Radiotherapy briefsheet

Thanks to Cancer Research UK's pioneering work, thousands of people are successfully treated with radiotherapy in the UK every year. None of our progress in this vital area would have been possible without the generosity of our supporters. Each year, we spend around £3.5 million on research to further improve radiotherapy so that more lives can be saved in the future.

What is radiotherapy?

Radiotherapy is a way of treating cancer with radiation – usually in the form of X-rays. Along with surgery and chemotherapy, it is one of the cornerstones of cancer treatment.

How many people get radiotherapy?

About four in ten people who have cancer receive radiotherapy as part of their treatment. In fact, radiotherapy helps cure more people than cancer drugs.

When might you have radiotherapy?

People have radiotherapy at different stages of their cancer journey. It is used to treat cancer, to shrink tumours before doctors operate, or after surgery to kill any cancer cells that are left behind. It is also used to control symptoms such as pain, for example, if cancer has spread to the bones. Radiotherapy can be given on its own or used in combination with other treatments.

Why do we need it?

Radiotherapy is a really effective way of treating some cancers. It provides an option for people unable to have surgery. And it can be used to treat cancers such as brain tumours that are difficult to remove completely with surgery because of where they are in the body.

Are there side effects?

Patients can experience short and long-term side effects because some healthy cells will also be affected by the radiation. But unlike chemotherapy, which can affect the whole body, side effects mainly occur within the area being treated.

How is radiotherapy given?

External radiotherapy is most common. This is where beams – usually X-rays – are aimed at a tumour from outside the body. Other patients may have internal radiotherapy – where radioactive material is placed in or close to the tumour, or they drink a radioactive liquid that is taken up by cancer cells.

How long is treatment?

People usually have external radiotherapy daily from Monday to Friday over a set number of weeks.

A patient receiving radiotherapy

Did you know?

Doctors prescribe radiotherapy treatments in numbers of 'Gray' – the unit that measures how much radiation your body absorbs. It is named after Hal Gray, a pioneer in radiotherapy who was funded by Cancer Research UK in the 1930s–60s.

100 years of radiotherapy – our impact

- Our pioneering research laid the foundations of modern radiotherapy, from its earliest beginnings to the present day. And, thanks to the generosity of our supporters, we continue to be world leaders in this field.
- We funded many of the pioneers, physicists and radiologists, who established the principles of radiotherapy early on in the twentieth century, and developed it as a cancer treatment.
- In the 1980s, we were at the forefront of research to develop a new type of radiotherapy, called IMRT. This targets cancer incredibly precisely and so limits damage to healthy cells. IMRT works by varying the intensity of radiation within each beam to fit the 3D shape of the cancer. This allows doctors to maximise the dose of radiation to a cancer while protecting vital organs nearby. IMRT could benefit one in five cancer patients each year in the UK.
- In the 1990s, we developed CHART, a type of radiotherapy that is delivered in many small doses over a much shorter period of time than conventional radiotherapy. This could mean fewer hospital visits for patients. CHART has shown promising results, particularly in lung cancer, but it is not yet widely available in the UK and research is ongoing.
- In 2008, we opened our flagship radiobiology institute in Oxford to take us into a new era of radiotherapy.
- And we are urging the government to ensure that all cancer patients can access radiotherapy when they need it.

Radiotherapy – our research

Over the years, we have made huge leaps in our understanding of cancer biology, and technology has accelerated at an incredible pace. These advances mean that, today, radiotherapy helps to cure more people and is kinder to patients. But we still have more work to do.

A new dawn for radiotherapy

As part of our five-year strategy, we're boosting research into radiotherapy and investing in the next generation of experts. We're funding research in two hubs – Oxford and Sutton – and in other key locations across the UK including Belfast, Leeds, London and Manchester. Our goal is to make radiotherapy more precise and more effective, saving more lives and reducing side effects. Here are some examples of our current research.

The Cancer Research UK – MRC Gray Institute for Radiation Oncology & Biology

In 2008, we launched our world-class radiobiology institute in Oxford, jointly funded with the Medical Research Council. Almost 200 scientists work at the Institute, who have been recruited from all over the world.

Under the leadership of Professor Gillies McKenna, scientists here are pushing the boundaries of radiobiology research. In particular, they're tackling the major challenge of how to make cancer cells more susceptible to radiation while protecting healthy cells from damage.

'This is an exciting time to be involved in radiotherapy research, as there are so many new possibilities on the horizon. Finding new ways of targeting tumours more precisely with radiation and making tumours more susceptible to radiation will benefit many cancer patients in the future.'

Professor Gillies McKenna

New treatments

A new way of giving radiotherapy is through radioactive drugs, called 'radiopharmaceuticals', which are designed to home in on cancer cells. The drugs then give out radiation, damaging the cancer cells' DNA and causing them to self-destruct. Because the radiation only travels a very short distance, the surrounding healthy cells shouldn't be harmed. This means fewer side effects for patients.

Our scientists are working on different types of these radioactive drugs. Dr Kate Vallis in Oxford is developing and testing radiopharmaceuticals to treat breast cancer, and head and neck cancer. And Professor Tim Illidge in Manchester is developing them for leukaemia and lymphoma.

Dr Kate Vallis

PHOTO: MATT COOKE

Image-guided radiotherapy

For many years, we have funded the pioneering research of Professor Alan Horwich, a cancer doctor who specialises in treating patients with radiotherapy. He and Professor Steve Webb at The Institute for Cancer Research, Sutton, were at the heart of work to develop IMRT.

Their current research uses imaging techniques and computer modelling to take into account changes in the size and shape of a tumour over the course of radiotherapy treatment. This means doctors can then make adjustments to the position of the radiation beam.

So-called 'image guided radiotherapy' is the latest development in radiation technology. The team is currently testing this approach in people with breast, prostate or bladder cancer.

Clinical trials

We currently fund over 25 trials testing ways to improve radiotherapy. They include changing the size and number of doses, combining radiotherapy with other treatments, such as chemotherapy, and investigating different types of radiotherapy such as IMRT or image guided radiotherapy.

Over the years, our radiotherapy trials have made a big difference to cancer patients. For example, in 2008, results from a trial we funded changed the guidelines for how to treat early breast cancer. It showed that fewer but larger doses of radiotherapy are just as effective as the standard treatment. Thanks to our work, women with early breast cancer can now have shorter treatment schedules and fewer hospital visits.

Spotlight on IMRT

Case study: David Jenkins

'In 2006, I was treated for throat cancer at the Royal Marsden Hospital. I was lucky enough to take part in the PARSPORT trial, funded by Cancer Research UK. They were testing a more subtle and sophisticated approach to treating head and neck cancer. I had 30 days of radiotherapy after two lots of chemotherapy. Before treatment, I had several tests so the doctors knew exactly where to aim the radiotherapy beams. I had virtually no side effects – all the way through treatment and afterwards, I could eat, drink and taste perfectly normally. I sailed through. All in all, I was incredibly lucky in the way IMRT worked for me. Thanks to the trial, I now lead a completely normal life again.'

Results from this groundbreaking study showed that IMRT is an effective treatment which reduces side effects for patients with head and neck cancer. IMRT is now being rolled out in centres across the UK to treat this type of cancer, which affects half a million people worldwide.

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