

CT Coronary Angiography (CTCA)

Consumer Information

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What is a CT Coronary Angiography (CTCA)?

It is now possible to take images of the beating heart that will provide information about the heart muscle, heart valves and, more importantly, the coronary arteries. The coronary arteries supply the blood to the heart muscle and it is the disease of these vessels that is responsible for most heart attacks.

The coronary arteries and heart chambers are made clearly visible against the background of other tissues in the area of the heart by injecting liquid contrast agents, sometimes called contrast medium (see [Iodine-containing contrast medium \(ICCM\)](#)), into a vein (usually given in your arm). The contrast agent increases the density of the blood in the vessels and allows the inside and outside structure of the blood vessels to be seen on pictures taken by a computed tomography (CT) scan.

Angiography is the X-ray examination (in this case using CT to produce live X-ray images) of blood vessels after the contrast medium has been injected into the bloodstream.

You may also need to be given a drug called a beta blocker to reduce your heart rate and make the images even clearer and easier to interpret. This will either be given to you in tablet form or intravenously through an IV (intravenous) cannula (a thin plastic tube) inserted directly into one of the veins in your arm.

How do I prepare for a CTCA?

The CT images are clearer if your heart rate is low and you may be given medications before the test to lower the heart rate to obtain these clearer images. It is advisable that you do not have any tea (including herbal teas), coffee, cola or chocolate before the procedure as these contain caffeine that can elevate heart rate.

It is not necessary to go without food or drink before having the test but a full stomach is not advisable as this together with the contrast agent may make you feel nauseated.

It is important that you advise the medical staff where you are having the CTCA test when you make the appointment if you have asthma, diabetes, any kidney problems, irregular heart rhythm, or have in

the past had an allergy to contrast agents used in a radiology procedure. If you have any of these conditions, you may not be able to have this test because you may have side effects from the medications or contrast agents that have to be used.

The procedure may require several hours of preparation after you arrive at the facility where you are having the test, before you have the CTCA.

If you are taking metformin for diabetes, you may or may not need to stop taking it for this test, depending on whether or not your kidney function is normal. If you are taking metformin, you will need to bring the results of a recent kidney function test with you so that it can be checked.

Many patients come with a companion who can drive them home because even though you may have to stay after the procedure until the effects of drugs used to lower the heart rate have worn off, you may still feel a little light headed walking or driving.

What happens during a CTCA?

A CTCA test is usually performed in three parts - preparation, scanning, and recovery.

Preparation:

Before having the procedure you will be asked about your medical history (your story about the problems or symptoms you have been having that led you to be referred for the test by your general practitioner or specialist).

Your heart rate will be checked using an electrocardiogram (or ECG) machine. About four electrode patches will be placed onto your skin on the front of your chest so the ECG wires can be attached.

The specialist doctor supervising your procedure, (a [radiologist](#) or cardiologist) will review the ECG. If your heart rhythm is regular, a thin plastic tube called an IV (intravenous) cannula is inserted into one of your veins, usually in a vein on the front of your elbow at the skin crease.

Depending on the type of CT scanner, if your heart rate is above 60 beats per minute, you may be given a drug called a beta blocker either orally (tablets by mouth) or intravenously (through the IV cannula) to reduce your heart rate. Reducing your heart rate makes the images clearer and easier to interpret. Your blood pressure and pulse rate are monitored and when the heart rate has reduced to the required level (a regular rhythm), you are taken from the preparation area to the CT scanner room.

Scanning:

You will be helped onto the CT scanner bed for the images or picture to be taken by the CT scanner (see [Computed Tomography \(CT\)](#)). The CT scan equipment is a large square machine with a circular hole, sometimes described as looking like a donut. The bed slides in and out of the hole while pictures of your heart are being taken. It is important not to

move during the scan as it will affect the quality of the pictures and make them harder for the radiologist to interpret.

Several minutes before the CT scan, nitroglycerin will be sprayed into the back of your mouth from a small spray container similar to that used by asthma sufferers. This is used to dilate (expand) the coronary arteries to assist in the procedure. This may cause headache or mild light headedness if you do not normally take the drug or use nitroglycerin patches for prevention or treatment of angina (heart muscle related chest pain).

At some hospitals or radiology practices, a "test dose" of contrast is given to enable the exact timing for the beginning of the scan, by measuring how long it takes for the contrast agent to get from the arm where it is injected, to the heart. This can also be done automatically without a test dose by monitoring the arrival of contrast agent in the heart at the time of the scan. The start of scanning can also be determined automatically by the scanner.

While you are on the bed, you will be given a rapid intravenous injection of iodine contrast agent (some people think of this as X-ray "dye" but it is clear and colourless fluid) (see [Iodine-containing contrast medium \(ICCM\)](#)). This injection is performed with a pressure injector through the cannula.

When the iodine contrast reaches the heart through the veins, the scan is commenced. You will hear the X-ray tube and detectors of the CT machine rotating around you, before the X-rays are turned on to create the images. The CT table will move while the pictures are being taken or, in some new scanners, the X-ray table may not move or may move in a series of short steps.

You will be asked to hold your breath while the pictures are being taken, which takes approximately 10 to 12 seconds because movement during this time will cause blurring of the images. The CT scanner takes a series of picture "slices" of the heart from the top to the bottom. At the same time as these images are being taken, your ECG is recorded. The scan uses the recording from the ECG of the electric pulses from your heart every times it beats, to control the processing of the CT scan images. The CT scan images are matched to the ECG and the period or periods when the heart moves the least are used to capture the images of the coronary arteries, free of motion, so that they appear sharp rather than blurred on the images.

The images are analysed and reconstructed by the medical imaging technologist (or [radiographer](#)) who takes the images, to show the coronary arteries. Complex computer programs are used for this purpose. Blockages in the coronary arteries which could be responsible for heart attacks can be confirmed. Other information can also be obtained about heart muscle changes, the inside of the four heart chambers, the valves, the membranes that surround the heart (the pericardium), and the rest of the chest outside the heart that is included in the area which is scanned.

Recovery:

The scan is over in a matter of seconds and you will be taken to a recovery area and observed before removing the IV cannula and being allowed to go home. If you have had drugs to lower your heart rate, you may be asked to stay for observation until the effects have subsided.

Are there any after effects of CTCA?

If drugs to slow your heart rate have been given, you will usually be kept under observation until the after effects of any possible light headedness have worn off, which is usually for about half an hour, although it may take longer. You might feel light headed if you were to walk or drive during this recovery time.

If you have a headache from the nitroglycerin, this usually subsides relatively quickly, i.e. in about 20 minutes and often even quicker than this.

Allergy to the contrast agent may occur (see [Iodine-containing contrast medium \(ICCM\)](#)). This can range from mild effects such as sneezing, itchiness, rash and hives, to severe reactions. Severe reactions are rare but may result in breathing difficulties, a drop in blood pressure and soft tissue swelling in the face and throat. When this occurs in the airways, it can be life threatening. Such reactions are very uncommon, but the reaction must be treated immediately by the medical staff, who are trained for such emergencies.

If you have had a previous allergic reaction to X-ray contrast agent or you have a strong history of allergy to other things (like foods, pollens, or dust), you should inform the medical staff at the facility before having the procedure.

The radiation dose for the procedure is approximately 2-21.5m millisieverts (a measure of radiation dose) (see [Radiation risk of medical imaging for adults and children](#)).

How long does a CTCA take?

The whole procedure, including the preparation, scanning process, and recovery, may take 3-4 hours, particularly if you have been given beta blockers, but you may be allowed to go home earlier. The actual CT scan will take approximately 20 minutes.

What are the risks of a CTCA?

The main risks of a CTCA are:

1. Complications of the IV procedure and iodinated contrast agent, e.g.:
 - Rupture of the vein from the cannula, which is rare.
 - Injection of contrast medium into the tissues from the rapid injection of contrast agent, if injected into a small vein and the vein wall is weak.
 - Air injected into the vein, although most modern power injectors provide safety measures so this does not happen.

- Side effects of the injection of contrast agent (see *Iodine-containing contrast medium (ICCM)*) that can include sneezing, itching, rash and hives, which occur in a small percentage of patients. They usually occur within minutes of the injection. More severe reactions are rare and include drop in blood pressure and soft tissue swelling, and can be life threatening. These reactions require immediate treatment. Medical staff at the facility where you are having the test are trained to treat severe reactions if they happen.
 - Patients with renal impairment (kidney problems) may experience worsening of kidney function following the iodinated contrast (see *Iodine-containing contrast medium (ICCM)*). This usually improves over several days. If impairment of kidney function is severe, then the procedure is generally not performed unless the information provided by the scan is considered to be so valuable that this outweighs the risk of further deterioration in kidney function.
2. Beta blockers can cause bronchospasm (major airway narrowing) in asthmatics, and are not given in patients who depend on high heart rates to maintain normal heart function.
 3. Nitroglycerin can cause headache and drop in blood pressure.
 4. Patients taking metformin for diabetes may or may not need to stop taking it for this test, depending on whether or not their kidney function is normal. If you are taking metformin, you will need to bring the results of a recent kidney function test with you so that it can be checked.
 5. The procedure would not normally be performed in pregnant women because of the radiation exposure to the foetus (unborn baby). In breast feeding patients, the contrast agent can enter the breast milk but not in sufficient quantities to affect your baby (see *Iodine containing contrast medium (ICCM)*).

What are the benefits of a CTCA?

CTCA is a relatively new test and the techniques are still evolving with the rapid development of new equipment. There is still disagreement amongst specialist doctors (cardiologists and radiologists) as to the benefits of the test. Published information would suggest that if this test is performed and no coronary artery disease is detected, there is an excellent prospect you will not have a heart attack in the near future.

Two studies have shown no cardiac events (heart attacks) occurred at 15 and 17 months after having this procedure in patients where no coronary artery disease was detected. Long term studies are not available at this stage because of the newness of the technology.

The test has the benefit of being able to demonstrate the extent and distribution of atherosclerosis (a disease that obstructs blood flow in the arteries) within the coronary arteries, even if it is not causing limitations to flow within the arteries.

At present, this test is mainly used for patients with suspected coronary artery disease who have a low or intermediate risk of the disease based on standard risk assessment criteria. Information about the heart muscle, heart valves, coronary arteries, previous myocardial infarction (heart attacks) and other lesions (abnormalities) within the chest can also be obtained from this procedure.

This area is evolving rapidly and it is probable that new uses for this test will appear in the future.

Who does the CTCA?

A team of people including specialist doctors (radiologists, cardiologists), radiographers and nurses are usually involved. The images are usually interpreted by the radiologist and/or cardiologist and a report written and provided to your referring doctor.

Where is a CT Coronary Angiography done?

CTCA will be performed in public or private hospital imaging departments and in private radiological practices.

When can I expect the results of my CT Coronary Angiography?

The time that it takes your doctor to receive a written report on the test or procedure you have had will vary, depending on:

- the urgency with which the result is needed
- the complexity of the examination
- whether more information is needed from your doctor before the examination can be interpreted by the radiologist
- whether you have had previous X-rays or other medical imaging that needs to be compared with this new test or procedure (this is commonly the case if you have a disease or condition that is being followed to assess your progress)
- how the report is conveyed from the practice or hospital to your doctor (in other words, email, fax or mail)

Please feel free to ask the private practice, clinic, or hospital where you are having your test or procedure when your doctor is likely to have the written report.

It is important that you discuss the results with the doctor who referred you, either in person or on the telephone, so that they can explain what the results mean for you.

Please note:

This information is of a general nature only and is not intended as a substitute for medical advice. It is designed to support, not replace, the relationship that exists between a patient and his/her doctor. It is recommended that any specific questions regarding your procedure be discussed with your family doctor or medical specialist

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