funding of research in the pursuit of breakthroughs in brain tumor diagnosis, treatment and care.

To learn more about the ABTA, visit [www.abta.org](http://www.abta.org).

We gratefully acknowledge Minesh Mehta, MD, Deputy Director and Chief of Radiation Oncology Miami Cancer Institute at Baptist Health South Florida, for his review of this edition of this publication.

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INTRODUCTION

# Conventional Radiation Therapy

## INTRODUCTION

Conventional external beam radiation therapy is the most common form of radiation treatment for brain tumors. The goal of radiation is to destroy tumor cells and slow tumor growth. Radiation success depends on several factors, including the type of tumor being treated and the size of the tumor. Additionally, some tumors are more sensitive to radiation than others, and smaller tumors are usually more treatable than larger ones.

Radiation can be used after a biopsy, or following partial or complete removal of a brain tumor. When a tumor is surgically removed, some microscopic tumor cells may remain. Radiation attempts to destroy these remaining cells. Some tumors are so sensitive to radiation that radiation therapy may be the only necessary treatment.

Radiation is also used to treat tumors that cannot be removed with surgery and tumors that have spread to the brain from another part of the body (metastatic brain tumors). Radiation may also be used to prevent metastatic brain tumors from developing. This type of therapy is called prophylactic or preventative radiation, and is most

often used for people with small-cell lung cancer. Sometimes the purpose of radiation therapy is to relieve symptoms rather than to eliminate the tumor. This is called palliative radiation.

Before a patient begins radiation treatments, he or she will meet a doctor – a radiation oncologist – to plan therapy. A radiation oncologist is a physician with advanced, specialized training in the use of radiation as a treatment for disease in any part of the body, including the brain. When meeting with the radiation oncologist, patients and their loved ones should take the opportunity to ask questions about the goals of treatment and how long it will take. They can also ask questions about the treatment itself to better understand the recommendations made by the radiation oncologist.

## **HOW DOES RADIATION WORK?**

Radiation (also called X-rays, gamma rays, protons or photons) either kills tumor cells directly or stops them from growing. Radiation affects both tumor cells and healthy cells. However, following radiation, healthy cells repair themselves more quickly and completely than tumor cells. As the radiation treatments continue, a larger number of tumor cells die. The tumor shrinks as the dead cells are broken down and disposed of by the immune system.

Like any organ in the body, the brain can handle only a certain amount of radiation. Different amounts of radiation are required to treat different brain tumors. Sometimes a form of focused radiation may be used in addition to, or following, conventional radiation. This is called a radiation “boost.”

Radiation therapy may be given before or after chemotherapy, or with drugs that make tumor cells more sensitive to the radiation (radio sensitizers). This is common in the treatment

of more aggressive brain tumors. In infants and young children, chemotherapy may be used to delay radiation therapy until the brain has developed enough to tolerate radiation.

## **WHAT HAPPENS BEFORE TREATMENT BEGINS?**

First, the radiation oncologist reviews the patient's medical records, including medical history, operative reports, pathology reports and imaging studies such as CT or MRI scans. The radiation oncologist will then meet with the patient and discuss the treatment plan and goals in detail. The physician then decides which area to treat and the amount of radiation the area should receive.

The area to be radiated can include the tumor and an area surrounding the tumor. This is because some brain tumors have "roots" that extend out into surrounding normal brain tissue. For those with a metastatic tumor, radiation may be given to the entire brain. If the tumor has spread to the spinal cord, or if there is a high risk of this type of spread, the spine might be radiated as well.

To maximize the amount of radiation the tumor receives, and to avoid as much healthy tissue as possible, the radiation frequently will be directed from several different angles. Computers are used to help shape and direct the radiation beams. The radiation oncologist will usually require a CT or MRI to assist with the treatment planning process and to confirm the target area.

Once the decision to proceed with radiation has been made, one or two planning sessions (called simulations) are scheduled. Each session lasts approximately 30 minutes. The patient may be fitted for a face mask designed to help hold the head still, and specialized marks will be placed on the mask to ensure accurate treatment delivery. On some occasions, a mask is not used, and marks will be placed on the skin. The marks and face mask help



Patient in a head-holding device, awaiting treatment

Courtesy of the American Society for Therapeutic Radiology and Oncology (ASTRO)

insure the accurate position of the patient's head for the radiation treatment.

The patient will have another opportunity to meet with the radiation oncologist before treatments begin. That time can be used to ask questions and address concerns. The patient might want to discuss the benefits and risks of the treatment. Managing potential side effects during or after treatment is another common area of concern.

It is important to have a clear idea of who to call, the phone number and when that call should be made if the patient has concerns between treatment sessions. Before starting treatments, it is also important to let the radiation oncologist know about all medications being taken.

Containers of antioxidant vitamins or herbal supplements that the patient takes should be brought so the doctor can see the products and the amounts taken. He or she will give instructions about using them during radiation therapy. Filling prescriptions at one pharmacy can help avoid drug interactions.

Once the radiation oncologist has planned the treatment, certified radiation technologists called radiation therapists will actually operate the

treatment equipment. They are specially trained and licensed to administer the prescribed treatments under the doctor's supervision.

## WHAT HAPPENS DURING TREATMENT?

Radiation therapy is usually given in an outpatient setting, which means that the patient can return home after each appointment. Unless radiation is to be delivered to the spine, the patient won't have to remove or change clothes for treatment.

The total procedure – checking into the radiation department, waiting to be treated, and receiving treatment – should take between 10 and 20 minutes. The treatment itself takes just a few minutes.

The session takes place in a specially designed room which houses the treatment machinery. The therapist helps the patient onto the table used for the treatment and positions him/her. The radiation machine will then be directed to rest above, below or to the side of the patient. The table may move slowly from side to side during treatment, but only under the expert guidance of the radiation therapists.

The therapist will leave the room prior to the actual treatment (just as the dentist does when X-raying teeth). He or she will be able to see and hear the patient via closed-circuit television monitor.



Linear accelerator used to deliver radiation therapy  
Photo courtesy of Siemens Medical Systems, Inc.

Radiation treatments are painless and feel no different than getting a chest X-ray . During the treatment, some people notice an unusual smell or see flashes of light even when their eyes are closed. This is normal. The patient will need to remain perfectly still until the session is over. Special equipment or medication can help infants and young children stay still.

During the treatment the patient may hear a gentle humming noise which is made by the treatment machine. Sometimes, the therapist will come in and out of the treatment room, usually to reposition the patient or the treatment equipment.

A typical schedule for radiation therapy consists of one treatment per day, five days a week for two to seven weeks. However, treatment schedules may vary.

A patient is NOT radioactive during or after this type of radiation therapy. The radiation is active only while the machine is on. There is no need to take any special precautions for the safety of others.

The patient may hear various personnel in the radiation oncology department use a variety of letters as a short hand to describe a portion of the treatment. The most common is IMRT, which stands for intensity modulated radiation treatment. This is a sophisticated method of treatment delivery that allows for precise placement of the radiation dose. It is most frequently used when the tumor is close to critical parts of the brain, such as the eyes or visual pathway. Another short hand expression one might hear is IGRT, which stands for image guided radiation therapy. It simply means that images are taken each day prior to the treatment to make sure that everything is lined up just as prescribed by the physician.

## HOW IS PROGRESS MONITORED AFTER RADIATION THERAPY?

The best way to measure the effects of radiation is by a CT or MRI scan. An initial follow-up scan is usually planned for one to three months following treatment unless there is some reason to perform one sooner.

Tumor cells damaged by radiation cannot reproduce normally and die over a period of weeks to months. During that time, the brain works to clear away those dead or dying tumor cells. This may cause swelling in the area of the tumor.

Scans taken during this time can be confusing because the dying or dead cells are often accompanied by brain swelling, resulting in the mass appearing larger than the original tumor when scanned. That mass may also cause symptoms similar to the original tumor.

Post-treatment scans do not always show tumor shrinkage immediately. Sometimes the scan results do not look promising because the tumor is replaced by scar tissue . It often takes several months or more before scans show the real results of treatment.

The patient's symptoms may fade as the tumor shrinks. Sometimes they disappear completely. Some effects may continue even if the brain tumor shrinks or is undetected on a scan. Some symptoms, whether related to the tumor or its treatments, may not resolve. The doctor and patient can discuss this possibility.

## WHAT ARE SOME OF THE COMMON SIDE EFFECTS?

Most people have some side effects from radiation therapy. The immediate or short-term effects tend to be manageable discomforts. Knowing about these in advance can help the patient plan for

some temporary, but necessary, flexibility in his/her schedule.

## **FATIGUE**

The most common side effect of radiation therapy is fatigue (tiredness). Fatigue is temporary. The patient may begin to feel unusually tired a few weeks into treatment, and this may last weeks or even several months after treatment has ended.

Those with fatigue find the following tips helpful:

- > Make a plan to save energy without becoming inactive.
- > Address most important tasks while feeling best.
- > Ask family and neighbors to help with routine jobs such as laundry, grocery shopping, or car pools.
- > Work shorter hours or working from home, if possible, while in treatment.
- > Plan easy meals using prepared foods or relying on frequent, nutritious snacks.
- > Exercise in small amounts (if approved by doctor). This may increase energy levels.

Once treatment is finished, the patient may begin feeling better. Most people generally feel less tired a few weeks after the treatment is complete, but it can be a long time (as long as six months or more) before a patient feels “normal” again.

## **HAIR LOSS**

About two weeks into treatment, the patient may start to lose the hair in the path of radiation beams. Hair loss is related to the amount of radiation, the area radiated and the use of other treatments such as chemotherapy. The doctor can advise whether hair loss is possible, and if it is likely to be permanent or temporary.

If the loss is temporary, hair regrowth usually begins about two to three months following

treatment, but may take six months to a year for maximum regrowth. Changes in texture and/or hair color may occur.

### **SKIN CHANGES**

The patient may notice changes in the skin over the area being treated. It may be reddened, darkened, itchy or appear “sunburned.” It’s important not to scratch or rub these spots. If ears are in the path of the radiation beams, they may become sore and reddened inside and out. The patient may have difficulty with hearing due to fluid collecting in the middle ear. None of these symptoms should be treated without medical supervision. A doctor or radiation therapist can be asked for advice.

Over the counter lotions can make the situation worse. Patients should use only products that doctors or nurses suggest. Heating pads, ice packs, or anything else that causes irritation to the area being radiated should be avoided. Patients should stay out of direct sunlight, and the head should be covered if he or she has any skin problems or is taking a radiosensitizing drug. When in doubt, consult your care team.

### **SWELLING/EDEMA**

Edema (brain swelling) is another common, usually temporary, side effect of radiation therapy. Edema can cause an increase in brain tumor symptoms. Steroids are medications used to help reduce this swelling. The medications may be given to the patient during treatments and for a while after.

It is important to follow a doctor’s exact instructions for taking steroids. Steroid medications should never be abruptly discontinued. When they are no longer needed, the doctor will provide instructions for “tapering,” or slowly reducing, steroid dosage. This process allows the body time to slowly begin making its own natural steroids again.

The doctor may prescribe a medicine to prevent

stomach irritation caused by steroid use. Taking steroids with meals can also help reduce stomach discomfort. Some people who take steroids experience increased appetite, along with weight gain which often is most apparent in the face and abdomen. The patient's facial appearance and body shape will return to baseline once the steroids are discontinued, but it may take several months. People with (or prone toward) diabetes may experience an increase in their blood sugar level. If a patient begins to have excessive thirst with frequent urination – common symptoms of diabetes – it is important to let the doctor know immediately.

Nervousness or difficulty sleeping may be experienced as a side effect of steroids. The doctor may prescribe a medication to help the patient sleep. Some people who take steroids develop a yeast infection in their mouth. They may notice a sore mouth or throat, possibly with “fruity” smelling breath. Yeast infections are treated with medication. Also, people who take steroids for more than a month may notice weakness in their legs. This may be noticed when they try to stand from a sitting position, or when they get up from the bed or the toilet. This symptom will likely disappear once the steroid medication is discontinued, although it may take several weeks to months for one's strength to completely return.

### **NAUSEA**

Sometimes people feel sick to their stomach following radiation treatment, especially if receiving chemotherapy at the same time. It is important to share this information with a health care professional. There are medications, called anti-emetics, which help control nausea. These medicines are generally taken prior to, and sometimes after, treatments. If for any reason the first anti-emetic medication does not work,

a medical provider should be informed. Other medications or medication combinations can be tried until a treatment is found that works best.

Constipation can be a side effect of common nausea medications. The medical care team can discuss the best way to manage this constipation.

While going through treatment, the body will need extra protein and calories to heal the effects of radiation and keep the immune system healthy. A licensed dietician or nutritionist can determine the patient's personal nutrition needs and help with personalized dietary counseling.

### **SEXUAL EFFECTS**

Lowered sexual desire is another common, and temporary, symptom of radiation treatment.

The fatigue of treatment, as well as the stresses associated with having a brain tumor, can cause this effect in both men and women. Sexual desires often return to normal after treatment. If sexually active, it is best to use effective birth control as it can be dangerous to conceive a baby during radiation treatment.

### **BLOOD CLOTS**

People with a brain tumors are at an increased risk of developing a blood clot. Most often, the clot develops in one leg, causing swelling of the foot, ankle and/or calf, usually with pain in the calf or behind the knee. If these symptoms appear, a doctor should be called immediately. A special test called a Doppler study can be performed. If a clot is seen, blood thinners can be prescribed to dissolve the clot and prevent it from traveling into the lungs.

Because some drug interactions can make blood clotting worse, it is important that the patient's doctor be aware of all the medications he or she is using. This includes over the counter drugs, herbs, vitamin supplements and complementary or alternative therapies.

## **EFFECTS ON MEMORY**

It is not uncommon for a patient to experience change in memory related to the treatment. It is usually short-term memory that is affected, such as not being able to remember what one ate for lunch yesterday. Memory changes can be related to the tumor, surgery, chemotherapy, or radiation. Although radiation can have an effect on memory, tumor growth has the greatest risk to memory and other neurologic decline. Fatigue also can play a role in decreasing memory and attention. Exercise can help improve memory, but a doctor should be consulted about what kind of exercise is best for the patient. Although memory issues can be persistent, patients generally feel that their potential memory issues are less bothersome over time.

## **OTHER EFFECTS**

Radiation therapy may have intermediate and long-term effects. Information about those effects should be given by a doctor who can help the patient weigh the benefits of the treatment against the risks involved. If the patient has any questions, or notices any changes he or she believes are important or worrisome, the doctor or the hospital radiation department should be contacted.

## **THE ABTA IS HERE FOR YOU**

The American Brain Tumor Association is here to help. Visit us at [www.abta.org](http://www.abta.org) to find additional brochures, read about research and treatment updates, connect with a support community, join a local event and more.

We can help you better understand brain tumors, treatment options, and support resources. Our team of caring professionals is available via email at [abta cares@abta.org](mailto:abta cares@abta.org) or via our toll-free CareLine at 800-886-ABTA (2282).

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CareLine: 800-886-ABTA (2282)

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## PUBLICATIONS

About Brain Tumors: A Primer for Patients and  
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Brain Tumors – A Handbook for the Newly  
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### Tumor Types:

Ependymoma

Glioblastoma and Malignant Astrocytoma

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All publications are available for download in Spanish.

Exceptions are marked\*

## CLINICAL TRIALS

TrialConnect®: [www.abtatrialconnect.org](http://www.abtatrialconnect.org) or

877-769-4833

More brain tumor resources and information  
are available at [www.abta.org](http://www.abta.org).

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