LUNG CANCER TREATMENTS


What you need to know about...

radiation therapy






LUNGEVITY

foreword

About LUNGevity

LUNGevity is the premier lung cancer-focused nonprofit, changing outcomes for people with lung cancer through research, education, and support.

About the LUNGevity PATIENT EDUCATION SERIES

LUNGevity has developed a comprehensive series of materials for patients and their caregivers, focused on understanding how lung cancer develops, how it can be diagnosed, and treatment options. Whether you or someone you care about has been diagnosed with lung cancer or you are concerned about your lung cancer risk, we have resources to help you.

The medical experts and lung cancer patients who provided their valuable expertise and experience in developing these materials all share the belief that well-informed patients make their own best advocates.

In addition to this and other booklets in the LUNGevity patient education series, information and resources can be found on LUNGevity's website at www.LUNGevity.org under "For Patients & Caregivers" and "For Supporters & Advocates."

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table of contents

introduction

Radiation therapy (also known as radiotherapy) is a type of treatment for lung cancer that uses various forms of high-powered energy beams, such as X-rays, to kill cancer cells and shrink tumors in their path while doing the least damage possible to the surrounding healthy tissue. Radiation therapy is used in a number of ways, alone and in combination with other therapies. It may be used at all stages of both non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). At an early stage, it may be used for curative intent, while in patients with advanced-stage lung cancer, it may be given to relieve symptoms.

This booklet will help you:

- Understand how radiation therapy works
- Find out what radiation therapy options are currently available
- Learn ways that radiation therapy side effects can be managed
- Understand whether radiation therapy might be a good treatment option for you

YOU'LL FIND A GLOSSARY TOWARD THE END OF THIS BOOKLET.
Words included in the glossary appear **blue** the first time that they are used in the text.

01 about radiation therapy

What is radiation therapy?

Radiation therapy (also known as radiotherapy) is a type of cancer treatment that uses high-powered energy beams. The type of energy that is most commonly used is X-rays, but other types of radiation may be used as well. Radiation is aimed directly to kill cancer cells and shrink **tumors** in the path of the energy beams while doing the least damage possible to the surrounding healthy tissue. Radiation therapy is used in a number of ways. How it is used depends on the patient's type and **stage** of cancer, the patient's health status in general, and other factors. In lung cancer, radiation therapy may be used for treatment of both **non-small cell lung cancer (NSCLC)** and **small cell lung cancer (SCLC)**.

Radiation therapy has been used as a cancer treatment for more than a century. However, in recent years, technological innovations in engineering and software development have led to significant advances in safety, precision, and effectiveness. Today, radiation therapy is safer and more effective than ever before, and it remains an important option among lung cancer therapies, which may also

include surgery, **chemotherapy**, **targeted therapies**, **angiogenesis inhibitors**, and **immunotherapy**. Each of these treatments attacks lung cancers in different ways.

Radiation therapy may be used alone or in combination with other treatments. After the patient is diagnosed with cancer, a group of healthcare professionals with expertise in that type of cancer commonly get together to discuss what is best for a patient; they help select the optimal treatment plan, which may or may not include radiation therapy. For patients with lung cancer, this group of professionals may include medical **oncologists** (cancer doctors who specialize in drug therapy), radiation oncologists (cancer doctors who specialize in radiation therapy), **thoracic surgeons**, lung cancer nurses, **pulmonologists**, and others.

Who is on the radiation therapy team, and what are their roles?

The radiation oncology department of any clinic or hospital is staffed by a team of professionals who have specialized training in delivering radiation therapy. This team works together to determine and administer the safest and most effective treatment plan for the patient's care. Key team members include:

- **Radiation oncologist:** The radiation oncologist has overall responsibility for the patient's radiation therapy treatment. The radiation oncologist meets with the patient for a lengthy initial consultation to fully understand the patient's medical history and complete a medical examination. The radiation oncologist also works with the patient's other doctors, as needed, to gather any additional necessary medical information. The goal of the initial visit is to determine whether the patient might be a candidate for radiation therapy and what type of treatment might be best. The radiation oncologist develops and prescribes the radiation therapy

plan, makes certain that the treatment is given accurately, monitors the patient's progress, and adjusts the plan as necessary to ensure it is the most effective plan possible. The radiation oncologist continues to meet regularly with the patient and coordinates care with the patient's other cancer doctors.

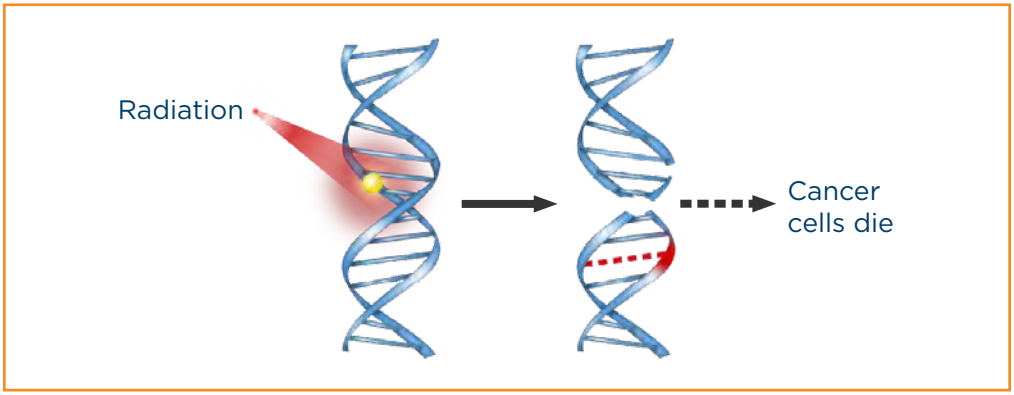
- **Radiation therapist:** The radiation therapist is a highly specialized member of the radiation therapy team who understands how the treatment machines work. The radiation therapist oversees the radiation treatments and makes sure that the prescribed treatments are delivered correctly. The radiation therapist also lets the radiation oncologist know if the patient is experiencing any problems with the treatment.
- **Radiation oncology nurse:** The radiation oncology nurse provides care for all patients undergoing radiation therapy, including care and support that is needed before, during, and after radiation therapy treatments. The radiation oncology nurse is there to answer any questions, monitor the patient's health, and help manage any side effects, and works very closely with the radiation oncologist.
- **Medical physicist:** The medical physicist provides quality control of the radiation equipment and the radiation treatment procedures. The medical physicist ensures that the equipment is properly working by conducting regular safety tests that include measuring the radiation beam itself. The medical physicist works closely with all members of the radiation therapy team. While patients may not meet the medical physicist, he or she plays a critical role on the team.
- **Dosimetrist:** The dosimetrist is a computer specialist who helps create radiation therapy treatment plans for the radiation oncologist. The dosimetrist works directly with the medical physicist and radiation therapist to calculate the proper dose of radiation given to the patient. As with the medical physicist, patients may not meet the dosimetrist, but he or she plays a critical role on the team.

There are additional members of a patient's healthcare team who may assist in a patient's care during treatment, including social workers, nutritionists, and physical therapists.

How radiation therapy works

Radiation therapy works by damaging the cancer cells' ability to grow and multiply; it attacks the **DNA** within the cells that control these functions. When cancer cells die, the body naturally eliminates them. Unlike systemic chemotherapy, which kills cancer cells wherever they are throughout the body, radiation therapy only kills the cancer cells at which it is aimed. It does not treat any cancer cells that may have spread elsewhere. At times, some cancer cells may survive radiation therapy and need more treatment.

HOW RADIATION THERAPY WORKS



Regardless of the number of doses of radiation a patient receives, radiation therapy does not work immediately, and it varies in its effectiveness by patient. It takes days or weeks before the damage to the DNA is enough for the cells to die. The treatment then continues to work; cancer cells continue to die for up to months after the treatment ends.

Radiation therapy can cause side effects. Side effects and their management are discussed later in this booklet.

What happens at initial consultations with a radiation oncologist

Radiation therapy does not begin right after the patient meets with the radiation oncologist for the first time. At the first appointment, the radiation oncologist conducts a physical exam, takes a medical history (including a review of medical records, scans, and pathology reports), and may order additional imaging tests such as **X-rays**, **MRI scans**, **CT scans**, and/or **PET scans** to get a better idea of the location and extent of the cancer. A follow-up appointment to review the results of any additional tests will be held.

The radiation oncologist may need anywhere from a few days to several weeks to design the patient's treatment plan. The radiation oncologist then reviews the radiation treatment plan with the patient and discusses its potential side effects, where the plan fits into the patient's overall treatment plan, and how the patient can take the best possible care of himself/herself both during and after treatment. This discussion may include a **palliative care** plan to prevent and ease the potential side effects of treatment.

The type of radiation therapy recommended determines the next steps in the process.

How radiation therapy is administered

Radiation therapy can come from a machine outside the body (external beam radiation therapy [EBRT]) or from radioactive material placed inside the body (internal radiation therapy).

External beam radiation therapy (EBRT)

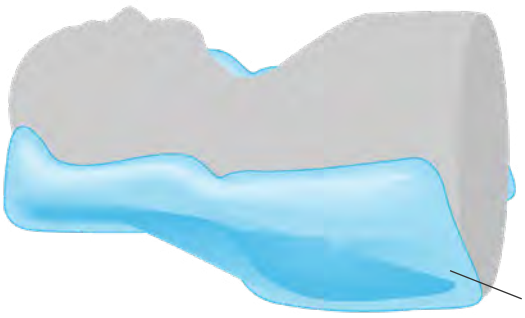
When radiation therapy is directed at the lung cancer from outside the body, it is called EBRT. This is the type of radiation therapy most frequently used to treat both NSCLC and SCLC. The radiation machine used most often is called a linear accelerator, also known as a "linac."

EBRT Procedure

Simulation before radiation treatments begin

Before EBRT is started, there is a planning session that the patient needs to attend following the initial consultations with the radiation oncologist; this is known as **simulation**. During the simulation, measurements are taken, often with a CT scan to generate a three-dimensional (3D) image of the patient's body and the cancer, to determine the proper way to give the radiation therapy. There are many decisions that the radiation oncologist needs to make prior to starting the therapy, including the selection of the correct angles for aiming the radiation beams, what dosage to prescribe, and over how many days the radiation doses will be administered. The patient may be fitted with a body mold that restricts movement. The mold helps ensure that the patient stays immobilized and maintains the same position for each treatment; it also ensures patient comfort. Small dots (which can be either temporary or permanent) are put on the patient's skin to serve as guides so that the radiation beams are properly aligned for each radiation therapy treatment session.

BODY MOLD



When do the radiation treatments actually begin following the simulation?

Radiation treatments do not begin right after the simulation. The radiation therapy start date may be from several days to two weeks after the simulation. It takes this much time for the medical physicist and dosimetrist to create a customized treatment plan that is safe and effective. There are a number of safety checks that have to occur, including confirmation of the calculations that are required by the linear accelerator. Treatments start only after the radiation oncologist gives final approval.

What happens during radiation treatments?

During each treatment, radiation beams are targeted at the marked area on the patient's body. The machine is large and can be noisy (typically a buzzing sound) when it is rotating around the patient delivering the radiation from different angles, but the machine never touches the patient's body. Radiation therapy is painless. Each session lasts 5 to 30 minutes; most of this time is spent positioning the body to make sure that the beam is aligned with the targeted area defined by the radiation oncologist.

EXTERNAL BEAM RADIATION THERAPY (EBRT)

Doctors use the term Gy (gray) to describe the dose of radiation therapy. Gy is the new international system unit of radiation dose, expressed as absorbed energy per unit mass of tissue.

A radiation therapy schedule usually consists of a specific number of treatments given over a set period of time. The schedule varies by circumstance, including the stage of lung cancer, the type of radiation therapy, and the goal of the radiation therapy. For example, a course for stage II or stage III lung cancer could consist of sessions five days per week (Monday through Friday) for six to seven weeks, for a total of 30 to 35 treatments, but even this may vary. In addition to these weekly radiation sessions for stage II or stage III lung cancer, the patient has a weekly meeting with the radiation oncologist and oncology nurse. These are called on-treatment visits, or OTVs. At the OTV, the patient can be assessed for side effects from treatment, and any other concerns are discussed. The OTV takes place even when the patient is feeling well. Based on the radiation oncologist's appraisal at the OTVs, the patient's treatment plan may be adjusted.

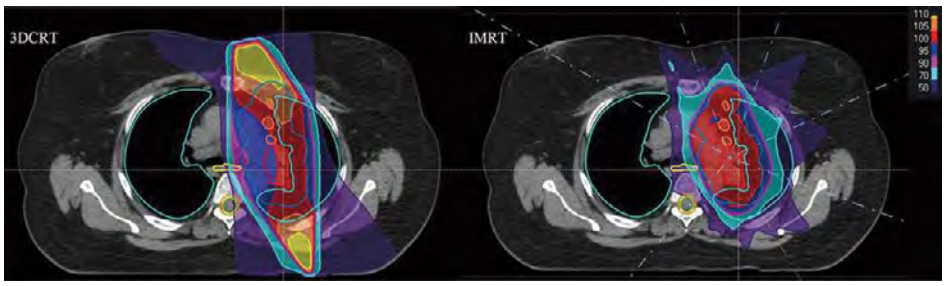
After the radiation treatments have ended, the patient continues to see the radiation oncologist for follow-up observation and care; the radiation oncologist determines how often and for how long this will be necessary.

Types of EBRT

The radiation oncologist determines which EBRT technique may be the most effective for the patient. Among these techniques are:

- **Three-dimensional conformal radiation therapy (3D-CRT):** 3D-CRT uses imaging technology (CT, MRI, PET, or PET-CT) to generate 3D images of a patient's tumor and the surrounding area. This level of detail allows for a stronger dose of radiation to be administered to the tumor while causing less damage to the normal, healthy tissue around the tumor. 3D-CRT is used for tumors that are shaped irregularly or that are positioned close to healthy organs or tissue.
- **Intensity-modulated radiation therapy (IMRT):** IMRT also uses 3D imaging. Coordinates of the tumor from the imaging are used to program a machine that can then deliver, from multiple angles, precisely shaped and higher doses of radiation to the tumor and lower doses to the surrounding normal, healthy tissue. Because it is so precise, IMRT is an especially useful technique for use when a tumor is situated near a vital structure, such as the spine.

DIFFERENCE BETWEEN 3D-CRT AND IMRT



- **Stereotactic body radiation therapy (SBRT):** SBRT, also called stereotactic ablative radiotherapy (SABR), combines image-guided radiation therapy (IGRT) with even more advanced techniques to precisely deliver extremely high doses of radiation to the tumor while decreasing the dose to normal, healthy tissue nearby. Instead of giving small doses of radiation each day for several weeks, SBRT can be given in two to five treatments. When the treatment is delivered in only one session, it is referred to as stereotactic radiosurgery (SRS). In lung cancer, SBRT is most often used to treat early-stage NSCLC when the patient's health does not allow surgery or the patient does not want surgery. It can be used for tumors small in size (5 cm or less). It may also be used if an NSCLC patient has limited metastases.
- **Proton therapy:** Proton therapy is a type of radiation therapy that uses **protons** instead of X-rays to treat cancer. Like X-rays, the proton beam damages the DNA within the cancer cells, leading to the cells' death. As with the other radiation therapy techniques, imaging is done to determine where exactly the radiation needs to be targeted. The machine used, known as a cyclotron or synchrotron, propels the protons at high speed. The main advantage of proton therapy is that all of the radiation is released when it gets to the tumor, so radiation damage to the normal, healthy tissue in the area is lessened; this may allow a higher radiation dose to be given to the tumor. However, proton therapy is very expensive and is not covered by all insurance companies for all diagnoses. In addition, it requires expensive and specialized equipment that only a handful of hospitals in the United States have.

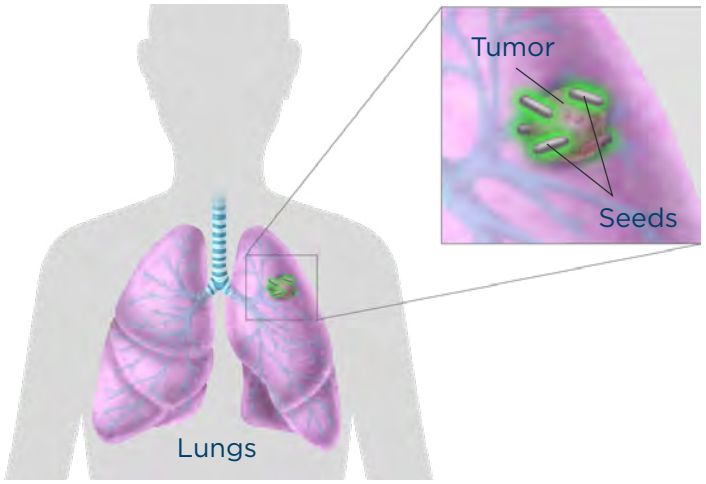
Type of EBRT	3D-CRT	IMRT	SBRT	Proton therapy
When is it used?	Stages II–IV	Stages II–IV	Stage I or IV	Stages I–IV
When is it not used?		Most palliative treatments	Whenever tumors are very close to critical body structures	Most palliative treatments
Main difference	Easiest type of radiation to deliver; less technical expertise required	Dose of radiation is shaped more conformally around tumor compared with 3D-CRT	Very high doses in a few **fractions** with sharp dose gradients; leads to higher rates of local control of the cancer	Reduces volume of tissue receiving low doses

Internal radiation therapy

The other type of radiation therapy is internal radiation therapy. Internal radiation therapy is used for lung cancer treatment only in situations when the radiation oncologist recommends a high dose of radiation in a small area, such as in the airway. This type of internal radiation therapy is called **brachytherapy**. During treatment, a small source of radioactive material, often in the form of small pellets or seeds, is inserted directly into the cancer or into the airway next to the cancer. This is usually done during a **bronchoscopy** or during surgery. The radiation travels only a short distance from the implanted radiation source to the tumor, which limits damaging effects on surrounding normal, healthy tissue. The radioactive

material may be removed after a short time—several minutes for high-dose-rate brachytherapy or up to a few days for low-dose-rate brachytherapy. Alternatively, radioactive seeds may be left in place permanently; the radiation gets weaker over time until it is no longer radioactive.

BRACHYTHERAPY SEEDING



Radiation therapy safety

EBRT does not make patients radioactive, so a patient cannot transmit radiation to anyone else. However, a patient who is treated with internal radiation therapy implants *can* emit radiation to other people; the radiation oncologist advises the patient about what precautions should be taken.

All forms of radiation therapy carry a very small risk of developing a second cancer. The risk is typically 1 in 5,000 patients.

02 radiation therapy and lung cancer

Goals of radiation therapy in lung cancer treatment

The overarching goal of radiation therapy in lung cancer treatment is to stop the growth of tumors while keeping the risk of side effects from toxicity due to the treatment to a minimum. As with all radiation therapy, how it is specifically used to treat lung cancer depends on the patient's type and stage of lung cancer, overall health and other medical factors, and other personal considerations. The radiation oncologist discusses the specific goals of the radiation therapy with the patient and may discuss how it can be combined with surgery and/or chemotherapy, targeted therapy, or immunotherapy. Typical strategies for radiation therapy include:

- As the patient's primary treatment, with or without chemotherapy, with intent to cure
- Before surgery, with or without chemotherapy, to reduce the size of a tumor
- After surgery, with or without chemotherapy, to kill any remaining cancer cells

- To treat areas where lung cancer has spread outside of the lungs, such as the brain and bones
- As a treatment to one area that is progressing when targeted therapy or immunotherapy is controlling other sites of disease
- To relieve symptoms, such as pain or shortness of breath, by shrinking the tumor

How radiation therapy fits into lung cancer treatment plans

Radiation therapy may potentially be used at all stages of both NSCLC and SCLC, alone or in combination with other treatments. The following treatments described are most commonly used; there may be other treatments recommended by the radiation oncologist that are not listed here as well as new treatment approaches being tested in **clinical trials**. More information about clinical trials can be found later in this booklet.

Non-small cell lung cancer (NSCLC)

Radiation therapy for NSCLC is usually given five days a week for five to seven weeks, but this can vary based on the type of EBRT being used, the stage and location of the NSCLC, and the intent of the radiation therapy. The following table shows, for example, how SBRT can be used for the treatment of NSCLC based on the location and size of the tumor.

Total dose	Total # of fractions	Size and location of lung tumor
25–34 Gy	1	Peripheral, small (<2 cm) tumors, especially >1 cm from chest wall
45–60 Gy	3	Peripheral tumors and >1 cm from chest wall
48–50 Gy	4	Central or peripheral tumors <4–5 cm, especially <1 cm from chest wall
50–55 Gy	5	Central or peripheral tumors, especially <1 cm from chest wall
60–70 Gy	8–10	Central tumors

Early-stage NSCLC (stages I and IIA with no spread to lymph nodes)

While the other types of EBRT may be used, SBRT is often recommended for early-stage patients (stages I and IIA with no spread to **lymph nodes**) who either cannot or choose not to have surgery. It is an option for patients who have high surgical risk possibly because of advanced age or poor lung function. For patients who have had surgery, EBRT following surgery is recommended when the margins of the removed cancer indicate that there are remaining cancer cells. In some cases, chemotherapy may be recommended after radiation.

Locally advanced NSCLC (stages II and III)

Radiation therapy for stages II and III lung cancer is typically delivered with concurrent chemotherapy (chemotherapy and radiation given at the same time). At times, surgery may be an alternative option and both are typically recommended for cure. In patients who cannot tolerate the potential side effects of concurrent radiation

and chemotherapy, the chemotherapy may be given before radiation therapy, or radiation therapy may be given without any chemotherapy at all.

Among stage III NSCLC patients whose cancer has not grown after cycle 2 following chemoradiation, the immunotherapy drug durvalumab (Imfinzi®), a PD-L1 checkpoint inhibitor, may be administered to help prevent progression and has been shown to improve survival. Durvalumab is given by infusion every two weeks until the cancer starts growing or for a maximum of 12 months.

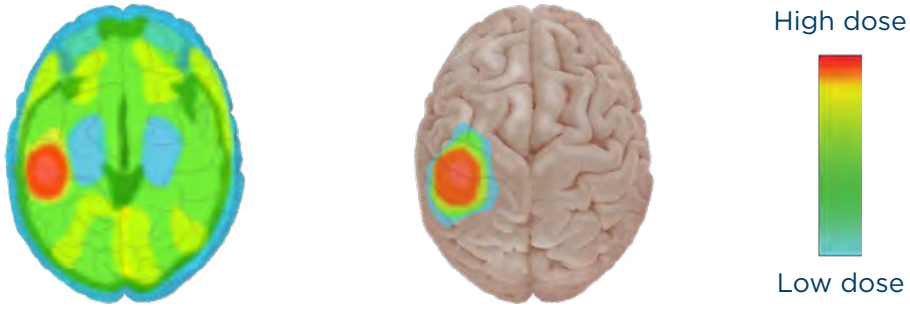
Advanced/metastatic NSCLC (stage IV)

In stage IV NSCLC with extensive metastases, radiation therapy, both EBRT and brachytherapy, can be used to relieve or prevent symptoms of lung cancer, such as pain or obstruction of an airway.

At times, it may be used to treat oligometastases, which are a small number of metastatic lesions found at limited sites. SBRT is often considered an option for this if it can safely be administered.

Patients with brain metastases have several radiation therapy options. Those with limited metastases may be treated with SRS (e.g., using the Gamma Knife® technology), in which precisely targeted beams deliver high doses of radiation to the metastases. The other radiation therapy option is whole-brain radiation therapy, in which radiation is given to the whole brain. It is not yet clear whether one technique has a survival benefit over the other, but the side effects may be lessened with SRS.

DIFFERENCE BETWEEN WHOLE-BRAIN RADIATION AND SRS



Whole-brain radiation Stereotactic radiosurgery (SRS)

In some situations, brain metastases may be treated with targeted therapies and not require radiation.

Small cell lung cancer (SCLC)

Limited-stage small cell lung cancer (LS-SCLC)

EBRT is often prescribed for **limited-stage small cell lung cancer (LS-SCLC)** with a goal of complete tumor eradication and long-term cure. It is often delivered with concurrent chemotherapy. Chemotherapy may begin at the same time or shortly before radiation therapy begins. The radiation therapy treatments may be delivered once daily for six to seven weeks or twice daily for three weeks. Patients and doctors often decide on the once- vs. twice-daily schedule based on convenience and preference, as it is generally not thought to make a difference to the long-term probability of tumor control. There are no major differences in side effects or treatment efficacy between once-daily and twice-daily radiation treatments, as shown in a large trial conducted in Europe comparing these two dosage schedules.

Certain patients with an LS-SCLC diagnosis who either cannot or choose not to have surgery may be treated specifically with SBRT, followed by chemotherapy.

In patients with LS-SCLC who have responded well to their initial treatment, **prophylactic cranial irradiation**—radiation to the brain—may be used to prevent brain metastases.

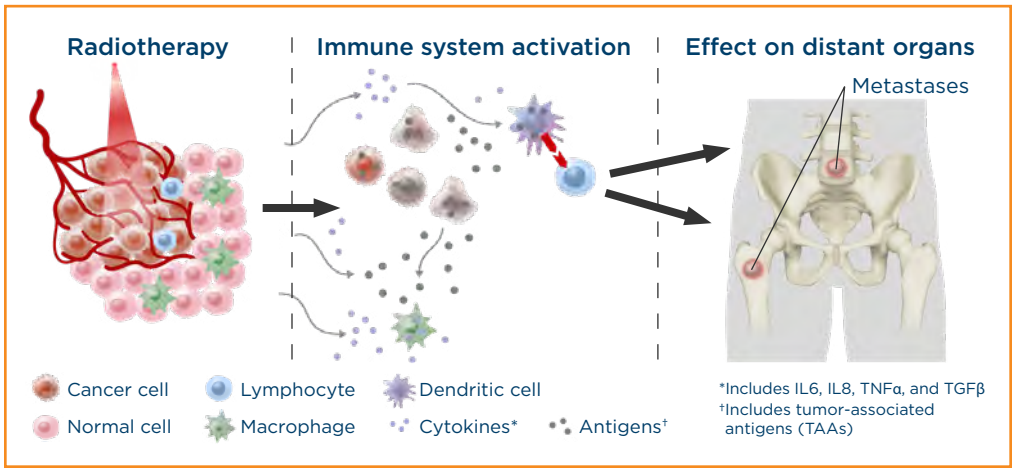
Extensive-stage small cell lung cancer (ES-SCLC)

EBRT cannot completely eradicate all sites of cancer in patients with **extensive-stage small cell lung cancer (ES-SCLC)**. However, it can be used after chemotherapy to improve control of disease in areas that are predicted to relapse. It may also be prescribed to the whole brain to reduce the risk of brain metastases and neurological complications. EBRT can also be used to help control symptoms that chemotherapy cannot help, such as pain, breathing problems, or bleeding.

What is the abscopal effect?

Radiation therapy kills cancer cells. Dying cells release proteins and attract immune cells, leading to immune cell activation. The addition of immunotherapy can boost this immune response. This immune activation can have an effect on distant organs by killing cancer cells at distant sites. This is referred to as the abscopal effect.

ABSCOPAL EFFECT



Managing radiation therapy side effects

Side effects from radiation therapy are caused by the damage to the normal, healthy cells that are near the cancer cells being treated. One major advantage of the more precise radiation therapy techniques that have been developed is that a smaller area of the normal, healthy tissue is damaged, which decreases the risk of side effects.

Side effects from radiation therapy for lung cancer are common, but just because a side effect is common does not mean that a patient will experience it. Before treatment begins, a patient should discuss with the radiation therapy team what side effects may be expected and how to prevent or ease them with a palliative care plan. Radiation oncologists check in weekly with each patient undergoing treatment to assess if any side effects are occurring. However, patients who are experiencing problems should speak with the radiation therapy team as soon as possible whenever a new side effect begins. This is because treating side effects early on is often more effective than trying to address them after they have become severe. Although most radiation therapy side effects go away when treatment is over, some can last a long time or even be permanent. It is important to know that a new side effect may occur even after treatment is over.

The following side effects and management techniques listed are not all-inclusive. The radiation therapy team will have a more comprehensive list of side effects that might be expected given the type of radiation therapy being used and can offer the patient a personalized set of recommendations for their management. They can also offer tips for caregivers.

Most side effects begin during the second or third week of treatment. Common side effects of radiation therapy and ways to manage them include:

- **Fatigue:** Fatigue can be treated with plenty of sleep, rest between activities, exercise, relaxation techniques (e.g., medication or yoga), good nutrition, and treatments (if appropriate) for anemia or depression. Another major cause of fatigue from radiation is dehydration. Patients should make sure to get plenty of fluids during radiation treatments (more than what they would take in normally), as this will markedly help with fatigue that develops.
- **Sunburn-like skin changes, such as dryness, itching, or peeling:** Symptoms may be relieved by washing with gentle soap and warm water (not hot) and using unscented creams/lotions.
- **Hair loss:** Hair will only fall out in the area where the radiation enters the body. (If radiation therapy is only to the chest area, for example, there will be no loss of hair on the head.)
- **Cough, difficulty breathing, and shortness of breath:** Many times these symptoms are due to the cancer itself. A cough can sometimes get worse during radiation as the airways develop inflammation. Anti-cough medicines can be given to help with this. Inflammation from radiation typically gets better within two weeks after treatment, and many times this symptom will go away as the inflammation goes down. A cough and shortness of breath can sometimes develop as "radiation pneumonitis" up to months after therapy and may require anti-inflammatory medication.
- **Sore throat, trouble swallowing, and chest pain:** These usually happen because the radiation causes the **esophagus** to develop inflammation. Pain and anti-inflammatory medications and speech pathology to learn different ways to swallow may help. Esophagus inflammation typically gets better within two weeks after radiation is completed, but can sometimes persist longer.
- **Loss of appetite and weight loss:** Appetite stimulants and nutritional supplements may be given to improve appetite and reduce weight loss.

- **Nausea and vomiting when the treated area is near the stomach:** Bland and easy-to-digest foods and frequent small meals and snacks may help prevent nausea. Techniques such as distraction, relaxation, and positive imagery can help change the expectation and fear of nausea and vomiting. In addition, there are multiple medications available to prevent and treat nausea and vomiting. If one anti-nausea medication does not work, a different one or an additional one can be prescribed.

Finding a clinical trial that might be right for you

There are many clinical trials under way that aim to improve outcomes for patients with lung cancer and to further improve the precision of imaging and radiation delivery techniques. Researchers are looking into new imaging techniques, and radiation therapy is also being studied at different stages in combination with surgery, chemotherapy, immunotherapy, and targeted therapy. It is important to note that no patient receives less than the current standard of care when participating in a clinical trial. For detailed information about clinical trials and the potential benefits and risks of participating in one, download LUNGevity's clinical trial education booklet on the Get Educational Resources page at www.LUNGevity.org.

If you are considering participating in a clinical trial, start by asking your doctor whether there is one for which you might qualify in your area. In addition, here are several resources to help you find one that may be a good match for you:

RESOURCES TO HELP YOU NAVIGATE YOUR CLINICAL TRIALS SEARCH:

- **LUNGevity Clinical Trial Finder:** https://clinicaltrials.lungevity.org/
  - Find available clinical trials by type of lung cancer and geographic location
  - Also find information and links to the medical centers at which these clinical trials are taking place
- **EmergingMed:** https://app.emergingmed.com/lcctal/home
  - LUNGevity partners with this free clinical trials matching service to help you with the decision of whether to pariticpate in a clinical trial; EmergingMed helps you identify lung cancer clinical trials for which you may be eligible
  - Clinical trial navigators are available Monday through Friday from 9:00am to 5:00pm ET at 877-769-4834
- **National Cancer Institute (NCI):** www.clinicaltrials.gov
- **My Cancer Genome:** www.mycancergenome.org/
  - My Cancer Genome gives up-to-date information on what mutations make cancers grow and related treatment options, including available clinical trials
- **Lung Cancer Mutation Consortium (LCMC):** www.golcmc.com/
  - Composed of 16 leading cancer centers across the country, LCMC's goal is to examine the tumors of patients who have advanced stage non-small cell lung cancer adenocarcinoma (stage IIIB or IV), and match those patients to the best possible therapies, including clinical trials

(CONTINUED)

RESOURCES TO HELP YOU NAVIGATE YOUR CLINICAL TRIALS SEARCH (CONTINUED):

- **Lung Cancer Master Protocol (LUNG-MAP):** www.lung-map.org/
  - For patients with non-small cell lung cancer (NSCLC), LUNG-MAP is a collaboration of many research sites across the country. They use a unique approach to match patients to one of several drugs being developed

QUESTIONS TO ASK YOUR HEALTHCARE TEAM ABOUT RADIATION THERAPY:

- What is the goal of my radiation therapy?
- What type of radiation therapy will I have?
- How long will the radiation treatments last?
- Will I be having other treatments at the same time as my radiation therapy?
- Will I feel anything during my radiation treatments?
- Do I need to bring someone with me for each treatment?
- When might side effects start? How long will they last?
- Will I be able to work while I am having radiation therapy?
- When should I call the doctor?
- What is the best way to communicate with the doctor?
- Whom should I contact if I have an issue outside of regular office hours (at night or on the weekend)?
- Are there any medications I should have on hand at home?
- Is there anything special I can do to take care of my skin while my treatments are ongoing?
- Do I need to eat a special diet?
- What happens when my radiation therapy is over?
- Will insurance cover my radiation treatments?
- Is financial assistance available?
- Is transportation assistance available?

03 glossary

Angiogenesis inhibitor—Drug given during cancer treatment to prevent the growth of new blood vessels that tumors need to grow

Antigen—Any substance that causes the body to make an immune response against that substance. Body tissues and cells, including cancer cells, have antigens on them that can cause an immune response

Brachytherapy—A type of radiation therapy in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called implant radiation therapy, internal radiation therapy, and radiation brachytherapy

Bronchoscopy—A procedure that uses a bronchoscope to examine the inside of the trachea, bronchi, and lungs. A bronchoscope is a thin tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue; this tissue can then be checked under a microscope for signs of disease. The bronchoscope is inserted through the nose or mouth

Chemotherapy—Treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing

Clinical trial—A type of research study that tests how well new medical approaches work in people. These studies test new methods of screening, prevention, diagnosis, or treatment of a disease. Also called clinical research trial or study

CT scan—A procedure that uses a computer linked to an X-ray machine to make a series of detailed pictures of areas inside the body. The pictures are taken from different angles and are used to create three-dimensional (3D) views of tissues and organs. A dye may be injected in a vein or swallowed to help the tissues and organs show up more clearly. Also called CAT scan and computed tomography scan

Cytokine—Any of a class of immunoregulatory proteins that are secreted by cells, especially of the immune system. Some cytokines stimulate the immune system, while others slow it down

Dendritic cell—A special type of immune cell that is found in tissues and boosts immune responses by showing antigens on its surface to other cells of the immune system

DNA—The molecules inside cells that carry genetic information and pass it from one generation to the next. Also called deoxyribonucleic acid

Esophagus—The muscular tube through which food passes from the throat to the stomach

Extensive-stage small cell lung cancer (ES-SCLC)—Small cell lung cancer (SCLC) that has spread outside the lung in which it began or to other parts of the body

Fraction—One of the number of smaller doses of radiation that together make up the full dosage of radiation to be delivered

Immunotherapy—A type of therapy that uses substances to stimulate or suppress the immune system to help the body fight cancer, infection, and other disease. Some types of immunotherapy only target certain cells of the immune system. Others affect the immune system in a general way

Limited-stage small cell lung cancer (LS-SCLC)—Small cell lung cancer (SCLC) found in one lung, the tissue between the lungs, and nearby lymph nodes only

Lymph node—A small bean-like structure that is part of the body's immune system. Lymph nodes filter substances that travel through the lymphatic fluid, and they contain lymphocytes (white blood cells) that help the body fight infection and disease. There are hundreds of lymph nodes found throughout the body

Lymphocyte—A type of immune cell that is made in the bone marrow and is found in the blood and in lymph tissue. The two main types of lymphocytes are B lymphocytes and T lymphocytes. B lymphocytes make antibodies, and T lymphocytes help kill tumor cells and help control immune responses. A lymphocyte is a type of white blood cell

Macrophage—A type of white blood cell that surrounds and kills microorganisms, removes dead cells, and stimulates the action of other immune system cells

MRI—A procedure in which radio waves and a powerful magnet linked to a computer are used to create detailed pictures of areas inside the body. These pictures can show the difference between normal and diseased tissue. MRI makes better images of organs and soft tissues than other scanning techniques, such as computed tomography (CT) or X-ray. MRI is especially useful for imaging the brain, the spine, the soft tissue of joints, and the inside of bones. Also called magnetic resonance imaging and nuclear magnetic resonance imaging (NMRI)

Non-small cell lung cancer (NSCLC)—A group of lung cancers that are named for the kinds of cells found in the cancer and how the cells look under a microscope. The three main types of NSCLC are lung adenocarcinoma, squamous cell lung cancer, and large cell lung cancer. NSCLC is the most common kind of lung cancer

Oncologist—A doctor who has special training in diagnosing and treating cancer. Some oncologists specialize in a particular type of cancer treatment. For example, a radiation oncologist specializes in treating cancer with radiation

Palliative care—Care given to improve the quality of life of patients who have a serious or life-threatening disease. The goal of palliative care is to prevent or treat as early as possible the symptoms of a disease, side effects caused by treatment of a disease, and psychological, social, and spiritual problems related to a disease or its treatment. Also called comfort care, supportive care, and symptom management

PET scan—A procedure in which a small amount of radioactive glucose (sugar) is injected into a vein, and a scanner is used to make detailed, computerized pictures of areas inside the body where the glucose is taken up. Because cancer cells often take up more glucose than normal cells, the pictures can be used to find cancer cells in the body. Also called positron emission tomography scan

Prophylactic cranial irradiation—Radiation therapy to the head to reduce the risk that cancer will spread to the brain

Proton—A small, positively charged particle of matter found in the atoms of all elements. Streams of protons generated by special equipment can be used for radiation treatment

Pulmonologist—A doctor who has special training in diagnosing and treating diseases of the lungs. Also called pulmonary specialist

Radiation therapy—The use of high-energy radiation from X-rays, gamma rays, neutrons, protons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external beam radiation therapy), or it may come from radioactive material placed in the body near cancer cells (internal radiation therapy, or brachytherapy). Also called irradiation and radiotherapy

Simulation—In cancer treatment, a process used to plan radiation therapy so that the target area is precisely located and marked

Small cell lung cancer (SCLC)—An aggressive (fast-growing) cancer that forms in tissue of the lung and can spread to other parts of the body. The cancer cells look small and oval-shaped when looked at under a microscope

Stage—The extent of cancer in the body. In non-small cell lung cancer (NSCLC), stages range from 0 to IV, where IV is the most advanced stage in which the cancer has spread to other parts of the body from where it started. In small cell lung cancer (SCLC), the same 0 to IV stages may be used, but most often a system with two stages is used: limited-stage disease and extensive-stage disease

Targeted therapy—A type of treatment that uses drugs to identify and attack specific types of cancer cells with less harm to normal cells. Some targeted therapies block the action of certain enzymes, proteins, or other molecules involved in the growth and spread of cancer cells

Thoracic surgeon—A surgeon who has special training in operating on organs inside the chest, including the heart and lungs

Tumor—An abnormal mass of tissue that results when cells divide more than they should or do not die when they should

X-ray—A type of radiation used in the diagnosis and treatment of cancer and other disease. In low doses, X-rays are used to diagnose diseases by making pictures of the inside of the body. In high doses, X-rays are used to treat cancer

04 notes

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