

Imaging Tests: A Look Inside Your Child's Body

If your pediatrician isn't sure what the cause of your child's illness or injury is, imaging tests may be needed. Imaging tests are used to "look" inside the body. They can help diagnose injuries and illnesses from broken bones to cancer. Some tests can even find problems before symptoms appear. Read this handout to learn more about imaging tests.

Who gives imaging tests?

Radiologists are doctors trained to give imaging tests. They also study the results and make diagnoses. Some radiologists have special training and a lot of experience working with children. If your child needs an imaging test, your pediatrician will refer you to a radiologist. The radiologist will share the results with your pediatrician. In some cases, a technician (not a doctor) gives the test. The technician usually cannot give you any information about your child's test. The radiologist needs to see the test results before any information can be shared.

What types of imaging tests are there?

X-rays

X-rays can help diagnose many illnesses. During an x-ray, electromagnetic waves (a form of light) pass through the body and create an image on film. This image is called an *x-ray* or *radiograph*. X-rays are usually used to see bones, muscles or organs (like the heart or liver), and air inside the body. Metal objects also can be seen.

X-rays can be done on most parts of the body. For example, chest x-rays can reveal pneumonia or a collapsed lung, an enlarged heart, or rib fractures. Arm or leg x-rays can show broken bones or other bone problems.

Time: Each x-ray takes only a few seconds, like a picture taken with a camera. Results may be ready during your visit or may take several days.

Radiation: X-rays expose the body to very small amounts of radiation, but only to the areas of the body being studied.

Pain: None.

Cost/availability: Low cost; widely available.

Before the test: Nothing special needs to be done before the test.

During the test: The body part to be examined is placed between the x-ray machine and the x-ray film. Other parts of the body may be covered with a lead-lined apron to reduce radiation exposure. The machine is turned on, and a picture is taken. Patients must keep very still for the image to be clear. Young children may need special straps to keep them still during the test. If you can stay with your child, you will be given a lead-lined apron to wear.

Isn't radiation dangerous?

There are different types of radiation, including ultraviolet rays from the sun, microwaves, radio waves, and ionizing radiation (like from x-rays and other imaging tests). While too much radiation can harm or kill living tissue, the amount of radiation in most imaging tests is generally very safe. In fact, no harm has been shown from the levels of radiation used in the imaging tests described here. Imaging machines have improved over the years, decreasing the amount of radiation used. Most people are exposed to more radiation from the environment than from these tests.

Radiologists take special steps to reduce radiation exposure during a test. For example, they only x-ray the body parts that need to be x-rayed and use lead aprons to cover other parts of the body not being studied. If you're still concerned, keep in mind that the benefits of imaging tests are greater than the risk of radiation.

Fluoroscopy

Fluoroscopy is a type of x-ray that creates a real-time "x-ray movie" of the inside of the body. An x-ray beam placed on a specific area of the body creates images that are shown on a TV-like monitor.

Fluoroscopy is mainly used to diagnose illness of the stomach and intestines, lungs and airway, or bladder. Fluoroscopy is also used to help guide instruments or devices into the body, such as a catheter for feeding tubes.

Time: About 5 to 20 minutes.

Radiation: Higher than x-rays, but it depends on how long the test lasts. For most studies, the fluoroscopy camera is only on when needed to keep radiation doses as low as possible.

Pain: None, but preparing before the test may be unpleasant.

Cost/availability: More expensive than x-rays; widely available.

Before the test: For some types of fluoroscopy tests patients may need to fast, drink only liquids, or have an enema. Sometimes a contrast material (a fluid that shows things in the body that are hard to see without it) is injected or given by mouth. If the child cannot drink it, a tube may need to be placed through the mouth to the stomach. (Placement of the feeding tube is very safe and is only uncomfortable for a short time. The use of the feeding tube can shorten the time it takes to do the test. Less time can reduce your child's exposure to radiation.)

During the test: The room is darkened, and the area of the body being examined is placed between the x-ray and fluoroscopy screen. Images of the body are then sent to a monitor where they can be seen in motion.

Computed tomography or CT scan

A CT scan is a special type of x-ray that uses computers to create detailed images of the body. A rotating x-ray tube that surrounds the patient takes pictures of organs and tissues from many angles. Hundreds of images can be created in a short time.

A CT scan is very useful because it can create more detailed pictures than an ordinary x-ray. It is often used to find tumors, infections, or evidence of injury in different parts of the body.

Time: A CT scan only takes a few seconds. Results can take a few hours to 24 hours, depending on where it's done.

Radiation: Higher than x-rays but lower than the dose from fluoroscopy.

Pain: None, unless the child will need an injection of a contrast material. This must be done through a vein (IV) in the arm.

Cost/availability: High cost; widely available.

Before the test: A contrast material may need to be injected or taken by mouth.

During the test: The patient lies on a narrow table that slides in and out of the CT scanner. The x-ray tube rotates around the patient, sending information to a computer that forms the images. Young patients may need to be sedated for a CT scan.

Magnetic resonance imaging (MR imaging or MRI)

An MRI uses a large and powerful magnet, radio waves, and a computer to create very detailed images of the inside of the body.

An MRI is very helpful in studying the brain and spinal cord, the soft tissues of the body, and the joints. An MRI is often used to detect birth defects, inflammation, infection, tumors, and injury.

Time: About 30 to 60 minutes. Results are usually ready within 24 hours.

Radiation: None.

Pain: None, but patients may need an injection of a contrast material and an IV. Also, some patients may feel cramped in the machine (open MRI machines are available in some areas). During scanning, loud humming and knocking will be heard. Small children may be frightened by these noises.

Cost/availability: High cost; not available everywhere.

Before the test: Younger children may need to be sedated before the test. All metal objects need to be removed before the test. Internal items like pacemakers, hearing aids, or insulin pumps may not be allowed in the MRI scanner room and may mean your child can't have an MRI.

During the test: The patient lies on a table that slides into the scanner (a narrow tunnel that holds the magnet). It's important that the patient stay very still. Inside the scanner, the patient will hear a fan and feel air blowing. Because the machine can be noisy, patients are given earphones. Some centers have headphones that your child can use to listen to music during the exam.

Ultrasound (sonography)

Ultrasound uses sound waves to create images of the body. The sound waves enter the body, and the returning echoes are captured as images. These images are called *sonograms*, *echocardiograms* (*heart echo*), or *ultrasound scans*.

What if my child needs to be sedated?

Your child may need to stay still for some imaging tests. If your child moves during the test, the image will be blurred, and the test may need to be redone. To keep this from happening, some children may need a sedative to help them relax and stay still.

If your child will be sedated, you may be asked to do the following **before the test:**

- Don't give your child anything to eat or drink for 3 to 8 hours.
- Limit how much sleep your child gets. This will help your child to fall asleep during the test.
- Let your pediatrician or radiologist know if your child is ill, has a fever, or is very congested on the day of the test. The exam may need to be rescheduled.

Ultrasound tests can help diagnose illnesses of the kidneys, bladder, and uterus; the heart (called an *echocardiography*); as well as the liver, spleen, gallbladder, and pancreas. Ultrasound is also used to look at the brains of young infants, especially premature babies. It is best used for looking at parts of the body that are either solid (like the liver) or fluid-filled (like the gallbladder). Ultrasound doesn't produce clear images of organs filled with gas or air (such as lungs) or with hard surfaces, such as the inside of bones.

Time: 15 minutes to 1 hour.

Radiation: None.

Pain: None.

Cost/availability: Moderate cost; widely available.

Before the test: In some cases, patients may need to fast or drink more water before the test.

During the test: First, a special jelly or oil is put on the skin. Next, a hand-held device called a *transducer* is moved back and forth over the area being examined. The transducer creates sound waves (that can't be heard or felt) that are reflected back to the machine. A computer creates images from the sound waves.

Nuclear imaging

A *nuclear imaging scan* (sometimes called *radionuclide scanning*) shows the structure of a body part as well as how it works. Before the scan, a radioactive substance called a *tracer* is injected or given by mouth. A machine called a *gamma camera* used outside the body then detects the rays of energy given off by the tracer, and an image is created and shown on a computer screen.

Organs including the kidneys, liver, heart, lungs, and brain are often studied using this test. Bone imaging may show trauma, infection, or a tumor even before any problems are seen with x-rays.

Time: Between 15 minutes and 1 hour. Most results take 1 to 3 days.

Radiation: Less radiation than from fluoroscopy or CT. The tracer loses its radioactivity within 24 hours, leaving the body in the urine or stool. For most nuclear medicine studies, the amount of radiation in the urine or stool is not harmful for the child or those exposed to the urine or stool.

Pain: None, but patients may need the tracer injected and an IV. With some exams, a catheter may need to be placed into the bladder.

Cost/availability: Moderate cost; often available wherever CT or MRI is available.

Before the test: The tracer is usually given by mouth or through an injection. Patients may need to fast or drink a lot of water before some nuclear imaging scans. Young children may need to be sedated.

During the test: After the tracer is in place, the patient lies on a scanning table. The camera is then moved slowly over the body. Images are created and displayed on a computer.

The information contained in this publication should not be used as a substitute for the medical care and advice of your pediatrician. There may be variations in treatment that your pediatrician may recommend based on individual facts and circumstances.

From your doctor

