

# Proton Therapy at a Glance

## Overview

Proton beam therapy is one of the most precise and aggressive forms of radiation treatment for some cancerous and non-cancerous tumors available today. Proton therapy uses a controlled beam of protons to destroy cancer cells, while minimizing harm to healthy tissue and other side effects. This is a non-invasive, painless form of therapy that is provided to patients of all ages on an outpatient basis.

Depending on the case, proton therapy may be used in conjunction with other treatment modalities, such as chemotherapy and surgery, and even radiation therapy. The average course of treatment usually ranges from approximately four to six weeks, depending on the type of cancer and tumor itself.

## Key Advantages of Protons vs. Photons

Proton beam therapy and conventional (photon) X-ray therapy both work on the principle of selective cell destruction. But the major advantage of proton beam treatment compared to conventional radiation is that the energy distribution of protons can be directed and deposited in tissues with far greater control and precision, thus allowing higher doses. This allows for more direct impact on the tumor and less potential for harmful side effects than with X-ray therapy, enabling the patient maintain a relatively active lifestyle throughout treatment. Protons have mass (whereas photons do not) and tend to penetrate tissues without being deflected as much as photons generated by an X-ray beam.

By comparison, much of the energy from a conventional X-ray beam is deposited in undesirable areas (e.g., healthy tissue near the body's surface and beyond the cancer site). The unfocused placement of energy from photons generated by an X-ray beam can result in significant damage to healthy tissue, often preventing physicians from using sufficient doses of radiation to control the cancer.

## Tumors Treated

Proton therapy is most effective on tumors that are localized (i.e., have not spread to distant parts of the body). It is considered a highly effective treatment for tumors in the head, neck, brain, central nervous system and spine, eye, lung and prostate gland, among others. Protocols are being developed to explore the use of protons in other parts of the body. Proton therapy is also beneficial for pediatric cases.

## Existing Hospital-Based Proton Therapy Treatment Centers in the U.S.:

- Proton Treatment Center at Loma Linda University Medical Center  
Loma Linda, Calif. – *Opened: 1990*
- Francis H. Burr Proton Therapy Center at Massachusetts General Hospital  
Boston, Mass. – *Opened: 2001*
- Midwest Proton Radiotherapy Institute  
Bloomington, Ind. – *Opened: 2004*
- The Proton Therapy Center at The University of Texas M.D. Anderson Cancer Center  
Houston, Texas – *Opened: 2006*
- The University of Florida Proton Therapy Institute  
Jacksonville, Fla. – *Opened: 2006*
- ProCure Proton Therapy Center  
Oklahoma City, Okla. – *Opened: 2009*
- Roberts Proton Therapy Center at University of Pennsylvania Health System  
Philadelphia, Penn. – *Opened: 2009*

## History

The first attempts to use proton radiation to treat patients began in the 1950s in facilities whose main purpose was conducting nuclear physics research. Only in recent years has it become possible to develop proton beam facilities in conjunction with established medical centers. Nonetheless, the early success of proton beam treatments led the way for their use in an integrated manner with other cancer treatments. Approximately 70,000 patients worldwide have been treated using proton therapy.