RadiologyInfo.org
For patients

Prostate Cancer Treatment

Prostate cancer overview



Prostate cancer is the most common form of cancer in American men. It is most prevalent in men over age 65 and common in men 50-64 years old. However, prostate cancer can occur in men younger than 50. Prostate-specific antigen (PSA) screening has dramatically improved the diagnosis of prostate cancer. As a result, men below the age of 65 years show an increased incidence of this disease.

What are my treatment options?

- Treatment options overview (http://www.radiologyinfo.org#treatment-ov)
- How can I choose from among the options? (http://www.radiologyinfo.org#decision)
- If I choose surgery, will radiation treatment still be required? (http://www.radiologyinfo.org#necessary)
- If I choose radiation therapy, will surgical treatment still be an option? (http://www.radiologyinfo.org#surgical_option)
- How effective is modern radiation treatment of prostate cancer? (http://www.radiologyinfo.org#effective)

Treatment options overview

There are many treatment options for cancer limited to the prostate gland. You and your doctor should carefully consider each option. Weigh the benefits and risk as they relate to the aggressiveness and/or stage of the cancer as well as your age, overall health, and personal preferences. Standard treatments include:

- **Surgery (radical prostatectomy):** The surgeon makes an incision in the lower abdomen or through the perineum (between the anus and the scrotum) and removes the prostate. If they cannot remove the entire tumor, you may need radiation therapy (http://www.radiologyinfo.org) . You will need to keep a urinary catheter in place for several weeks after the procedure. Possible side effects can include incontinence (http://www.radiologyinfo.org) and impotence (http://www.radiologyinfo.org) . Some surgeons may use three small incisions to do a robot-assisted prostatectomy. This may result in a shorter hospital stay and quicker recovery. This procedure may be preferable for some patients, but not for all.
- External beam therapy (EBT) (https://www.radiologyinfo.org/en/info/ebt) *:* EBT delivers a beam of high-energy x-rays or protons to the tumor. A machine generates and targets the radiation beam at the tumor site. EBT destroys cancer cells, and conformal treatment plans spare surrounding normal tissues from exposure.
- **Active surveillance**: No treatment, with careful observation and medical monitoring.

Advanced treatment options may avoid or minimize some of the side effects associated with standard therapies. These options include:

- **Nerve-sparing radical prostatectomy:** The surgeon removes the prostate without severing the critical nerves that enable sexual function. A skilled, experienced surgeon may be able to preserve sexual function for some patients using this procedure.
- **Intensity modulated external beam radiation therapy (IMRT):** External beam radiation therapy uses high energy

Copyright© 2026, RadiologyInfo.org

radiation beams to kill cancer cells. IMRT uses advanced technology to target radiation to body structures. The doctor uses computerized three-dimensional images of the prostate, bladder, and rectum to shape and conform the radiation to the tumor. They may also target nearby lymph nodes. In this way, less radiation reaches the surrounding normal tissues. 3-D conformal radiation therapy and IMRT both deliver a higher radiation dose to the tumor while protecting healthy nearby organs. Doctors consider IMRT to be more highly focused. They typically provide IMRT daily (Monday through Friday) for four to nine weeks. IMRT is typically used with daily image guidance to help decrease the margin of normal tissue. *For more detailed information see the IMRT page (https://www.radiologyinfo.org/en/info/imrt)* .

- Stereotactic Body Radiation Therapy (SBRT) (https://www.radiologyinfo.org/en/info/stereotactic) uses photon or x-ray therapy at a much larger dose per treatment. SBRT treats prostate cancer over one to two weeks with four to five treatments. It requires higher precision and requires special equipment. Not all patients are candidates for SBRT.
- *Proton beam therapy (https://www.radiologyinfo.org/en/info/protonthera)* **:** Protons are atoms that carry a positive charge. Doctors use protons and x-rays (photons) to treat both benign and malignant tumors. There is no significant difference in the biological effects of protons versus photons. However, protons deliver radiation to the tumor in a much more confined way than photons. After they enter the body, protons release most of their energy within the tumor region. Unlike photons, they deliver only a minimal dose beyond the tumor boundaries. This allows the doctor to conform the radiation much tighter to the tumor. This may cause less damage to healthy tissue. Proton therapy allows the doctor to potentially give an even greater dose to the tumor while minimizing unwanted side effects. This is especially important when treating children because protons help reduce radiation to growing and developing tissues. Proton therapy costs more than other radiation treatments and is not widely available in the U.S. Doctors are currently investigating the use of proton therapy in various cancers.
- Image-guided radiation therapy (IGRT) (https://www.radiologyinfo.org/en/info/igrt) : 3-D conformal, IMRT, SBRT and proton therapy use daily image guidance to improve treatment setup. This is necessary because of organ movement and uncertainties in set-up. Depending on how full your bladder and rectum are, the prostate position can vary. So, the doctor must locate and verify the prostate's position before each treatment. Various technologies are used to verify the position of the prostate. The type of IGRT you receive will depend on your case and what technology is available at your treatment center.
    - If digital x-rays are taken on the linear accelerator, fiducial markers (https://www.radiologyinfo.org/en/info/fiducial-marker) are placed in the prostate gland before the simulation. The digital x-ray images locate the metallic markers. This allows them to check the position of the prostate daily just before the treatment. They will make appropriate adjustments and align the prostate within the planned high-dose radiation treatment field.
    - Another method uses ultrasound to locate the prostate before each treatment. The patient keeps his bladder as full as possible to produce a good ultrasound image. This also moves the bladder out of the radiation treatment field.
    - Other methods use computed tomography (CT) and/or MRI scanning before each treatment to verify prostate position.
- ***Cryotherapy (https://www.radiologyinfo.org/en/info/thermal-ablation-therapy)*** : This procedure uses extremely low temperatures (-190°C) to freeze and destroy cancer cells. Some patients get good results and have few complications with cryotherapy. Others do not. Cryotherapy is an alternative to surgery for patients whose prostate cancer has returned after radiation treatment. It is not typically used in the primary treatment of prostate cancer.
- Brachytherapy (https://www.radiologyinfo.org/en/info/brachy) : Brachytherapy may be temporary or permanent. Talk to your radiation oncologist (http://www.radiologyinfo.org) about the specifics of your treatment.
    - Temporary brachytherapy (http://www.radiologyinfo.org) places radioactive material inside a catheter for a specific amount of time and then removes it. It is given at a low-dose rate (http://www.radiologyinfo.org) (LDR) or high-dose rate (http://www.radiologyinfo.org) (HDR).
    - Permanent brachytherapy (http://www.radiologyinfo.org) is also called seed implantation. It permanently places radioactive seeds (about the size of a grain of rice) in or near the tumor. After several months, the seeds lose their radioactivity. Sometimes, active seeds may trigger radiation detectors at security checkpoints. You may need a doctor's note to explain your situation to security personnel. Inactive seeds are harmless and rarely trigger metal detectors.
- **Radium 223 treatment**: Xofigo (pronounced zoh-fee-go) is a brand name for Radium 223. Doctors use this isotope to treat prostate cancers that have spread to the bones. Bone cells absorb radium because it chemically resembles calcium.

Copyright© 2026, RadiologyInfo.org

Cancer cells are more active than normal bone cells, so they are more likely to absorb the isotope. The isotope releases radiation within a very small area. It kills the nearby cancer cells while sparing the surrounding, healthy bone cells. Radium 223 effectively controls advanced prostate cancer and reduces pain in more than one area because it travels throughout the body. The injection takes up to a minute. The doctor will typically repeat injection every four weeks for up to six or more total treatments. This is an outpatient procedure, so you may return home afterwards. Treatment side effects include diarrhea, anemia, and pain around the tumor. Radium treatment may cause sperm damage. Therefore, men who receive it shouldn't father children for at least six months.

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. You should meet with everyone involved in your treatment planning before choosing a treatment, including:

- your primary care doctor
- a urologist to discuss surgery
- a radiation oncologist to discuss radiation therapy
- a medical oncologist to discuss hormone suppression, if your cancer is more advanced

After you meet with these doctors, you can make an informed decision regarding your treatment options. You may have an early-stage or moderately advanced cancer with no evidence of spread to other organs (non-metastatic). If so, your two major treatment options are active surveillance (for the earliest, least aggressive cancers), surgery (by your urologist) or radiation therapy (by a radiation oncologist (http://www.radiologyinfo.org)).

You may have advanced cancer and require hormonal suppression therapy or chemotherapy (http://www.radiologyinfo.org) . If so, you will need a medical oncologist to administer these drugs. Doctors use hormone-ablation therapy to treat advanced prostate cancer. It suppresses androgen (or testosterone) because these hormones stimulate most prostate cancer growth. Your internist, urologist, radiation oncologist or medical oncologist may administer the treatment. Depending on the stage of the cancer, your doctor may use hormone suppression therapy and radiation therapy to help control your disease. You may receive hormone suppression therapy 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?

Your surgery may be incomplete (meaning some cancer remains) or show a more advanced cancer. If the surgeon has inadvertently cut through tumor, you have what is called a positive margin. Having a positive margin or disease that breaks through the capsule of the prostate gland or invades the seminal vesicles (T3) are reasons to meet with a radiation oncologist soon after you recover from surgery. Additional radiation therapy within three to six months may prevent the cancer from coming back. Discuss this option with your treatment team.

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

Your doctor may use radiation therapy as your primary treatment. It is important to note that the cure rates for surgery and radiation are similar. Therefore, you have the same risk of cancer recurring if surgery is performed.

If it is not successful, your doctor will likely not consider surgery or repeat radiation therapy due to the risk of serious complications. If your doctor recommends surgery after radiation or additional radiation, the doctor performing the re-treatment or surgery should have a significant 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 whom radiation is not effective are treated with systemic therapy or closely monitored. Additional treatment will depend on the PSA level and rate of rise of the PSA.

How effective is modern radiation treatment of prostate cancer?

Copyright© 2026, RadiologyInfo.org

Thanks to improvements in technology and daily imaging, radiation therapy can deliver a higher radiation dose directly to the tumor while sparing surrounding healthy tissue. Doctors use different imaging techniques to see the prostate and surrounding tissues in three dimensions. This allows the doctor to tailor the radiation more precisely to the individual patient's unique needs. Treatment planning allows them to estimate and minimize radiation exposure to the rectum, small bowel, bladder, and hips. This helps reduce the risk of side effects and complications. The goal is to safely provide a high dose of radiation, which improves the chance of cure. For similar stage and prostate cancer types, radiation therapy is as effective as surgery.

What happens during radiation therapy?

Radiation therapy uses high-energy x-rays (photons) or a stream of particles (protons). High doses of radiation (many times those used for x-ray exams) can destroy abnormal cancer cells. Each treatment destroys some of the cancer cells at a microscopic level. Patients do not feel the radiation during treatment. They will only hear some electrical noise and may see light from the machine.

What are possible side effects of radiation therapy?

Initially, most patients do not have side effects. Radiation side effects build with time. They tend to be worse toward the end of a week and better after the weekend break. As radiation treatment goes on, it may cause you to feel tired. While adequate rest is important, doctors will usually advise you to stay as active as you can. You may have some rectal irritation such as bowel urgency, discomfort, diarrhea, and/or frequent and uncomfortable urination. Also, skin in the treated area may become dry. Redness, tenderness, or hair loss is unusual.

Radiation therapy can cause impotence in some men at a similar rate as nerve-sparing prostatectomy. Typically, radiation induced impotence will respond to medications to improve erectile function. There is also a small risk of late bladder or rectal problems with radiation. These may appear one to three years after radiation therapy. Your radiation oncologist will monitor you for late complications and check your PSA in your follow-up appointments.

What kind of treatment follow-up should I expect?

Patients usually return to see the radiation oncologist about two to eight weeks after the last radiation therapy session. The main purpose of this visit is to see if the side effects from treatment—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 you make good progress in recovery. After that, you will have regular follow-ups every three to six months. Your doctor may use a digital rectal exam to assess your prostate. A blood test will measure your PSA level and assess your response to treatment. Higher PSA levels can indicate the presence of prostate cancer. During follow-up, your doctor can also monitor any late treatment side effects and help manage them.

You may ask the radiation oncologist, “How am I doing? Is the cancer all gone? Am I cured?” However, they cannot answer these questions immediately. After radiation therapy, it may take months to see your full treatment response. The body gradually disposes of dead cancer cells. Some cancer cells, even if technically dead (they cannot multiply), may continue to function for a while before ultimately dying. The rate of PSA level drop for successful radiation therapy is much slower than that of surgery. PSA usually drops by half every three to four months after radiation, and typically to the lowest level in about 12 to 18 months.

Are there any new developments in treating my disease?

Doctors often successfully treat prostate cancer. Sometimes, however, the disease returns (recurs). An FDA-approved radiotracer for PET/CT called Axumin® (fluciclovine F-18) helps detect and locate cancer that recurs following radiation therapy or surgery.

Conventional imaging, such as MRI or ultrasound, cannot locate recurring prostate cancer when it is small. PET/CT with Axumin® can detect recurring cancer when PSA levels are low and when the cancer is small.

Identifying the exact location and extent of the disease at an early stage is vital. It allows doctors to specifically target the cancer

Copyright© 2026, RadiologyInfo.org

and limit exposure to healthy tissues.

Prostate-specific membrane antigen (PSMA) is a protein that helps develop prostate cancer. A PSMA scan uses PET imaging and a radiotracer to locate recurrent cancer. Lutetium-177 PSMA therapy is recently shown to improve survival in certain metastatic prostate cancer patients.

Clinical Trials

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

- RadiologyInfo's Clinical Trials (https://www.radiologyinfo.org/en/info/screening-clinical-trials) page.
- Clinical Trials (https://www.cancer.gov/pediatric-adult-rare-tumor/participate/featured-clinical-trials) - from the National Cancer Institute's Web site

Which test, procedure or treatment is best for me?

- *Post-treatment Follow-up of Prostate Cancer (https://www.radiologyinfo.org/en/info/acs-followup-prostate-cancer)*

Disclaimer

This information is copied from the RadiologyInfo Web site (http://www.radiologyinfo.org) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at **http://www.radiologyinfo.org** to view or download the latest information.

Note: Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

Copyright

This material is copyrighted by either the Radiological Society of North America (RSNA), 820 Jorie Boulevard, Oak Brook, IL 60523-2251 or the American College of Radiology (ACR), 1891 Preston White Drive, Reston, VA 20191-4397. Commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is prohibited.

Copyright ® 2026 Radiological Society of North America, Inc.