

# Using Proton Therapy to Treat Head and Neck Cancer

## Overview

Proton therapy is a powerful treatment tool for fighting head and neck cancers and is now available to patients in the region. Physicians at the Maryland Proton Treatment Center (MPTC) use the most advanced form of proton therapy, called pencil-beam scanning (PBS), or intensity modulated proton therapy (IMPT) to target tumors with unmatched precision, while minimizing damage to surrounding healthy tissue.



This revolutionary treatment is a non-invasive and low-risk option that delivers highly precise beams of protons to the tumor site. Proton therapy can be an excellent treatment option for head and neck malignancies because it can deliver high doses of radiation to the tumor without damaging healthy tissue in the head and neck, including the jaw, salivary glands, eyes, throat, vocal cord and spinal cord.

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, including damage to patients’ sense of smell.

Specific tumor types that can benefit from proton therapy include:

- Oropharyngeal cancers
- Larynx cancer
- Supraglottic Larynx
- Hypopharynx
- Nasopharyngeal cancer
- Thyroid cancer
- Salivary gland cancer
- Sinus/paranasal sinus cancers
- Orbit/paraorbital cancers
- Lacrimal gland cancer

Proton therapy is likely to benefit additional head and neck cancer patient subgroups, including:

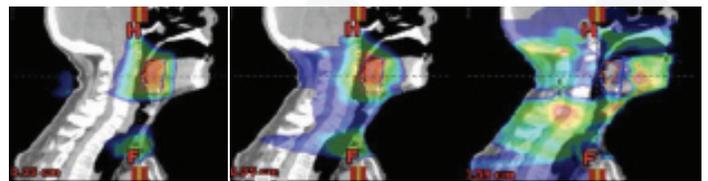
- **Patients with prior radiation to the head or neck:** When any part of the body is radiated a second time, the risk of short- and long-term side effects increases. For this reason, patients who have previously received radiation to the head or neck from prior cancers are often good candidates for 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 and adolescent 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 head and neck tumors. All patients treated at MPTC 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.

Clinical trials at MPTC will soon include:

- NCT01893307: Phase II/III Randomized Trial of Intensity-Modulated Proton Beam Therapy (IMPT) Versus Intensity-Modulated Photon Therapy (IMRT) for the Treatment of Oropharyngeal Cancer of the Head and Neck Cancer
- NCT02289209: A Phase II Trial of Re-Irradiation Combined with Open Label MK3475 (Pembrolizumab) in Patients with Loco-Regional Inoperable Recurrence or Second Primary Squamous Cell Carcinoma of the Head and Neck (SCCHN) (*available now*)

- 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.

“Evaluation of Robustness to Setup and Range Uncertainties for Head and Neck Patients Treated With Pencil Beam Scanning Proton Therapy.” *Int J Radiat Oncol Biol Phys.* 2016 May 1;95(1):154-162.

*A robustness database was created for the treatment of head and neck patients with intensity modulated proton therapy based on previous clinical experience.*

“Radiotherapy for sinonasal undifferentiated carcinoma.” *Am J Otolaryngol.* 2014 Mar-Apr;35(2):141-146.

*A multimodal approach is best when treating sinonasal undifferentiated carcinoma patients.*

“Effect of Anatomic Changes on Pencil Beam Scanned Proton Dose Distributions for Cranial and Extracranial Tumors.” *Int J Radiat Oncol Biol Phys* 97 (3), 616-623. 2016 Nov 16.

*Clinically delivered plans of pencil beam scanning proton therapy have been found to be robust to anatomic changes.*

## Outcomes

A 2016 study found that intensity modulated proton pencil beams (IMPT) “provides excellent tumor coverage while sparing critical tissues.<sup>1</sup> Also in 2016, researchers assessed clinical outcomes in children with rhabdomyosarcoma (RMS) treated with pencil beam scanning (PBS) proton therapy (PT). The study found that PBS PT lead to an excellent outcome in the children, leading to a good quality of life and minimal late non-ocular toxicity.<sup>2</sup>

A study comparing oropharyngeal cancer patients treated with intensity modulated proton therapy (IMPT) versus

patients treated with intensity modulated photon therapy (IMRT) found that the patients that received proton therapy reported lower symptom burdens, or side effects.<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>1</sup> Malyapa R et al. “Pencil beam scanning intensity modulated proton therapy for head and neck cancers involving skull base.” *J Neurol Surg B* 2016; 77-A087

<sup>2</sup> Malyapa R et al. “Tumor control and quality of life in children with rhabdomyosarcoma treated with pencil beam scanning proton therapy.” *Radiotherapy and Oncology*, June 2016.

<sup>3</sup> “Intensity modulated proton therapy versus intensity modulated photon radiation therapy for oropharyngeal cancer: first comparative results of patient-reported outcomes.” *Int J Radiat Oncol Biol Phys.* 2016 February.