PROCEDURE

Radiation therapy for cancer

Radiation therapy uses high-energy radiation to destroy cancer cells or control their growth.

PURPOSE
Destroy cancer cells, shrink tumours, or relieve cancer symptoms

PROCEDURE TYPE
Therapeutic, delivered externally, internally, or through radioactive medicines

WHERE IT IS DONE
Outpatient clinic; operating theatre or hospital for some internal treatments

ANAESTHESIA
None; sedation or general anaesthesia for some internal treatments

HOW LONG IT TAKES
Minutes per session; internal treatment may take hours or days

PREPARATION
Planning scans, positioning devices, and treatment-area instructions

RECOVERY
Usually same day; driving restrictions after sedation

MAIN RISKS
Fatigue, skin changes, nearby organ damage, later cancers

RESULTS
Assessed over weeks or months using symptoms, examinations, and scans

Overview

Radiation therapy, also called radiotherapy, uses high-energy radiation to damage the DNA inside cancer cells. This stops the cells from growing or causes them to die. Normal cells can also be affected, but many recover better than cancer cells.

Radiation usually treats a specific part of the body. The treatment plan aims radiation at the cancer while limiting exposure to nearby healthy tissue.

The main types are:

Treatment may involve one session or many sessions spread over several weeks. The schedule is chosen according to the cancer, its location, the treatment goal, and the radiation dose that nearby organs can safely receive.

- External beam radiation therapy: A machine directs radiation into your body. You are not radioactive afterward.
- Brachytherapy: A radioactive source is placed inside or close to the tumour, temporarily or permanently.
- Systemic radiation therapy: A radioactive medicine is swallowed or given through a vein. It travels to cells with particular biological features.

Why the procedure is performed

Radiation therapy can be used to cure cancer, reduce the chance that it returns, slow its growth, or relieve symptoms.

It may be your main treatment. It can also be given before surgery to shrink a tumour or after surgery to destroy cancer cells that may remain. Some cancers respond best when radiation is combined with chemotherapy, hormone therapy, immunotherapy, or another medicine.

When cure is not possible, radiation may still improve comfort. For example, it can reduce pain from cancer in a bone, control bleeding, or relieve pressure caused by a tumour. This is called palliative radiation therapy.

Who should and should not have it

Radiation may be considered when the cancer is sensitive to radiation and the tumour can be treated without exposing nearby organs to an unacceptable dose. Your overall health, previous treatments, treatment goals, and personal preferences also matter.

Radiation is not the right option for every cancer. It may be avoided, changed, or delayed when:

Certain connective tissue diseases, implanted electronic devices, infections, or serious health problems may affect planning. They do not always prevent treatment, but the radiation team needs to know about them.

- You have already received a high radiation dose to the same area
- The tumour is too close to an organ that cannot safely receive the planned dose
- You are pregnant, especially when treatment would expose the abdomen or pelvis
- A surgical wound has not healed enough for treatment
- You cannot safely hold the required position, even with support or sedation

- Another treatment is more likely to control the cancer with fewer harms

How to prepare

Your treating facility's instructions take priority because preparation differs by treatment site and radiation type.

Before external beam treatment, you usually have a planning appointment called simulation. A CT scan maps the treatment area. Staff may make a firm mask, body mould, or other support to help you stay in the same position each time. Small permanent tattoo dots or temporary skin marks may guide positioning.

Tell the team if you could be pregnant, have an implanted device such as a pacemaker, or have previously received radiation. Give them a complete list of medicines, supplements, and allergies.

Most external beam treatments do not require fasting. Some treatments require a comfortably full bladder, an empty bowel, or fasting before sedation or anaesthesia. Do not stop blood thinners or other medicines unless your treating team specifically tells you to do so.

Ask whether you need someone to take you home. This is particularly important if you will receive sedation, general anaesthesia, or medicine that makes you drowsy.

What happens during the procedure

For external beam therapy, you lie on a treatment table in the position used during planning. Staff align you using skin marks, imaging, and positioning equipment. The machine may move around you, but it does not touch you.

You must remain still, although you can breathe normally unless instructed otherwise. Staff leave the room while radiation is delivered, but they can see and hear you. The radiation itself cannot be seen or felt. Most of the appointment is spent positioning you; delivery often takes only a few minutes.

For brachytherapy, an applicator, tube, seeds, or another device places the radioactive source in or near the tumour. Placement may require local anaesthetic, sedation, or general anaesthesia. The source may remain for minutes, hours, days, or permanently. Temporary sources are removed after treatment.

Systemic radiation is given as a capsule, drink, injection, or infusion. Because radiation may remain in body fluids for a period, you may receive temporary instructions about distance from

others, toilet use, laundry, and contact with children or pregnant people.

Recovery and what to expect afterward

Pain: External beam radiation is painless during delivery. Skin soreness, mouth or throat pain, bladder irritation, or discomfort in the treated area may develop later. Brachytherapy can cause temporary pain where an applicator was placed. Tell your team about pain so it can be assessed and managed.

Eating: You can usually eat normally after external beam treatment. Radiation to the head, neck, chest, abdomen, or pelvis may affect swallowing, appetite, nausea, or bowel habits. A dietitian can help you maintain nutrition and hydration.

Activity: Light activity is often possible and may help with fatigue. Side effects commonly build during a course of treatment and may continue briefly after it ends. Balance activity with rest and follow restrictions related to brachytherapy or systemic radiation.

Driving: You can usually drive after external beam therapy if you feel well and have not received a sedating medicine. Do not drive after sedation or general anaesthesia until the facility says it is safe. Arrange transport if treatment affects your vision, movement, concentration, or strength.

Work: Some people continue working, while others reduce their hours or take leave. Your ability to work may change as fatigue or site-specific effects develop.

Risks and possible complications

Side effects are linked to the body area treated, the dose, the number of sessions, and other cancer treatments. They are not the same for everyone.

Early effects can include fatigue, skin redness or darkening, hair loss limited to the treatment area, nausea, diarrhoea, mouth soreness, swallowing difficulty, or urinary irritation. Blood cell counts may fall if a large area of bone marrow is treated.

Some effects appear months or years later. These may include tissue scarring, persistent bowel or bladder changes, dry mouth, reduced fertility, early menopause, or changes in the function of a nearby organ. Radiation can sometimes weaken treated bone or damage small blood vessels and nerves.

Radiation may slightly increase the long-term chance of another cancer in the treated area. This risk is weighed against the expected benefit of controlling the current cancer.

Brachytherapy also carries risks related to applicator placement, such as bleeding, infection, or injury to nearby tissue. Anaesthesia has its own risks.

Results and follow up

Radiation does not always destroy cancer cells immediately. The treated tumour may continue shrinking for weeks or months, so a scan directly after treatment may not show the final result.

Your team will assess how you are feeling, examine the treated area, and arrange blood tests or imaging when appropriate. The timing differs by cancer type because treatment-related swelling can make early scans difficult to interpret.

Routine follow-up also checks for side effects and signs that the cancer has returned or progressed. Keep these appointments even if you feel well. Ask which team will manage long-term effects and when you should return to your usual cancer specialist or primary care clinician.

Alternatives

The alternatives depend on the cancer and the goal of treatment. In some situations, more than one approach offers a reasonable chance of control.

Proton therapy is another form of external beam radiation. It can reduce the radiation dose beyond some tumours, but it is not proven to be better for every cancer and may not be locally available.

- Surgery removes the tumour directly and may provide detailed tissue results. It is more invasive and may require anaesthesia and a longer recovery.
- Chemotherapy, targeted therapy, hormone therapy, or immunotherapy can treat cancer throughout the body. They may be better for cancer that has spread, but can affect healthy cells beyond one treatment area.
- Ablation destroys selected tumours using heat, cold, or another energy source. It is less invasive than major surgery but only suits certain tumour sizes and locations.
- Active surveillance delays treatment while the cancer is monitored. It avoids immediate side effects but carries a risk that the cancer will grow or require treatment later.
- Supportive or palliative care without radiation focuses on comfort using medicines and other treatments. It avoids radiation side effects but may not control the tumour as effectively.

- A clinical trial may provide access to a newer radiation method or another treatment. Benefits and uncommon harms may be less certain.

When to call your healthcare team

Contact your radiation team during routine hours about worsening skin changes, persistent nausea, trouble eating, increasing diarrhoea, urinary discomfort, new pain, or fatigue that interferes with daily activities. These effects may need treatment, but they are not usually emergencies.

Seek urgent advice for a fever when your team has warned that your blood counts may be low, repeated vomiting, inability to keep fluids down, rapidly increasing swelling, uncontrolled pain, heavy bleeding, or signs of infection around a brachytherapy insertion site.

Call emergency services for severe trouble breathing, severe chest pain, fainting, a seizure, sudden confusion, new one-sided weakness, or bleeding that will not stop.

Common questions

Will I be asleep?

External beam radiation is usually given while you are awake. Some brachytherapy procedures require sedation or general anaesthesia for placement of the radioactive source.

Can I drive home?

Usually, yes, after external beam treatment if you feel well. You need someone else to drive after sedation or general anaesthesia, and whenever your symptoms or medicines make driving unsafe.

How painful is radiation therapy?

You do not feel external radiation entering your body. Soreness may develop later in the skin or organs within the treatment area. Brachytherapy placement can cause temporary discomfort.

Will I be radioactive afterward?

Not after external beam therapy. Temporary precautions may be needed after brachytherapy or systemic radioactive medicine. Your team will explain how long they apply.

When will I know whether it worked?

Results are usually assessed over weeks or months. The timing of examinations, blood tests, or scans is based on your cancer and the expected healing period.

Will I lose my hair?

Only hair within the treated area is affected. It often grows back, although regrowth may be thinner or incomplete after a higher dose.

Sources

- National Cancer Institute. Radiation Therapy to Treat Cancer
- National Cancer Institute. External Beam Radiation Therapy for Cancer
- National Cancer Institute. Brachytherapy to Treat Cancer
- National Health Service. Radiotherapy
- American Cancer Society. Getting External Beam Radiation Therapy
- American Cancer Society. Internal Radiation Therapy