



Computed Tomography (CT) - Abdomen and Pelvis

Computed tomography (CT) of the abdomen and pelvis is a diagnostic imaging test used to help detect diseases of the small bowel, colon and other internal organs and is often used to determine the cause of unexplained pain. 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. These medications must be taken 12 hours prior to your exam. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is CT Scanning of the Abdomen/Pelvis?

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.

The cross-sectional images generated during a CT scan can be reformatted in multiple planes. They can even generate three-dimensional images. These images can be viewed on a computer monitor, printed on film or by a 3D printer, or transferred to a CD or DVD.

CT images of internal organs, bones, soft tissue and blood vessels provide greater detail than traditional x-rays, particularly of soft tissues and blood vessels.

What are some common uses of the procedure?

This procedure is typically used to help diagnose the cause of abdominal or pelvic pain and diseases of

the internal organs, small bowel and colon, such as:

- infections such as appendicitis, pyelonephritis or infected fluid collections, also known as abscesses.
- inflammatory bowel disease such as ulcerative colitis or Crohn's disease, pancreatitis or liver cirrhosis.
- cancers of the liver, kidneys, pancreas, ovaries and bladder as well as lymphoma.
- kidney and bladder stones.
- abdominal aortic aneurysms (AAA), injuries to abdominal organs such as the spleen, liver, kidneys or other internal organs in cases of trauma.

CT scanning of the abdomen/pelvis is also performed to:

- 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.
- stage, plan and properly administer radiation treatments for tumors as well as monitor response to chemotherapy.

How should I prepare?

You should wear comfortable, loose-fitting clothing to your exam. You may need to wear a gown during 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. You may also be asked to remove hearing aids and removable dental work. Women will be asked to remove bras containing metal underwire. You may be asked to remove any piercings, if possible.

You will be asked not to eat or drink anything for a few hours beforehand, if contrast material will be used in your exam. You should inform your physician of 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 before the exact time of your exam.

Also inform your doctor of 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](#) 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 examination 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 located 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 the procedure 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.

In a conventional x-ray exam, a small amount of radiation is directed through the part of the body being examined. 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, so that the x-ray beam follows a spiral path. A special computer program processes this large volume of data to create two-dimensional cross-sectional images of your body. These images are then displayed on a monitor. CT imaging is sometimes compared to looking into a loaf of bread by cutting the loaf into thin slices. When the image slices are reassembled by computer software, the result is a very detailed multidimensional view of the body's interior.

Refinements in detector technology allow nearly all CT scanners to obtain multiple slices in a single rotation. These scanners, called multi-slice or multidetector CT, allow thinner slices to be obtained in a shorter amount of time. This results in more detail and additional view capabilities.

Modern CT scanners can scan through large sections of the body in just a few seconds, and even faster in small children. Such speed is beneficial for all patients. It's 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 CT scanner technique will be adjusted to their size and the area of interest to reduce the radiation dose.

For some CT exams, a contrast material is used to enhance visibility in the area of the body being studied.

How is the procedure performed?

The technologist begins by positioning you on the CT exam table, usually lying flat on your back. Straps

and pillows may be used to help you maintain the correct position and remain still during the exam.

Many scanners are fast enough that children can be scanned without sedation. In special cases, sedation may be needed for children who cannot hold still. Motion will cause blurring of the images and degrade the quality of the examination the same way that it affects photographs.

If contrast material is used, depending on the type of exam, 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 as the actual CT scanning is performed. Depending on the type of CT scan, the machine may make several passes.

You may be asked 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, you will be asked to wait until the technologist verifies that the images are of high enough quality for accurate interpretation.

The CT examination is usually completed within a few minutes. However, if you are required to drink oral contrast you will be asked to arrive approximately two hours prior to your scan time or begin drinking the contrast at home prior to arriving.

What will I experience during and after the procedure?

CT exams are generally painless, fast and easy. With multidetector CT, the amount of time that the patient needs to lie still is reduced.

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 an intravenous contrast material is used, you will feel a pin prick when the needle is inserted into your vein. You may feel warm or flushed while 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, this is a contrast effect and subsides quickly.

If the contrast material is swallowed, you may find the taste mildly unpleasant; however, most patients can easily tolerate it. You can expect to experience a sense of abdominal fullness and an increasing need to expel the liquid if your contrast material is given by enema. In this case, be patient, as the mild discomfort will not last long.

Many patients also receive an iodine-based contrast material intravenously (injected into a vein) to help evaluate blood vessels and organs such as the liver, kidneys and pancreas.

When you enter the CT scanner, you may see special light lines projected onto your body. These lines are

used to ensure that you are properly positioned. 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 will be required to wear a lead apron to minimize radiation exposure.

After a CT exam, the technologist will remove the intravenous line used to inject the contrast material. The tiny hole made by the needle will be covered with a small dressing. You can return to your normal activities.

Who interprets the results and how do I get them?

A 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.

Follow-up exams may be needed. If so, your doctor will explain why. Sometimes a follow-up exam is done because a potential abnormality needs further evaluation with additional views or a special imaging technique. A follow-up exam may also be done to see if there has been any change in an abnormality over time. Follow-up exams are sometimes the best way to see if treatment is working or if an abnormality is stable or has changed.

What are the benefits vs. risks?

Benefits

- Viewing a CT scan, an experienced radiologist can diagnose many causes of abdominal pain or injury from trauma with very high accuracy, enabling faster treatment and often eliminating the need for additional, more invasive diagnostic procedures.
- When pain is caused by infection and inflammation, the speed, ease and accuracy of a CT examination can reduce the risk of serious complications, such as those caused by a burst appendix or an infected fluid collection and the subsequent spread of infection.
- 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 examinations 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.
- CT can be performed if you have an implanted medical device of any kind, unlike MRI.
- CT imaging provides real-time imaging, making it a good tool for guiding minimally invasive procedures such as needle biopsies and needle aspirations of many areas of the body, particularly the lungs, abdomen, pelvis and bones.
- A diagnosis determined by CT scanning may eliminate the need for exploratory surgery and surgical biopsy.
- No radiation remains in a patient's body after a CT examination.
- X-rays used in CT scans should have no immediate side effects.

Risks

- There is always a slight chance of cancer from excessive exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
- The effective radiation dose for this procedure varies. See the Radiation Dose in X-Ray and CT Exams page for more information about radiation dose.
- Women should always tell their doctor and x-ray or CT technologist if there is any chance they are pregnant. See the Safety in X-ray, Interventional Radiology and Nuclear Medicine Procedures page for more information about pregnancy and x-rays.
- CT scanning is, in general, not recommended for pregnant women unless medically necessary because of potential risk to the unborn baby.
- The risk of serious allergic reaction to contrast materials that contain iodine is extremely rare, and radiology departments are well-equipped to deal with them.
- 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 and its references.
- Because children are more sensitive to radiation, they should have a CT exam only if it is essential for making a diagnosis and should not have repeated CT exams unless absolutely necessary. CT scans in children should always be done with low-dose technique.
- Radiology departments tailor the radiation dose for CT scans, especially when scanning children, so that the benefits of the scan far outweigh any possible risks from the exposure to diagnostic

radiation.

What are the limitations of CT Scanning of the Abdomen/Pelvis?

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

CT scanning of the abdomen may not be as sensitive in identifying gallstones as ultrasound of the abdomen.

Alternate imaging techniques such as plain films, gastrointestinal (GI) contrast exams and ultrasound are preferred for evaluation of acute abdominal conditions in babies, such as vomiting or blood in stool.

For some conditions, including but not limited to some liver, kidney, pancreatic, uterine or ovarian abnormalities, the evaluation and diagnosis with MRI may be preferable over CT scanning.

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