Prostate Cancer Basics

Patient education

The prostate is a muscular, walnut-sized gland that surrounds part of the urethra, the tube that transports urine and sperm out of the body. (A gland is a group of cells that secretes chemicals that act on or control the activity of other cells or organs.)

The main function of the prostate is to produce semen, the milky fluid that transports sperm. Sperm is produced in the testicles, which also produce the main male hormone testosterone. Testosterone stimulates the growth and function of the prostate during puberty, as well as the production of prostatic fluid for semen.

During sexual climax (orgasm), the muscles of the prostate contract to push the semen through the urethra and out through the penis. The urethra also carries urine, a waste product made by the kidneys and stored in the bladder. When the penis is erect during sexual intercourse, the flow of urine is blocked from the urethra, allowing only semen to be ejaculated at orgasm.

Where is the prostate located?

The prostate is located directly beneath the bladder and in front of the rectum. Because the upper portion of the urethra passes through the prostate, if the gland becomes enlarged it can obstruct the passage of urine or semen through the urethra.

What is prostate cancer?

Prostate cancer is the most common cancer in men, and the second leading cause of cancer death among men in the U.S. More than 180,000 men in the U.S. will be diagnosed with prostate cancer this year, and more than 40,000 will die of the disease. Eighty percent of men who reach age 80 have prostate cancer.

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Prostate cancer is a malignant tumor that usually begins in the outer part of the prostate. In most men, the cancer grows very slowly. In fact, many men with the disease will never know they had the condition. Early prostate cancer is confined to the prostate gland itself, and the majority of patients with this type of cancer can live for years with no problems.

Prostate cancer is characterized by both “grade” and “stage.” The size and extent of the tumor determine its stage. Early stage prostate cancer, Stages T1 and T2, are limited to the prostate gland. Stage T3 prostate cancer has advanced to tissue immediately outside the gland. Stage T4 prostate cancer has spread to other parts of the body.

What causes prostate cancer?

Like many cancers, the cause of prostate cancer is unknown. But doctors do know that it is more common in African-American men and men with a family history of the disease. The male sex hormone testosterone also contributes to its growth.

What are the symptoms of prostate cancer?

Prostate cancer, by nature, is silent in its initial stages. Its symptoms don’t appear until later, when patients may notice a need to urinate frequently, particularly at night. Prostate cancer may also cause a difficulty or inability to urinate, a weak or interrupted flow of urine or painful and burning urination. Other symptoms may include painful ejaculation, blood in urine or semen, and frequent pain or stiffness in the lower back, hips or extremities.

Who is at risk for prostate cancer?

The number of cases of prostate cancer has declined among white American men. The incidence of the disease in black men and the mortality rate among black men is more than twice that of white men, according to the American Cancer Society.

The following are some of the risk factors for prostate cancer:

- **Age**. The greatest risk factor for prostate cancer is age. More than 75 percent of all prostate cancers are diagnosed in men older than 65 years.
- **Family history**. Men whose relatives have had prostate cancer are considered to be at high risk. Having a father or brother with the disease doubles your risk for prostate cancer, according to the American Cancer Society. Therefore, screening for prostate cancer should be started at age 40 in men with a family history of the disease. To date, two genes have been identified that predispose a man to prostate cancer. Experts estimate that the hereditary form of prostate cancer accounts for just 9 percent of all cases.
- **Race**. African-Americans have the highest incidence of prostate cancer. They are 30 to 50 percent more likely to develop prostate cancer than other races in the U.S. Japanese and African men living in their native countries have a low incidence of prostate cancer. Rates for these groups increase sharply when they immigrate to the U.S. African-Americans, therefore, represent another group of men for whom prostate cancer screening should begin at age 40. The increase in the incidence of prostate cancer in African-American men suggests an environmental connection, possibly related to high-fat diets, inadequate exposure to the sun, exposure to heavy metals such as cadmium, infectious agents, or smoking.
- **Diet**. Research also suggests high dietary fat may be a contributing factor. The disease is much more common in countries in which meat and dairy products are dietary staples, compared with countries in which the basic diet consists of rice, soybean products, and vegetables.

- **Male hormones**. High levels of male hormones called androgens may increase the risk of prostate cancer for some men, according to the American Cancer Society. Research is currently under way to determine whether medicines that lower androgen levels can lower the risk of prostate cancer.
- **Sedentary lifestyle**. You may be able to reduce your risk for prostate cancer by getting regular exercise and maintaining your optimal weight.

How is prostate cancer detected?

The most effective means of detecting prostate cancer early is through a screening, which involves a digital rectal exam and measuring the amount of prostate-specific antigen (PSA) in the blood.

The PSA test is believed to detect most prostate cancers. PSA is a protein secreted by the prostate into the bloodstream. Elevated levels of this antigen may indicate the presence of prostate cancer.

If cancer is suspected, a prostate biopsy (removal of tiny pieces of prostate tissue) will be performed. By removing a tissue sample from the tumor and examining it, doctors can confirm or rule out a diagnosis of cancer and determine whether the disease has spread to other organs.

What if prostate cancer is diagnosed?

Fortunately, most prostate cancers have not spread at the time they are diagnosed, and the cancer is most often confined to the prostate gland.

To help predict the aggressiveness of the prostate cancer, your physician will look at your PSA levels before the biopsy and will also calculate the “Gleason Score.” The Gleason Score is a sum of the grades of the two most common prostate tumors. After looking at microscopic sections of the biopsied prostate tissue, the pathologist assigns a grade (from 3 to 5, with 3 being closest to normal appearance and 5 being least normal) to the tumors based on their appearance. The Gleason Score is therefore a score that ranges from 6 to 10, with 6 representing the least aggressive form (confined to the gland) and 10 representing the most aggressive form of cancer (highest risk of spreading outside the gland).

From the PSA levels and the Gleason Score, a treatment plan is devised. For men with a low risk of the cancer having spread outside the gland, staging studies such as bone scans and computed tomography scans are not needed. Men with cancer with a higher likelihood of spreading may require these staging studies to determine where the cancer may have spread.

What are the treatment options for prostate cancer?

Physicians tailor prostate cancer treatment plans to their patient’s needs, taking into account the type of cancer, the age of the individual, the degree to which the cancer has spread and the general health of the patient.

- **Observation or surveillance**. For men with low-risk cancer, observation may be an initial strategy.
- **Laparoscopic radical prostatectomy**. A minimally invasive procedure, laparoscopic prostatectomy removes the prostate gland. Laparoscopic prostatectomy is offered at only a handful of medical centers in the country. Unlike conventional surgery, a laparoscopic prostatectomy requires only five button-hole incisions. Through these incisions, a surgeon uses a laparoscope—a tiny camera—and surgical instruments to conduct the operation and remove the prostate.

- **Robotic radical prostatectomy**. Robotic prostate cancer surgery is offered at some institutions. During the procedure, surgeons use robotic arms to guide the laparoscope through small incisions to remove the cancerous prostate and affected tissue. Various robotic systems are available, which may consist of a 3-armed robot connected to a remote console. The surgeon operates the system while seated at the console. Foot pedals are used for control, and 3-dimensional displays provide a unique depiction of the surgical field.
- **Open radical prostatectomy**. Open radical prostatectomy removes the entire prostate with an incision in the lower abdomen. Since the prostate wraps around the urethra, once it is removed the surgeon must reconnect the bladder with the urethra.
- **Radiation therapy**. Radiation therapy uses high energy x-rays to kill cancer cells and shrink tumors. Radiation can be produced from a machine outside the body (external radiation) or by putting materials that produce radiation (radioisotopes) through thin plastic tubes into the area in which the cancer cells are found (internal radiation).
- **Interstitial brachytherapy (seed implantation)**. Interstitial brachytherapy is a form of radiation therapy. A radiation oncologist and urologist implant radioactive pellets or “seeds” into the prostate, and the pellets radiate the prostate and surrounding tissue over time.
- **Intensity-modulated radiotherapy**. An advanced form of radiotherapy called intensity-modulated radiotherapy has shortened the duration of prostate cancer treatment by several weeks. With computer guidance, high doses of radiotherapy can be delivered precisely to the tumor, reducing the risk to normal tissue.
- **Cryotherapy**. Small needle-shaped probes can be inserted into the prostate to freeze the gland to temperatures lethal to a prostate cancer. This minimally invasive, incision-free procedure is performed either on an outpatient basis or with a one-night hospital admission. Patients recover in a matter of days and usually experience minimal after effects.
- **Hormone therapy**. Hormone therapy is a prostate cancer treatment that alters the body’s hormone balance to prevent certain cancers from growing. Hormone therapy may be accomplished using drugs that alter the way hormones work or with surgery that removes hormone-producing organs such as the testes.
- **Chemotherapy**. Chemotherapy involves the use of drugs to kill cancer cells. Chemotherapy may be taken orally or injected into a vein. Chemotherapy is usually a systemic treatment, which means that the drugs enter the bloodstream, travel through the body, and can kill cancer cells anywhere in the body, including the prostate.

What is the outlook for prostate cancer?

Eighty-nine percent of the men diagnosed with prostate cancer will survive at least 5 years, while 63% will survive 10 years or longer.

Because prostate cancer is a slow-growing disease, many affected men will die from other causes. Evidence also indicates that many patients detect their prostate cancer, at a curable stage, because of annual screening.

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