HOUSE•CALL

"Seeing" Cancer from the Outside

Modern imaging tests that detect disease or injury inside the body play a vital role in accurate diagnosis and effective treatment. Imaging technology allows physicians to "see" inside organs, bones, and other tissues. In cancer care, doctors use imaging to determine a tumor's exact size and location and even to reveal how well a treatment is working.

A variety of imaging tests are available, each using a different process. These are the imaging techniques most frequently used in diagnosing cancer.

X-ray imaging is the most common way physicians make pictures of the inside of the body. X-rays are a form of radiation, and the images they produce result from differences in how much radiation different tissues absorb. The film or digital recording of these images is called a radiograph.

By studying the radiograph, a radiologist can identify abnormal areas that might indicate the presence of cancer. Mammograms, for instance, use x-rays to look for tumors or suspicious areas in the breast, while chest radiographs help doctors determine whether there is cancer in the lungs or other areas in the chest.

Computed tomography (also called CT or CAT scanning) uses x-rays to create detailed images of the body's interior. For some CT scans, the patient receives a drink or injection of a contrast agent during the exam, which can help highlight specific areas of the internal anatomy.

Because the scan information is collected using multiple detectors and a computer system rather than a flat piece of film or digital detector, CT scans produce cross-sectional images, as if the body had been sliced into sections. This yields more detailed information than a standard 2-dimensional radiograph and allows physicians to see tumors or other lesions much more clearly. With CT, for instance, a doctor can tell exactly how deep a tumor is in the body.

A variety of imaging tests are available that help physicians detect and treat cancer.

Magnetic resonance imaging (or MRI) uses radio waves in a powerful magnetic field to create detailed computer images of a patient's soft tissues, blood vessels, and major organs. Because the image characteristics depend on many different properties, MRI offers better views of soft tissues than CT and can produce images at any angle without the patient being moved. Another advantage is that unlike CT, MRI does not expose the patient to radiation.

For the best results, patients must lie completely still during MRI procedures, which usually last 40 minutes to an hour. Depending on what part of the body is examined, patients may be injected with a contrast agent.

Positron emission tomography (or PET) is a type of nuclear imaging that can help identify cancers early and track their response to treatment. Unlike other imaging techniques that show only structures in the body, PET detects areas of increased cell activity and uses the information to create images of those areas.

For the most common PET study, an ^{18}FDG-PET scan, a patient receives an injection of a safe, radioactive sugar solution about an hour before the scan. Because cancer cells absorb more of this solution than do most healthy tissues, it will accumulate where an active tumor is present. The PET scan "sees" the radiation and shows the radiologist where the sugar solution has accumulated. The procedure usually takes 45 minutes to an hour. PET is sometimes paired with CT, allowing doctors to pinpoint cancer activity on a detailed image of the patient's anatomy.

Ultrasonography (or ultrasound) uses high-frequency sound waves to create images of internal organs, body structures, and blood flow. In this test, a gel is applied to the patient's skin, and a small hand-held instrument called a transducer is passed over that part of the body. The transducer emits sound waves that can't be heard by humans. These waves bounce off internal organs and return to the transducer. A computer converts the reflected sound waves (or echoes) into an electronic picture.

Ultrasonography is often used to determine whether a suspicious lump is a solid tumor or a benign, fluid-filled cyst and to guide doctors during biopsies and some types of cancer treatment. ●

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