

Using Proton Therapy to Treat Skull Base Tumors

Overview

Proton therapy is a powerful treatment tool for fighting skull base tumors, and it is now available to patients at the Maryland Proton Treatment Center (MPTC). Physicians at 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-dosed radiation, while sparing more of the surrounding healthy tissue.



This revolutionary treatment is a non-invasive and low-risk option that delivers highly precise beams of protons. Proton therapy can be an excellent treatment option for skull base tumors because it can deliver high doses of radiation to the tumor without damaging healthy tissue including the brainstem, optic/visual pathway, and

hearing pathway. IMPT can allow for dose escalation, resulting in potentially improved cure rates. IMPT is also well suited for tumors with complex shapes: the proton beam “paints” the radiation on layer-by-layer. These attributes allow physicians to treat tumors aggressively while reducing the risk of short- and long-term side effects of radiation therapy.

Specific tumor types that can benefit from proton therapy include:

- head and neck cancers: oropharynx, tonsil, base of tongue, nasopharynx, nasal cavity and paranasal sinus, nasopharynx, skin with perineural invasion
- tumors of cranial nerves
- schwannoma (acoustic neuroma)
- esthesioneuroblastoma
- glomus tumors
- meningioma
- orbital tumors
- tumors of the middle ear
- optic nerve sheath meningioma
- optic nerve glioma
- lacrimal gland/lacrimal sac tumors
- skull base chordoma and chondrosarcoma

Proton therapy is likely to benefit additional skull base tumor patient subgroups, including:

- **Patients with prior radiation to the head or neck:** When any part of the body is radiated a second time, the risk of short- and long-term side effects increases. For this reason, patients who have previously received radiation to the head or neck from prior cancers are often good candidates for proton therapy’s precision targeting.
- **Patients with disease recurrence:** Proton therapy can aim a higher dose of radiation precisely at the site of the recurrence, limiting normal tissues’ 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.

Proton Therapy Versus Photon Therapy

One reason proton therapy is so promising is that the highly targeted proton beams go to the site of the tumor and stop, eliminating “exit radiation.” Like photon therapy, proton therapy can be used alone, or in conjunction with surgery and/or chemotherapy.

The image below 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).



Proton therapy

Photon therapy



MPTC-Specific Clinical Trial Offerings

MPTC is dedicated to advancing scientific knowledge about the role of proton therapy in the treatment of skull base tumors. All patients treated at the center have access to a wide range of clinical trials available through the Maryland Proton Alliance. Plans are also underway at MPTC to open in-house clinical trials in addition to multi-institutional trials.

Current clinical trials at MPTC include:

- 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.**

Published Research

The Maryland Proton Treatment Center is led by nationally recognized radiation oncologists from the University of Maryland School of Medicine who are involved in cutting-edge research and clinical trials. Below are several published papers, co-authored by our own Dr. Robert Malyapa, highlighting research involving proton treatment for patients with skull base tumors.

“Long-term outcomes and prognostic factors of skull-base chondrosarcoma patients treated with pencil-beam scanning proton therapy at the Paul Scherrer Institute.” *Neuro Oncol.* 2016 Feb;18(2): 236-243.
*Data indicate that protons are safe and effective.*¹

“Proton therapy for skull base chordomas: an outcome study from the University of Florida Proton Therapy Institute.” *J Neurol Surg B Skull Base.* 2014 Feb;75(1): 53-57.
*Proton therapy is an effective treatment modality for skull base chordomas.*²

“Long term outcomes of patients with skull-base low-grade chondrosarcoma and chordoma patients treated with pencil beam scanning proton therapy.” *Radiother Oncol.* 2016 Jul;120(1):169-74.

*Pencil beam scanning proton therapy has the most favorable outcome for chordomas and chondrosarcomas of the skull base.*³

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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¹ Malyapa R et al. “Long-term outcomes and prognostic factors of skull-base chondrosarcoma patients treated with pencil beam scanning proton therapy at the Paul Scherrer Institute.” *Neuro-Oncology* 2015, Aug 30.

² Malyapa R, Badiyan S et al. “Proton therapy for skull base chordomas: an outcome study from the University of Florida Proton Therapy Institute.” *J Neurol Surg B Skull Base.* 2014 Feb;75(1): 53-57.

³ Malyapa R et al. “Long term outcomes of patients with skull-base low-grade chondrosarcoma and chordoma patients treated with pencil beam scanning proton therapy.” *Radiother Oncol.* 2016 Jul;120(1):169-74.