PREDICTING YOUR RISK OF HEART DISEASE WITH CORONARY CALCIUM SCORING

QUESTION:

I heard my doctor talking about a test called cardiac scoring or coronary calcium scoring, can you tell me what that is and how it works?

ANSWER:

Coronary calcium scoring is a new, non-invasive test that has emerged as the most accurate method of determining an individual's risk of having a heart attack or suffering sudden cardiac death. With cardiovascular disease still ranking as the number one cause of death in the United States (more than the next five causes of death – cancer, chronic lung disease, accidents, diabetes, and influenza/pneumonia – combined), this is welcome news for the millions of Americans at risk for heart disease. The risk factors for heart disease include those that cannot be changed (family history, age, sex) and those that can be modified (cholesterol levels, blood pressure, blood sugar, diet and exercise). Identification of patients at high risk for heart disease allows the early, aggressive treatment of the risk factors that can be controlled and results in better patient outcomes. The accurate quantification of a patient's risk of heart disease is the goal of cardiac calcium scoring.

Currently, the most common method of determining a person's risk of heart disease involves evaluating their cardiac risk factors using tools such as the Framingham risk assessment tool found on the American Heart Association's website (http://www.americanheart.com, click on Health Tools). By entering a patient's age, sex, blood pressure, smoking history, and cholesterol levels, a 10-year risk of coronary heart disease can be generated. The risk estimate is very accurate for large populations of people, and has become the standard for estimating cardiac risk. The risk estimates have been found to be less useful for estimating an individual's risk, however, because a large number of additional factors, such as lifestyle, diet, exercise, genetic influences, and a multitude of unknown risk factors are not accounted for in the models. Calcium scoring overcomes this limitation by allowing physicians to obtain a measure of the actual amount of atherosclerosis (hardening of the arteries) that is occurring in an individual's heart. The result is a test that has been shown to add separate and independent information about cardiac risk, beyond the traditional risk factors.

The calcium scoring test is a very simple one. The heart is scanned using a high-resolution CT scanner. No injections are needed. A simultaneous EKG recording is made to allow the computer to reconstruct the images of the beating heart without motion. The radiologist then outlines the major coronary arteries, and a score is generated based on the amount of calcium in the tissue. The entire test takes 10 minutes from start to finish, with the actual heart scanning taking place in under 20 seconds. The calcium score is then compared to age- and sex-matched controls to determine a patient's risk of developing coronary disease.

The calcium score can be invaluable for helping to decide which patients might benefit from aggressive treatment of their modifiable cardiac risk factors. The test is

most effective for patients with an intermediate risk of developing coronary disease, defined as a 5-20% risk of heart attack or sudden cardiac death over 10-years. Studies have shown, for example, that it is not cost-effective to aggressively treat everyone in this group with lipid-lowering medications. The current cost of cholesterol-lowering drugs is around $1000/year, and the medication is theoretically continued indefinitely. It has been shown that treating such an intermediate risk group with cholesterol-lowering medication results in a 30-40% reduction in coronary events. Some quick math demonstrates that treating 1000 people that collectively had a 5% 10-year risk of heart disease would cost $10 million. Without treatment, 50 people (5%) would have a cardiac event, whereas with treatment, 30-35 people (3.0-3.5%) would have events. Thus, 15-20 people would have been helped by the medication, but 980-985 people would have taken the medication for 10 years without a clear benefit and at a substantial overall cost. So when does lipid-lowering therapy become cost-effective? Recent national conferences have addressed this issue and proposed guidelines that state the aggressiveness of preventive therapy should be matched with the patient's risk of developing heart disease. Lipid-lowering medication is cost-effective when the 10-year risk of a coronary event is 20% or higher. Calcium scoring can play an important role in identifying the patients that traditionally have been classified as "intermediate-risk" but in reality fall into the high-risk group.

Calcium scoring in this intermediate-risk group can stratify a large number of patients into low risk (<5% 10-year risk), and high-risk (>20% 10-year risk) categories. In a standard 50-year old male population, over 35% would have a no coronary calcium (a calcium score of 0) and truly represent a low-risk group in whom cholesterol-lowering medication and other aggressive risk-factor reduction interventions would likely not be indicated. Patients in the highest quartile of calcium scores are at a much higher risk for cardiac events than those below the 75th percentile. In a recent study of 1172 asymptomatic people followed for an average of 3.6 years after coronary calcium scoring, there were 39 cardiac events. Thirty-two of the events (82%) occurred in patients whose scores were in the highest quartile. Various strategies using either the highest quartile or absolute cutoff values of coronary calcium result in 25-30% of patients in the intermediate group being reclassified as being at high-risk for heart disease. Thus, by performing calcium scoring in the intermediate-risk population, 35% would be move to low-risk, 25-30% would be moved to high-risk, and 35-40% would remain intermediate risk.

Calcium scoring also gives prognostic information in both the high- and low-risk groups, but the cost-effectiveness is less clear. In the low-risk group, for example, the 10-year risk might be 3% before testing. A positive calcium score test, however, may only increase the overall risk of a coronary event to 8% - a significant increase, but not enough to justify adding lipid-lowering drugs. Nonetheless, some patients would find this type of information valuable to help motivate their lifestyle changes.

For patients who are classified as high-risk using traditional risk models, the opposite is true. Most individuals in this category should already be employing aggressive risk-factor management that includes lipid-lowering drugs. The added information provided by calcium scoring may not lead to additional therapy and as such is not routinely recommended in these patients.

So which patients should undergo calcium scoring? The decision to undergo calcium scoring is an individual one that a patient needs to discuss with his or her physician. All patients should undergo a physical examination and analysis of their risk factors using the standard Framingham risk assessment tool, or other similar tool. Patients that fall into the intermediate risk group are the most likely to benefit from the added information provided by calcium scoring, and should consider undergoing this quick, painless and potentially life-saving test.

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