Body CT

Computed tomography (CT) of the body uses sophisticated x-ray technology to help detect a variety of diseases and conditions. CT scanning is fast, painless, noninvasive and accurate. In emergency cases, it can reveal internal injuries and bleeding quickly enough to help save lives.

Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, medications you're taking, and allergies. You will be instructed not to eat or drink anything for a few hours beforehand. If you have a known allergy to contrast material, your doctor may prescribe medications to reduce the risk of an allergic reaction. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is CT scanning of the body?

Computed tomography, more commonly known as a CT or CAT scan, is a diagnostic medical imaging test. Like traditional x-rays, it produces multiple images or pictures of the inside of the body.

A CT scan generates images that can be reformatted in multiple planes. It can even generate three-dimensional images. Your doctor can review these images on a computer monitor, print them on film or via a 3D printer, or transfer them to a CD or DVD.

CT images of internal organs, bones, soft tissue, and blood vessels provide greater detail than traditional x-rays. This is especially true for soft tissues and blood vessels.

Using specialized equipment and expertise to create and interpret CT scans of the body, radiologists can more easily diagnose problems such as cancer, cardiovascular disease, infectious disease, appendicitis, trauma and musculoskeletal disorders.

What are some common uses of the procedure?

CT imaging is:

- one of the fastest and most accurate tools for examining the chest, abdomen and pelvis because it provides detailed, cross-sectional views of all types of tissue.
- used to examine patients with injuries from trauma such as a motor vehicle accident.
- performed on patients with acute symptoms such as chest or abdominal pain or difficulty breathing.
- often the best method for detecting cancers in the chest, abdomen and pelvis, such as lymphoma (https://www.radiologyinfo.org/en/info/lymphoma) and cancers of the lung, liver, kidney, ovary and pancreas. It's considered the best method since the image allows a physician to confirm the presence of a tumor, measure its size, identify its precise location and determine the extent of its involvement with other nearby tissue.
- an examination that plays a significant role in the detection, diagnosis and treatment of vascular diseases that can lead to stroke, kidney failure or even death. CT is commonly used to assess for pulmonary embolism (a blood clot in the lung vessels) as well as for aortic aneurysms.

In pediatric patients, CT imaging is often used to evaluate:

- lymphoma
- neuroblastoma
- kidney tumors
- congenital malformations of the heart, kidneys and blood vessels
- cystic fibrosis
- complications of acute appendicitis
- complications of pneumonia
- inflammatory bowel disease
- severe injuries

Radiologists and radiation oncologists often use the CT examination to:

- quickly identify injuries to the lungs, heart and vessels, liver, spleen, kidneys, bowel or other internal organs in cases of trauma.
- guide biopsies and other procedures such as abscess drainages and minimally invasive tumor treatments.
- plan for and assess the results of surgery, such as organ transplants or gastric bypass.
- stage, plan and properly administer radiation treatments for tumors as well as monitor response to chemotherapy.
- measure bone mineral density for the detection of osteoporosis.

How should I prepare?

Wear comfortable, loose-fitting clothing to your exam. You may need to change into a gown for the procedure.

Metal objects, including jewelry, eyeglasses, dentures, and hairpins, may affect the CT images. Leave them at home or remove them prior to your exam. Some CT exams will require you to remove hearing aids and removable dental work. Women will need to remove bras containing metal underwire. You may need to remove any piercings, if possible.

Your doctor may instruct you to not eat or drink anything for a few hours before your exam if it will use contrast material. Tell your doctor about all medications you are taking and if you have any allergies. If you have a known allergy to contrast material, your doctor may prescribe medications (usually a steroid) to reduce the risk of an allergic reaction. To avoid unnecessary delays, contact your doctor well before the date of your exam.

Also tell your doctor about any recent illnesses or other medical conditions and whether you have a history of heart disease, asthma, diabetes, kidney disease, or thyroid problems. Any of these conditions may increase the risk of an adverse effect.

Women should always inform their physician and the CT technologist if there is any possibility that they may be pregnant. *See the CT Safety During Pregnancy (https://www.radiologyinfo.org/en/info/safety-ct-pregnancy) page for more information.*

What does the CT equipment look like?

The CT scanner is typically a large, donut-shaped machine with a short tunnel in the center. You will lie on a narrow table that slides in and out of this short tunnel. Rotating around you, the x-ray tube and electronic x-ray detectors are located opposite each other in a ring, called a gantry. The computer workstation that processes the imaging information is in a separate control room. This is where the technologist operates the scanner and monitors your exam in direct visual contact. The technologist will be able to hear and talk to you using a speaker and microphone.

How does it work

In many ways, a CT scan works like other x-ray exams. Different body parts absorb x-rays in different amounts. This difference allows the doctor to distinguish body parts from one another on an x-ray or CT image.

A conventional x-ray exam directs a small amount of radiation through the body part under examination. A special electronic image recording plate captures the image. Bones appear white on the x-ray. Soft tissue, such as the heart or liver, shows up in shades of gray. Air appears black.

With CT scanning, several x-ray beams and electronic x-ray detectors rotate around you. These measure the amount of radiation being absorbed throughout your body. Sometimes, the exam table will move during the scan. A special computer program processes this large volume of data to create two-dimensional cross-sectional images of your body. The system displays the images on a computer monitor. CT imaging is sometimes compared to looking into a loaf of bread by cutting the loaf into thin slices. When the computer software reassembles the image slices, the result is a very detailed multidimensional view of the body's interior.

Nearly all CT scanners can obtain multiple slices in a single rotation. These multi-slice (multidetector) CT scanners obtain thinner slices in less time. This results in more detail.

Modern CT scanners can image large sections of the body in just a few seconds, and even faster in small children. Such speed is beneficial for all patients. Speed is especially beneficial for children, the elderly, and critically ill – anyone who finds it difficult to stay still, even for the brief time necessary to obtain images.
For children, the radiologist will adjust the CT scanner technique to their size and the area of interest to reduce the radiation dose.

Some CT exams use a contrast material to enhance visibility in the body area under examination.

How is the procedure performed?

The technologist begins by positioning you on the CT exam table, usually lying flat on your back. They may use straps and pillows to help you maintain the correct position and remain still during the exam.

Many scanners are fast enough to scan children without sedation. In special cases, children who cannot hold still may need sedation. Motion may cause blurring of the images and degrade image quality the same way that it affects photographs.

The exam may use contrast material, depending on the type of exam. If so, it will be swallowed, injected through an intravenous line (IV) or, rarely, administered by enema.

Next, the table will move quickly through the scanner to determine the correct starting position for the scans. Then, the table will move slowly through the machine for the actual CT scan. Depending on the type of CT scan, the machine may make several passes.

The technologist may ask you to hold your breath during the scanning. Any motion, including breathing and body movements, can lead to artifacts on the images. This loss of image quality can resemble the blurring seen on a photograph taken of a moving object.

When the exam is complete, the technologist will ask you to wait until they verify that the images are of high enough quality for accurate interpretation by the radiologist.

The CT examination is usually completed within 30 minutes. The portion requiring intravenous contrast injection usually lasts only 10 to 30 seconds.

What will I experience during and after the procedure?

CT exams are generally painless, fast, and easy. Multidetector CT reduces the amount of time that the patient needs to lie still.

Though the scan is painless, you may have some discomfort from remaining still for several minutes or from placement of an IV. If you have a hard time staying still, are very nervous, anxious, or in pain, you may find a CT exam stressful. The technologist or nurse, under the direction of a doctor, may offer you some medication to help you tolerate the CT exam.

If the exam uses iodinated contrast material, your doctor will screen you for chronic or acute kidney disease. The doctor may administer contrast material intravenously (by vein), so you will feel a pin prick when the nurse inserts the needle into your vein. You may feel warm or flushed as the contrast is injected. You also may have a metallic taste in your mouth. This will pass. You may feel a need to urinate. However, these are only side effects of the contrast injection, and they subside quickly.

If you swallow oral contrast material, you may find the taste mildly unpleasant. However, most patients can easily tolerate it. If you receive an enema, you can expect to experience a sense of abdominal fullness. You may also feel an increasing need to expel the liquid. If so, be patient; the mild discomfort will not last long.

When you enter the CT scanner, you may see special light lines projected onto your body. These lines help ensure that you are in the correct position on the exam table. With modern CT scanners, you may hear slight buzzing, clicking and whirring sounds. These occur as the CT scanner's internal parts, not usually visible to you, revolve around you during the imaging process.

You will be alone in the exam room during the CT scan, unless there are special circumstances. For example, sometimes a parent wearing a lead shield may stay in the room with their child. However, the technologist will always be able to see, hear and speak with you through a built-in intercom system.
With pediatric patients, a parent may be allowed in the room but may need to wear a lead apron to minimize radiation exposure.

After a CT exam, the technologist will remove your intravenous line. They will cover the tiny hole made by the needle with a small dressing. You can return to your normal activities immediately.

Who interprets the results and how do I get them?

A radiologist (https://www.radiologyinfo.org/en/info/article-your-radiologist) , a doctor specially trained to supervise and interpret radiology exams, will analyze the images. The radiologist will send an official report to the doctor who ordered the exam.

You may need a follow-up exam. If so, your doctor will explain why. Sometimes a follow-up exam further evaluates a potential issue with more views or a special imaging technique. It may also see if there has been any change in an issue over time. Follow-up exams are often the best way to see if treatment is working or if a problem needs attention.

What are the benefits vs. risks?

Benefits

- CT scanning is painless, noninvasive, and accurate.
- A major advantage of CT is its ability to image bone, soft tissue, and blood vessels all at the same time.
- Unlike conventional x-rays, CT scanning provides very detailed images of many types of tissue as well as the lungs, bones, and blood vessels.
- CT exams are fast and simple. In emergency cases, they can reveal internal injuries and bleeding quickly enough to help save lives.
- CT has been shown to be a cost-effective imaging tool for a wide range of clinical problems.
- CT is less sensitive to patient movement than MRI.
- Unlike MRI, an implanted medical device of any kind will not prevent you from having a CT scan.
- CT imaging provides real-time imaging, making it a good tool for guiding needle biopsies and needle aspirations. This is particularly true of procedures involving the lungs, abdomen, pelvis, and bones.

- A diagnosis via CT scan may eliminate the need for exploratory surgery and surgical biopsy.
- No radiation remains in a patient's body after a CT exam.
- The x-rays used for CT scanning should have no immediate side effects.

Risks

There is no conclusive evidence that radiation at small amounts delivered by a CT scan causes cancer. Large population studies have shown a slight increase in cancer from much larger amounts of radiation, such as from radiation therapy. Thus, there is always concern that this risk may also apply to the lower amounts of radiation delivered by a CT exam. When a CT scan is recommended by your doctor, the expected benefit of this test outweighs the potential risk from radiation. You are encouraged to discuss the risks versus the benefits of your CT scan with your doctor or radiologist, and to explore whether alternative imaging tests may be available to diagnose your condition.

- The radiation dose for this procedure varies. *See the Radiation Dose (https://www.radiologyinfo.org/en/info/safety-xray) page for more information.*
- Women should always tell their doctor and x-ray or CT technologist if there is any chance they are pregnant. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) page for more information about pregnancy and x-rays.*
- Doctors do not generally recommend CT scanning for pregnant women unless medically necessary because of potential risk to the unborn baby.
- IV contrast manufacturers indicate mothers should not breastfeed their babies for 24-48 hours after contrast material is given. However, the most recent American College of Radiology (ACR) Manual on Contrast Media reports that studies show the amount of contrast absorbed by the infant during breastfeeding is extremely low. *For further information please consult the ACR Manual on Contrast Media (https://www.acr.org/Clinical-Resources/Contrast-Manual) and its references.*
- The risk of serious allergic reaction to contrast materials (https://www.radiologyinfo.org/en/info/safety-contrast) that contain iodine is extremely rare, and radiology departments are well-equipped to deal with them.
- Because children are more sensitive to radiation, they should have a CT exam only if it is essential for making a diagnosis. They should not have repeated CT exams unless necessary. CT scans in children should always be done with low-dose technique.

What are the limitations of body CT scanning?

Soft-tissue details in areas such as the brain, gallbladder, internal pelvic organs, and joints (such as knees and shoulders) can often be better evaluated with magnetic resonance imaging (MRI). In pregnant women, while CT can be performed safely, other imaging exams not involving radiation, such as ultrasound or MRI, are preferred but only if they are likely to be as good as CT in diagnosing your condition.

A person who is very large may not fit into the opening of a conventional CT scanner. Or, they may be over the weight limit—usually 450 pounds—for the moving table.

Disclaimer

Note: Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

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