

The Medical Minute: Stress tests - echo vs. nuclear

February 8 2012, By Claude Fanelli

Your health care provider has ordered a stress test for your heart. No problem, you think; you've seen people walk on treadmills before. In fact, you used the one in your basement a few times, a couple of years ago. Then, you look at the request and see that you are going to have a pharmacologic nuclear stress test. So, what exactly did your physician order?

While the most frequent reasons for stress testing remain the same -- diagnosis of coronary artery disease (CAD), risk stratification of those with known CAD; diagnosis of valvular [heart](#) disease; or diagnosis of arrhythmia—the procedure itself has evolved considerably over the years. The basic [stress test](#) involves walking on a treadmill while your electrocardiogram (EKG) is continuously monitored for changes that may indicate a blocked artery to the heart. However, there are options if you are unable to walk on a treadmill or if your EKG is already abnormal at rest. The existing options include: imaging stress tests -- echocardiographic or nuclear -- and pharmacologic stress tests -- adenosine and dobutamine.

There are a variety of situations in which the EKG alone cannot be used to monitor stress tests, such as baseline abnormalities or the potential for changes that look like but are not due to blockages. These situations include pacemakers, bundle branch block, enlarged heart and various medications. In these situations, imaging with either echocardiography (ultrasound) or nuclear agents is used.

In echo stress testing, the heart is imaged with ultrasound at rest and then again immediately following stress. With stress the heart beats faster and more vigorously and therefore, more [blood flow](#) is required. If there is a blockage severe enough to limit blood flow, that area of the heart will not work as well as compared to normal areas.

Nuclear imaging involves the use of agents (thallium or technetium, for example) that are taken up by heart muscle cells and a gamma camera to detect the radioactivity. For this to occur, the cells must be living, and there must be blood flow. Scar tissue, as from a previous heart attack, is not living and, therefore, takes up no radioisotopes. Where there are significant blockages, blood flow cannot adequately increase, and there will be less radioisotope uptake in those areas as compared to normal.

A significant number of patients are unable to adequately walk on a treadmill, usually due to age-related or orthopedic issues. In these, the heart can be stressed using adenosine or dobutamine. These pharmacologic stress tests are always coupled with an imaging modality because their effects may not be detectable with an EKG alone.

Adenosine is a potent agent that dilates the blood vessels and increases blood flow. Where there is a blockage, the vessel is unable to dilate as much as in normal vessels, so there will be less increase in blood flow and less detected radiation.

Dobutamine, on the other hand, truly simulates exercise by increasing heart rate and blood pressure. In dobutamine stress echo, your doctor will see a lack of the expected increase in heart muscle function where there is a blockage that limits blood flow.

While both echo stress tests and nuclear stress tests ultimately can provide the same information, there are differences and advantages and disadvantages between the two.

Advantages of echo stress test:

- Faster
- Less costly
- Additional information
- No radiation
- Results are immediately available

Advantages of nuclear stress test:

- Rarely unable to obtain adequate images
- Less difficult to interpret in those with baseline abnormalities of heart function

Which is chosen by your [health care provider](#) ultimately depends on your unique situation, the information needed and the local expertise with the various tests.

Provided by Pennsylvania State University

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