Questions & Answers About Prostate Cancer, Bone Metastases, and Treatment-Related Osteoporosis

A Publication of

The Bone and Cancer Foundation

General Information about Prostate Cancer

1. Q. What is prostate cancer?

A. Prostate cancer is an abnormal (malignant) growth of the prostate, a walnut-sized gland at the base of the urinary bladder in men.

2. Q. How common is prostate cancer?

A. Prostate cancer is the most common form of cancer in men (except for skin cancer) and a leading cause of cancer death worldwide. In 2010, approximately 217,730 men will be diagnosed with prostate cancer and 32,050 men will die from prostate cancer in the U.S.

3. Q. How is prostate cancer diagnosed?

A. Prostate cancer is most often diagnosed by needle biopsy of the prostate gland. Biopsies are usually advised for men found to have either an abnormal digital rectal exam (DRE) or elevated PSA blood level. (The medical term for PSA is prostate-specific antigen.) Some, but not all men with an abnormal DRE or PSA have prostate cancer.

Digital rectal exam (DRE) — is a procedure in which a gloved finger is put into the rectum to check the prostate gland.

Prostate-specific antigen (PSA) — is a protein produced by the prostate gland. PSA circulates in the blood and can be measured with a blood test. PSA levels goes up in the blood of some men who have prostate cancer. PSA levels can also go up with other conditions that affect the prostate. These include infections (prostatitis) and a non-cancerous growth that comes with aging, benign prostatic hyperplasia (BPH).

4. Q. What are the risk factors for prostate cancer?

A. Risk for prostate cancer increases with age. More than 90% of men diagnosed with prostate cancer are older than 50 years. African-American men have a higher risk for prostate cancer than men of other races. A family history of prostate cancer increases prostate cancer risk. About 10% of prostate cancers appear to run in families although little is known about how or why this happens. Some other factors, including high intake of dietary fat, appear to increase prostate cancer risk.

5. Q. How is early-stage prostate cancer treated?

A. There are several treatment choices for men with early-stage prostate cancer (tumors that appear confined to the prostate gland):

- **Prostatectomy**: surgical removal of the prostate gland.

- **External beam radiation therapy**: the most frequently used form of radiotherapy involving delivery of radiation to a tumor from a source (machine) outside the body.

- **Brachytherapy**: placement of radioactive seeds in the prostate gland.

In some cases, hormone therapy is given along with other treatments (See Question # 10).

Not all prostate cancers need to be treated. Some men with favorable prostate cancers may undergo what is called watchful waiting or active surveillance, where the physician monitors the patients' condition to determine whether treatment is needed.

Bone Metastases

6. Q. Where in the body does prostate cancer spread?

A. Cancers may spread or metastasize to other organs in the body. Some cancers have distinct patterns of metastases. Prostate cancer, for example, tends to spread to either lymph nodes or bone.

The spine, pelvis, ribs, and bones of the arm and thigh are the most common sites if cancer spreads to the bone. Prostate cancer that has spread to the bone is called metastatic prostate cancer – it is not bone cancer, which is treated differently.

7. Q. What are the symptoms of bone metastases?

A. Pain is the most common symptom of metastatic prostate cancer. It may be caused by pinched nerves due to metastases in the bones. Less often, pain is caused by fractures. Cancer can cause bones to weaken and break. Not all bone metastases result in pain.

8. Q. How are bone metastases detected?

A. Bone metastases from prostate cancer can be found by a number of tests. A bone scan is the standard method for detecting bone metastases from prostate cancer. It is highly sensitive. A bone scan often detects bone metastases before they cause symptoms or before they can be seen by plain x-rays. In some cases, more tests may be needed to diagnose bone metastases. These tests include computed tomography (CT) scan, magnetic resonance imaging (MRI) scan, or bone biopsy.

Treatment of Men with Prostate Cancer and Bone Metastases

9. Q. What types of physicians and other health professionals treat patients with prostate cancer affecting the bone?

A. Most often more than one health care specialist will take part in the care of men with bone metastases from prostate cancer. Urologists, radiation oncologists, and medical oncologists may provide care depending on the medical condition. Orthopedic surgeons provide care for bone fractures or impending fractures. Treatment by a neurosurgeon may be needed for metastases that press on the spinal cord or nerves. Physical medicine physicians may help in prescribing physical therapy.

Oncology nurses, orthopedic nurses, and physical therapists will often be called upon to assist with the use of

medications and rehabilitation so that patients are able to return to their usual daily activities.

Because of the emotional and social impact of prostate cancer in bone, many patients may consult mental health professionals (e.g., psychologists, social workers, or psychiatrists). Psychotherapy, medication for depression, and/or support groups may help some patients.

10. Q. What treatments are available for men with metastatic prostate cancer?

A. Hormone therapy is the cornerstone of treatment for men with metastatic prostate cancer. At first, prostate cancer cells need the male hormone testosterone in order to grow. In almost all men with metastatic prostate cancer, treatments to reduce testosterone levels are helpful but they are not cures. Testosterone levels can be lowered by surgical removal of either testes (bilateral orchiectomies) or treatment with medicines termed gonadotropin-releasing hormone (GnRH) agonists and GnRH antagonists (see drug chart on page 8). In some cases, men who had both testes removed or are receiving a GnRH agonist are also treated with antiandrogens such as bicalutamide (Casodex®) or flutamide (Eulexin®). The only approved GnRH antagonist is degarelix (Firmagon®). All of these drugs provide similar benefit in lowering testosterone levels.

Chemotherapy may provide extra help in men with metastatic prostate cancer that has grown despite hormone therapy. Docetaxel (Taxotere®), cabazitaxel (Jevtana®), and mitoxantrone (Novantrone®), are the most commonly used chemotherapy drugs for prostate cancer. Because of potential side-effects, chemotherapy may not be suitable for all men.

11. Q. What other therapies are available to treat bone metastases?

A. Along with hormone and chemotherapy treatments for prostate cancer, there are other therapies designed to treat or prevent the problems that are due to the spread of prostate cancer to bone.

External Beam Radiation Therapy (similar to that used to treat early stage prostate cancer) can be aimed at sites of painful bone metastases. External beam radiation relieves pain in the majority of men and is most useful for treatment of one or two sites of pain.

Radiopharmaceuticals are drugs given by IV (intravenous infusion), such as strontium-89 (Metastron®) or samarium-153 (Quadramet®). These drugs target radiation to bone metastases. They relieve pain in most men. Because radiopharmaceuticals travel throughout the skeleton, this therapy may be most helpful for men with a number of painful bone metastases.

Bisphosphonates are a class of drugs that keep bone from breaking down or becoming resorbed. Zoledronic acid (Zometa®) is a bisphosphonate given by intravenous infusion. It reduces the risk of bone complications, including pain and fractures, in men with metastatic prostate cancer.

Denosumab (Xgeva™) is a drug that prevents bone breakdown or resorption by inhibiting RANKL, a protein that activates osteoclasts, the cells that are involved in bone breakdown or resorption**.** Denosumab reduces the risk of bone complications, including pain and fractures, in men with metastatic prostate cancer. Denosumab is given by subcutaneous (under the skin) injection every 4 weeks and can be used with standard anti-cancer therapy.

Surgery may be needed to treat bone fractures or to relieve pressure on the spinal cord by bone metastases.

Pain medications are an important part of care for most men with metastatic prostate cancer. They are used in combination with other treatments for prostate cancer.

12. Q. Can bone metastases be prevented?

A. The best ways to prevent the spread of prostate cancer to bone are early diagnosis and treatment. In men whose cancer comes back after treatment for early-stage prostate cancer, hormone therapy may delay or prevent the spread of cancer to the bone. Ongoing and future clinical trials will examine new ways to prevent bone metastases.

13. Q. What are the emerging therapies to prevent or treat bone metastases?

A. Several drugs are in development for the prevention and treatment of bone metastases in men with prostate cancer.

Denosumab is approved for treatment of men with bone metastases. Denosumab is also being evaluated to prevent bone metastases in men with high risk prostate cancer.

Radium-223 (Alpharadin®) is a new radiopharmaceutical (a drug that targets radiation to bone metastases) in development for the treatment of men with bone metastases.

Osteoporosis in Men with Prostate Cancer

14. Q. What is osteoporosis?

A. Osteoporosis is a condition of general loss of bone mass that can lead to fractures.
Although osteoporosis is usually thought of as a disease of older women, it is also common in men. About two million American men have osteoporosis. Another twelve million men are at risk. Hormone therapy increases risk of osteoporosis and fractures in men with prostate cancer.

15. Q. What are the symptoms of osteoporosis?

A. In the absence of fractures osteoporosis has no symptoms; if a fracture occurs there may be significant pain. Fractures of the spine are the most common sign of osteoporosis. Spinal fractures may be caused by bending, lifting, or other minimal stress. Pain comes from the collapse of the small bones of the spine (vertebrae). It may be worsened by standing or sudden movements. A person with many spinal fractures may become shorter and have a curvature of the spine. Early diagnosis and treatment are the most effective ways to prevent fractures.

16. Q. How is osteoporosis diagnosed?

A. Osteoporosis is diagnosed by testing the density of the bone called bone mineral density (BMD). There are several ways to measure BMD; all are convenient, safe and painless. The most common method is a DXA (dual energy x-ray absorptiometry) scan.

17. Q. How can osteoporosis be treated or prevented?

A. There are several approaches most men with prostate cancer can take to treat and prevent osteoporosis:

- Change unhealthy habits including smoking and excessive use of alcohol.

- Take adequate calcium and vitamin D. Daily calcium (1000-1500 mg daily) and vitamin D (800-1200 IU) from diet and supplements are advised for most men who receive hormone therapy.

- Exercise regularly.

- Prescription medications including bisphosphonates may be suitable for some men.

- Denosumab, the drug discussed in Question 13, has been shown in clinical trials to increase bone density and prevent fractures in men who develop osteoporosis as a result of androgen deprivation therapy.

- Denosumab used to treat osteoporosis is called Prolia™. Prolia™ is approved for women with postmenopausal osteoporosis at increased risk for fractures. Prolia™ is given by subcutaneous (under the skin) injection every 6 or 12 months to treat osteoporosis.

Glossary

Androgen Deprivation Therapy: Use of medications or surgical removal of the testes to prevent male hormones from stimulating further growth of prostate cancer. Also called Hormone Therapy.

Anemia: Having too few red blood cells. Symptoms include tiredness, weakness, and shortness of breath.

Anus: Opening at the lower end of the rectum through which solid waste leaves the body.

Benign prostatic hypertrophy (BPH): Enlargement of the prostate, blocking urine flow. BPH is not cancer, but can cause some of the symptoms. Also called benign prostatic hyperplasia.

Biopsy: Removal of a sample of tissue, examined under a microscope to check for cancer cells.

Bisphosphonates: Drugs used to prevent breakdown of bone.

Brachytherapy: Implanting radioactive material into the tumor or close to it. Also called internal radiation therapy, interstitial radiation therapy, or seed implant therapy.

Calcium: Major mineral component of bone, important for normal function of nerves and other organs.

Clinical trial: Research study involving volunteers, designed to answer medical questions and find better ways to prevent or treat disease.

Chemotheraphy: Drugs that kill cancer cells.

CT scan (computerized tomography or CAT scan): Series of detailed pictures of areas inside the body, created by a computer linked to an x-ray machine.

Digital rectal examination (DRE): Procedure in which the doctor inserts a gloved finger into the rectum to examine the rectum and prostate.

DXA or DEXA scan (dual energy x-ray absorptiometry): An imaging test that measures bone density with special X-rays to measure how much calcium and other bone minerals are contained in a segment of bone. A DEXA scan can measure the bone mineral density of the whole skeleton, as well as specific points that are more likely to break, such as the hip, spine and wrist. Also called BMD scan or bone mineral density scan.

External beam radiation therapy: The most frequently used form of radiotherapy involving delivery of radiation to a tumor from a source (machine) outside the body. External beam radiation may also be used to relieve pain. It is effective in the majority of men and is most useful for treatment of one or two sites of pain.

Hormones: Body chemicals secreted by glands. Male hormones include androgen and testosterone (produced mainly by the testes) plays important role in a man's sexuality and fuels the growth of prostate cancer). Estrogen is a female sex hormone. These hormones circulate in the blood-stream, and control the actions of certain cells or organs.

Hormone therapy: Use of medications or surgical removal of the testes to prevent male hormones from stimulating further growth of prostate cancer.

Intravenous: Into a vein.

Lymph nodes: Small, bean-shaped organs that are part of the body's immune system. They are located throughout the body along the channels of the lymphatic system. Also called lymph glands.

Medical oncologist: Doctor trained in the diagnosis and treatment of cancer.

Metastasis (pl., metastases; v. metastasize): Spread of cancer cells throughout the body. Cells that have

metastasized are the same as those in the original tumor.

Monoclonal antibodies: A type of protein made in the laboratory that targets and attaches to a specific substance in the body, such as a tumor cell. Each monoclonal antibody is made to find only one substance. Monoclonal antibodies are currently being used to treat some types of cancer, and are being investigated as a treatment in several others**.**

MRI (magnetic resonance imaging): Imaging technique that produces detailed pictures of areas inside the body by linking a computer with a powerful magnet.

Multiple myeloma: Disease of the bone marrow in which certain cells grow out of control and break down bone.

Oncology: Branch of medicine dealing with cancer.

Osteoporosis: Loss of and thinning of bone that increases the risk of fractures, especially in the spine, wrist, and hip.

Pituitary gland: Master gland in the brain that makes hormones that control hormone production in other glands such as the testes.

Prostate: A walnut-sized gland at the base of the bladder in men. The prostate produces fluid that forms part of the semen.

Prostatectomy: Surgical removal of the prostate gland.

Prostate-specific antigen (PSA): Protein produced by the prostate gland. PSA circulates in the blood and can be measured with a blood test. Its level goes up in the blood of some men who have prostate cancer. PSA levels can also go up with other conditions that affect the prostate. These include infections (prostatitis) and a non-cancerous growth that comes with aging, benign prostatic hyperplasia (BPH).

Radiation oncologist: Doctor who specializes in using radiation to treat cancer.

Radiation therapy: Treatment with high-energy rays to kill cancer cells.

Radiopharmaceuticals: Drugs such as strontium-89 (Metastron®) or samarium-153 (Quadramet®) given by intravenous infusion to deliver radiation to bone metastases. These drugs relieve pain in most men. Because radiopharmaceuticals travel throughout the skeleton, this therapy may be most helpful for men with a number of painful bone metastases.

RANK Ligand: A protein that activates osteoclasts, the cells that are involved in bone breakdown or resorption.

Scrotum: External skin pouch containing the testes.

Testes: Pair of egg-shaped glands contained in the scrotum that produce sperm and male hormones. Also called testicles.

Total androgen blockade: Complete blockage of androgen production. Also called combination hormone therapy.

Tumor: Abnormal growth of tissue. A tumor can be malignant (cancerous) or benign (noncancerous).

Urologist: Doctor who specializes in disorders of the urinary and male reproductive systems.

Watchful waiting: Following the patient closely, postponing aggressive therapy unless signs of disease progress.

Drugs Approved to Treat Prostate Cancer In The United States

I Hormone Therapy:

a) Gonadotropin-releasing hormone (GnRH) agonist:
   i) Goserelin acetate (Zoladex®)
   ii) Leuprolide acetate (Lupron®)
   iii) Leuprolide acetate (Eligard®)
   iv) Leuprolide acetate implant (Viadur®)

b) Gonadotropin-releasing hormone (GnRH) antagonist:
   i) Degarelix acetate (Firmagon®)

c) Antiandrogens:
   i) Bicalutamide (Casodex®)
   ii) Flutamide (Eulexin®)

II Chemotherapy:

a) Docetaxel (Taxotere®)
b) Cabazitaxel (Jevtana®)
c) Mitoxantrone (Novantrone®)

III Bisphosphonates:

a) Zoledronic acid (Zometa®)

IV RANKL-targeted therapy:

a) Denosumab (Xgeva™)

V Radiopharmaceuticals:

a) Strontium-89 (Metastron®)
b) Samarium-153 (Quadramet®)

The mission of The Bone and Cancer Foundation is to:

- Provide information to cancer patients and family members on the causes and current treatment of cancer that involves the bone;

- Provide information and serve as a resource for physicians, nurses and other health professionals regarding the management of cancer that spreads to the bone.

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