Prostate Cancer: Diagnostic Tests, Pathology and Staging

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Prostate cancer is the most common cancer in men and the second cause of cancer related deaths in the US. The early diagnosis of prostate cancer has been made possible with the advent of the blood test PSA (prostate specific antigen). Now a very routine blood test for men over the age of 50, PSA is a molecule released into the blood stream only by the prostate gland. It is as of yet the only organ specific blood marker. Various levels of the PSA in the blood may indicate a higher risk of a man developing or having prostate cancer.

A PSA level between 0-4 ng/ml was typically considered safe, however in more recent long term studies it has been shown that up to 15-20% of men with a PSA between 2.5 – 4.0 ng/ml had prostate cancer. A significant percentage of those men had aggressive prostate cancer. Newer recommendations suggest screening men over 40 years old if they have a family history of prostate cancer and if their PSA is more than 2.5 ng/ml they should have a further evaluation.

A " normal " PSA may not tell the whole story since a significant number of men may have a low PSA but an abnormal feeling prostate of examination. Those men should be evaluated further to make sure they do not have early stage prostate cancer.

Transrectal Ultrasound (TRUS) and Prostate Needle Biopsy (Bx.)

TRUS is an ultrasound (sound waves) used to view the anatomy of the prostate. This is done by placing a short thin probe inside the rectum, which sends out waves that echo and bounce back from the prostate tissue and are then translated into an image and a picture. This procedure is used to view the prostate for any suspicious areas as well as to direct the placement of the biopsy needle. Most patients experience mild discomfort from the probe. Typically, a local anesthetic (numbing medication) is given near the prostate that aids in minimizing any discomfort caused by the biopsy itself. The whole procedure usually takes less than a half hour. Some patients may experience blood in the urine and/or semen shortly after the procedure, which normally clears with fluids, antibiotics and warm baths. Also, avoidance of sexual activity is advised for at least two weeks after the biopsy has been done.

The biopsy specimens are sent to a laboratory where *pathologists* (doctors whose expertise is to examine body tissues/fluids for cancer, as well as other diseases) perform several tests to see if prostate cancer is present or not. Usually it takes about 5-7 days to receive the results. Occasionally, additional "staining" tests may have to be performed, or biopsies may need to be sent out to another pathologist for a "second opinion" to confirm an unusual result.

Grading of Prostate Cancer: Gleason Score

If a cancer is found in the prostate biopsy sample, it will be graded to predict how aggressive it is likely to be. The most common prostate cancer grading system is called the Gleason score, named after Dr. Donald Gleason, the U.S. pathologist who developed it. This system

grades cancer cells into a primary and secondary grade based upon how closely the prostate cancer cells mimic the normal prostate cells. Each primary and secondary grade is assigned a number from 1-5, therefore a pathology report for prostate cancer will reflect a score between 2-10 (i.e. 3+3 equals a Gleason score 6 prostate cancer). The higher the number is closer to 10, the more likely that the cancer will grow and spread rapidly, and the worse the prognosis.
Therefore the Gleason score is an important factor in the determination of the treatment and prognosis of the disease. Most often a Gleason score 2-4 (low grade) is considered slow growing and least life threatening, a Gleason score 5-6 is moderately aggressive, and a Gleason 7 is typically in its own "category" because it behaves more aggressively than Gleason 6 cancers. Gleason 8-10 is considered very aggressive and may have the least favorable response to treatment.

CT (CAT) Scan

This x-ray test uses a rotating series of x-ray beams to generate a 3 dimensional image of the body from many angles. A CT scan is usually not done for staging purposes as it offers very little additional information especially if the patient has a PSA less than 20 and a Gleason score on the biopsy/pathology report of 7 or less. CT scans are used in preparation for some treatment protocols such as external radiation therapy and /or seed implantation.

MRI (Magnetic Resonance Imaging)

This test uses magnetic fields instead of x-rays to generate detailed cross sectional areas of the human body. Again this test has very limited use in prostate cancer staging and is not commonly used as it once was.

Bone Scan

This nuclear test helps show in some cases if the prostate cancer may have spread to the bones. The patient receives an injection of a nuclear medicine that attaches itself to diseased bone cells throughout the skeleton, thus visualizing the extent and location of the cancer. In addition, arthritis and prior bone trauma may be seen on the bone scan image. A bone scan is not routinely ordered unless there is a markedly elevated PSA result, or a high Gleason score.

Prostascint Scan

This is not very widely available and its' usefulness is debated by many experts. Essentially the radioactive material injected is attached to a monoclonal antibody that recognizes a prostate specific membrane antigen (PSMA), which is found only in normal and cancer prostate cells. The potential advantage of this test is that it may detect the spread of prostate cancer to bone, lymph nodes and other organs.

Genetic Testing

Much effort and research is being concentrated in this exciting area of science. The human genome ("blueprint"), or DNA (deoxyribonucleic acid), is being studied extensively for clues to the causes of prostate cancer, better treatment methods, as well as prevention of the disease. A lot of the current data is preliminary but promises for the future are great and not too distant.

Staging

Prostate cancer, like many other cancers, is staged using the TNM system, where T stands for tumor, N refers to nodes (lymph nodes or glands), and M signifies metastasis ("spread").
T stages are typically from **T1-T4** with T4 being the most aggressive or extensive form of cancer. Most prostate cancers in the U.S. are **T1c**, that is, "PSA detected prostate cancer", since the investigation and diagnosis are prompted by an abnormal PSA level. This explains why the PSA blood test is such a powerful tool as a screening test in medicine.

N stages are usually from Nx to N1. In stage **Nx** the lymph nodes cannot be assessed; in **N0** no regional lymph node metastasis is present; and in **N1**, there is evidence of cancer spread to the lymph nodes.

M stages are categorized from **Mx** to **M1c** and again the higher the M number (i.e. M1, M2, etc.), the more the cancer has spread to different organ sites (bone, liver.).

A typical patient would have a staging of T1c N0 M0 meaning that the prostate cancer was detected by PSA elevation and biopsy, there is no evidence of lymph node spread and no evidence of distant metastasis.
Over the years with collection and study of data from thousands of prostate cancer patients we have learned that certain types of prostate cancers with specific PSA levels, Gleason pathology scores and prostate examination characteristics, have a very low potential for spread to lymph nodes or bone (most common sites) and therefore the CT scan, bone scan or lymph node biopsy needed to aid a more complete staging can be avoided.
In the next part of our series we will discuss treatment options based upon the various stages of prostate cancer.

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