Radiotherapy

This information is about radiotherapy treatment for lymphoma.

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Radiotherapy is a treatment that uses radiation to destroy cancer cells.

What is the aim of radiotherapy?

You might have radiotherapy with the aim of curing your lymphoma (curative radiotherapy) or to control your symptoms (palliative radiotherapy). Not everyone who has lymphoma has radiotherapy.

How often will I have treatment and how long does it take?

A course of radiotherapy usually involves an initial ‘planning session’. Treatment then usually starts on a different day. Your doctor decides how many treatments (‘fractions’) of radiotherapy you should have; this can vary from a single treatment, to treatment 5 days a week over 3-4 weeks. You usually have it once a day, Monday to Friday, with a rest at the weekend.

Is radiotherapy painful?

You cannot feel radiotherapy; it is painless.

What are the side effects of radiotherapy?

It is quite common to feel tired after radiotherapy. Other side effects depend on the area of your body that is treated with radiotherapy and the type of radiotherapy you have.

What is radiotherapy?

Radiotherapy uses high energy X-rays and other types of radiation. The treatment has been used successfully to treat lymphoma for over 50 years.
How does radiotherapy work?

Lymphoma is a type of cancer. It develops when lymphocytes (specialised white blood cells) grow out of control and build up in the lymph nodes and other organs. This can happen when lymphocytes divide more often than normal. It can also happen when they do not die when they should.

Radiotherapy causes damage to lymphoma cells in the treated area, which means that they die off with time. Although surrounding healthy cells can also be affected by radiotherapy, they can repair themselves and recover. Lymphoma cells are much more sensitive to radiotherapy than most other types of cancer cell. The dose of radiation needed to treat lymphoma is therefore relatively low, so side effects are often mild.

Radiotherapy is a local treatment, which means it only affects the part or parts of the body being treated. Radiotherapy is painless and does not make you radioactive.

Radiotherapy for lymphoma

You might have radiotherapy with the aim of curing your lymphoma or to control your symptoms.

Radiotherapy to cure lymphoma (curative radiotherapy)

Radiotherapy is often used with the aim of curing the lymphoma by destroying all of it.

Depending on which type and stage of lymphoma you have, your treatment might involve radiotherapy alone, or a combination of chemotherapy and radiotherapy.

- Some types of lymphoma that are low grade or ‘indolent’ (slow-growing) can be cured with radiotherapy alone if they are at an early stage.
- High-grade lymphomas that are early stage are often treated with chemotherapy followed by radiotherapy.
- High-grade lymphomas that are at a more advanced stage are usually treated with chemotherapy. You may also have some radiotherapy after finishing your chemotherapy.
Radiotherapy to control symptoms of lymphoma (palliative radiotherapy)

Sometimes, radiotherapy is used to control symptoms such as pain and discomfort. This is known as ‘palliative radiotherapy’. It helps by reducing the size of the lymphoma.

When will I have radiotherapy?

Radiotherapy might be your only treatment, or you might have it after chemotherapy.

When both chemotherapy and radiotherapy are used, the aim is that:

- Chemotherapy treats the main area of the lymphoma. It also destroys small clusters of lymphoma cells that are some way away from the main site (area) of the disease.
- Radiotherapy then targets the main site of the lymphoma. With curative radiotherapy, this aims to increase the likelihood that the lymphoma is completely destroyed.

It is unusual for a lymphoma to relapse (come back) in a part of the body that has already been treated with curative radiotherapy.

Which types of lymphoma does radiotherapy treat?

Radiotherapy for Hodgkin lymphoma

You might be treated with radiotherapy if you have:

- **Classical Hodgkin lymphoma** that is at an early stage, after a course of chemotherapy.
- **Advanced Hodgkin lymphoma**, sometimes if there are very enlarged (bulky) lymph nodes or areas that seem not to have completely responded to chemotherapy.
- **Nodular lymphocyte-predominant Hodgkin lymphoma** (NLPHL) that is at an early stage. In these cases, radiotherapy alone is often recommended.
Radiotherapy for non-Hodgkin lymphoma

Radiotherapy is used to treat many types of non-Hodgkin lymphoma. You might be treated with radiotherapy if you have a:

- Low-grade or ‘indolent’ (slow-growing) non-Hodgkin lymphoma, such as follicular lymphoma or marginal zone lymphoma. In these cases, it can be used if the lymphoma is localised to just one area with the aim of cure. If the lymphoma is more widespread, palliative radiotherapy might be used to control symptoms.

- High-grade or ‘aggressive’ (fast-growing) types, such as diffuse large B-cell lymphoma (DLBCL). If the lymphoma is at an early stage, treatment often involves a course of chemotherapy followed by radiotherapy. If the lymphoma is more advanced, chemotherapy is usually given. Nonetheless, radiotherapy can be used after chemotherapy to treat areas of lymphoma that were large before chemotherapy. It may also be given after chemotherapy to areas that may not have responded completely to chemotherapy.

What types of radiotherapy are there?

The type of radiotherapy and length of treatment depends on where the lymphoma is and the aim of the radiotherapy.

Most radiotherapy is given by high energy X-rays (photons). These are produced by a linear accelerator (Linac) machine and can be given in different ways, including:

- single beams
- multiple beams
- intensity modulated radiotherapy (IMRT), which shapes the dose delivered using lots of beams.
Your clinical oncologist (a doctor who specialises in the treatment of cancer) chooses the most appropriate method for you.

Usually, you walk into the machine and lie on a couch.

*Figure: Radiotherapy machine. Image courtesy of Leeds Teaching Hospitals NHS Trust*
Sometimes, if the lymphoma is on the skin or near the surface, electron beam therapy may be recommended. Electrons are tiny particles of radiation that are unable to travel very far in the body. This keeps them to within a short distance under the skin, which means that they cannot affect tissues that are deeper than this.

Electrons are produced by a linear accelerator machine that has an ‘applicator’ connected to the head of the machine. The applicator directs electrons to the area of your body that is to be treated. When the machine is set up, the applicator is brought very close to you and may even touch you. You won’t feel anything during the treatment, though.

Three types of radiotherapy are occasionally used in particular circumstances: total body irradiation (TBI), total skin electron therapy (TSET) and proton beam therapy (PBT).

**Total body irradiation (TBI)**

Total body irradiation (TBI) is a type of high energy X-ray radiotherapy that is delivered to the whole body.

If you need an *allogeneic (donor) stem cell transplant*, you might have TBI as part of your conditioning treatment before the procedure. This helps to destroy your own *bone marrow* (a part of larger bones, where blood cells are made). In doing so, space is made for the healthy new stem cells, which stops you rejecting the transplant.

TBI can be given as a single dose or twice a day over several days. Your radiotherapy team should talk you through your treatment plan.

**Total skin electron radiotherapy (TSET)**

Total skin electron radiotherapy (TSET) is a specialised technique for *skin lymphoma*. Electrons are used to treat the whole skin surface. There are different ways of doing this. Your doctor should explain which technique is best for you.
Proton beam therapy (PBT)

Proton beam therapy (PBT) is a type of radiation therapy that uses charged particles (protons) instead of X-rays (photons) to deliver radiation to tumour cells. This type of radiation beam can target treatment more precisely so less radiation reaches surrounding healthy tissues. This might reduce some of the long-term side effects (late effects) of radiotherapy.

PBT is most useful for:

- treating cancer in children, who have a higher risk of developing late effects
- cancers that need to be treated with a high radiation dose and that are very close to important structures, such as the brain or spinal cord.

At the moment, there is not enough evidence to confirm whether or not PBT has better long-term outcomes than modern radiotherapy for adults with lymphoma. Scientists are carrying out further research to find out if it could be helpful.

PBT is not currently available on the NHS for adults with lymphoma. It is available privately at some centres in the UK and abroad. The exact techniques and treatments vary from centre to centre.
Where will I have radiotherapy?

You need to go to hospital for your treatment to be planned and each time you are given radiotherapy.

You may have to travel for radiotherapy if your local hospital does not have a radiotherapy department. Not all hospitals have a radiotherapy department because the equipment is very expensive and requires a dedicated treatment room. Staff members giving radiotherapy are also highly specialised.

Radiotherapy for lymphoma is usually given Monday to Friday. The length of treatment can vary from a single day to 4 weeks. Don’t worry if your schedule differs from this – your treatment plan is designed specifically for you and your medical team will talk you through it beforehand.

How much radiotherapy will I need?

The total dose of radiotherapy, measured in Gray (Gy), is split into separate treatments or ‘fractions’. Highly trained specialists calculate the right dose of radiation for you.

Palliative radiotherapy can be very effective when given in just one fraction; however, it might be given over a longer course.

Curative radiotherapy is usually given over a few weeks and treatment sessions are spread out to give healthy cells a chance to repair between treatments. Giving treatment in fractions also increases the likelihood of the treatment reaching the lymphoma cells at a time when they are most sensitive to radiotherapy.

Modern techniques and knowledge mean that it is possible to use a much lower total dose of radiotherapy and to target lymphoma cells more accurately than in the past. This reduces the side effects caused by radiation to healthy cells. At the same time, it allows successful treatment of the lymphoma.
How is radiotherapy planned?

Radiotherapy needs careful planning. This is to make it as effective as possible and to minimise side effects.

When you and your medical team have decided on radiotherapy, you are under the care of a clinical oncologist.

During planning, the radiotherapy team make sure that the right amount of radiotherapy is delivered to precisely the right place. They look at:

- exactly where the lymphoma is – this area will receive the most of your total dose of radiotherapy
- the area around the lymphoma – this area may receive a smaller amount of radiotherapy if there is a risk that some lymphoma cells have spread there
- organs at risk – critical structures in the body (such as the brain, heart, and salivary glands). Your treatment is planned to protect these organs from radiation in order to prevent damage to them.

You won’t receive radiotherapy to the rest of your body unless you are having total body irradiation (TBI).

How your radiotherapy is planned

You may first have a radiotherapy mask made to help keep you in the same position for each treatment.

For most treatments, radiotherapy is planned with a computed tomography (CT) simulator scan (also known as a ‘CT planning scan’). This transfers images to a radiotherapy planning system to help plan your radiotherapy.

For some treatments (usually electron treatments), after you have been positioned ready for treatment, your doctor might use a felt-tipped-like pen to mark the area to be treated.
When you have the CT simulator scan, marks are often made on your skin (unless you are being treated for lymphoma in the head and neck area). Some of these are made using ink, with a felt-tipped-like pen. You may also need a few permanent marks (‘tattoos’) – usually two or three tiny dots of ink just under the surface of your skin. When you have your treatment, the marks are lined up with the X-ray beams on the treatment machine to make sure the radiotherapy goes to exactly the right place. You might also be given an injection of a ‘contrast agent’ (dye) through a drip into one of your veins, which helps your doctor to plan your treatment.

The CT simulator scan is used to make a detailed 3D map. The map shows where the lymphoma is and the exact positions of nearby tissues and organs. This information is given to your clinical oncologist and to the radiotherapy physics team. Using computer software, they work out how best to direct the X-ray beams to treat the lymphoma while keeping radiation to nearby parts of the body low. They work within limits of radiation that are known to be safe.

A clinical oncologist approves the radiotherapy treatment plan.

In some hospitals, you may have a practice or ‘dummy run’ to allow the radiotherapy team to check the treatment before you are given it.

When you have your treatment, the marks are lined up with the X-ray beams on the treatment machine. This is to ensure that the radiotherapy goes to exactly the right place.

**Treatment shell or mask**

If you have radiotherapy treatment for lymphoma in the head and neck area, you will probably have a thin plastic shell or mask made. The mask helps to get you into the same position each time you have treatment and also helps to keep you still during each treatment.
The shell is usually made from a sheet of thermoplastic. The thermoplastic is softened in warm water for a couple of minutes to make it mouldable. The sheet is then gently laid over your face. You need to stay still while it cools and sets into the shape of your face – this doesn’t take long and most people say it doesn’t feel unpleasant.

After your shell is made, the radiographers make marks on it to line the radiotherapy beams up with. This ensures that the radiotherapy goes to exactly the right place.

I had to have a head and neck ‘shell’ or ‘mask’ made to ensure I received radiotherapy to exactly the same position each time. I found it very odd that I could only see from one angle. I was able to breathe easily, though I found that the best way to cope was to think about totally different things.

– Julian, diagnosed with nodal marginal zone lymphoma
The thought of wearing a shell might seem daunting but most people find it OK, even if they feel nervous beforehand. Holes in the shell over your mouth allow you to breathe easily and often extra holes can be cut out over your eyes and nose. Staff will try to make you feel as comfortable as possible. If you are worried about wearing a mask, let your medical team know. They are very used to this and can give you suggestions to help you feel more relaxed.

What happens during a radiotherapy session?

You are treated by a radiographer using a linear accelerator machine. This produces high-energy X-ray beams, which deliver an accurate dose of radiation inside the body.

The total time for each treatment session is typically about 10–20 minutes. Most of this time is spent getting you into the correct position to receive the radiotherapy.

Setting up

- You will be in a linear accelerator room, usually lying down on a couch. Staff will take time to get your positioning exactly right. They will check that you are comfortable and that you know what to expect.
- The lights will be dimmed. You will probably notice a beam of light coming from the head of the machine. There will also be some coloured laser beams that come from different points around the room. Laser beams are not harmful. They guide the radiographer to get you and the machine into the correct position.

Having your radiotherapy

The radiographers turn on the lights fully and then leave the room. They then turn on the machine.
• From outside the room, the radiographers watch you on closed-circuit television (CCTV). They can see and hear you the whole time, and you will be able to hear them, too.

• The radiation is given for only a few minutes. The machine makes a whirring noise but you don’t feel anything. Sometimes the radiographers take X-ray or CT images during the treatment session. These are to ensure you are in the correct position – they are not to check that the treatment is working.

• You should feel fine immediately after the treatment and the radiographers will come back into the room to help you up.

What side effects might I have?

Your medical team should advise you on whether they expect you to have side effects during or soon after your treatment. They should also talk to you about any possible late effects you might have. Late effects are health problems that first appear weeks, months or years after treatment has finished.

The side effects you experience depend on which area of your body is treated and the type of radiotherapy you have. Generally, other than tiredness, radiotherapy only causes side effects in the area being treated.

The side effects listed here are intended as a general guide. Please note, however, that the side effects you experience will depend upon which part of your body is being treated and the dose of radiotherapy you have.

Shorter term side effects can include:

• fatigue
• sore skin
• sore mouth
• nausea
• diarrhoea
• hair loss.
Fatigue

Most people feel tired after radiotherapy. You may even experience **fatigue** – an extreme tiredness that doesn’t go away after rest or sleep. Fatigue can be difficult to cope with, both physically and emotionally. There are **things you can do to help**. It may also be helpful to arrange for a friend or relative to provide you with transport to and from the hospital each time you have treatment.

I found the whole process of having radiotherapy quite exhausting. The journey to hospital, waiting for my treatment session to be completed and then travelling home.

— Julian, diagnosed with nodal marginal zone lymphoma

Sore skin

Some people experience temporary changes to the skin around the treatment area after radiotherapy, which can include:

- soreness that feels a bit like sunburn
- darkening of the skin
- reddening of the skin.

Whether you have sore skin depends on the natural sensitivity of your skin and the area of your body treated. Generally, any changes to your skin improve within a few weeks after finishing treatment.

If your skin becomes very sore during treatment, or if you have a reaction that leads to blistering, your medical team might advise that you have a short break from treatment to allow your skin to recover.

There are lots of **things you can do** to help with sore skin. You can also ask your medical team about how best to care for your skin during and after radiotherapy treatment.
Mucositis happens when the mucous membrane (soft tissue that lines the inside of your mouth and throat) becomes inflamed (swollen, red and painful). This can cause pain when swallowing and mouth ulcers (sores). Sore mouth and throat is more common after radiotherapy to the head and neck, particularly at high doses. It typically occurs a couple of weeks after you begin treatment. The risk of sore mouth and throat increases if you are have radiotherapy after chemotherapy.

Sore mouth and throat usually recovers once you finish your treatment, but it can take several weeks.

Ask your medical team how they can help if you have a sore mouth. There are also some simple measures you can take to help relieve pain.

Nausea (feeling sick)

You may feel sick during or for a little while after having radiotherapy and you might actually be sick. Nausea is more likely if the area of your body being treated is around your stomach.

Let your medical team know if you experience nausea – they may be able to prescribe anti-emetics (medication to stop you from feeling sick). There are some simple things you can try to help reduce nausea, too.

Diarrhoea

If you have radiotherapy to the abdominal (stomach) or pelvic area, you might experience diarrhoea. This usually begins several days after starting treatment with radiotherapy and can last for a few weeks.

If you have diarrhoea, tell a member of your medical team so that they can help you to manage it. They may prescribe medication or suggest some steps you can take that may help.
Hair loss

As radiotherapy is given only to a precise area of the body, you will only lose hair from this area.

In general, hair loss happens gradually towards the end of radiotherapy treatment, although it varies from one person to another.

It usually takes around 6–12 months for hair to grow back after treatment has finished. For a small number of people, hair loss in the area treated with radiotherapy is permanent.

What late effects might I have?

Late effects are health problems that first appear weeks, months or years after treatment has finished.

Not everyone gets late effects. The late effects you have depend on which area of the body was treated with radiotherapy. Your doctor should talk to you about possible late effects before you begin treatment.

Dental problems

Radiotherapy to the head and neck can increase your risk of tooth decay later. Have regular check-ups with your dentist and follow their advice to keep your teeth healthy.

Eye problems

If you’ve had radiotherapy to an area that includes your eyes, you might have dry eyes. This can be a short-term or a permanent problem. Ask your doctor if there are any treatments that could help. You are also at increased risk of developing cataracts (cloudy patches in the lens of your eye that reduce your vision) in the future. Have regular check-ups with your optician as your prescription may change slightly during treatment and for a short while afterwards.

Heart problems

Radiotherapy can increase the risk of heart problems years later if your heart is in or near the treated area. To minimise this risk, it is sensible to avoid smoking and keep to a healthy lifestyle.
**Mouth dryness**

This can occur if your salivary glands are treated and depending upon the radiotherapy dose can be a long term effect.

**Reduced fertility**

There is a risk of **infertility** if the testes or ovaries are close to the area treated with radiotherapy. This can happen when treatment is given near to the scrotum for men, and near to the pelvis for both men and women. Your doctor will advise if this is the case.

It is important to note that even if there is a risk of an effect on your fertility, radiotherapy does not guarantee infertility; you should use a reliable method of contraception during and for some time after radiotherapy – your medical team will advise you for how long.

If you are of (or younger than) reproductive age, talk to your medical team about **preserving your fertility** before you begin treatment.

**Risk of developing a cancer related to radiotherapy**

There is a small risk that radiotherapy can cause a cancer to develop in or near the treated area years later; however, this is rare. Ask your medical team which cancers you are at a higher risk of developing. Make sure you know the symptoms of these cancers – cancer is usually more treatable when it is diagnosed early. **Cancer Research UK** has information about different types of cancers. It is important to avoid smoking to reduce the risk of developing other cancers.

**Lung problems**

Radiotherapy to the chest can cause inflammation or scarring to part of your lungs, which can lead to a cough or shortness of breath. Your radiotherapy will be planned to keep this risk as low as possible. It’s particularly important **not to smoke** if you have had radiotherapy to the lungs.
Thyroid problems

Radiotherapy to the neck or upper chest can affect your thyroid gland, which may then make less of the hormone thyroxine. This is called ‘hypothyroidism’ and can slow your metabolism (the speed at which your body uses energy). Hypothyroidism can make you feel cold and tired, and make you gain weight easily.

The risk of developing hypothyroidism is higher in the first five years after treatment but remains increased after this time. Hypothyroidism is usually picked up early by regular thyroid function blood tests. If you have hypothyroidism, your doctor can prescribe thyroxine tablets to treat it.

You should have regular thyroid function tests. Tell any doctors treating you that you have had treatment for lymphoma so that they are aware of your increased risk of thyroid problems.

How will I be followed-up after treatment?

After finishing your treatment for lymphoma, you will have regular follow-up appointments at the hospital. These involve conversations and physical tests with a member of your medical team.

The aim of follow-up is to:

- monitor your recovery from treatment
- check for signs of relapse (the lymphoma coming back)
- manage any late effects of treatment.

How often you are followed-up depends on several factors. These include the type of lymphoma you had, how long it’s been since you had treatment and whether you were treated as part of a clinical trial.
Frequently asked questions

Below are some frequently asked questions about radiotherapy. You may find it reassuring to know that radiotherapy is closely supervised by highly skilled radiographers who should explain everything as you go through the process; however, do not hesitate to ask questions – your medical team are used to going over things and want to help you.

Will radiotherapy make me radioactive?

Radiotherapy will not make you radioactive. Those around you, including children, are not at any risk from being near to you after you have had treatment.

Can I take someone into the room with me when I have radiotherapy?

It can be helpful to take someone with you to the hospital for emotional support. However, friends or family members are asked to wait outside the treatment room.

Can I call for attention during treatment if I need to?

Your radiography team can see and hear you the whole time during treatment; you will be able to hear them, too. You can call for attention simply by asking for it or by raising a hand.

Is it safe to have radiotherapy if I have a pacemaker (cardiac rhythm device)?

Generally, people who have a pacemaker can have radiotherapy. However, the radiation can affect how the pacemaker works. Your medical team will carefully monitor you during your treatment to ensure that it works as it should.
Is it safe to have radiotherapy while I am pregnant?

Doctors may wait until after you have given birth before giving you radiotherapy. If you require treatment urgently, they might advise you to go ahead with treatment while taking suitable precautions.

Can I breastfeed if I am having radiotherapy?

Speak to your doctor if you are breastfeeding or plan to breastfeed and radiotherapy has been recommended for you. The safety of breastfeeding depends on which areas of your body receive treatment and the type of radiotherapy you have.

Note: if you are also having drug treatment (such as chemotherapy), you may be advised not to breastfeed during and for a while after treatment.

We have more information about treatment for lymphoma during pregnancy.

We have separate information about the topics in bold font. Please get in touch if you’d like to request copies or if you would like further information about any aspect of lymphoma. Phone 0808 808 5555 or email information@lymphoma-action.org.uk.

References

The full list of references for this page is available on our website. Alternatively, email publications@lymphoma-action.org.uk or call 01296 619409 if you would like a copy.
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