



Cardiac CT for Calcium Scoring

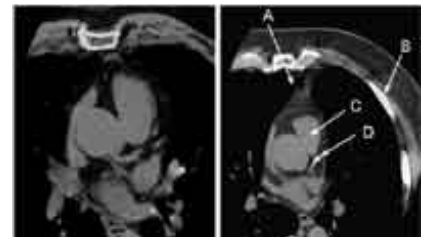
What is Cardiac CT for Calcium Scoring?

CT scanning—sometimes called CAT scanning—is a noninvasive medical test that helps physicians diagnose and treat medical conditions.

CT scanning combines special x-ray equipment with sophisticated computers to produce multiple images or pictures of the inside of the body. These cross-sectional images of the area being studied can then be examined on a computer monitor, printed or transferred to a CD.

CT scans of internal organs, bones, soft tissue and blood vessels provide greater clarity and reveal more details than regular x-ray exams.

A cardiac CT scan for coronary calcium is a non-invasive way of obtaining information about the presence, location and extent of calcified plaque in the coronary arteries—the vessels that supply oxygen-containing blood to the heart muscle. Calcified plaque results when there is a build-up of fat and other substances under the inner layer of the artery. This material can calcify which signals the presence of atherosclerosis, a disease of the vessel wall, also called coronary artery disease (CAD). People with this disease have an increased risk for heart attacks. In addition, over time, progression of plaque build up (CAD) can narrow the arteries or even close off blood flow to the heart. The result may be chest pain, sometimes called "angina," or a heart attack.



Because calcium is a marker of CAD, the amount of calcium detected on a cardiac CT scan is a helpful prognostic tool. The findings on cardiac CT are expressed as a calcium score. Another name for this test is coronary artery calcium scoring.

What are some common uses of the procedure?

The goal of cardiac CT scan for calcium scoring is to determine if CAD is present and to what extent, even if there are no symptoms. It is a screening study that may be recommended by a physician for patients with risk factors for CAD but no clinical symptoms.

The major risk factors for CAD are:

- high blood cholesterol levels
- family history of heart attacks
- diabetes

- high blood pressure
- cigarette smoking
- overweight or obese
- physical inactivity

How should I prepare?

No special preparation is necessary in advance of a cardiac CT examination. You should continue to take your usual medications, but should avoid caffeine and smoking for four hours prior to the exam.

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

Metal objects including jewelry, eyeglasses, dentures and hairpins may affect the CT images and should be left at home or removed prior to your exam. You may also be asked to remove hearing aids and removable dental work.

Women should always inform their physician and the CT technologist if there is any possibility that they are pregnant. See the Safety page (www.RadiologyInfo.org/en/safety/) for more information about pregnancy and x-rays.

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.



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. At the same time, the examination table is moving through the scanner, 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. This technique is called helical or spiral CT.

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.

How is the procedure performed?

The technologist begins by positioning you on the CT examination table, usually lying flat on your back or less commonly, on your side or on your stomach. Straps and pillows may be used to help you maintain the correct position and to hold still during the exam. Depending on the part of the body being scanned, you may be asked to keep your hands over your head.

Electrodes (small, sticky discs) will be attached to your chest and to an electrocardiograph (ECG) machine that records the electrical activity of the heart. This makes it possible to record CT scans when the heart is not actively contracting.

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.

Patients are asked to hold their breath for a period of 10 to 20 seconds while images are recorded.

When the examination is completed, you will be asked to wait until the technologist verifies that the images are of high enough quality for accurate interpretation.

The entire procedure including the actual CT scanning is usually completed within 10 minutes.

What will I experience during and after the procedure?

This CT exam is painless, fast and easy.

Though the scanning itself causes no pain, there may be some discomfort from having to remain still for several minutes. If you have a hard time staying still, are claustrophobic or have chronic pain, you may find a CT exam to be stressful. The technologist or nurse, under the direction of a physician, may offer you some medication to help you tolerate the CT scanning procedure.

When you enter the CT scanner, special light lines may be seen on 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 revolves around you during the imaging process.

You will be alone in the exam room during the CT scan, unless there are special circumstances. However, the technologist will always be able to see, hear and speak with you at all times.

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

Who interprets the results and how do I get them?

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

A negative cardiac CT scan for calcium scoring shows no calcification within the coronary arteries. This suggests that CAD is absent or so minimal it cannot be seen by this technique. The chance of having a heart attack over the next two to five years is very low under these circumstances.

A positive test means that CAD is present, regardless of whether or not the patient is experiencing any symptoms. The amount of calcification—expressed as the calcium score—may help to predict the likelihood of a myocardial infarction(heart attack) in the coming years and helps your medical doctor or cardiologist decide whether the patient may need to take preventive medicine or undertake other measures such as diet and exercise to lower the risk for heart attack.

The extent of CAD is graded according to your calcium score:

Calcium Score	Presence of CAD
0	No evidence of CAD
1-10	Minimal evidence of CAD
11-100	Mild evidence of CAD
101-400	Moderate evidence of CAD
Over 400	Extensive evidence of CAD

Follow-up examinations are often necessary, and your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a suspicious or questionable finding needs clarification with additional views or a special imaging technique. A follow-up examination may be necessary so that any change in a known abnormality can be detected over time. Follow-up examinations are sometimes the best way to see if treatment is working or if an abnormality is stable over time.

What are the benefits vs. risks?

Benefits

- Cardiac CT for calcium scoring is a convenient and noninvasive way of evaluating whether you may be at increased risk for a heart attack.

- The exam takes little time, causes no pain, and does not require injection of contrast material.
- No radiation remains in a patient's body after a CT examination.
- X-rays used in CT scans usually 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 Safety page (www.RadiologyInfo.org/en/safety/) 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 (www.RadiologyInfo.org/en/safety/) 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 baby.
- A high calcium score may sometimes be followed by other diagnostic tests for heart disease, which may or may not provide results with clinical value and can be associated with side effects.

What are the limitations of Cardiac CT for Calcium Scoring?

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.

CAD, especially in people below 50 years of age can be present without calcium (non-calcified plaque) and may not be detected by this exam.

Not all health insurance plans cover cardiac CT for calcium scoring.

A high heart rate may interfere with the image quality of the test. If a patient's heart rate is 90 or more beats per minute, the exam may need to be rescheduled.

Exactly how your treatment or prevention for heart attacks should be modified according to your calcium score remains uncertain.

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