University College Hospital

Intensity Modulated Radiotherapy (IMRT): a guide for patients

Radiotherapy Department
Patient information series

№ 55
If you need a large print, audio or translated copy of the document, please contact us on:

020 3447 3711 (Direct line)
020 3456 7890 ext 73711/bleep 1458
0845 155 5000 ext 73711/bleep 1458

We will try our best to meet your needs.
Contents
What is radiotherapy and how does it work? 5
What is Intensity Modulated Radiotherapy (IMRT)? 6
How will my treatment be planned? 7
How is the radiotherapy treatment given? 8
If IMRT is so good, why isn’t it used for everyone? 8
What are the drawbacks of IMRT? 9
What side effects may be improved with IMRT? 9
More information 10
Useful contact numbers 10
Space for notes and questions 11
What is radiotherapy and how does it work?

Radiotherapy is treatment using high energy X-rays, aimed specifically at the site of the cancer. Most people with cancer will have radiotherapy as part of their treatment.

Radiotherapy has clear benefits since it is a localised treatment which destroys cancerous cells and reduces the risk of the cancer coming back. Whilst radiotherapy obviously has to be used very carefully, doctors and radiographers have a lot of experience in its use in treating cancer. However, no treatment is completely risk free. A beam of X-rays will affect all cells in its path as it travels through the body to reach the cancer target, and this includes normal cells.

Radiation causes damage to the building blocks of the cells genetic structure: the DNA. We know that the damage radiotherapy does to the DNA of cancer cells results in the cancer cell being less likely to survive. Whilst normal cells are capable of repairing themselves after DNA damage, and thus return to normal, cancer cells are much less capable of doing so and therefore are usually killed by radiotherapy. Therefore, radiotherapy is carefully planned to treat as little of the normal body tissue as possible, whilst at the same time ensuring that the cancer receives the radiotherapy dose it needs to eliminate it. In certain situations, a full dose of treatment with standard radiotherapy techniques cannot be given because of an unacceptably high risk of damage to the normal tissues.

Radiotherapy treatment is a quick and painless procedure. Treatments are normally extended over a period of weeks. This allows normal cells to recover from the effects of radiation. Common treatment prescriptions vary between five and seven weeks, treating daily, excluding weekends. The exact schedule will be decided by your doctor.

In recommending your treatment, your radiotherapy doctor (Clinical Oncologist) has weighed up the risks and benefits. Please do discuss these issues with your doctor or a member of the radiotherapy team if you are worried.
What is Intensity Modulated Radiotherapy (IMRT)?

IMRT is a new way of treating cancer with radiotherapy. It is a technique which allows the treatment team to spare more of the patient’s healthy cells from the effects of radiation, at the same time as giving the cancer the radiotherapy dose it needs.

IMRT uses the same treatment machines as other forms of radiotherapy, but there are differences in the way the treatment is planned and delivered to the patient.

The usual way to give radiotherapy is to aim a beam of radiation at the cancer from outside of the body using a machine called a linear accelerator. The machine moves in a circle around the patient who is lying on a treatment couch and is switched on for approximately a minute when it is in the correct position. Patients will normally need more than one beam of radiation aimed at the cancer to treat it properly, and between two and four beams are usually needed, aimed from various directions, to treat the cancer thoroughly.

Once the beam is switched on, the intensity, or strength, of the beam is the same wherever the beam lands. The overall effect is a little like aiming spotlights at a person on a stage.

IMRT is a new way of giving radiotherapy where the intensity (or strength) of the radiation beam is varied (or modulated) when it is switched on. IMRT allows each radiation beam to deliver different strengths of radiation to cells in different places in its path, allowing healthy cells to be less exposed to radiation than cancerous ones. In combination with an increase in the number of beams (to between five and nine), the treatment team can deliver more tightly focused radiation beams than has been possible in the past. As a result, a precise radiation dose is shaped around the cancer, while reducing the amount of radiation to surrounding healthy cells. To return to the analogy of a person standing on a stage; the overall effect is a little
like shining more spotlights, each with more intense, tightly focussed beams of light onto that person on the stage, but without illuminating the stage at the same time.

IMRT has been shown in several studies, treating different types of cancer, to reduce the volume of normal tissue that receives a high dose of radiation and this, in turn, leads to a reduction in side effects in certain situations. This technique has also allowed doctors to give full, or higher, doses of radiation to cancers without increasing the risk of damaging the surrounding normal tissue to an unacceptable degree.

**How will my treatment be planned?**

IMRT is planned in a very similar way to standard treatment. Both treatments require you to have a CT scan of the area of the cancer. Both treatments require the doctors to define on each picture of the scan where you need radiation (ie. where the cancer cells are) and where you don’t (normal cells). Each treatment then needs the doctors, physicists and radiographers (your treatment team) to work out how to arrange the beams to ensure the cancer gets the dose it needs whilst keeping the side effects to a minimum.

IMRT, however, needs the team to use a more sophisticated computer planning system to arrange the beams of radiation to achieve the best way of treating the cancer. It allows us to vary the intensity of the beams and to use more of them. Once the treatment is planned, both treatments will then require you to undergo a “plan check”, or “dummy run”, in the simulator. This is where the team take measurements and X-rays to ensure the treatment fits you as planned. You will then be ready to start treatment.
How is the radiotherapy treatment given?
The way the treatment is given is almost the same as a standard treatment. With both treatment methods it is important that you are carefully positioned for your treatment. Naturally, careful safety checks are done before each treatment, whatever technique is used.

Because the number of beams is larger with IMRT, and the treatment is more complex, it takes a little longer to do IMRT treatment checks and deliver the treatment itself. A standard daily treatment usually takes 10 minutes, whilst an IMRT daily treatment takes approximately 20 minutes. This allows us to use more beams to treat you, and to perform the necessary safety checks so that we can deliver the treatment as accurately as possible.

If IMRT is so good, why isn’t it used for everyone?
For most patients, standard radiotherapy treatments are now sophisticated enough to deliver to the cancer the dose it needs, and to do this with an acceptable side effect profile. However, there are occasions when IMRT offers a significant advantage to the patient.

IMRT is most useful in the situation when, using standard techniques it would not be possible to deliver the full radiation dose to a cancer without causing serious side effects. Using standard techniques, the doctor would normally need to limit the dose to the area, with the risk of reducing the chance of the treatment being successful. IMRT, however, can sometimes allow the treatment to be given in a way that will reduce the radiation side effects to such a degree that it enables the planned radiation dose to be delivered to the cancer safely.

In some situations both techniques will allow the cancer to be treated to the right dose, but IMRT offers an advantage over standard techniques because it protects healthy tissues better, thus preventing undesirable side effects.
What are the drawbacks of IMRT?

There are now several studies showing that it is possible to reduce the chances of the cancer coming back by allowing a higher dose to be given to the cancer, which could not be done with more conventional treatment techniques.

However, by targeting IMRT treatment more accurately, we are able to avoid damage to the normal tissues by reducing the intensity of the radiotherapy given to the areas surrounding them. Some doctors think that this could increase the risk of the cancer coming back, but studies have not demonstrated this so far.

When treated with radiotherapy you are exposed to increased levels of low-level radiation in areas not included within the radiation fields. Most of this dose comes from the fact that the radiation beams travel through the body on their way to the cancerous areas and beyond it, and is related to the total number of beams. Because IMRT uses more beams, a patient will receive this low level of radiation to a larger volume. Theoretically, this might slightly increase your risk of developing a new cancer in the future.

What side effects may be improved with IMRT?

Side effects of radiotherapy treatment depend on the area being treated. Most side effects from radiotherapy, although unpleasant, are not serious and go away within a few weeks after treatment ends. Your doctor will tell you what side effects to expect and will give you information leaflets describing radiotherapy for your type of cancer.

With your IMRT treatment, the treatment team may have been able to reduce the side effects that you will experience. Your doctor will tell you what to expect.
More information
Your doctor will tell you why they recommend that you have IMRT rather than standard treatment. If there is anything that you would like to discuss regarding your treatment, please let a member of the treatment team know.

Useful contact numbers
Macmillan Information and Support Radiographer
Mark Williams
Direct telephone: 020 3447 3711
Main switchboard: 0845 155 5000
ext 73711
bleep 1458
Alternative switchboard: 020 3456 7890
ext 73711
bleep 1458
Email: mark.williams@uclh.nhs.uk
Space for notes and questions