When the Patient Asks

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Q: Should I get a heart scan?

Electron beam CT (EBCT) can accurately detect and quantify the degree of calcified atherosclerotic plaque in the coronary arteries.[1-6] Patients who have a family history of heart disease, who have hyperlipidemia, or who smoke tobacco should be considered for a heart scan before the onset of angina or ischemic symptoms.

In the absence of cardiac events or symptoms, coronary artery calcification (CAC) is referred to as *subclinical atherosclerosis*. A high calcium score determined via EBCT has good sensitivity (80%-90%) but low specificity (40%-60%) for CAC.[7] The less-than-ideal specificity is most likely a result of calcification that is occurring in nonobstructive lesions.[3]

PATHOPHYSIOLOGY OF ATHEROSCLEROSIS

Atherosclerotic disease occurs in the high-pressure coronary vasculature as a result of defects in the endothelium. Subintimal plaque accumulations enlarge into fatty streaks over time. The fatty streaks become calcified and can potentially cause stenosis if a large enough area is involved. If stenosis develops gradually, collateral vessels can perfuse the area of the myocardium affected by the stenosis. However, if a thrombus forms in a stenosed vessel, the collateral arteries are often inadequate for maintaining normal perfusion. In addition, plaques can rupture. Rupture of vulnerable plaques leading to coronary thrombosis accounts for most acute coronary syndromes. Myocardial ischemia becomes evident when a coronary artery becomes partially or totally occluded.

PERFORMING THE SCAN

EBCT does not require IV access, fluids, or contrast material. The patient is positioned supine on the scanner table. Three electrode patches are placed on the inferior-anterior chest, and an ECG tracing is obtained. The patient's arms are placed over the head, and the patient is asked to hold a breath while the scanner passes over the body from the shoulders to the hips.

The first image is used for calibrating the scanner to the diameter of the patient's chest; subsequent images are cross-sectional images of the heart taken every 3 mm. The images are obtained during the diastolic phase of the cardiac cycle; one image is taken during each heart beat, as confirmed by the ECG tracing. The scan also includes cross-sectional images of the aorta from the aortic arch to the iliac bifurcation. These images are taken every 6 mm.

Radiation exposure to the patient during EBCT is minimal, approximately 0.8 rad to the chest and 2.5 rad to the abdomen. EBCT radiation exposure is less than 2% of the federal regulations (50 rad) for any single organ or tissue.

INTERPRETING THE RESULTS

The images are used to calculate a *calcium score* for each of the major coronary arteries. The calcium score is generated with a Base Value Region of Interest computer program. This program extracts all the pixels in the image that are higher than 130 Hounsfield units (HU) within a 3-mm thick region. All pixels higher than 130 HU and larger than 1 mm within the coronary arteries are considered to be calcium. A calcium score is then calculated by multiplying the area of all significant pixels by a grade number (1, 2, 3, or 4) that indicates the peak CT number. The sum of the individual artery scores is the total coronary artery calcium score. The same calculation is used for the aorta. Reports will include the calcium scores and a percentile comparison of individuals matched for sex and age. The ideal score is 0, which indicates no calcium was detected. Scores range from 0 to +400; a score higher than +100 is suggestive of future cardiac morbidity.

BOTTOM LINE

EBCT is the ideal method for identifying CAC in asymptomatic patients at increased risk for atherosclerosis-related cardiac event. Patients whose calcium scores are higher than +100 should be strongly advised to reduce their modifiable risk factors for atherosclerosis. Effective methods for lowering patients' risk profiles include smoking cessation, dietary and lifestyle modifications, and maintaining healthy BP and cholesterol levels. JAAPA

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WHAT IS CORONARY DISEASE?

In coronary disease, the arteries of the heart become blocked and blood cannot reach the heart. This is called *atherosclerosis*. A person with this type of heart disease may feel chest pain. Shortness of breath can be another sign that a person has coronary disease. The arteries can start to become blocked many years before a person feels symptoms of coronary disease. A person with coronary disease is at risk of having a heart attack.

WHO IS AT RISK FOR DEVELOPING CORONARY DISEASE?

A person who smokes cigarettes is at risk of developing coronary disease. A person with high blood pressure or high cholesterol can develop it. A person with diabetes can develop it. A person with parents or brothers and sisters who have coronary disease is at risk of developing it, too. The risk of developing coronary disease increases as a person gets older. Men who are older than 45 years have a higher risk of developing coronary disease than younger men do. Women who are older than 55 years have a higher risk of developing coronary disease than younger women. A person with any of these risk factors should consider getting a heart scan.

WHAT IS A HEART SCAN?

A heart scan is a test used to look for early signs of coronary disease. The test is called *electron beam computed tomography* (EBCT). EBCT takes a series of pictures of the arteries that bring blood to the heart. A cardiologist looks at the pictures to see if there is any calcium in the arteries. Calcium in the heart arteries means that the arteries are becoming blocked. A person may feel chest pain or have trouble breathing when the arteries of the heart become blocked. A heart scan will show if the arteries are becoming blocked before a person feels pain or has trouble breathing.

WHO SHOULD GET A HEART SCAN?

A person who has a high risk of developing coronary disease should consider getting a heart scan, even if that person does not have any symptoms yet. In addition, a person who has high blood pressure or high cholesterol should consider getting a heart scan. A person who has diabetes should consider getting a heart scan.

HOW DOES THE SCAN WORK?

The EBCT scanner moves over your body while you are lying on a table and takes pictures of your heart. The scanner will take one picture every 3 mm and then put all the pictures together to create one picture of your entire heart. The pictures are taken the same way as a regular CT scan. But EBCT takes pictures much faster than a CT scan does.

HOW IS THE HEART SCAN DONE?

You will not need to stop eating or have an IV inserted for this test. You lie down on the scanner table with your arms resting above your head. Three patches with electrodes are placed on your chest. These patches will measure the activity of your heart while the EBCT takes pictures of your heart. The scanner passes over your body from your shoulders to your hips. You will be asked to hold your breath for a short time when the scanner is taking pictures. This process may be repeated several times in order to get the best possible pictures of your heart. The entire test takes approximately 20 minutes. You can return to normal activity immediately after the test.

IS THERE ANY EXPOSURE TO RADIATION?

Yes, EBCT exposes a person to the same amount of radiation as a regular chest x-ray. The heart scan is safe, even for people with liver or kidney disease or implanted medical devices made of metal.

WHAT HAPPENS NEXT?

A cardiologist looks at the heart scan pictures and measures the amount of calcium that shows up in the pictures. The cardiologist then adds up all the measurements for the four main arteries of the heart. This is called the *calcium score*. The best score is 0, which means no calcium was found in the arteries of the heart. Your calcium score will be compared to the calcium scores of thousands of other people who are the same age and sex as you. This comparison is used to determine your risk of developing coronary disease. Your clinician will talk with you about your calcium score.

THE BOTTOM LINE

You should talk to your clinician if you think you are at risk for developing coronary disease. Your clinician can help you decide if you should get a heart scan. After you get the heart scan, your clinician can help you make a plan that will keep you healthy. This plan may include eating a healthy diet and exercising more often. If you smoke cigarettes, a way for you to stop smoking will be a part of the plan. You may need to take medication to lower your blood pressure and cholesterol. All these changes can help you reduce your risk of having a heart attack. JAAPA