

## Nuclear Medicine (NM) Cardiac Stress Test

### Consumer Information

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### What is a Nuclear Medicine (NM) Cardiac Stress Test?

This is a nuclear medicine study which evaluates the blood supply to the heart. Some information about the heart function is also obtained. The study involves imaging the heart at rest and after the patient's heart is stressed. The stress is in the form of exercise on a treadmill or exercise bike, or if this is not possible by giving the patient a medication. The purpose of the stress test is to maximally increase the blood flow to the heart. Differences in blood flow to different parts of the heart are more obvious when the blood flow is increased. Think of the effect of closing a lane of traffic on a main road; the delays are longer when the road is busy and being used by lots of cars, but when there are few cars using the road there may be no hold ups or delays.

In order to take the image or picture of the heart, a radioactive medication (radiopharmaceutical) is injected into the patient. The radiopharmaceutical passes through the blood stream and is concentrated in the heart. A gamma camera or scanner is then positioned in front of the heart to capture the images from the gamma rays emitted from the patient (see [Nuclear Medicine](#)). With the patient lying down, the scanner rotates around the chest and 3 dimensional images of the heart are constructed.

In most cases the radiopharmaceutical used is called  $^{99m}\text{Tc}$  sestamibi or  $^{99m}\text{Tc}$  tetrafosmin. In some laboratories and in certain circumstances a third agent called  $^{201}\text{Thallium}$  may be used instead.

The stress and rest scans are then compared. Parts of the heart receiving blood from diseased arteries will show a reduction in radioactivity in the stress scan and improvement in the rest scan.

### How do I prepare for a NM Cardiac Stress Test?

There are no preparations for the scanning or imaging component of the test.

However, it is important that you let staff at the hospital or radiology practice where you are having the scan done know if you are **pregnant** or **breast feeding**.

This study is not suitable for pregnant women because of the radiation dose to the growing foetus.

Women who are breastfeeding and people who are the primary or sole carer for small children may need to make special preparations for after the test, to stop breastfeeding for a short time, and to avoid close contact with young children. This is due to the small amount of radioactivity your body may release for a while after the test. Talk to your referring doctor or the nuclear medicine practice where you will have the test for details. The Australian Radiation Protection and Nuclear Safety Agency has [recommendations](#) about breastfeeding and close contact with children after nuclear medicine tests.

To prepare for the stress component of the test, it is recommended you dress appropriately for physical exercise, as the stress test may involve walking on a treadmill or riding an exercise bike.

There are some medications you may be taking which work by slowing the heart rate. These medications may need to be stopped prior to the stress test. Your doctor is usually consulted before you are asked to stop taking any medication.

The stress test may consist of using a medication to increase blood flow to the heart. All forms of beverages and foods containing caffeine (e.g. coffee, tea, colas, cocoa) should be avoided for 24 hours prior to the study, as they may interfere with the effect of a stress medication called dipyridamole (Persantin). Decaffeinated teas or coffee and herbal teas should also be avoided as there may still be traces of caffeine.

Some patients may be on a regular prescription dipyridamole or Persantin, which is also an agent used for preventing strokes. If this is the case then dipyridamole or Persantin should not be used to stress the heart for the purpose of this study.

The nuclear medicine specialist who conducts the study will need to know what medications the patient is taking. It is a good idea to bring a list of medications with you on the day of the study.

### What happens during a NM Cardiac Stress Test?

The study is performed in 2 parts.

**Part 1:** The doctor will need to assess your heart under "stress". This is done by exercising on a treadmill or exercise bike. If you are unable to exercise sufficiently, a medication to mimic exercise will be used.

For the stress test an intravenous line (a thin plastic tube) will be put into a vein in your arm. You will also have electrocardiograph (ECG) leads placed on your chest, connected to a heart monitor. The doctor will closely monitor your heart with the ECG and regular blood pressure checks.

When your heart has reached a target work capacity, you will be injected with a

radiopharmaceutical into the intravenous line. You will then be asked to rest in the waiting room for approximately half an hour before the first set of heart images is taken. During this time you may be given a drink of water or milk, or a small tub of ice cream to eat. This helps make the images of your heart clearer.

Imaging involves lying on a scanning bed of a gamma camera for about 20 minutes while the camera rotates around your heart. During this time 3 ECG leads will again be placed on your chest and connected to a monitor as the scan is timed according to the rhythm of your heart. It is preferable for you to have your arms above your head during the scan. However scanning with the arms by your sides is also possible.

You will then be given an appointment time to return in the afternoon for Part 2 (usually 3-4 hours after Part 1). In between Parts 1 and 2 you may have caffeine and a light lunch. During this interval it is important that you avoid heavy physical activity as we need to assess your heart at "rest" in part 2, e.g. a slow 5 minute walk to the cafeteria is acceptable but a brisk 30 minute walk into the city is not. The tubing in your arm will remain in place during this time.

**Part 2:** You will be given a second dose of the same radiopharmaceutical through the same plastic tubing in your arm. The tubing is then removed. Again you will be asked to sit in the waiting room for approximately half an hour and you will be given another drink or small tub of ice cream. Your second set of images is then taken. This procedure is very similar to your scan in the morning and will take approximately the same time.

The above scanning procedure applies for the use of the radioactive medication  $^{99m}\text{Tc}$  sestamibi or  $^{99m}\text{Tc}$  tetrafosmin which is usually the case in most nuclear medicine services. In the event the radioactive medication used is  $^{201}\text{Tl}$  Thallium, the scan is performed straight away after it has been administered without the half hour wait and you won't be given anything to eat or drink prior to the scan. Also, if  $^{201}\text{Tl}$  Thallium is used you may be asked to return the next day for another set of images, but there will be no further injections involved.

## Are there any after effects of a NM Cardiac Stress Test?

You may feel tired after the stress test, but the radiopharmaceuticals do not cause any side effects. Patients having the medicine stress test instead of exercise sometimes experience side effects. These should disappear shortly after the stress test and before you leave the Nuclear Medicine department (see below).

If you are breastfeeding or caring for young children, see the "how do I prepare" section for more information about special precautions you may need to take.

## How long does a NM Cardiac Stress Test take?

The time it takes to achieve the target heart rate during the "stress" component of the test will vary depending on the patient. It usually takes no longer than 15 minutes. When the waiting interval is included, the first scan should be completed in about 1 hour.

There is another 3 to 4 hour interval, during which you are free to leave the imaging department.

The "rest" scan will take a total of about an hour from when you receive the second dose of radioactive medication to the completion of the scan.

## What are the risks of a NM Cardiac Stress Test?

The main risks of the study relate to the stress component.

If you are performing an exercise stress test, there is a small risk of sustaining a heart attack (myocardial infarction) if you do have significant coronary artery disease and you work too hard on the treadmill or exercise bike.

If you are unable to perform a stress test on a treadmill then one of 3 types of medications, dipyridamole (Persantin), adenosine or dobutamine, may be given intravenously (directly into a vein) to increase blood flow in your heart.

Dipyridamole works by causing the heart arteries to dilate (open fully). There are multiple potential side effects:

- headache
- you may feel a warm sensation in your face
- it may make asthma worse
- in cases of significant coronary artery disease it may induce a heart attack, although the risk of this adverse event is low

If symptoms of headaches persist, a caffeinated beverage such as tea or coffee is recommended and should relieve the headache. You may be given another medication called aminophylline which acts to reverse the side effects of dipyridamole if they do not resolve quickly.

Adenosine works in a similar manner to dipyridamole. Side effects similar to dipyridamole may be experienced. Symptoms of chest pain or pressure may also occur, but these side effects go away quickly once the adenosine administration stops.

Dobutamine is a short acting medication that is designed to increase the pumping capacity of the heart, mainly by increasing the heart rate and to a lesser extent increasing the strength of the cardiac contractions. It may result in the sensation of palpitations which is a normal phenomenon. Some patients may experience light headedness and nausea. There is a theoretical risk of inducing a fast and abnormal cardiac rhythm (e.g. atrial fibrillation, ventricular tachycardia, ventricular fibrillation) which

could adversely affect heart function requiring urgent therapy. These cardiac rhythm disturbances are unlikely with the doses of dobutamine used. If you have significant coronary artery disease, there is also a small risk of inducing a heart attack (myocardial infarction).

Occasionally, the target heart rate cannot be achieved with the maximum allowable dose of dobutamine. You may then be given a second medication called atropine, again in small doses. Atropine may cause the symptom of dry mouth and may cause confusion in some patients. It is also not to be given if you have the eye condition glaucoma.

The overall risk of sustaining a heart attack from a stress test is about 2 to 4 in 10,000. There is no significant risk from the imaging or the radiopharmaceutical, and this risk is the same as for an Exercise ECG stress test as performed by a cardiologist.

### What are the benefits of a NM Cardiac Stress Test?

The NM Cardiac Stress Test is a non invasive (simple), low risk study that:

- Has a higher accuracy in the detection of coronary artery disease than an exercise ECG stress test alone;
- Can be performed in patients who are unable to perform exercise on a treadmill or exercise bike;
- Has a proven value in predicting the risk of a heart attack;
- Is relevant for patients with known coronary artery disease and patients being assessed for their fitness before major surgery;
- Allows determination of the viability of heart muscle after a previous or recent heart attack. This information can help decide whether or not to proceed to coronary artery bypass surgery, i.e. if the heart muscle is irreparably damaged, invasive surgery to improve the blood flow would not improve the heart function.

### Who does the NM Cardiac Stress Test?

The stress test is usually conducted by a nuclear medicine specialist with the assistance of a nurse who is also trained in cardiac resuscitation. The scan is performed by a nuclear medicine technologist. The images are interpreted by the nuclear medicine specialist.

### Where is a NM Cardiac Stress Test done?

The stress component of the test is conducted in a laboratory with the appropriate exercise equipment (treadmill or exercise bike) and the appropriate resuscitation equipment (oxygen supply, medications and defibrillator).

Most public or private facilities with nuclear medicine services should have the capacity to perform this study.

### When can I expect the results of my NM Cardiac Stress Test?

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 specialist
- 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.

### Useful websites for about NM Cardiac Stress Test:

- Society of Nuclear Medicine  
[www.snm.org](http://www.snm.org)

#### 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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