

Using Proton Therapy to Treat Lymphoma

Overview

Patients with lymphoma (both Hodgkin and non-Hodgkin) have a powerful new treatment tool available: proton therapy. 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 can receive higher doses of radiation, while sparing more of the surrounding healthy tissue.

Because lymphoma (and particularly Hodgkin lymphoma) typically responds well to treatment, many lymphoma patients will be cured with chemotherapy and radiation therapy and go on to live long lives. However, these patients may experience late morbidities, such as secondary cancers or cardiopulmonary disease, as a result of their lymphoma treatment.

Proton therapy is ideal for lymphoma patients because it can substantially reduce the radiation dose to the following organs:

- heart – leading to decreased cardiac morbidity
- lungs – decreasing pneumonitis risk
- esophagus – less difficulties with swallowing
- breast – decreasing the risk of future breast cancer development
- other normal tissues.¹

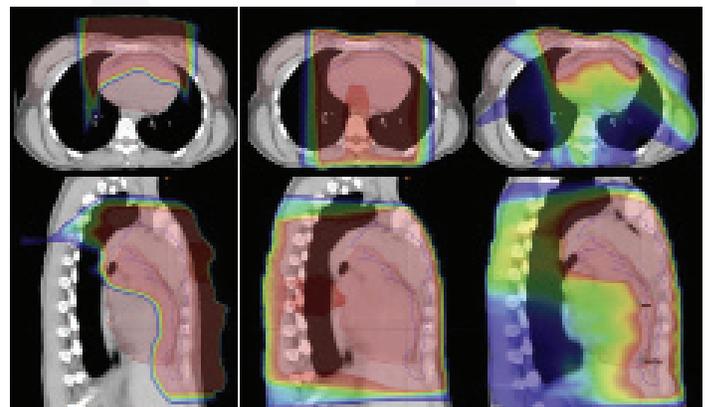
Proton therapy is likely to benefit both Hodgkin lymphoma and non-Hodgkin lymphoma patients, particularly:

- **Children or young adult/adolescent 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 patients with long life expectancies.²
- **Patients who have had prior 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 prior cancers (breast, lung, 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 tissues, 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, eliminating "exit radiation." 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 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 lymphoma. 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

¹ "Proton Therapy in the Management of Lymphoma." Cancer J. 2014 Nov-Dec;20(6):387-92

² "Dosimetric comparison of involved-field three-dimensional conformal photon radiotherapy and breast-sparing proton therapy for the treatment of Hodgkin's lymphoma in female pediatric patients." Int J Radiat Oncol Biol Phys. 2011 Nov 15;81(4):e667-71



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



Outcomes

Proton therapy's unique properties can improve outcomes for many patients with lymphoma. The expected late benefits of proton therapy will require longer follow up to be fully appreciated, but prospective data show that proton therapy is well tolerated in the short term. A 2015 study found proton therapy to be a feasible and effective treatment for non-Hodgkin lymphoma, with favorable short-term outcomes.³

Another study of Hodgkin lymphoma patients found that proton therapy reduced the radiation dose to surrounding healthy tissues (in this case, the stomach, bowel, liver, pancreas, and kidneys) compared to traditional photon therapy and IMRT.⁴ A 2014 study of Hodgkin lymphoma patients concluded that "Although decades of follow-up will be needed to realize the likely benefit of proton therapy in reducing the risk of radiation-induced late effects, proton therapy following chemotherapy in patients with Hodgkin lymphoma is well-tolerated, and disease outcomes were similar to those of conventional photon therapy."⁵

A 2016 study found that given the potential for cardiac sparing in Hodgkin Lymphoma when there is mediastinal disease treated with proton therapy, there would be a lower expected risk of long term cardiotoxicity.⁶ Further studies indicate that protons

allow for excellent early outcomes with fewer toxicities than would be expected.⁷

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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³"Proton therapy in the management of non-Hodgkin lymphoma." *Leuk Lymphoma*. 2015 56(9): 2608-2612.

⁴"Proton therapy to the subdiaphragmatic region in the management of patients with Hodgkin lymphoma." *Leuk Lymphoma*. 2015 Jul;56(7): 2019-2024.

⁵"Involved-node proton therapy in combined modality therapy for Hodgkin lymphoma: results of a phase 2 study." *Int J Radiat Oncol Biol Phys*. 2014 Aug;89(5): 1053-1059.

⁶"Radiation Dose-Response Relationship for Risk of Coronary Heart Disease in Survivors of Hodgkin Lymphoma." *J Clin Oncol*. 2016 Jan 20;34(3):235-43.

⁷"Proton therapy patterns-of-care and early outcomes for Hodgkin lymphoma: results from the Proton Collaborative Group Registry." *Acta Oncol*. 2016 Nov;55(11):1378-1380.