Prostate Cancer

2.0 Contact Hours

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Prostate Cancer

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Objectives:

At the completion of this course, the learner will be able to:

1. Recognize statistics concerning prostate cancer.
2. Identify screening guidelines for prostate cancer.
3. Identify tests used to diagnose prostate cancer.
4. Specify treatment of prostate cancer.

Statistics

Prostate cancer strikes 1 out of 6 men. This disease is the second leading cause of death in males. Of those who develop prostate cancer, 1 out of 8 will die from it. Forty percent of prostate cancer that occurs early in life is genetic, comprising 5 to 10% of all cases. It is estimated that over 2 million American men alive today have prostate cancer. The number of yearly deaths from prostate cancer has declined in the past 5 years due to widespread PSA testing which began about 1990. The cancer is still localized in the prostate gland in 95 to 99% of cases at diagnosis as a result of routine PSA screening that allows early detection. About 40% of newly diagnosed cases are not detectable with palpation.

Anatomy and Physiology

The prostate is found beneath the bladder, wrapped around the male urethra. The prostate is small at birth and continues to grow until it reaches the size of a walnut. Glandular cells of the prostate manufacture fluid that provides nutrients to sperm. The cavernous nerves responsible for penile erections cross on either side of the prostate on their way to the penis, adhering to the prostate surface. The innermost portion of the prostate surrounding the urethra is subject to overgrowth, causing benign prostatic hyperplasia (BPH) which partially occludes the urethral opening in many older men. Androgens (mainly testosterone) fuel the growth of prostate cells and are also needed to nourish prostate cancer cells. Androgens are produced primarily in the testes and small amounts are made by the adrenal glands.

Pathophysiology

Prostate cancer occurs when changes occur in genes that detoxify carcinogens. Inflammation can also play a role since prostate cancer is commonly found next to an

area of inflammation called proliferative-inflammatory atrophy (PIA). The vast majority of prostate cancers (95%-99%) occurs in the gland cells and is adenocarcinoma. Sarcoma, squamous, or transitional cell tumors comprise the rest. Tumor growth begins with prostatic intraepithelial neoplasia (PIN) in the ducts of the prostate gland. These cells are pre-cancerous and present in half of all men before age 50. PIN cells vary in pattern. When high-grade cellular changes are present in PIN cells, prostate cancer can also be present. Other suspicious cells that can be seen on biopsy include atypical small acinar proliferation (ASAP). The presence of PIA, PIN or ASAP on biopsy prompts a repeat biopsy at a later date to see if prostate cancer has developed. Prostate cancer can spread to the surrounding seminal vesicles, lymph nodes of the groin, to the rectum, and elsewhere in the body, primarily the bones. The pelvic bones, upper thigh bones, and lower spine are common sites of metastasis. The lower spinal column can partially collapse and trap the spinal cord or nerves exiting the spinal column. The time it takes from the development of PIN to full blown cancer with metastasis to other parts of the body and resultant death can takes decades, is highly variable, and depends on whether the cancer is low, intermediate, or high-grade. Cancer of the colon or bladder can invade the prostate directly but this is a rare occurrence.

Risk factors

Men who eat a diet high in dietary fats with a lot of red meat and high-fat dairy foods are at higher risk for prostate cancer. A high calcium intake has also been implicated in its development. Age is a factor. Prostate cancer rarely occurs before forty years of age. Rates rise after age 50 and 2 out of every three men with it are over 65 years old. The risk of the disease rises to double if a brother or father has it and quadruples if more than 2 family members have the disease. African-American males are at highest risk and Asian-American and Hispanic/Latino males have the lowest incidence.

Prevention

Studies are investigating whether there are ways to avoid prostate cancer. A high intake of foods containing genistein can be preventative. Cruciferous vegetables have a general anti-cancer property. Lycopene-containing foods such as tomatoes, pink grapefruit, and watermelon can be helpful. Statin drugs are also being studied as a possible deterrent to prostate cancer.

Symptoms

Symptoms of prostate cancer include those of outlet obstruction affecting the strength and quality of the stream, hesitancy, urgency, and ability to empty the bladder. Incontinence can occur. There can be changes in the amount and force of ejaculation. Blood can appear in the ejaculate or urine.

When prostate cancer metastasizes there can be pain in the upper thighs, hips, lower spine, and ribs. Vertebrae can collapse and compress the spinal cord and nerves resulting in weakness, numbness of the lower extremities, and bowel and bladder incontinence.

Screening Guidelines

The American Cancer Society advises that men from 50 to 76 years old should be offered a prostate-specific antigen (PSA) and a digital rectal examination (DRE) annually if the man is expected to live at least 10 more years. Men with a positive family history should be first screened at ages 40 or 45 and then annually.

Prostate-specific antigen is produced by both normal and cancerous prostate cells. The PSA can fluctuate without reason. Dietary supplements aimed at male urinary health can cause the PSA to be falsely low, as can obesity. A higher PSA can be caused by age, prostatitis, ejaculation within the past 2 days, benign prostatic hyperplasia, and prostate cancer. The PSA rises up to ten times higher after a biopsy is performed and does not decrease for up to 10 weeks. A DRE does not affect PSA results. If all tissue is removed during a radical prostatectomy, the PSA should then be 0.

For men under 60 years old, a PSA over 2.6 ng/ml will prompt further diagnostic testing. For men over 60 years old, a PSA of 4.0 or more is the guideline. When the PSA begins to rise, the amount of rise within a year is significant. A rise of more than 0.5 ng/ml per year from a baseline PSA of less than 4 or 0.75 ng/ml from a baseline PSA of > 4 suggests active prostate cancer. The amount of time it takes the PSA to double is also indicative of the grade of prostate cancer.

Diagnosis

Prostate cancer grows in the outer layer of the gland. During screening, a DRE is performed to check the size and consistency of the prostate gland via palpation through the rectal wall. Any abnormalities within or near the prostate, such as hard, irregular nodules are noted.

When PSA and DRE results are suspicious for prostate cancer, a needle biopsy is scheduled. From 12 to 14 cores are obtained using transrectal ultrasound to guide needle insertion. Each core is examined to determine if cancer is present, and the amount of each core that is affected. The cells are examined to determine the histological patterns. The Gleason Grading System is used to grade the patterns of the dominant and secondary patterns present. Well-differentiated patterns are scored 1 and undifferentiated patterns score 5, with gradations in between. The patterns are then added to give a Gleason Score of between 2 and 10:

2-4 Well-differentiated or low-grade
5-7 Moderately-differentiated or intermediate-grade
8-10 Poorly-differentiated or high-grade

When the biopsy confirms cancer, imaging studies are scheduled to assess the extent of the disease in the gland and involvement of lymph nodes, pelvic structures, and bones. Magnetic resonance imaging (MRI) or specialized computed tomography (CT) is used for this purpose. Radionuclide bone scans are performed to look for metastasis to the bones.

Lymph node biopsies can be taken to help stage the cancer. They are taken via laparoscopy, by fine needle aspiration, or during a radical prostatectomy. When all test results are available a determination of the stage of the prostate cancer is made. The cancer is staged according to whether it is localized in the gland, has invaded the surrounding capsule, or has spread to lymph nodes or other body structures. This information guides treatment based on algorithms in the National Comprehensive Cancer Network (NCCN) Clinical Practice Guideline for Prostate Cancer.

Treatment

Treatment is governed by the patient's symptoms, goals for therapy (monitor, cure, or control), expected lifespan, other medical conditions, type of prostate cancer, and the chances of symptoms during the patient's lifetime. The chances of curing the disease with one mode of therapy versus the need for both local and systemic treatment are weighed. The patient's feelings about side effects of treatments such as impotence, urinary incontinence and bowel problems is also explored prior to making the decision whether to monitor the disease with periodic testing or to actively treat the disease to cure or control it.

Active monitoring is done by scheduling periodic testing to watch for any progression as evidenced by a rising PSA, local tumor growth as noted by DRE, or symptoms of local disease or metastatic growths. This option is preferred when the patient is older or the cancer is slow growing and other co-morbid conditions are likely to cause death before prostate cancer does.

When prostate cancer is localized to the gland a radical prostatectomy can be done to attempt to cure it. This procedure is done using a retropubic, perineal, or laparoscopic approach. It can be done via open surgery, minimally invasive, or robotic techniques. The goals of surgery are to excise the entire tumor while trying to preserve the internal urinary sphincter and the cavernous nerves that supply the penis. Surgical techniques are continuing to improve through better visualization of the cancer within the gland and improved case selection and surgical planning. As a result, recovery time has been reduced along with lower rates of incontinence and impotence after surgery. Older men have a higher risk of incontinence due to shortening of the urethra that occurs with age. Younger men who have strong erections prior to surgery are most likely to retain potency if the nerves are able to be spared. Erections can resume in about 6 months if both nerves are spared. Preservation of only one nerve will result in impotence half of the time. When both nerves are lost, nerve grafting can be attempted to restore potency. Many

men are able to have erections with the use of medications such as Viagra, Levitra, or Cialis. Intraurethral or intracavernous injections, vacuum, and implantation of penile prostheses can also be used to produce erections.

Local prostate cancer can also be treated by radiation. Radiation can be delivered by 3-dimensional conformal proton beam with intensity modulation to give the highest dose possible to the tumor while delivering the lowest possible dose to surrounding tissues. This method provides the greatest tumor control with the lowest rate of side effects such as diarrhea and proctitis. Erectile dysfunction can develop gradually after radiation therapy and is caused by damage to the arteries that supply the penis. Effective radiation therapy will cause the PSA to decline to 1 ng/dl or less. A relapse of the disease after treatment is considered to be present after 3 consecutive PSA elevations of the PSA nadir (the lowest PSA after radiation therapy is completed).

Radiation can also be delivered to the tumor via brachytherapy. In this technique, radioactive rods are inserted into the prostate gland transperineally under the guidance of transrectal ultrasound imaging. The rods can be left in place for a few hours or long term. Intense radiation is thus delivered directly to the tumor while sparing surrounding tissues as much as possible. Side effects include urinary frequency and urgency that lasts several months. Incontinence and proctitis are rare complications in 2 to 4 % of men. Men who had a previous transurethral resection of the prostate or symptoms of outlet obstruction tend to have more side effects.

Cryosurgery has been performed using needles inserted transperineally into the tumor to deliver cold gas to freeze the tissue. This treatment has a higher rate of side effects such as impotence (80%), bloody urine, urgency and frequency of urination, perineal pain, penile and scrotal edema, and bladder and intestinal pain. It is a newer treatment and long term studies that demonstrate efficacy have yet to be done.

Cancer Reactivation

If the PSA rises and signs of renewed tumor activity or metastasis occur, radiation can be given to patients who had a prostatectomy to treat areas of the pelvis or bones where cells are growing. Patients who chose to have radiation as a primary therapy can choose to have a prostatectomy at this point. Decisions to treat the disease further are made depending on the expected lifespan, symptoms, and patient wishes. The interval to PSA failure and the PSA doubling time help to guide this decision. Further treatment is usually advised when the PSA doubling time is 12 months or less.

Androgen depletion therapy can be attempted to slow tumor growth. Depletion will greatly reduce the number of cancerous cells but some will remain resistant. The major supply of androgen to the cancer is from the testes. Surgical castration (orchiectomy) can be performed to stop this supply permanently. This is the gold-standard androgen-depletion treatment but is least accepted by patients, especially younger men. The

provision of silicone testicular prostheses can help to improve scrotal appearance and penile implants can help to restore a measure of potency.

Chemical castration can be accomplished by the use of testosterone-lowering and antiandrogen agents. These agents block all androgen from the prostate cancer cells, including that made by the testicles and the adrenal glands. This therapy can be given consistently or on an intermittent basis to control tumor growth and symptoms. Androgen depletion causes a syndrome of side effects that include the following symptoms:

- Hot flashes
- Weakness, fatigue
- Impotence
- Loss of libido
- Personality changes
- Weight gain
- Gynecomastia
- Increased serum cholesterol level
- Loss of muscle mass
- Osteoporosis
- Anemia
- Depression
- Glucose intolerance, insulin resistance
- Metabolic syndrome
- Higher risk of diabetes, hypertension, and cardiovascular disease

Androgen depletion therapy results in an initial decrease of cancer cell activity and a period of remission of the disease. Renewed growth occurs in a variable amount of time depending on the extent of the disease when deprivation therapy began. The cells that survive deprivation are now the ones that cause renewed activity and symptoms. They can be treated with different agents then originally used. Some patients may have two or three rounds of deprivation therapy with different agents each time.

Metastatic prostate cancer attacks the bones primarily. When this occurs systemic chemotherapy may be used to slow the progression of the disease and to provide palliation of pain. This method provides better pain control with less use of narcotics and less fatigue. Biophosphonates, corticosteroids, radiation, and radioactive injections are also used to provide relief from bone pain.

Nursing Implications

The patient and family need information to guide therapy decisions. Referrals to agencies should be made to provide assistance with financial and other concerns. An outlet for emotions and concerns can be provided as needed. Support groups can help families deal with the disease. Patients can be referred to clinical study groups for treatment when desired and appropriate. Pre-operative and post-operative teaching is

essential for those having surgery. Thorough education is provided about all tests, procedures, and medications. Hospice referrals help the patient and family when treatment has failed and symptom control is needed until death occurs.

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