

# Using Proton Therapy to Treat Brain Tumors

## Overview

Proton therapy is a powerful treatment tool for fighting benign and malignant tumors in the brain, and it is now available to patients in the region. Physicians at the Maryland Proton Treatment Center (MPTC) use the latest pencil-beam scanning (PBS)/intensity modulated proton therapy (IMPT) to target tumors and deliver high doses of radiation with unmatched precision. Using proton therapy, the tumor receives maximum-dose radiation, while sparing more of the surrounding healthy tissue.

Because tumors in the brain are surrounded by vitally important and very delicate structures, it is crucial to limit the dose of radiation that surrounding healthy cells receive. Proton therapy is particularly effective when used after surgery to eliminate any remaining cancer cells. IMPT is also well suited for brain cancers or tumors with complex shapes: the highly targeted proton beam “paints” the radiation dose on layer-by-layer.

This revolutionary treatment is a non-invasive and low-risk option that delivers highly precise proton beams. For patients with brain tumors, proton therapy has the potential to lead to fewer short- and long-term side effects to critical neurocognitive structures as well as structures necessary for vision and hearing. Proton therapy is also safe to deliver concurrently with chemotherapy agents.

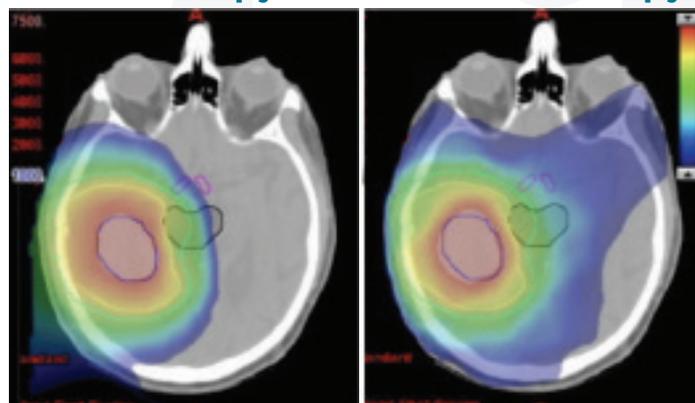
Specific tumor types that can benefit from proton therapy include:

- low grade, high grade, and recurrent gliomas (including glioblastoma multiforme)
- astrocytomas
- oligoastrocytomas
- oligodendrogliomas
- ependymomas
- pineal tumors
- embryonal tumors
- medulloblastomas
- sellar tumors
- CNS primitive neuroectodermal tumors (PNET)
- atypical teratoid/rhabdoid tumors
- pituitary adenomas
- craniopharyngiomas
- meningiomas
- arteriovenous malformations (AVMs)
- vascular malformations

Proton therapy is also likely to benefit:

- **Patients with disease recurrence:** Proton therapy can aim a higher dose of radiation precisely at the site of the recurrence, limiting normal tissue exposure and potentially leading to better outcomes.
- **Pediatric patients:** While there is no threshold below which radiation is risk free, proton therapy can expose a smaller volume of tissue to radiation, offering a benefit for pediatric patients, whose growing bodies are especially susceptible to radiation damage.<sup>1</sup>

## Proton Therapy Versus Photon Therapy



Proton therapy

Photon therapy

Proton therapy’s highly targeted proton beams go to the site of the tumor and stop, eliminating “exit radiation.” The image above shows the areas surrounding the tumor exposed to radiation (dose delivered to tumor and surrounding tissue shown in color) during treatment. The proton therapy (left) delivers significantly less radiation to the surrounding areas than the photon treatment (right).

## MPTC-Specific Clinical Trial Offerings

MPTC is dedicated to advancing scientific knowledge about the role of proton therapy in the treatment of benign and malignant brain tumors. All patients treated at the center have access to a wide range of clinical trials available through the Maryland Proton Alliance,

<sup>1</sup>Malyapa R et al. “Tumor control and QoL of very young children with atypical teratoid/rhabdoid tumor treated with focal only chemo-radiation therapy using pencil beam scanning proton therapy.” J Neuro-Oncology 2014 Nov 2.



including currently open and additional planned in-house and multi-institutional clinical trials.

Clinical trials at MPTC will soon include:

- NCT02179086: Randomized Phase II Trial of Hypofractionated Dose-Escalated Photon IMRT or Proton Beam Therapy Versus Conventional Photon Irradiation with Concomitant and Adjuvant Temozolomide in Patients with Newly Diagnosed Glioblastoma
- NCT01730950: Randomized Phase II Trial of Concurrent Bevacizumab and Re-Irradiation Versus Bevacizumab Alone as Treatment for Recurrent Glioblastoma
- NCT01255748: Evaluation Tracking Project: A Prospective Chart Review of Patients Treated with Radiation Therapy (*available now*)

For more information on our currently available clinical trials, **please call our research department at 410-369-5353.**

## Outcomes

Your patients may be hesitant to explore different treatment options for cancer/brain tumors and may pose questions related to side effects and outcomes. Studies are ongoing, and early results confirm this treatment's power and precision. Proton therapy's unique properties can improve outcomes for many patients with brain tumors.

In a 2015 study published in *Cancer*, investigators concluded that proton therapy was well tolerated in patients with low-grade gliomas, and "there is no evidence for overall decline in cognitive function or QOL."<sup>2</sup>

Researchers have also compared proton radiation therapy to x-ray radiation therapy in terms of the patient's risk of developing a second tumor. They concluded that compared to traditional radiation therapy, proton therapy "decreases the risk of [radiation therapy-associated] second tumors by half and delivers

significantly lower doses to neurocognitive and critical structures of vision and hearing."<sup>3</sup>

## About the Maryland Proton Treatment Center

The Maryland Proton Treatment Center is affiliated with the University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center, an NCI-designated comprehensive cancer center. MPTC is focused on clinical excellence, affordability, accessibility, as well as comfort and convenience for your patients. In addition, our team has initiated the Maryland Proton Alliance to bring the latest research and clinical trials to patients and physicians. We have taken a leadership role in the industry by offering proton therapy at the same cost as IMRT.

MPTC provides a unique level of proton therapy experience and expertise. Our University of Maryland Department of Radiation Oncology physicians have a combined 20-plus years of proton therapy experience. Associate Professor and MPTC Medical Director Charles Simone has more than 5 years of experience from the University of Pennsylvania Proton Therapy Center; Professor Robert Malyapa has more than 12 years of experience from the Paul Scherrer Institute, which is world renown as a key innovator of proton therapy, and University of Florida Proton Therapy Institute; Assistant Professor Adeel Kaiser has three years of experience from the Loma Linda Proton Therapy Center and Assistant Professor Shahed Badiyan trained at the Paul Scherrer Institute.

## Contact Information

To refer a patient or to discuss treatment options with one of our physicians, please call **410-369-5200** or email us at **info@mdproton.com**.

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<sup>2</sup>"Proton therapy for low-grade gliomas: Results from a prospective trial." *Cancer*. 2015 May 15;121(10): 1712-1719.

<sup>3</sup>"Projected second tumor risk and dose to neurocognitive structures after proton versus photon radiotherapy for benign meningioma." *Int J Radiat Oncol Biol Phys*. 2012 Jul 15;83(4): 495-500.