

Introduction

RADIATION therapy (or radiotherapy) uses radiation such as high-energy X-rays, gamma rays, electrons or charged particles — protons — to directly damage the DNA of cancer cells, thus preventing or slowing cellular replication.

The damage inflicted on malignant cells leads to tumour death, which may reduce tumour size or activity, and help alleviate symptoms caused by cancer.

Radiation therapy is a safe and effective treatment for many cancer types. Highly targeted radiation therapy can be delivered to tumours virtually anywhere in the body.

Malignant cells are more susceptible to the effects of radiation compared with normal, non-cancerous cells, which are more adept at recovering from radiation-induced injury. This results in a 'therapeutic ratio' (effect on cancer cells:effect on normal cells) that is exploited to maximise cancer cell kill, while limiting damage to nearby normal tissues.

Radiation therapy forms an integral part of the treatment protocol in 40% of all curable cancers.

It is a modern, effective cancer treatment modality that has seen remarkable technological improvements over the past decade.

Indications

It has been estimated radiotherapy can potentially benefit one in two patients with cancer at some time through the course of their disease.¹ Radiation therapy can be

Attuned to radio

ONCOLOGY

Remarkable technological improvements over the past two decades make radiotherapy an essential element in cancer therapy.

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effective in a number of indications in the treatment of most cancers.

It may have an important role as a:

- Definitive treatment (primary/radical).
- Adjuvant treatment (post-operatively).
- Neo-adjuvant treatment (pre-operatively).
- Combined treatment with chemotherapy (chemoradiation) and/or other systemic therapies.
- Palliative treatment.

Adjuvant therapy, following wide local excision (lumpectomy) for breast cancer, is commonly used in the curative setting in patients after breast conserving surgery. The combined use of breast conserving surgery and adjuvant whole breast irradiation is equivalent to mastectomy in terms of local control in the treated breast, thereby avoiding this more invasive surgery.

It is also used following mastectomy in high-risk patients, particularly those with nodal involvement. Similarly, radiation therapy is used before or after surgery in patients with bowel cancers at high risk of recurrence.

In many men, radiation therapy is an effective treatment option for radical prostatectomy for localised or locally advanced prostate cancer.

A common misunderstanding is that radiation therapy is only an option for men who cannot have surgery. In fact, nearly all localised prostate cancers requiring treatment

are suitable for radiation therapy (either in the form of external beam radiation therapy and/or brachytherapy), even for younger men.

Radiation therapy is also indicated in some men with rising PSA post-prostatectomy, or in those with high-risk pathological features after surgery, such as positive surgical margins or extracapsular extension.³

Many skin cancers can be cured with either definitive radiation therapy, or after surgical excision plus adjuvant radiation therapy.⁴

Radiation therapy is a very effective and cost-effective treatment in the palliative setting, especially for bone pain due to metastases.⁵ Often short courses of radiation (1-10 treatments) are used

radiation therapy. Importantly, urgent referral while the patient is still ambulant is critical to maximise positive outcomes.

Types of radiation therapy

External beam radiation therapy

External beam radiation therapy refers to the delivery of targeted radiation beams from a source directed from outside the body. A course usually involves several daily treatments, or fractions, over a few days to weeks.

It is produced by a linear accelerator, which generates and directs high energy (ionising) radiation towards the intended tumour target. Radiation beams can be directed to target the area of interest within millimetre accuracy, while minimising doses to normal tissues.

The process for patients receiving radiation therapy is very similar to having a plain X-ray or CT scan. Apart from a buzzing noise, this short therapy of only a few minutes does not give a sensation of being "treated". It is classified as:

Conventional external beam radiation therapy

The radiation beams are shaped as they come out of the linear accelerator and/or before they reach the patient to make sure they are carefully directed to the intended target.

Intensity-modulated radiation therapy

This is a special form of external beam radiation therapy involving the delivery of hundreds of small radiation beams of varying intensities, which enter the body at different angles. It is available for use for many different cancer types in Australia, and is associated with improved patient reported outcomes due to greater sparing of normal tissues.

Image-guided radiation therapy

This incorporates sophisticated real-time imaging of the tumour before, during and after treatment to ensure correct patient and tumour positioning.

Stereotactic radiosurgery

This is used to treat small tumours with well-defined edges, and is particularly useful for cancers in the brain or spine.

Stereotactic body radiation therapy

This delivers an ablative radiation dose to defined targets outside the spine or brain. This technique is increasingly used to treat solitary metastases.

Brachytherapy

Brachytherapy involves radiation delivered from a small

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with 70-80% pain reduction response rates.

Palliative radiation therapy is used to relieve symptoms caused by bronchial or oesophageal obstruction, and can help stop bleeding from tumours of the lung, stomach or bladder.

Paralysis from malignant spinal cord compression, secondary to vertebral metastases, may be prevented by

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source, or sources, implanted directly into or next to the tumour. These sources produce gamma rays, which have the same effect on cancer cells as X-rays. This treatment reduces damage to surrounding healthy tissue, thereby limiting side effects.

There are two main types of brachytherapy:

Low dose rate

Small radioactive 'seeds' are permanently implanted near or in the tumour. These stay in place, releasing small amounts of radiation over several weeks or months. This technique is most commonly used in Australia and New Zealand for treating localised prostate cancers. Men can get back to their usual activities within a day or two following treatment.

High dose rate

The radioactive sources are removed from the patient at the end of each treatment session. They deliver a more intense, but short-lived, dose of radiation during each of several (usually 1-3) sessions. It is sometimes used in high-risk localised prostate and gynaecological cancers, often in conjunction with external beam radiation therapy.

Recent developments in radiation therapy

The field of radiation oncology has changed dramatically over the past decade. Not only is it an area of vigorous clinical trial activity and emerging evidence honing the indications for radiation therapy, but also the sophistication of treatment planning and delivery has developed rapidly.

The technical advances result in the ability to target a tumour in any anatomical location with increasing accuracy. This has allowed the dose to some tumours to be increased ('escalated'), leading to higher cure rates, such as for localised prostate cancers.⁶

It has also led to reduced side effects and improved patient reported outcomes in the treatment of many cancers, by limiting the amount of normal tissue included in the high-dose radiation region.

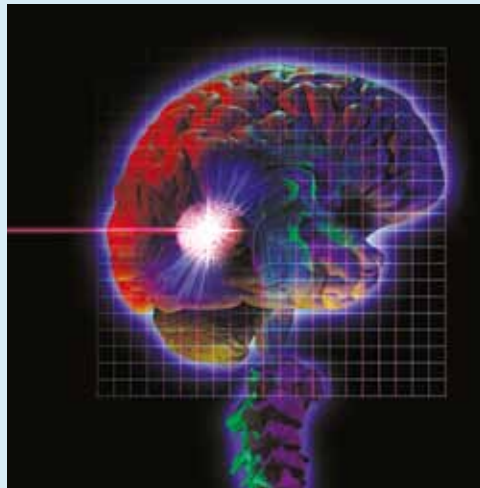
Referral to radiation oncologists

GPs have an important role in identifying patients who may benefit from a discussion about radiation therapy.⁷ Not all specialists know comprehensive details of modern radiation therapy options. For example, all men diagnosed with localised prostate cancer should be managed by a multidisciplinary team comprising urologists, radiation oncologists and nursing

Online resource

ALL radiation oncology services within Australia and New Zealand can be found at the Targeting Cancer website. This resource has up-to-date information about radiation therapy for health professionals, patients and their families, and is endorsed by the Faculty of Radiation Oncology of the Royal Australian and New Zealand College of Radiologists. It includes patient videos and more detail on radiation therapy indications, how to better understand correspondence received about patient's treatment, and when emergency/priority treatment may be important.

www.targetingcancer.com.au



staff familiar with modern therapy techniques and side effect profiles. Many patients are suitable candidates for non-surgical curative management with radiation therapy.

Patients with malignant bone pain or potential spinal cord compression should be directed to a radiation oncologist by their GP, who is managing them in the community, in conjunction with other specialists.

GPs may refer directly to their local cancer centre, where there will always be a

radiation oncologist or nurse able to take the referral. ●

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References

Available on request

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