National University Cancer Institute Singapore

Proton Therapy

Patient and Family Information

Content

Understanding Proton Beam Therapy

As you begin your Proton Beam Therapy journey, use this booklet as an informational roadmap to help you navigate the process. We have included an overview of how proton therapy works, its advantages, and a step-by-step description of the treatment process.

Depending on your condition and the type of cancer, Proton Beam Therapy may be used in combination with chemotherapy, immunotherapy, or surgery. You and your doctor will discuss the different options available to determine if combination therapy is right for you. Be sure to consult any questions that you may have regarding the information contained in this guide with your healthcare team.

Benefits of Proton Beam Therapy

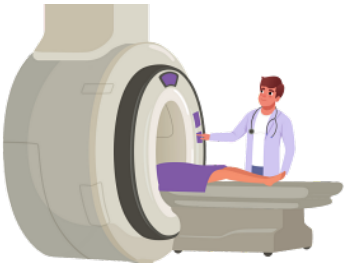
Proton Beam Therapy offers a number of advantages:

- Delivers a high dose of proton beam directly to the tumour
- Sculpts doses to the complex shape and size of an individual tumour
- Spares more healthy tissues near the targeted tumour
- Lesser side effects, and lower risk of second malignancy

Types of cancers treated by Proton Beam Therapy:

Proton Beam Therapy is effective in treating various cancers as per the Ministry of Health (MOH) indications. Please refer to the MOH website for more information.

How does it work?

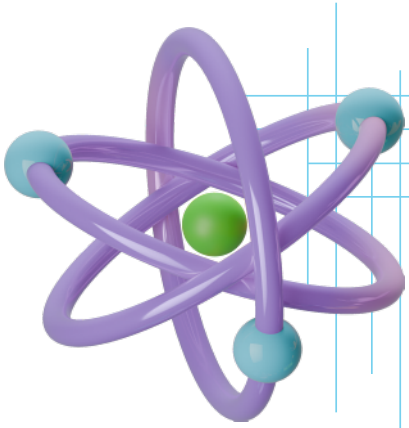


All radiotherapy, including proton and high-energy X-rays (photon), destroy cancer cells by damaging their DNA. Proton Beam Therapy is an advanced type of radiation therapy that uses a beam of protons delivered directly to the tumour, destroying cancer cells while minimising damage to healthy tissues.

As compared to conventional radiotherapy which utilises photon, Proton Beam Therapy uses protons which are positively charged particles found in the nucleus of an atom. They can be accelerated and controlled to release their energy within a well-defined range in tissues, such as a tumour. Unlike traditional radiotherapy, protons have a unique stopping power. This means they can be targeted to deposit their cancer-fighting energy right at the tumour, thereby minimising damage to surrounding healthy organs and tissue.

This is ideal for treating tumours near vital structures, recurrent cancers, and cancers in children.

Healthy cells can repair themselves after exposure, depending on the level of DNA damage.



The NCIS Proton Beam Therapy Patient Journey

Proton Beam Therapy involves several steps: tumour visualisation through simulation, treatment planning, delivery, and follow-up. Your clinical team will guide the appropriate treatment technique and address any questions before, during, or after the process.

1 First Visit at NUH Radiotherapy Centre (RTC)

On the first visit or consultation, the radiation oncologist will discuss the various treatment options with you. Following this, an appointment will be arranged in preparation for the treatment.

2 Simulation

Before your treatment begins, a Simulation is conducted by taking images to locate the tumour's size and position relative to the surrounding tissues and organs. This is typically done with a Computed Tomography (CT) scan machine.

Additional scans, like Magnetic Resonance Imaging (MRI) or, a Positron Emission Tomography (PET), may be utilised for planning Proton Beam Therapy, depending on the location of the tumour and other factors. These images provide detailed views of the tumour from various angles, and the process is non-invasive. Depending on treatment needs, immobilisation devices such as a customed body mold or head mask, and tiny skin marks may be used to ensure consistent positioning during each session.

3 Planning

With the completed scans, your clinical team will use an advanced treatment planning software to create a 3D model of the area to receive the treatment. They will calculate the radiation dose, delivery angles, and session frequency, considering factors such as cancer type, location and size of the tumour, medical history, and lab results to tailor a unique treatment plan for you.

Treatment Process

Before each treatment session, your Radiation Therapist (RT) will help position you on the treatment couch. You will be aligned based on specific measurements and tattoo marks, and customised immobilisation devices made earlier during CT Simulation. Pre-treatment image verification will be done to ensure set-up and treatment accuracies.

Throughout the treatment session, your therapist will be in constant contact with you through the cameras and microphones in the treatment room.

Follow-up Care

During your course of Proton Beam Therapy treatment, your radiation oncologist will review you weekly to monitor progress and side effects. After completion of your treatment, your radiation oncologist and healthcare team will monitor your progress with a series of follow-up visits that may include physical examination, interval imaging and/or blood tests.

Frequently Asked Questions (FAQ)

Am I eligible for proton beam therapy?

- Eligibility depends on the type of cancer, size and location.
- Please refer to the MOH website for the latest updates.
- Your medical team will assess your case and recommend the most effective treatment plan.

Who are the people involved in my Proton Beam Therapy?

- **Radiation Oncologists** are specialist physicians trained in treating cancer using radiation, and is responsible to prescribe, plan and oversee the patients' radiation treatment course.
- **Radiation Therapists** are specially trained health professionals who operate the systems and administer radiation treatments to patients.
- **Dosimetrists** are medical professionals who plan and calculate the proper radiation dose for treatment. Dosimetrists work with the radiation oncologists to design a customised radiation plan which will deliver the prescribed dose to treat the cancer.
- **Medical Physicists** ensure that the equipment delivers the right doses of radiation and functions accurately.
- **Nurses** coordinate cancer care, counsel patients and caregivers on managing side effects, and address concerns about radiation therapy.

Frequently Asked Questions (FAQ)

Is Proton Beam Therapy safe or painful?

- Proton Beam Therapy is a well-established and clinically proven treatment. It is especially beneficial for tumours close to critical structures (e.g. brain, eyes, spinal cord).
- Proton Beam Therapy is **painless**, similar to getting an x-ray. However, some patients may experience side effects depending on the treatment area.

Will I experience any side effects?

- Side effects **vary** depending on the location and dose.
- Common side effects include: **fatigue, skin changes** and localised **discomfort**.

How long is the treatment?

- Each treatment typically lasts for 30 - 40 minutes, which is inclusive of patent positioning, image verification and radiation delivery. Treatment will be delivered over a course of a few weeks, depending on the type, size and location of cancer.

Things to Do During Treatment Period

Food & Water Intake

Eat sufficiently to maintain your weight before and after treatment. Your body needs more calories during treatment so you may need to eat more than usual.

Eat a well-balanced diet daily. A dietician can help you set up a nutritional food plan.

Drink fluids that are high in calories, like shakes or nutritional supplements. You can approach our staff to learn about these supplements.

Drink at least eight cups of fluids every day. Fluids can come from water, gelatin, ice cream, fruit juice, iced tea, soup or milk.

Sleep & Rest

Get plenty of rest. You can resume your regular activities as long as you have adequate rest and do not overexert yourself. Your radiation oncologist can advise how much exercise you should get.

Sleep at least eight hours daily and take naps during the day if you need to. Fatigue is a common side effect, which will ease or subside when your course of treatment is completed.

Things to Do During Treatment Period

Inform Your Dentist

If you have had radiation therapy or is undergoing radiotherapy to the head and neck region, you will need to inform your dentist and schedule regular dental review.

Preparing Your Skin

The effects of radiation therapy may continue for a few weeks after your last treatment session and will take some time to subside.

Remember to be very gentle with your skin. Take special care as it may get sensitive due to the treatment.

A gentle moisturising cream like Aloe Vera gel can be used. Please consult your radiation oncologist or nurses when in doubt.

The skin that is exposed to treatment will be sensitive to the sun. You will need additional sun protection on and around the treatment area.

About NCIS

The National University Cancer Institute, Singapore (NCIS) is a national specialist centre under the National University Health System (NUHS). It is the only public cancer centre in Singapore treating both paediatric and adult cancers in one facility.

At NCIS, Every Person Matters and our goal is to provide comprehensive yet personalised care for each and every patient incorporating cancer awareness, prevention, diagnosis, treatment, rehabilitation and palliative care.

About RTC @ NCIS

The Radiation Oncology team at the Radiotherapy Centre (RTC) is here to support you and your caregivers throughout your treatment journey. Our team will be with you to discuss your treatment plans and guide you through the stages of planning, treatment, and post-treatment care.

The team regularly checks and maintains the equipment to ensure accurate functioning for each patient's treatment. This ensures that the radiation treatment is delivered precisely and safely.

We recognise that your journey involves more than just medical care. If you are interested, approach us to find out more information about additional resources, such as cancer support groups and counselling services.

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Information is correct at time of printing (2025) and subject to revision without prior notice.