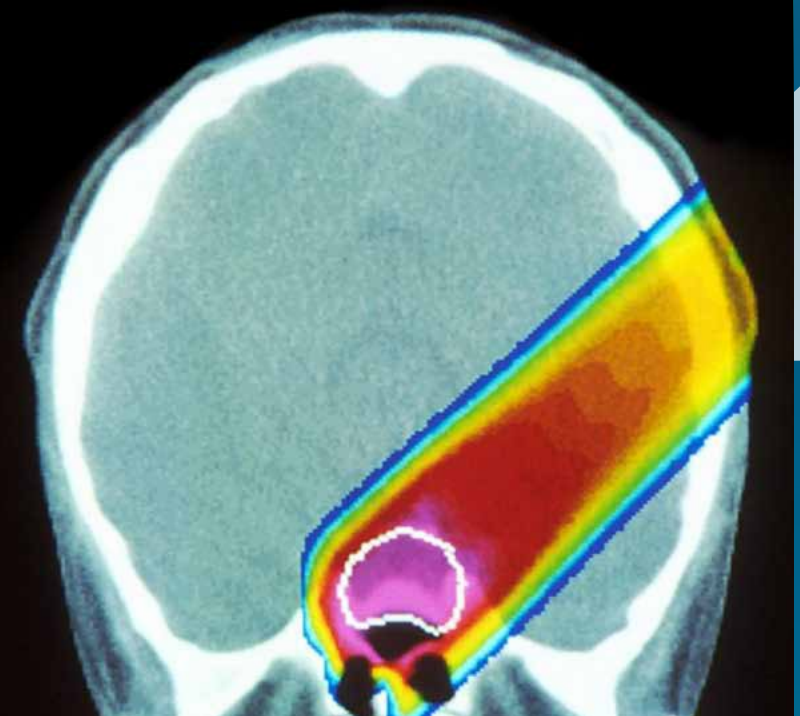
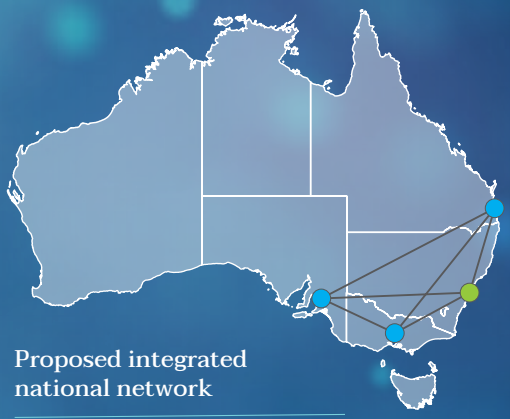
Particle Therapy
An advanced form of radiation treatment for cancer

Particle therapy is similar to traditional forms of radiation therapy, but it offers an even more targeted approach. This means that the risk of harm to tissue around a tumour is lower than with standard radiation. Instead of x-rays used in standard radiation, particle therapy uses protons or heavy ions such as carbon, which have an improved ability to kill cancer cells. Particle therapy, like standard radiation, is painless and delivers radiation through the skin. And the particles release their energy at the site of the tumour more precisely.

This makes the treatment suitable for cancers near critical parts of the body, such as the eyes, brain and spinal cord. As well as being very precise, carbon ions deposit more energy to the tumour than protons or standard radiation. This means carbon ion therapy can be more effective at killing tumours that are resistant to standard radiation.

While traditional radiation therapy can target such tumours, there is a higher risk of side effects because of potential damage to the surrounding tissue and organs.





Proposed integrated national network

Proton facility

Carbon/Proton facility

In other countries, particle therapy is recommended for some patients with difficult-to-treat cancers.

Proton therapy has been approved overseas for use in children, adolescents and young adults, who are more at risk of long-term side effects from traditional treatment approaches.

It minimises the radiation to critical structures in the body and limits the risks of long-term side effects.

More than 4500 Australian patients each year could benefit from particle therapy.

How particle therapy works

Particle accelerators are used to speed up particles to increase their energy and deliver them to the desired location in the body. The particles deliver the required radiation dose precisely in the tumour to kill the cancer cells.

> *This is a global phenomenon in terms of improving the delivery of radiation therapy to optimise cancer care for our patients.*
>
> **Stephen Frank MD**
> Proton Center Medical Director
> University of Texas MD Anderson Cancer Center, USA

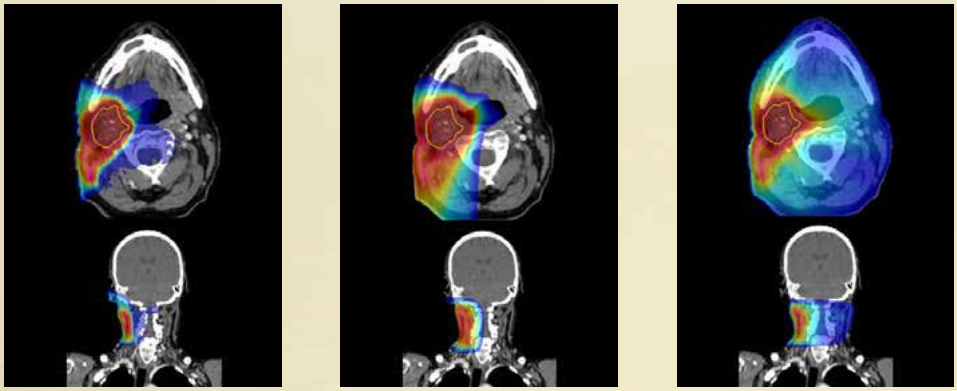
With particle therapy, there is less radiation deposited outside of the tumour. With traditional radiation therapy, x-rays continue to give radiation dose as they leave the person's body. This means that radiation is deposited in nearby healthy tissues, possibly causing side effects.

Using particle therapy, the radiation oncology team can customise the beam of radiation to target within the borders of the tumour, whatever shape it is.

The number of treatment sessions depends on the type and stage of the cancer but can be fewer than a course of traditional radiation therapy. This, combined with the lower chance of side effects with particle therapy, means patients benefit from a faster return to their normal life. Although the Royal Australian and New Zealand College of Radiologists has stated that particle therapy should be available to Australian cancer patients, currently there are no facilities here*.

* The first proton therapy facility is under construction in Adelaide.

Carbon ions | **Protons** | **X-rays**



A comparison of where radiation is deposited using carbon ions, protons and x-rays.

- **RED**
  Tumour receiving desired high dose radiation.
- **BLUE**
  Low (but still significant) dose radiation outside the tumour – this can result in side-effects.
- **NO COLOUR**
  No significant dose.

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