

of the myocardium have decreased blood flow. This is done by injecting a radionuclide (thallium or technetium) into a vein in the arm or hand.

There are different types of radionuclides. When one type of radionuclide is used, areas of the myocardium that have blocked or partially blocked arteries will be seen on the scan as "cold spots," or "defects," because these areas will be unable to take in the radionuclide into the myocardium. Another type of radionuclide binds to the calcium that is released when a heart attack occurs, so it will accumulate in area(s) of injured heart tissue as a "hot spot" on the scan.

There are two types of stress myocardial perfusion scans, one that is used in conjunction with exercise (myocardial perfusion scan with exercise) and one that is used in conjunction with medication (pharmacologic myocardial perfusion scan).

### **Myocardial perfusion scan with exercise**

A myocardial perfusion scan with exercise is used to determine what areas of the heart muscle (myocardium) have decreased blood flow during exercise. This is done by injecting a radionuclide (thallium or technetium) into a vein in the arm or hand during exercise. After the radionuclide has been injected into a vein and has circulated through the blood stream, a special machine called a gamma camera takes pictures of the heart while the person lies still on a table. This scanning usually lasts about 30 minutes.

Any areas of the myocardium that have blocked or partially blocked arteries during exercise will be seen on the scan as "cold spots," or "defects," because these areas will be unable to absorb the radionuclide into the myocardium.

A second set of scans is taken some hours later, at rest. The resting phase is done in order to compare the results with the exercise phase to see if areas that do not get adequate blood flow while exercising are able to absorb the radionuclide during rest.

### **Myocardial perfusion scan with pharmacological intervention**

A pharmacological myocardial perfusion scan is used when the physician has determined that exercise on a treadmill is not an appropriate choice due to the person's medical condition. In this situation, a medication is given that causes the coronary arteries to dilate. This dilation of the coronary arteries increases blood flow and is very similar to the response of the arteries during exercise. The medication is injected into a vein in the arm or hand.

After a given period of time, the radionuclide will be injected into a vein in the arm or hand. The gamma camera will take pictures of the heart while the person lies still on a table. A resting scan will be performed afterwards, just as with the actual exercise scan.

Coronary artery disease (CAD) is the narrowing of the coronary arteries (the blood vessels that supply oxygen and nutrients to the heart muscle), caused by a buildup of fatty material within the walls of the arteries. This buildup causes the inside of the arteries to become rough and narrowed, limiting the supply of oxygen-rich blood to the heart muscle.

### **Reasons for the Procedure**

- Indications for an exercise or pharmacologic myocardial perfusion scan may include, but are not limited to, the following:
- Chest pain, either new onset or occurring over a period of days or longer following a heart attack (myocardial infarction, or MI) to assess blood flow to areas of the myocardium that have been reperfused (coronary artery blood flow restored) by bypass surgery, angioplasty (the opening of a coronary artery using a balloon or other method), or stent (a tiny expandable metal coil placed inside an artery to keep the artery open)

There may be other reasons for your physician to recommend a myocardial perfusion scan.

### **Risks of the Procedure**

The exercise portion of the test may have rare instances of abnormal heart rhythms, chest pain, or heart attack due to the stress on the heart caused by the exercise.

The injection of the radionuclide may cause some slight discomfort. Allergic reactions to the radionuclide are rare.

If you are pregnant or suspect that you may be pregnant, you should notify your physician due to the risk of injury to the fetus from a myocardial perfusion scan. Radiation exposure during pregnancy may lead to birth defects. If you are lactating, or breastfeeding, you should notify your physician due to the risk of contaminating breast milk with the radionuclide.

Patients who are allergic to or sensitive to medications, contrast dyes, iodine, shellfish, tape, or latex should notify their physician.

There may be other risks depending upon your specific medical condition. Be sure to discuss any concerns with your physician prior to the procedure.

Certain factors or conditions may interfere with or affect the results of the test. These include, but are not limited to, the following:

- Medications containing theophylline
- caffeine within 24 hours of the procedure
- digitalis, quinidine, or nitrate medications

### **Before the Procedure**

Your physician will explain the procedure to you and offer you the opportunity to ask any questions that you might have about the procedure.

You will be asked to sign a consent form that gives your permission to do the test. Read the form carefully and ask questions if something is not clear.

Notify your physician if you are allergic to or sensitive to medications, local anesthesia, contrast dyes, iodine, shellfish, tape or latex.

Fasting may be required before the procedure. Your physician will give you instructions as to how long you should withhold food and/or liquids.

If you are scheduled for a pharmacologic myocardial perfusion scan, you will need to avoid taking any medications containing theophylline or caffeine. Coffee, even decaffeinated, is not allowed, as it contains some caffeine. Medications for asthma may contain theophylline. If you have asthma, inform your physician. Theophylline medications should be stopped 48 hours prior to the test. Medications that contain caffeine and all food and drink containing caffeine should be held for 12 to 24 hours. Some over-the-counter medications that contain caffeine include Anacin(r), Excedrin(r), and NoDoz(r). Consult your physician for specific instructions.

If you are pregnant or suspect that you may be pregnant, you should notify your physician.

Notify your physician of all medications (prescription and over-the-counter) and herbal supplements that you are taking.

Notify your physician if you have a pacemaker.

For an exercise scan, plan to wear loose, comfortable clothing for the exercise portion of the test, as well as a pair of comfortable walking shoes.

Based upon your medical condition, your physician may request other specific preparation.

### **During the Procedure**

A stress myocardial perfusion scan may be performed on an outpatient basis or as part of your stay in a hospital. Procedures may vary depending on your condition and your physician's practices.

Generally, a stress myocardial perfusion scan follows this process:

You will be asked to remove any jewelry or other objects that may interfere with the procedure.

If you are asked to remove clothing, you will be given a gown to wear.

An intravenous (IV) line will be started in your hand or arm.

You will be connected to an ECG machine with leads and a blood pressure cuff will be placed on your arm.

### **Exercise myocardial perfusion scan:**

You will exercise on a treadmill. The intensity of the exercise will be gradually increased by increasing the speed of the treadmill.

Your heart rate and blood pressure will be monitored. Once you have reached your maximal exercise point (determined by the physician based on your heart rate and age), the radionuclide will be injected into your IV line.

After the radionuclide has been injected, you will continue to exercise for one to two minutes.

### **Pharmacological myocardial perfusion scan:**

You will not exercise on a treadmill. Instead, you will lie on the table while a medication is injected into your IV to increase your heart rate.

Your heart rate and blood pressure will be monitored.

Once you have reached your target heart rate, the radionuclide will be injected into your IV line.

### **Procedure completion, both methods:**

If you experience any symptoms such as dizziness, chest pain, extreme shortness of

breath, or severe fatigue at any point during the procedure, let the physician or technologist know.

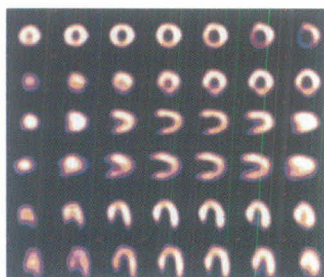
You will lie flat on a table while the images of your heart are obtained. Approximately 10 to 60 minutes after the radionuclide is injected, the gamma camera will begin to take pictures of your heart. In a special kind of test called SPECT (single photon emission computed tomography), the scanner will rotate around you as it takes pictures.

Your arms will be positioned above your head. It will be necessary for you to lie very still while the images are being taken, as movement can adversely affect the quality of the images.

After the scan is completed, you may be allowed to leave the area, but will need to return at the appropriate time for a second set of scans. The second set of scans will be taken three to six hours after the first set. During this time, you will not be allowed to eat, unless specifically instructed to do so by the technologist, and will be allowed limited water or decaffeinated/non-caloric liquids. Your physician may decide to have you return on another day for the second set of scans.

The second set of scans will be similar to the first set - you will lie on the table as before while the scanner takes pictures of your heart.

Once the second set of scans has been completed, the IV line will be discontinued, and you will be allowed to leave, unless your physician instructs you differently.



#### After the Procedure

You should move slowly when getting up from the scanner table to avoid any dizziness or lightheaded from lying flat for the length of the procedure.

You will be instructed to drink plenty of fluids and empty your bladder frequently for 24 to 48 hours after the test to help flush the remaining radionuclide from your body.

The IV site will be checked for any signs of redness or swelling. If you notice any pain, redness, and/or swelling at the IV site after you return home following your procedure, you should notify your physician as this may indicate an infection or other type of reaction.

Your physician may give you additional or alternate instructions after the procedure, depending on your particular situation



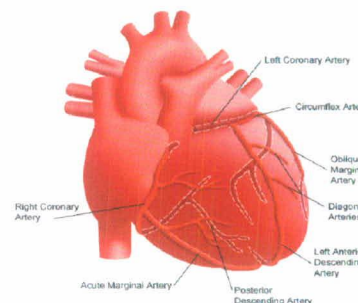
## SAIFEE HOSPITAL

under the auspices of Saifee Hospital Trust Reg. No. E-5448 (Bom)

### DEPARTMENT OF NUCLEAR MEDICINE

## STRESS MYOCARDIAL PERFUSION PATIENT INFORMATION

Coronary Arteries of the Heart



#### Using nuclear medicine to look for heart abnormalities

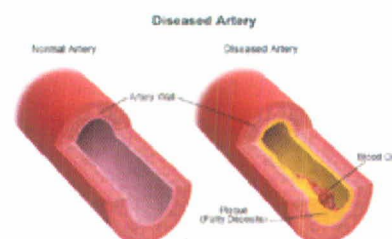
To better understand how coronary artery disease affects the heart, a review of basic heart anatomy and function follows.

The heart is basically a pump. The heart is made up of specialized muscle tissue, called the myocardium. The heart's primary function is to pump blood throughout the body, so that the body's tissues can receive oxygen and nutrients and have waste substances taken away.

Like any pump, the heart requires fuel in order to work. The myocardium requires oxygen and nutrients, just like any other tissue in the body. However, the blood that passes through the heart's chambers is only passing through on its trip through the body - this blood does not give oxygen and nutrients to the myocardium. The myocardium receives its oxygen and nutrients from the coronary arteries, which lie on the outside of the heart.

When the heart tissue does not receive an adequate blood supply, it cannot function as well as it should. If the myocardium's blood supply is decreased for a length of time, a condition called ischemia may develop. Ischemia can decrease the heart's pumping ability, because the heart muscle is weakened due to a lack of food and oxygen.

Fortunately, the technology is available to restore blood flow to heart tissue when coronary artery blockages are diagnosed. One of several diagnostic procedures used to diagnose and evaluate coronary artery disease is the myocardial perfusion scan.



#### What is a stress myocardial perfusion scan?

A myocardial perfusion scan is a type of nuclear medicine procedure. This means that a tiny amount of a radioactive substance, called a radionuclide (radiopharmaceutical or radioactive tracer), is used during the procedure to assist in the examination of the tissue under study. Specifically, the myocardial perfusion scan evaluates the heart's function and blood flow.

A radionuclide is a radioactive substance used as a "tracer," which means it travels through the blood stream and is taken up (absorbed) by the healthy heart muscle tissue. On the scan, the areas where the radionuclide has been absorbed will show up differently than the areas that do not absorb it (due to decreased blood flow to the area or possible damage to the tissue from decreased or blocked blood flow).

A stress myocardial perfusion scan is used to assess the blood flow to the heart muscle (myocardium) when it is stressed by exercise or medication and to determine what areas