

Proton Beam Therapy: A patient Guide

Learn about the innovative and precise proton beam therapy from Advanced Medicine (Proton SG) with this comprehensive guide.

Contact us at frontdesk@proton.sg

Prepared by Dr(s) Wong Ru Xin, Shaun Ho and Looi Wen Shen.

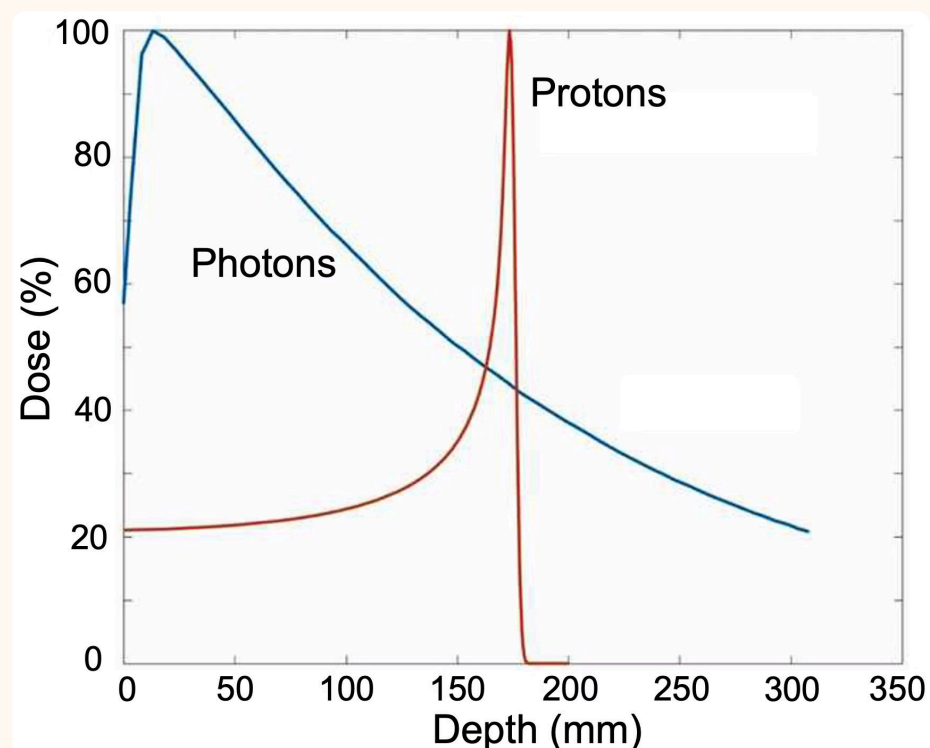


How Proton Therapy Works

Proton beam therapy (PBT) is an advanced form of radiation therapy used to treat cancer. Unlike traditional radiation therapy, which uses X-rays (photons) to deliver radiation to cancerous cells, proton therapy uses protons, which are positively charged particles, to target tumors.

Here's how proton beam therapy works:

1. **Generation of Proton Beams:** Proton beams are generated using a specialized machine called a cyclotron or synchrotron. These machines accelerate protons to very high speeds, creating a beam of protons that can penetrate tissue.
2. **Precise Targeting:** Proton therapy allows for highly precise targeting of tumors. The energy of the proton beams can be adjusted to match the depth of the tumor within the body, allowing the radiation to be delivered directly to the tumor while minimizing damage to surrounding healthy tissues.
3. **Bragg Peak Effect:** One of the key advantages of proton therapy is the Bragg peak effect. Unlike X-rays, which deposit radiation along their entire path through tissue, protons deposit most of their energy at a specific depth within the body, known as the Bragg peak. This allows for a high dose of radiation to be delivered to the tumor while sparing nearby healthy tissues beyond the tumor.

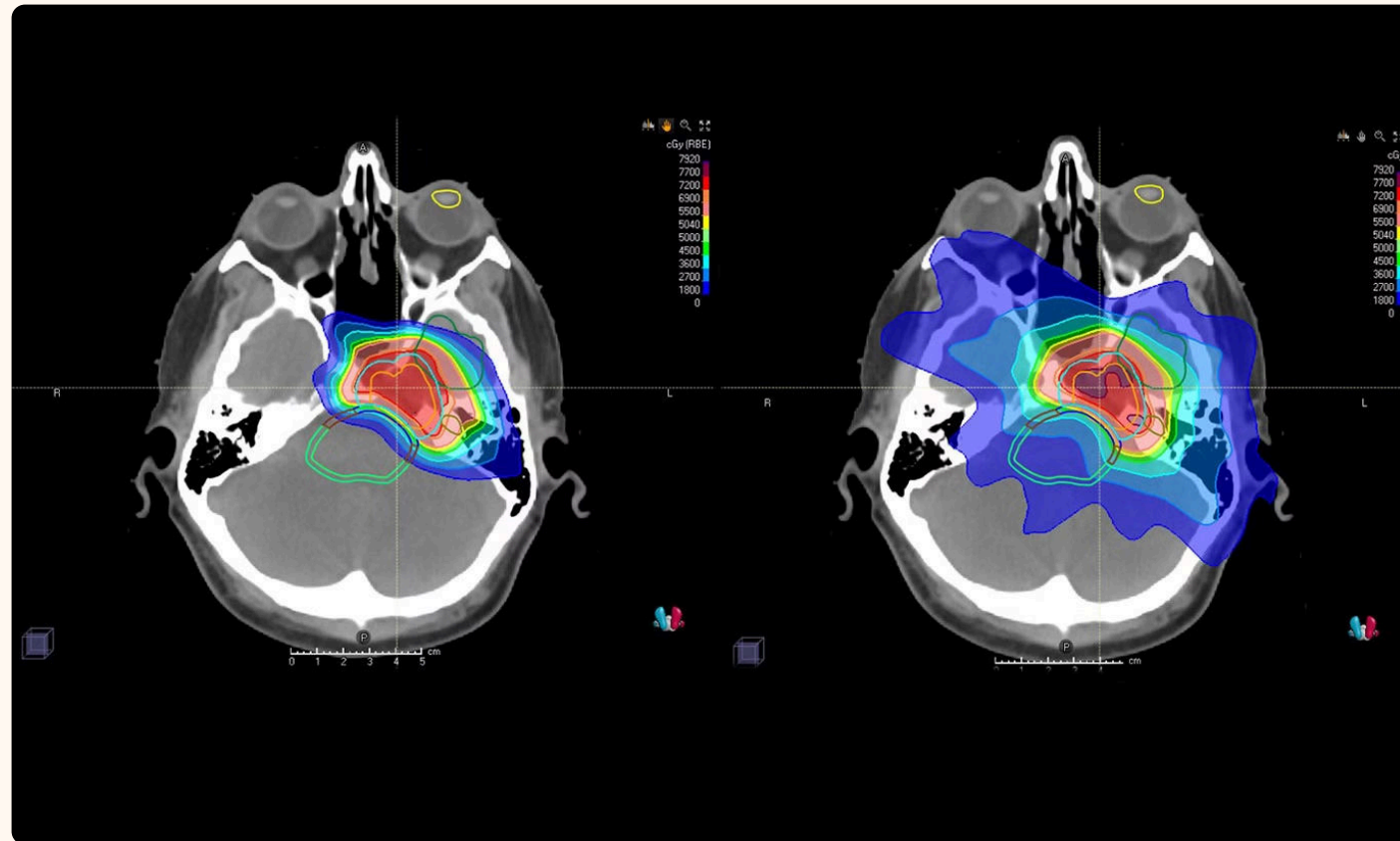


The ProBeam® proton therapy system allows us to target tumors with unprecedented precision thanks to its use of high-definition pencil beam scanning and best-in-class imaging.



Proton Therapy vs. Photon Radiotherapy

Proton therapy's unique stopping power minimizes damage to healthy tissues, making it ideal for treating recurrent tumors, cancers in children, and those near vital structures. There is less low radiation dose splash to surround brain as seen below (left proton, right xray).



Singapore's Ministry of Health Indications

- Treatments can be claimed from medisave and medishield, and covered by private shield plans or other medical insurances.
- Please refer to MOH website for more information.



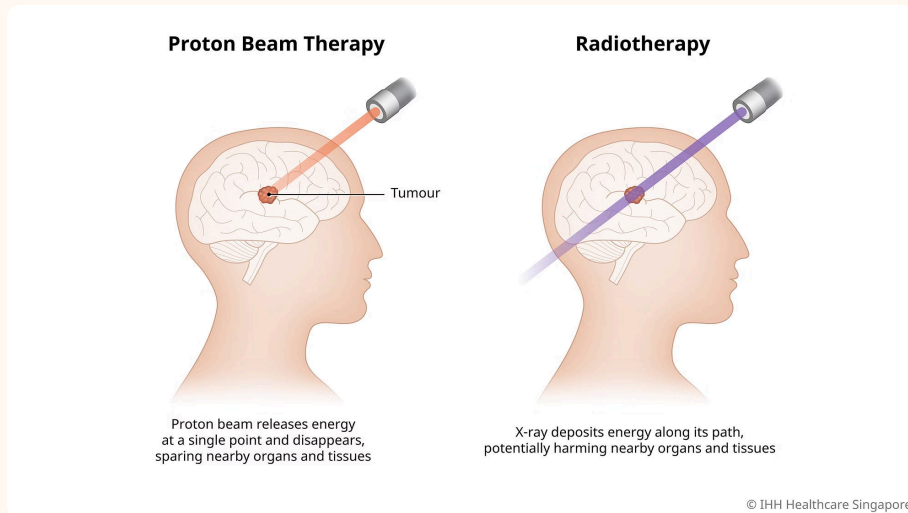
Treatment process

Simulation: Before treatment begins, detailed imaging is used to map the size, shape, and location of the tumor, allowing for a customized treatment plan.

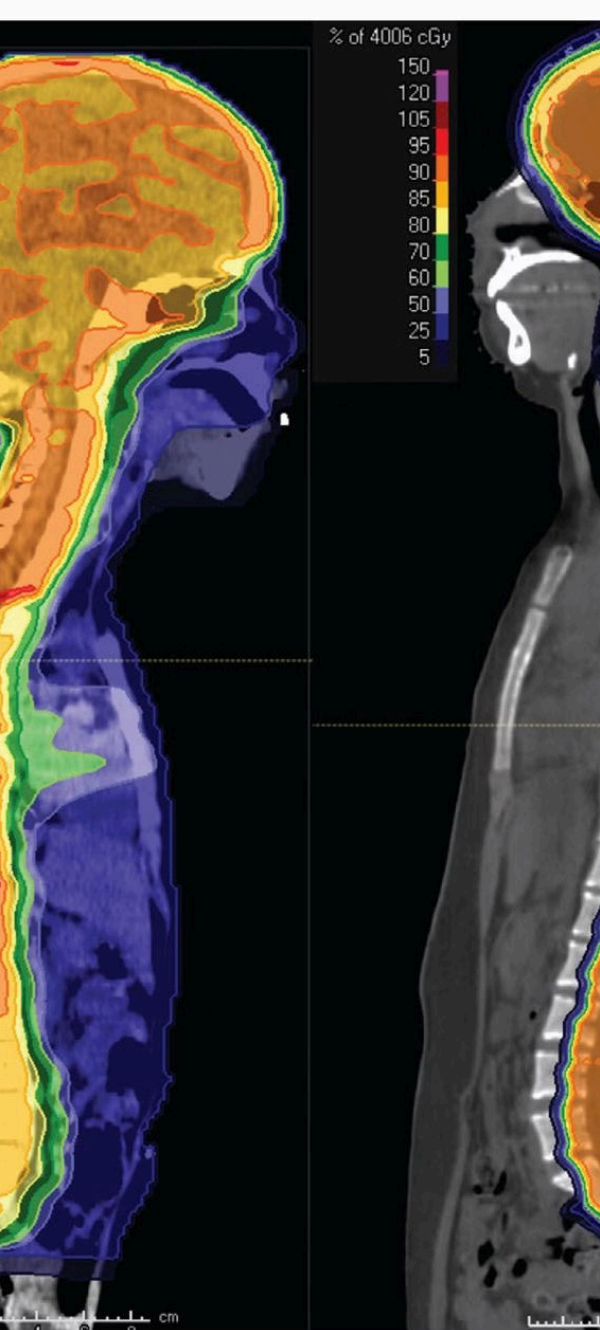
Treatment delivery: Patients lie on a treatment table during sessions, and the proton beam delivery system directs the beams to the tumor from multiple angles. This precise targeting reduces damage to healthy tissues and minimizes side effects. Throughout the treatment process, patients are monitored closely, and adjustments may be made to ensure optimal tumor targeting.



Types of Cancers Treated - intent should be curative



- Liver cancer
- Lung cancer
- Central nervous system tumors
- Head & neck cancers
- Esophageal cancer
- Breast cancer
- Pancreatic cancer
- Prostate cancer
- Pediatric tumors
- Recurrent cancers



Advantages of Proton Therapy

1 Precision Treatment

Pencil beam scanning ensures high precision in delivering proton therapy directly to the tumor.

2 Reduced Side Effects

Proton therapy may offer fewer side effects than traditional radiotherapy, enhancing patient comfort.

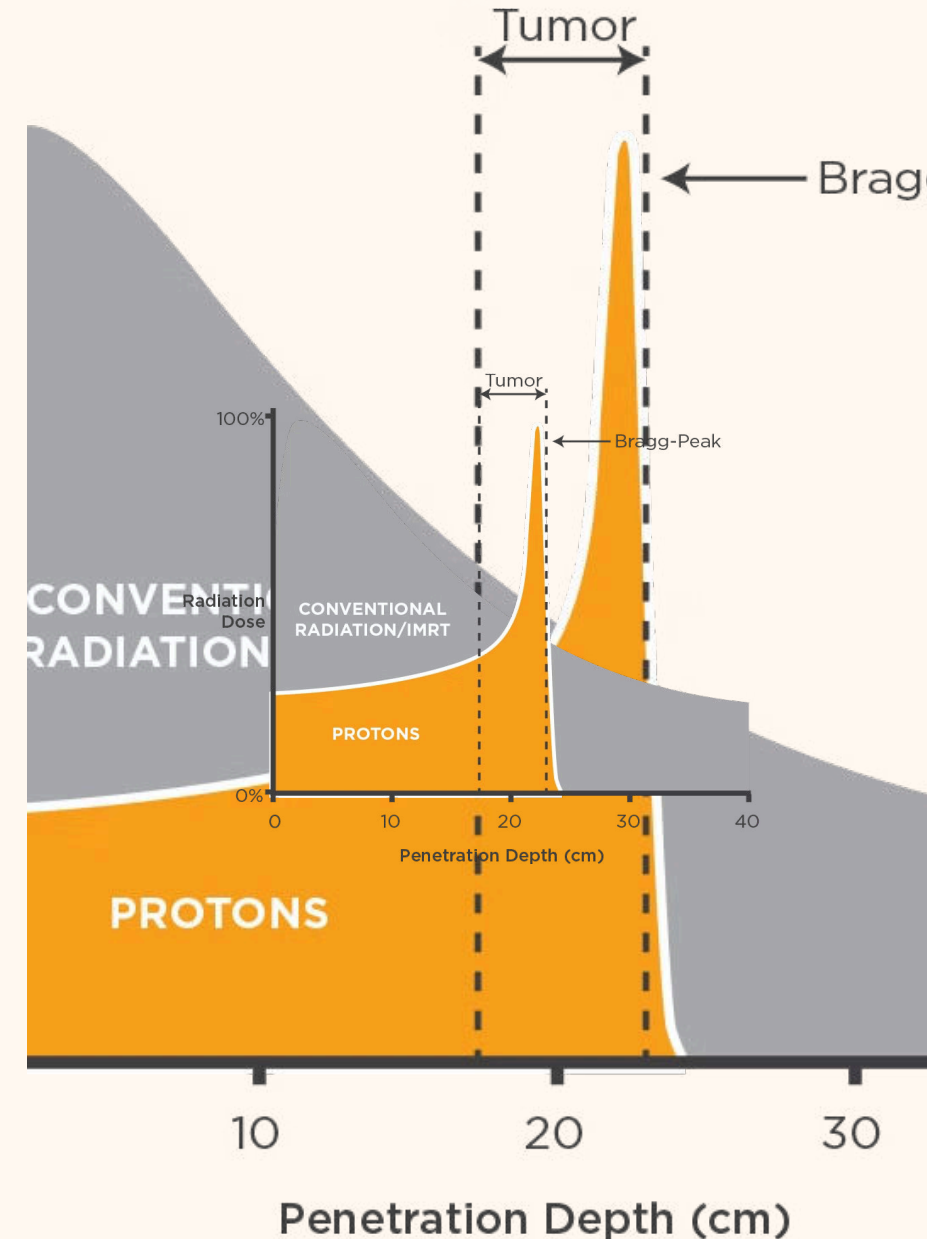
3 Efficient Treatment

Reduced treatment times and non-invasive procedures make proton therapy efficient and convenient.

Accurate Precision with Proton Therapy

The ProBeam® system at Advanced Medicine offers unmatched precision by sculpting doses to conform to the tumor's complex shape while minimizing damage to healthy tissues.

The Varian system goes around the patient in 360 degree, with mounted CT-imaging on the gantry, and is powered by a fast-throughput cyclotron.



Less Risk of Secondary Cancers

With proton therapy, there is a reduced risk of developing secondary cancers compared to traditional radiotherapy methods. This is especially for childhood cancers as these patients have decades of years of survivorship ahead of them, and growing tissues are more sensitive to radiation.



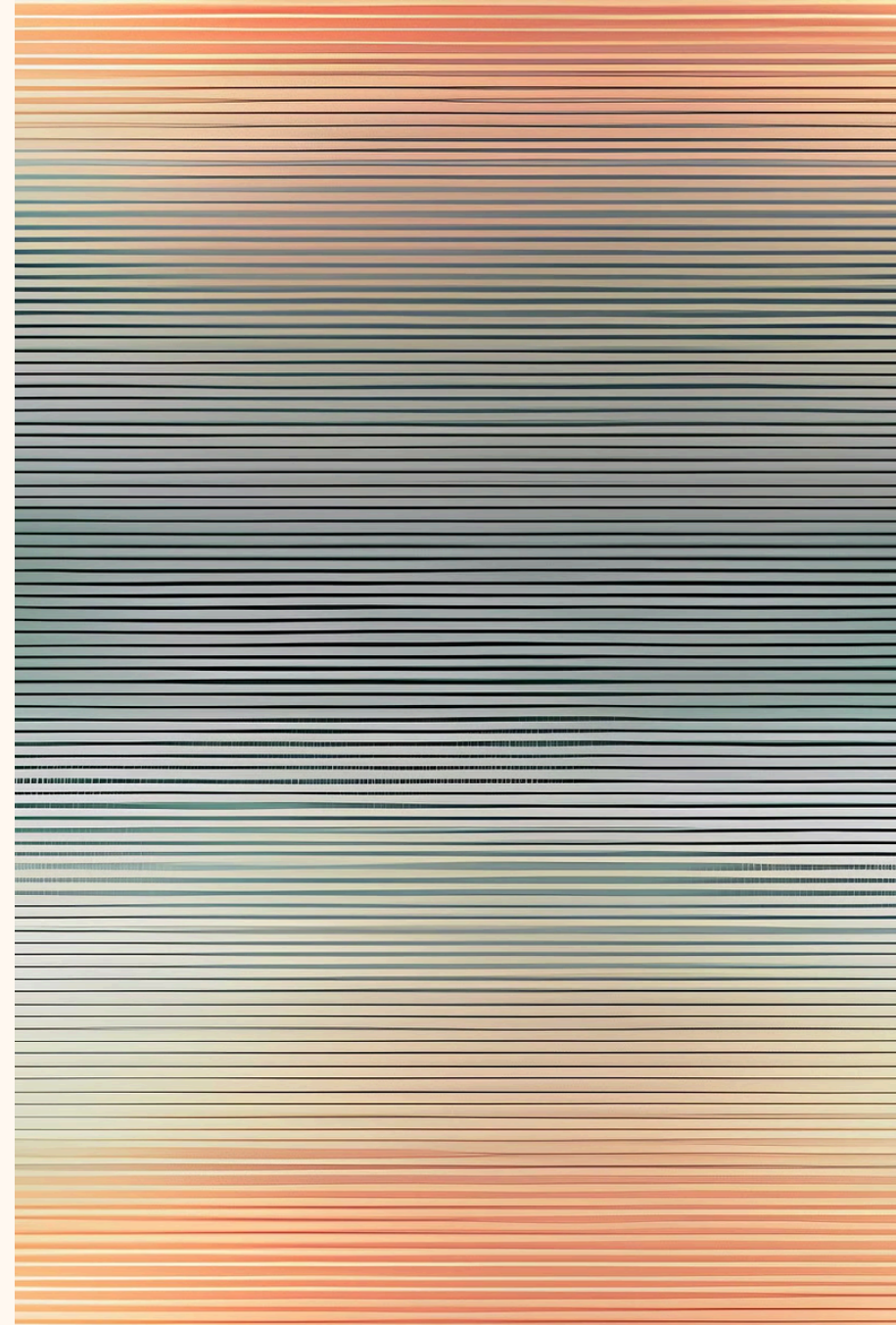
Considerations for Treatment

- Consultation with healthcare team, and adherence to MOH criteria
- Proper positioning required for treatment
- Treatment duration and scheduling

Careful Positioning with Proton Therapy

As proton therapy is more sensitive to patient body changes, very accurate set-up is necessary.

Proton particles are also more sensitive to implants and tumour size changes than conventional x-ray radiotherapy.



Challenges of proton beam therapy

1. **Cost:** Proton beam therapy is often more expensive to deliver than conventional radiation therapy.
2. **Limited Accessibility:** Proton therapy centers are not as widely available as facilities offering conventional radiation therapy.
3. **Treatment Planning Complexity:** While proton therapy offers precise targeting of tumors, treatment planning can be complex and time-consuming.
4. **Technical Challenges:** Proton therapy requires highly specialized equipment and expertise. Technical challenges, such as patient's organ motion and surgical implants may affect treatment and require mitigation strategies.