



## CT Colonography

Computed tomography (CT) colonography or virtual colonoscopy uses special x-ray equipment to examine the large intestine for cancer and growths called polyps. During the exam, a small tube is inserted a short distance into the rectum to allow for inflation with air while CT images of the colon and the rectum are taken.



Prior to your exam, your doctor may restrict you to clear fluids and give you instructions on clearing your bowels. 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 Colonography?

Computed tomography, more commonly known as a CT or CAT scan, is a diagnostic medical test that, like traditional x-rays, 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, and can even generate three-dimensional images. These images can be viewed on a computer monitor, printed on film 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.

CT colonography, also known as virtual colonoscopy, uses low dose radiation CT scanning to obtain an interior view of the colon (the large intestine) that is otherwise only seen with a more invasive procedure where an endoscope is inserted into the rectum and passed through the entire colon.

## What are some common uses of the procedure?

The major reason for performing CT colonography is to screen for polyps or cancers in the large intestine. Polyps are growths that arise from the inner lining of the intestine. A very small number of polyps may grow and turn into cancers.

The goal of screening with CT colonography is to find these growths in their early stages, so that they can be removed before cancer has had a chance to develop. The American Cancer Society (ACS) recommends that women and men undergo screening for colon cancer or polyps beginning at age 50. As part of its recommendation, ACS suggests CT colonography as an option once every five years. Individuals at increased risk or with a family history of colon cancer may start screening at age 40 or younger and may be screened at shorter intervals (for example, having a colonoscopy every five years). Risk factors for the disease include a history of polyps or having a family history of colon cancer. Signs and symptoms of colon cancer include a persistent change in bowel habits, the presence of blood in the stool, abdominal discomfort or pain, bloating and unexplained weight loss.

## How should I prepare?

You should wear comfortable, loose-fitting clothing to your exam. You will be given a gown to wear during the procedure.

Women should always inform their physician and the CT technologist if there is any possibility that they may be pregnant. See the Safety page for more information about pregnancy and x-rays.

The bowel-cleansing regimen for CT colonography may be similar to that for a colonoscopy or consist of a smaller volume of cleansing liquid. Your diet will be restricted to clear liquids the day before the examination. It is very important to clean out your colon the night before your CT colonography examination so that the radiologist can clearly see any polyps that might be present. You will be asked to take either a set of pills and/or a liquid laxative. Some common preparations are Magnesium Citrate and bisacodyl tablets and/or NuLytely®, Go-Lytely® (Polyethylene glycol electrolyte solutions). Additional agents may also be taken the day before the exam. These may include small quantities of barium and iodinated liquids. These agents help the radiologist better distinguish stool from polyps by "tagging" the remaining stool and fluid.

Be sure to inform your physician if you have heart, liver or kidney disease to be certain that the bowel prep will be safe. Your physician can advise you on dietary restrictions prior to the exam. You will be able to resume your usual diet immediately after the exam.

## What does the equipment look like?

The CT scanner is typically a large, box-like machine with a hole, or short tunnel, in the center. You will lie on a narrow examination table that slides into and out of this 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, where the technologist operates the scanner and monitors your examination in direct visual contact and usually with the ability to hear and talk to you with the use of a speaker and microphone.

During CT colonography, you will be asked to lie on your back and then on your stomach and/or side.

## How does the procedure work?

In many ways CT scanning works very much like other x-ray examinations. X-rays are a form of radiation—like light or radio waves—that can be directed at the body. Different body parts absorb the x-rays in varying degrees.

In a conventional x-ray exam, a small burst of radiation is aimed at and passes through the body, recording an image on photographic film or a special image recording plate. Bones appear white on the x-ray; soft tissue shows up in shades of gray and air appears black.

With CT scanning, numerous x-ray beams and a set of electronic x-ray detectors rotate around you, measuring the amount of radiation being absorbed throughout your body. Sometimes, the examination 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, which 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 new CT scanners to obtain multiple slices in a single rotation. These scanners, called multislice CT or multidetector CT, allow thinner slices to be obtained in a shorter period of time, resulting in more detail and additional view capabilities.

Modern CT scanners are so fast that they can scan through large sections of the body in just a few seconds. Such speed is beneficial for all patients but especially children, the elderly and critically ill.

For CT colonography, the computer generates a detailed three-dimensional (3-D) model of the colon, which the radiologist uses to view the bowel in a way that simulates traveling through the colon. This is why the procedure is often called a virtual colonoscopy. Two-dimensional (2-D) images of the inside of the colon as well as the rest of the abdomen and pelvis are obtained and reviewed at the same time without any additional radiation.

## How is the procedure performed?

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

A very small, flexible tube will be passed two inches into your rectum to allow air to be gently pumped into the colon using a hand-held squeeze bulb. Sometimes an electronic pump is used to deliver carbon

dioxide gas into the colon. Sometimes a small balloon is inflated on the rectal tube to help keep the tube positioned correctly. The purpose of the gas is to distend the colon as much as possible to eliminate any folds or wrinkles that might hide polyps from the physician's view.

Next, the table will move through the scanner. Patients are asked to hold their breath for about 15 seconds or less before turning over and lying on their back or side for a second pass that is made through the scanner. In some centers, the sequence of positions may be the opposite: facing upward first and then facing down. Once the scan is done, the tube is removed.

The entire examination is usually completed within 15 minutes.

## What will I experience during and after the procedure?

The vast majority of patients who have CT colonography report a feeling of fullness when the colon is inflated during the exam, as if they need to pass gas. Significant pain is uncommon, occurring in fewer than 5 percent of patients. A muscle-relaxing drug may be injected intravenously or subcutaneously to lessen discomfort, but this is seldom necessary. The scanning procedure itself causes no pain or other symptoms.

When you enter the CT scanner, special light lines may be seen projected onto your body, and are used to ensure that you are properly positioned. With modern CT scanners, you will hear only slight buzzing, clicking and whirring sounds 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.

After a CT exam, you can return to your normal activities.

## Who interprets the results and how do I get them?

A radiologist with expertise in supervising and interpreting radiology examinations will analyze the images and send an official report to your primary care physician or physician who referred you for the exam, who will discuss the results with you.

In some cases, information about whether you have polyps is available immediately. Some imaging centers are equipped to perform colonoscopy and, if necessary, polyp removal the same day as the CT colonography.

Follow-up examinations may be necessary. Your doctor will explain the exact reason why another exam is requested. 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 examination may also be necessary so that any change in a known abnormality can be monitored over time. Follow-up examinations are sometimes the best way to see if treatment is working or if a finding is stable or changed

over time.

## What are the benefits vs. risks?

### Benefits

- This new minimally invasive test provides both 2-D and 3-D images that can depict many polyps and other lesions as clearly as when they are directly seen by conventional colonoscopy.
- CT colonography has a markedly lower risk of perforating the colon than conventional colonoscopy. Most people who undergo CT colonography do not have polyps and can be spared having to undergo a full colonoscopy which typically requires sedation.
- CT colonography is an excellent alternative for patients who have clinical factors that increase the risk of complications from colonoscopy, such as treatment with a blood thinner or a severe breathing problem.
- Elderly patients, especially those who are frail or ill, will tolerate CT colonography better than conventional colonoscopy.
- CT colonography can be helpful when colonoscopy cannot be completed because the bowel is narrowed or obstructed for any reason, such as by a large tumor.
- If conventional colonoscopy cannot reach the full length of the colon—which occurs up to 10 percent of the time—CT colonography can be performed on the same day because the colon has already been cleansed.
- CT colonography provides clearer and more detailed images than a conventional barium enema x-ray examination.
- CT colonography can detect abnormalities outside of the colon, including early-stage malignancies in other organs and potentially dangerous conditions, such as abdominal aortic aneurysms.
- CT colonography is tolerated well. Sedation and pain relievers are not needed, so there is no recovery period and you can return to your normal daily activities immediately after the test.
- CT colonography is less costly than colonoscopy.
- 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 a very small risk that inflating the colon with air could injure or perforate the bowel. This has been estimated to happen in fewer than one in 10,000 patients.
- 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 Safety page for more information about radiation dose.
- Women should always inform their physician and x-ray or CT technologist if there is any possibility that they are pregnant. See the Safety 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 fetus in the womb.

## What are the limitations of CT Colonography?

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 colonography is strictly a diagnostic procedure. If any clinically significant polyps are found, they will have to be removed by conventional colonoscopy.

The ability of CT colonography to differentiate stool from artifacts and smaller polyps may not be as good as that of conventional colonoscopy.

CT colonography is not recommended for patients who have active Crohn's disease, ulcerative colitis, inflammatory bowel disease or diverticulitis, because of increased risk of perforating the colon. Patients with a history of bowel perforation and those experiencing severe pain or cramps on the day of the examination should not undergo CT colonography.

Some insurance companies do not cover CT colonography as a screening test for colonic polyps, but they may cover the cost if a patient has symptoms related to the colon. Recently, the United States Preventive Services Task Force (USPSTF) assigned a grade of “A” to CT colonography as a screening modality for the detection of colon cancer. This decision, according to provisions included in the Affordable Care Act, mandates coverage by private insurance companies participating in the insurance exchange program. Medicare does not currently cover CT colonography but may do so in the near future due to the decision of the USPSTF.

### Disclaimer

This information is copied from the RadiologyInfo Web site (<http://www.radiologyinfo.org>) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at <http://www.radiologyinfo.org> to view or download the latest information.

**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.

### Copyright

This material is copyrighted by either the Radiological Society of North America (RSNA), 820 Jorie Boulevard, Oak Brook, IL 60523-2251 or the American College of Radiology (ACR), 1891 Preston White Drive, Reston, VA 20191-4397. Commercial reproduction or multiple distribution by any traditional or electronically based

reproduction/publication method is prohibited.

Copyright © 2017 Radiological Society of North America, Inc.