

Using Proton Therapy to Treat Thoracic Cancer

Overview

Patients with thoracic malignancies have several treatment options at their disposal. One new treatment tool in the toolbox to fight cancer for patients is proton therapy. 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.

All radiation therapy, whether it uses traditional x-ray radiation or proton radiation, is associated with an increased risk of pulmonary and cardiac morbidity in patients with thoracic cancers.

Given these risks, proton therapy can be an attractive option for patients with thoracic cancers because it is a noninvasive option that can substantially reduce the radiation dose to the lungs and heart compared to x-ray therapy. Proton therapy's precision targeting allows physicians to target the tumor with a higher dose of radiation and increase its oncologic benefit to the patient.^{1,2} Proton therapy is safe to deliver before or after surgery, or concurrently with chemotherapy agents.

Proton therapy has demonstrated benefits for patients receiving radiation for thoracic cancers, including:

- non-small cell lung cancer
- small cell lung cancer
- thymoma/thymic carcinoma³
- mesothelioma⁴
- thoracic sarcomas and cardiac tumors

Proton therapy is likely to benefit additional thoracic cancer patient subgroups, including:

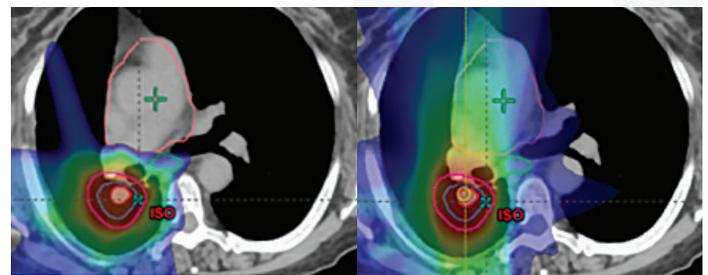
- **Patients who have had prior chest radiation therapy:** When any part of the body is radiated a second time, the risk of short- and long-term side effects increases. For this reason, patients who have previously received radiation to the

chest from prior cancers (breast, lung, esophagus, lymphoma, etc.) are often good candidates for proton therapy's precision targeting.

- **Patients with disease recurrence:** Proton therapy can aim a higher dose of radiation at the site of the recurrence, potentially leading to improved outcomes. Proton therapy's precision can reduce the radiation dose that surrounding normal tissue, including the heart and lungs, receive.

Proton Therapy Versus Photon Therapy

Because of the physics of proton particles, proton radiation goes to the site of the tumor and stops. The image below shows the areas surrounding the tumor exposed to radiation (dose delivered to tumor and surrounding tissue shown in color) during treatment. 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 thoracic cancer. All patients treated at the center have access to a wide range of clinical trials available through the Maryland Proton Alliance, including currently open and additional planned in-house and multi-institutional clinical trials.

¹ Simone CB 2nd, et al. "Intensity-modulated proton therapy for elective nodal irradiation and involved-field radiation in the definitive treatment of locally advanced non-small-cell lung cancer: a dosimetric study." *Clin Lung Cancer*. 2015;16(3):237-44.

² Simone CB 2nd, et al. "Establishing the feasibility of the dosimetric compliance criteria of RTOG 1308: phase III randomized trial comparing overall survival after photon versus proton radiochemotherapy for inoperable stage II-III NSCLC." *Radiat Oncol*. 2016;11:66.

³ Simone CB et al. "Prospective study of proton beam radiation therapy for adjuvant and definitive treatment of thymoma and thymic carcinoma: Early response and toxicity assessment." *Radiother Oncol*. 2016 Mar;118(3): 504-509.

⁴ Friedberg JS, Simone CB 2nd, et al. "Prospective Assessment of Proton Therapy for Malignant Pleural Mesothelioma." Accepted, International Association for the Study of Lung Cancer 16th World Conference on Lung Cancer, 2015. [Oral]



Clinical trials include:

- RTOG 1308: Phase III Randomized Trial Comparing Photon Versus Proton Chemoradiotherapy for Inoperable Stage II-III NSCLC where the primary endpoint is overall survival. The expectation is that the lower dose to the heart and lung will improve survival.
- Proton Collaborative Group LUN005: Phase I/II Study of Hypofractionated Proton Therapy for Stage II-III NSCLC is a trial where the dose of radiation will be escalated in a novel fashion by delivering radiation in a shorter treatment time with a goal of delivering 60 Gy in 3 weeks.
- NCT01255748: Evaluation Tracking Project: A Prospective Chart Review of Patients Treated with Radiation Therapy

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. Faculty at the University of Maryland School of Medicine were involved in developing international consensus guidelines into the optimal use of proton therapy for patients with lung cancer.⁵

In a 2017 report of over 243,000 patients, MPTC Medical Director Charles Simone found that proton therapy was associated with a 38% improvement in overall survival at 5 years compared with x-ray therapy.⁶

Dr. Simone also found in a clinical trial published in 2016 that proton therapy “has low rates of early toxicity and excellent initial outcomes” for patients with thymomas and thymic carcinomas.⁷

He also found in two other clinical studies both published in 2017 that proton therapy may be the

safest way to treat patients with lung cancer who have received surgery⁸ or who have developed a recurrence after initial treatment.⁹

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**.

Maryland Proton Treatment Center
850 West Baltimore Street
Baltimore, MD 21201

⁵ Simone CB 2nd, et al. “Consensus Statement on Proton Therapy in Early-Stage and Locally Advanced Non-Small Cell Lung Cancer.” Int J Radiat Oncol Biol Phys. 2016 May 1;95(1):505-516.

⁶ Simone CB 2nd, et al. “National Cancer Database Analysis of Proton Versus Photon Radiation Therapy in Non-Small Cell Lung Cancer.” Int J Radiat Oncol Biol Phys. 2017;97(1):128-137.

⁷ Simone CB 2nd, et al. “Prospective study of proton beam radiation therapy for adjuvant and definitive treatment of thymoma and thymic carcinoma: Early response and toxicity assessment.” Radiother Oncol. 2016;118(3):504-9.

⁸ Simone CB 2nd, et al. “First Clinical Report of Proton Beam Therapy for Postoperative Radiotherapy for Non-Small-Cell Lung Cancer.” Clin Lung Cancer. 2017 Jan 5.

⁹ Simone CB 2nd, et al. “Multi-Institutional Prospective Study of Reirradiation with Proton Beam Radiotherapy for Locoregionally Recurrent Non-Small Cell Lung Cancer.” J Thorac Oncol. 2017;12(2):281-292.