Stress Echocardiography

Background: Heart disease is the leading killer of Americans today, and heart attack is the most visible sign of heart disease. A heart attack occurs when the blood supply to the heart is restricted to the point that a portion of the heart muscle dies. This is usually brought on by blockages in the arteries feeding the heart, known as coronary atherosclerosis, and try to determine the patient's risk of developing a heart attack in the future. In addition these tests can be used to assess the damage to the heart after a heart attack. One of these tests is the stress echocardiogram, in which a patient's heart is "stressed" either with exercise or a chemical agent, and ultrasound images of the heart are obtained.

Who can be tested? The stress echocardiogram is a very versatile procedure. It is equally diagnostic in women or men of all ages. Diagnostically sufficient echocardiograms can be obtained in the vast majority of patients. For the few that cannot be ideally imaged, other tests (such as nuclear cardiac studies) are available. Usually, if the patient can walk adequately, he or she is asked to walk on a treadmill to stress the heart. If they are unable to walk due to arthritis, lung disease or other medical problems, their hearts can be stressed using an intravenous chemical agent known as dobutamine. This chemical is similar to adrenaline, and works by increasing the heart rate and force of heart contraction.

What does the test show? The echocardiogram is a remarkable tool that can obtain a wealth of information about the heart. It can tell the size and strength of the heart muscle, the condition of the heart valves, or if there is fluid around the heart. It can tell us if the patient has had a previous heart attack and the extent of the damage. It can demonstrate blood clots or infections in the heart. In case of the stress cardiogram, it can also tell if the blood supply to a portion of the heart. is critically limited and how much of the heart is affected. In addition, it can tell us if the heart muscle is simply "stunned" by its limited blood supply and might therefore improve in strength if the blood supply is improved.

How is the test done? An echocardiogram (sound wave picture of the heart) is done on the patient while he or she is at rest and displayed in a video screen for interpretation. The images are also stored on video tape in digital format for later analysis and to create a permanent record of the exam. Single representative heart beats imaged from four different angles are selected and stored in computer memory. The patient is then stressed either by exercise or dobutamine until their heart rate has reached a level predetermined by the patient's age. The echocardiogram is repeated at peak stress and the patient is allowed to recover. Heart images obtained before stress are then compared with those obtained at peak stress, using a computer to display the pictures in a side-to-side fashion. In brief, healthy heart muscle will appear to squeeze normally at rest and get stronger with exercise. Heart tissue that has been damaged by a previous heart attack may not squeeze at all at rest or with stress. In some cases however, the heart tissue is simply starved but not permanently damaged. In these situations, the heart tissue will appear weak at rest, get stronger with low levels of stress, then again as stress increases. All of these changes can be readily seen on the echocardiograms.

How long does it take? The stress echocardiogram includes at least two complete studies of the heart as well as the stress test. It usually takes about an hour to obtain all of this information. On

the bright side, the physician supervising the examination can often interpret the study immediately and give the patient the results before they leave the office.

What does the patient feel? In order to get the echocardiographic pictures, the technologist will have the patient undress from the waist up and usually have them put on a gown. Wires to an echocardiogram monitoring machine will be stuck on the patient's chest. A water-soluble gel is used to get a good connection between the echocardiogram imaging probe and the patient's chest. Unfortunately, this usually feels cold. How the patient feels next depends on how their heart is stressed. If they walk on a treadmill, they will feel tired, breathless, and perhaps experience chest discomfort. If dobutamine is used, an IV needle will be inserted into the patient's arm. The dobutamine usually causes the patient to feel palpitations, shortness of breath and possibly some anxiety or chest discomfort. The dobutamine is usually given for 15-20 minutes and wears off within an additional 10-15 minutes.

What are the advantages of a stress echocardiogram? For many patients, a standard stress test without any pictures of the heart is adequate. If the patient's baseline electrocardiogram is abnormal, however, a routine stress test may not be diagnostic and an imaging test like the stress echocardiogram is essential. In addition, the routine stress test is notoriously unreliable in women where false test results are common. Stress echocardiography is able to accurately assess both women and men. Finally, additional information such as heart strength and valve function is easily attainable with stress echocardiography but not with a standard stress test.

Is it dangerous? Routine stress tests are very safe for the diagnosis of coronary disease. The risk of a serious complication in the general population is less than one chance in 2000. The addition of echocardiography to the exam does not increase the risk. An exercise test should not be done in patients with acute unstable angina, uncontrolled arrhythmias, uncompensated heart failure, critical aortic stenosis, severe obstructive hypertrophic cardiomyopathy, or controlled hypertension in order to keep risk at a minimum. If dobutamine is used to stress the heart, the risk of serious complication is somewhat higher (about 3 chances in 1,000 of a serious side effect), but still quite low. Certainly the risk of complications with undiagnosed or misdiagnosed atherosclerosis is much higher.

Conclusion? Stress echocardiography is a versatile test for safely and accurately evaluating coronary heart disease including its risks and complications. It can be performed in a wide variety of patients in the cardiologist's office or at the patient's hospital bedside. It does not require the use of radioactive isotopes or x-rays and can often be done without even inserting an IV into the patient, yet it provides an enormous amount of information about heart structure, function, and blood supply.