Proton Beam Therapy for Prostate Cancer

Prostate cancer is the most common cancer among US men.

Prostate cancer can be treated either by surgical removal of the prostate gland or by radiation therapy. Radiation therapy kills cancer cells by delivering large amounts of energy to tumors. External radiation is usually given by **intensity-modulated radiation therapy** (**IMRT**), which sends many small radiation (x-ray) beams to the tumor in a way that maximizes the amount of radiation that reaches the cancer and minimizes radiation exposure of tissues around the tumor. IMRT has been proven to work and most men tolerate the side effects.

What Is Proton Beam Therapy?

A new kind of radiation treatment using proton beams is now available. **Protons** are heavier than x-rays and tend not to scatter as much. Also, unlike x-rays, protons slow down as they travel through the body. It is possible that proton beam therapy delivers less unwanted energy to tissues around the tumor than IMRT, but studies have found mixed results, and some have shown that IMRT better spares certain tissues than proton treatment. But protons are very sensitive to the different densities of tissues they pass through, more so than x-rays. If healthy cells are spared, patients being treated for prostate cancer will have fewer side effects, such as bowel, bladder, or erection problems, from radiation treatment. Proton beam therapy is also more sensitive than IMRT to daily variations in a patient's anatomy and positioning and theoretically can have more uncertainty in the dose delivered to the prostate.

Proton beam therapy has been shown to be better than older methods for treating children with certain brain and spinal cord cancers, but these cancers are very rare. Because prostate cancer is very common, it provides a greater opportunity to study the experience with proton beam therapy than do most other cancers.

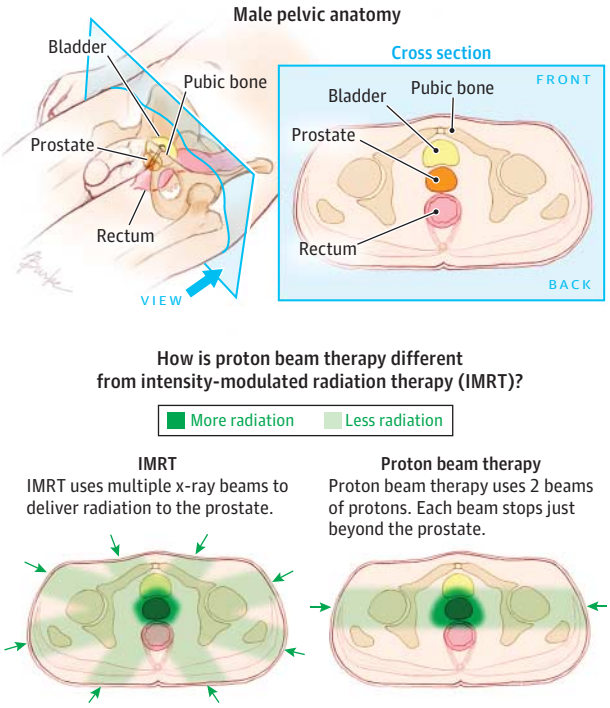
Studies of Proton Beam Therapy

So far, only a few studies have compared IMRT and proton beam therapy for prostate cancer. The results showed that

- There was no suggestion that proton beam therapy was better than x-ray radiation therapy in the treatment of prostate cancer.
- Although in the first 6 months after treatment there were fewer bladder problems with proton beam therapy, 1 year after treatment there was no difference in toxic effects.
- Patients report similar moderate problems with bowel function 2 years after either IMRT or proton beam therapy.
- IMRT was a little more than half the cost of proton beam therapy.

Although published studies have not found differences between IMRT and proton beam therapy in patient outcomes, research is ongoing, including clinical trials.

An article about proton beam therapy and IMRT was published in the April 18, 2012, issue of *JAMA* and a JAMA Forum blog post about proton beam therapy appeared online on September 4, 2013.



FOR MORE INFORMATION

- National Library of Medicine
  www.nlm.nih.gov/medlineplus/ency/article/007281.htm
- ClinicalTrials.gov
  clinicaltrials.gov/ct2/show/nct01617161

To find this and previous JAMA Patient Pages, go to the Patient Page link on *JAMA*'s website at *jama.com*. Many are available in English and Spanish. A Patient Page on prostate cancer was published in the July 9, 2008, issue; one on radiation therapy in the December 25, 2013, issue; and one on grading of prostate cancer in the October 3, 2007, issue.

Authors: Deborah Tolmach Sugerman, MSW; Edward H. Livingston, MD

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.