



Prostate Cancer Treatment

Prostate cancer overview

Prostate cancer is the most common form of cancer in American men, most prevalent in men over age 65 and fairly common in men 50-64 years old. However, prostate cancer can occur in men younger than 50. The incidence of diagnosed prostate cancer among American men has increased dramatically since 1990 because of the use of a screening blood test called prostate-specific antigen (PSA). More recently, men below the age of 65 years have shown an increased incidence of this disease.



What are my treatment options?

Treatment options overview

There are many treatment options for prostate cancer that is confined to the prostate gland. Each option should be considered carefully, balancing the advantages against the disadvantages as they relate to the individual man's age, overall health and personal preferences.

Historical standard options include:

- **Surgery (radical prostatectomy):** An incision is made in the lower abdomen or through the perineum (between the anus and the scrotum), and the prostate is removed. Incomplete surgery, in which the entire tumor cannot be removed, may need to be followed by radiation therapy. The patient is required to keep a urinary catheter in place for a number of weeks after the procedure. Possible side effects of surgery can include incontinence (inability to control urination) and impotence (inability to achieve erection). More recently, several centers are using three small incisions to do robot assisted prostatectomy that results in shorter hospitalization and faster recuperation. This may be preferable for selected patients, but not for all.
- **External beam therapy (EBT):** a method for delivering a beam of high-energy x-rays or proton beams to the location of the tumor. The radiation beam is generated outside the patient (usually by

a linear accelerator for photon/x-ray and a cyclotron or synchrotron for proton beam) and is targeted at the tumor site. These radiation beams can destroy the cancer cells, and conformal treatment plans allow the surrounding normal tissues to be spared. See the External Beam Therapy page for more information.

- Active surveillance: No treatment is performed. Patients will undergo careful observation and medical monitoring with routine PSA blood test and doctor examination.

Newer, advanced options have been developed in the past 10 to 15 years. These newer options avoid or minimize some of the unpleasant side effects sometimes associated with the standard therapies. These options include:

- Nerve-sparing radical prostatectomy: Surgical procedure in which the prostate gland is removed without severing the critical nearby nerves that send signals between the brain and penis to allow normal sexual functioning. A skilled and experienced surgeon may be able to preserve sexual function for some patients by successfully using this procedure.
- Conformal external beam radiation therapy with photon or x-rays: Uses advanced technology to tailor the x-ray or photon radiation therapy to an individual's body structures. Relying on computerized three-dimensional images of the prostate, bladder and rectum, the x-ray radiation beam is shaped to conform to the prostate gland. In this way, less radiation reaches the surrounding normal tissues. Today there are three levels of conformal radiation therapy: 3-D conformal radiation therapy, intensity modulated radiation therapy (IMRT), and stereotactic body radiation therapy (SBRT). All three allow for increased doses to the tumor while protecting the normal surrounding organs. IMRT and SBRT are considered the more conformal. Radiation treatment with 3-D conformal and IMRT are administered over a period of six to nine weeks while SBRT is given over a period of one week. For more detailed information see the Intensity-Modulated Radiation Therapy page and the Stereotactic Body Radiation Therapy page.
- Image-guided radiation therapy: For either proton or photon (3-D conformal, SBRT or IMRT) radiation treatment, daily image guidance is increasingly used to improve the setup due to organ movement. Since the prostate position varies day-to-day depending on bladder and rectal filling, the prostate position must be localized and verified prior to each treatment. In one method, several fiducial markers, or tiny pieces of biologically inert metal such as gold or carbon, are placed in the prostate gland before the simulation. Digital x-ray images are taken which localize the metallic markers to check the position of the prostate on a daily basis just before the treatment and appropriate adjustment and alignment of prostate to the planned high-dose radiation treatment field. Another method involves using ultrasound to localize the prostate before each treatment. The patient is asked to keep his bladder full as much as possible in order to produce a good ultrasound image, and also to displace the bladder mucosa out of the radiation treatment field. A third method involves the use of a low-dose computed tomography (CT) scan of the prostate area in the treatment couch right before each treatment to verify prostate position. Depending on your case and available technology at your treatment center, your physician will inform you of the type of IGRT you will receive. See the Image-Guided Radiation Therapy page for more information.
- Proton beam therapy: a type of conformal radiation therapy that bombards the diseased tissue with proton particles instead of x-rays (photons). With a multiple beam setup, the high-dose area around the tumor is similar between protons and x-rays with IMRT. There is, however, less low- and moderate-dose radiation delivered to surrounding normal tissues (bowels, bladder, bone, soft tissues) with protons. Proton beam therapy is more costly compared to other radiation treatments,

and the potential clinical benefits are currently the subject of ongoing investigation. Proton facilities are much less available in the U.S. See the Proton Therapy page for more information.

- **Brachytherapy:** Radiation treatment is delivered to the prostate via the placement of radioactive materials inside the prostate. There are two forms of brachytherapy, including low-dose rate (LDR) and high-dose rate (HDR):
 - **Low-dose rate (LDR) brachytherapy or permanent seed implant treatment:** About one hundred small radioactive seeds are inserted into the prostate gland through hollow needles using ultrasound or MRI guidance. These radioactive seeds deliver radiation continuously over a period of several weeks to months then become inactive. These seeds remain in the prostate forever. While the implant technique has been around for decades, recent advances in imaging technology have made it more effective. Prior to the implant, imaging such as CT, MRI or ultrasound is performed in order to plan the procedure. The implant procedure is done under conscious sedation or local/regional anesthesia. During the implant procedure, ultrasound (or sometime MRI) is used to see the prostate gland better. Using needles, physicians can carefully insert the seeds into the prostate transperineally (the area behind the testicle and in front of the anus). This is an outpatient procedure, and the patient may be required to keep a urinary catheter in place for about a week. Long-term results are available for up to 15 to 20 years at some institutions. These results show that in experienced centers, ultrasound-guided radioactive seed implantation is highly effective in controlling prostate cancer and has essentially the same result as surgery or external beam radiation for appropriately selected prostate cancer patients.
 - **High Dose Rate (HDR) Brachytherapy:** This technique was developed to supplement external beam therapy to treat patients with high risk prostate cancer. Patients receive about five weeks of external beam radiation therapy, followed by one to three HDR brachytherapy sessions. In this treatment, the radiation is delivered into the prostate via radioactive isotopes (often, Iridium-192) temporarily. This procedure is done as an in-patient procedure. First, about 12 to 18 hollow catheters are inserted into the prostate transperineally using ultrasound and x-ray guidance while patient is under general anesthesia. Then, a CT scan and treatment planning are done to determine location and duration of the placement of the Iridium-192 source. When the patient receives treatment, these catheters are connected to the HDR machine, which controls the delivery of the Iridium-192 radioactive source to the specific areas in each of these catheters. The treatment often lasts about 10 to 20 minutes per session, and the patient usually receives three to four sessions over a two-day period. At the end of the last session, the catheters are removed from the patient, and he is released from the hospital. While the catheters are in the prostate, the patient is required to be bed-ridden and hospitalized during that two-day period. The patient does not have permanent radioactive materials when he leaves the hospital and may be required to keep a urinary catheter in place for about a week. Use of this technique by itself (i.e., without the external beam treatments) for low-risk patients is still in the experimental stages.

See the Brachytherapy page for more information.

- **Radium 223 treatment:** Radium 223, sold under the brand name Xofigo (pronounced zoh-fee-go), is an isotope of the metal radium that is used to treat prostate cancers that have spread to the bones. Because of its chemical similarity to calcium, radium is absorbed by bone cells. Because cancer cells are more active than normal bone cells, they are more likely to absorb the radium 223. Once the radium is in the bones, it releases radiation within a very small area to kill the nearby cancer

cells while sparing the healthy bone cells surrounding the cancer. Radium 223 is effective at controlling advanced prostate cancer and reducing pain in more than one area of the bone because it travels throughout the body. The injection takes up to a minute and is typically repeated every four weeks for up to six or more total treatments. Treatment is performed on an outpatient basis, so you may return home afterwards. The side effects of radium 223 include diarrhea, anemia and pain in the areas of the tumor where the radium is working. Men who receive radium treatment shouldn't father children for at least six months because radium may cause sperm damage.

How can I choose from among the options?

In addition to talking with family and friends, you will need a team of physicians to help advise you. By the time of diagnosis, you will already have met two of the three or four doctors you will need for your cancer treatment planning: your primary care physician (an internist or family practice doctor) and a urologist, who probably performed the biopsy. (In some cases, a radiologist performs the biopsy.) If you have an early-stage cancer or moderately advanced cancer and there is no evidence of spread to other organs (non-metastatic), you need to talk to one more doctor: a radiation oncologist. The two major options for treatment are surgery (performed by your urologist) or radiation therapy (performed by a radiation oncologist).

If your cancer is advanced and you require hormonal suppression therapy or chemotherapy, then you will also need a medical oncologist, who administers these drugs. Hormone-ablation therapy, which is often used to treat more advanced prostate cancer by suppressing your androgen (or testosterone) hormones since most prostate cancer growth is stimulated by androgen or testosterone. The androgen suppression treatment can be administered by your internist, urologist, radiation oncologist or medical oncologist. Depending on the stage of the cancer, hormone suppression therapy may be used in addition to radiation therapy to help control the cancer. Hormone suppression therapy may be administered for as little as four to six months, or for as long as two to three years.

If I choose surgery, will radiation treatment still be required?

If your surgery is incomplete (meaning that some cancer still remains) or shows a more locally advanced cancer stage than was expected, additional radiation therapy within three to six months can prevent reoccurrence in many men. You will want to discuss this option with your physician team.

If I choose radiation therapy, will surgical treatment still be an option?

If radiation therapy is used as the primary treatment, and the treatment is not successful, surgery or repeat radiation therapy are not considered to be desirable treatments due to the high risk of serious complications. If performed, the physician performing the re-treatment should have a high level of experience. There are experimental clinical studies being evaluated for use of very localized re-irradiation (brachytherapy or stereotactic body radiation therapy) for this group of patients. Some patients for which radiation is not effective are treated by systemic therapy or by close surveillance.

How effective is modern radiation treatment of prostate cancer?

With modern technology and recent advances in software, radiation therapy can give more radiation dose directly to the prostate than to surrounding healthy tissues. Physicians use various imaging techniques to see the prostate and surrounding tissues in three dimensions, so that the radiation beams can be tailored

more precisely to the individual patient's unique needs. Physicians can estimate and minimize the dose of radiation that will be received near the rectum, small bowel, bladder and hips during the course of radiation treatment to reduce the risk of side effects and complications. The goal is to safely provide a higher dose of radiation than even five years ago, which helps to improve the chances of cure. For similar stage and prostate cancer types, radiation therapy is as effective as surgery but with a different treatment process and different side effects.

What happens during radiation therapy?

Radiation therapy uses high-energy x-rays (photons) or a stream of particles (protons). When radiation is used at high doses (many times those used for x-ray imaging exams), it can destroy abnormal cells. Cancer cell death and injury are accumulated with each radiation treatment. Each treatment destroys some of the cancer cells. This happens at a microscopic level. Patients do not feel the radiation during treatment. They will only hear some electrical noise and see warning lights from the machine.

What are possible side effects of radiation therapy?

As radiation treatment progresses, it may cause patients to become tired. While adequate rest is important, doctors usually advise patients to try to stay as active as they can. Patients may have some rectal irritation such as bowel urgency, discomfort, diarrhea and/or frequent and uncomfortable urination. In addition, skin in the treated area may become dry. Redness or tenderness is unusual. Radiation therapy can also cause hair loss in the pelvic area. The loss may be temporary or permanent, depending on the amount of radiation used.

Radiation therapy (either external radiation or brachytherapy) causes impotence in some men. The rate of impotence is similar to patients who undergo nerve-sparing prostatectomy. There is also a risk that bladder or rectal problems may occur with any type of radiation. If this occurs, it usually presents itself one to three years after radiation therapy. Interventions, usually medications, are sometimes required. Surgical intervention for these problems is uncommon.

What kind of treatment follow-up should I expect?

Patients are usually asked to return to see the radiation oncologist about two to eight weeks after the last session of radiation therapy. The main purpose of this first visit after the treatment is to see whether the side effects—such as bowel or urinary symptoms—have subsided. In most patients, these symptoms subside in a few weeks. The doctor will check up on you and make sure that you make good progress in recovery. After that, you will have regular follow-up at intervals of three to six months. A digital rectal examination will be done to assess the prostate gland. A blood test will be performed to measure your PSA level and to assess your response to the treatment. An elevated level of PSA can indicate the presence of prostate cancer. During follow up the physician can also monitor any late side effects from your radiation treatment and offer assistance in managing these side effects.

If you ask the radiation oncologist, "How am I doing? Is the cancer all gone? Am I cured?" he or she cannot answer these questions immediately, as is the case following surgery. After radiation therapy, the response may take months to become fully manifest. Dead cancer cells have to be gradually disposed of by the body. Some cancer cells, even if technically dead (i.e., they cannot multiply), may continue to function for some time before they ultimately die. For successful radiation therapy, the PSA level drop is much slower than that of surgery. The PSA usually drops by half every three to four months after the radiation, and typically to the lowest level in about 12 to 18 months.

Are there any new developments in treating my disease?

Clinical Trials

For information and resources about clinical trials and to learn about current clinical trials being conducted, visit:

- RadiologyInfo's Clinical Trials page.
- Clinical Trials - from the National Cancer Institute's Web site

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