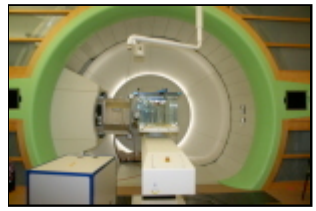
DOTmed Tours UPenn Proton Center



One of UPenn's four proton therapy gantries

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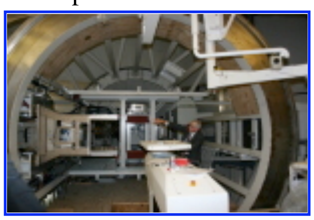
by Barbara Kram, Editor

A sneak peek at the state-of-the-art facility in Philadelphia.

The University of Pennsylvania held a seminar and tour of its new proton therapy center October 15.

While the facility is not treating patients yet, and we don't have the exact opening date, it won't be long before particle beam cancer therapy is available in the Delaware Valley at the Penn Medicine Roberts Proton Therapy Center, 3400 Civic Center Boulevard in Philadelphia.



A treatment room under construction reveals the beam entry site into the gantry area

In a pre-opening science writers seminar, UPenn and the National Cancer Institute briefed reporters on the therapy.

Stephen Hahn, M.D. Chair, Department of Radiation Oncology, Penn Medicine explained the chief benefit of proton therapy to "improve conformity to limit [radiation therapy] dose to the tumor...without expense to healthy tissues." He outlined the research direction that will be undertaken in conjunction with clinical work at the proton center to answer critical questions: "Who will benefit from proton therapy in a meaningful way we can measure?" and "It's intuitive that less dose is better, but does it translate to benefits to patients?" Also, "Does the positive effect of proton therapy translate into measurable benefit compared to regular radiation therapy?"

Among its promises, proton therapy may enable patients to take drugs that can't be used with conventional IMRT radiation therapy. "We need to find out if new combination therapies translate to lower side effects and higher cure rates ...to improve morbidity and mortality," Dr. Hahn said. "The technology may be the next best thing but we need to know what is best for the patient," he stressed.

A row of energy selector magnets adjust the

James Metz, M.D. Vice Chair, Clinical Operations Division, Department of Radiation Oncology explained that proton particles, essentially "scramble the DNA of cells" in a manner similar to conventional radiation therapy. It's a complicated issue to determine which cancers to target with protons. The

proton beam strength

precision targeting from proton therapy suggests it is applicable for some but not all cancers. Among the likely tumor site targets at Penn are lung, prostate, critical structures like the brain and eye, and pediatric cancers. Other areas of focus may be cancers in which conventional therapy does a poor job of improving outcomes.

Another question that Penn will try to address is, "How do protons fit into the multidisciplinary care of cancer to augment other therapies and make them work better?" Dr. Metz posed.

"How do we utilize this scarce resource?" he asked, articulating a key clinical and ethical question that underpins proton therapy.

"Proton therapy is still in its infancy and we are still optimizing how to deliver this radiation," Dr. Metz said. He noted that CT, MR and PET imaging are all used to visualize tumors and give a more conformal dose of radiation. Penn Medicine will be unique compared to the nation's six operational proton centers in the way proton therapy will be fully integrated into its radiation oncology facility.

Partnering with UPenn on the project are Varian and IBA

"UPenn has created a unique way to serve its patients by integrating the precision and benefits of proton therapy into its existing radiation oncology practice as they perform research and expand the promises of the proton beam," noted Leonard Arzt, Executive Director of the National Association for Proton Therapy, who attended the seminar.

Uncommon Disease, Uncommon Treatment

"Cancer is not a common disease, but a collection of rare diseases," observed Vikram Bhadrasain, M.D. Chief, Clinical Radiation Oncology Branch, National Cancer Institute who discussed improving outcomes in radiation oncology.

"While radiation therapy is still associated with adverse effects in too many patients, especially in advanced cancers, technological advances as well as pharmacological mitigators are needed," Dr. Bhadrasain indicated. He also described the important role electronic records will play including the electronic radiation oncology record to capture data and support clinical decision-making and comparative effectiveness research.

How It Works

Richard Maughan, Ph.D., Director of Medical Physics, Penn Medicine, explained the advanced technology: The cyclotron particle accelerator moves protons to a velocity of 60% of the speed of light. Protons obtain the energy to penetrate 32cm into the human body.

Proton therapy also uses a magnet system in which RF voltage is applied.

"It's [about the same] radio frequency that powers a radio station... [the proton] gains energy and spirals as it accelerates... and you deflect it out of the machine," said Dr. Maughan.

Inside the gantry, Dr. Maughan explains the multi-leaf collimator

Once the beam leaves the cyclotron, a long system of magnets adjusts the beam strength before it is sent to the treatment rooms. Four of the rooms are fitted with gantries--large rotating structures with 100-ton magnets to direct the beam at any angle. (The fifth room is a fixed-beam design.) The beam is also conformed through an adjustable multi-leaf collimator to target the tumor.

Because the proton beam is so precise, it must be dispersed into the tumor. This is accomplished either through a scattering or a layered scanning technique. Penn can do both but plans to begin its work using scattered beams because they cause no problems with organ motion.

Research partners for Penn include the Children's Hospital of Philadelphia and the U.S. military. Vendor partners in some of the technology at the University of Pennsylvania Roberts Proton Therapy Center include Varian and IBA.