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Coronary CT Calcium Scan and Coronary Artery Calcium Score

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For Heart Month this year, I'd like to discuss the Coronary CT Calcium Scan and the resulting Coronary Artery Calcium score (CAC). This simple test is a low radiation CT scan of the chest that helps clinicians gauge cardiovascular risk and decide on appropriate interventions to offer to patients. This scan can be extremely helpful for the right subset of patients, but unnecessary for others, and I hope to help you understand this distinction.

First, let's review some terminology and pathophysiology. Atherosclerotic cardiovascular disease (ASCVD) is the process of plaque formation in the arteries of our bodies. These plaques are made up of a mixture of cholesterol, inflammatory cells, calcium, and other substances. Upon growing large enough or rupturing, these plaques can obstruct blood flow through arteries. If this obstruction occurs in the coronary arteries that provide oxygen-rich blood to the heart itself, it can cause chest pain or a heart attack. If this obstruction occurs in arteries of the neck or brain, it can cause stroke. Chest pain, heart attack, and stroke are all late-stage manifestations of ASCVD which was likely developing and worsening for some time before symptoms developed.

Of course, we'd prefer to catch ASCVD in its early stages and arrest its progression before it causes any of these problems. This is where obtaining a CAC can help. Because most plaques contain calcium, as ASCVD plaques develop in the coronary arteries, calcium in these arteries also increases (Kramer & Villines, 2022). Because calcium shows up on CT scans (and the rest of the plaque doesn't), we can use a Coronary CT Calcium Scan (aka, a CT scan of the heart) to identify calcium-containing plaque early, before it causes symptoms, and quantify its extent. The extent of calcium build up in the coronary arteries helps to predict the likelihood of a major coronary event in the ensuing years (Kramer & Villines, 2022). Whether the calcium is absent, mild, or extensive will inform whether cholesterol-lowering statin therapy or low dose aspirin therapy is right for you.

Coronary CT calcium scan is generally indicated for selected adults 40 and over who are not having any symptoms of a significant blockage in a coronary artery (like chest pain or unusual exertional shortness of breath) and do not have any previously established history of ASCVD (like a previous heart attack, stent, bypass surgery, or TIA/stroke). Appropriate candidates have either borderline, intermediate, or high 10-year risk of ASCVD as determined by one of several validated, multivariate risk models (Kramer & Villines, 2022). In our practice, we typically use the American College of Cardiology's ASCVD Risk Calculator which provides a 10-year estimate of risk of a first time ASCVD event like heart attack or stroke. Patients with a low 10-year risk score may be appropriate candidates if they have other risk-enhancing features such as a strong family history or a chronic inflammatory condition (Kramer & Villines, 2022).

CT coronary calcium scan is not for those with established ASCVD, low 10-year risk of ASCVD without risk enhancing features, very high 10-year risk of ASCVD, or who have had a previous CAC score greater than 0. As mentioned earlier, this scan is not for those having any

symptoms suggestive of a blockage in a coronary artery (Kramer & Villines, 2022). Patients with such symptoms will most likely be referred for stress testing, coronary CT angiography, or a coronary angiogram to determine if a significant blockage is present.

The CAC score is reported both as a raw number and as a percentile which compares the patient to peers of similar age, sex, and ethnicity. The CAC score translates as follows: 0 = no identifiable disease; 1 to 99 = mild disease; 100 to 399 = moderate disease; >/= to 400 = severe disease.

Once you have your CAC score, you will have the chance to discuss it, along with your other cardiovascular risk factors, and decide whether lifestyle changes, pharmacologic intervention, or both should be pursued to reduce the risk of heart attack in the future. In general, for a significantly elevated CAC score of greater than 100 (or greater than the 75th percentile for age, sex, and race), a cholesterol lowering medication called a statin will be recommended. For those under 70 years of age, a daily aspirin 81 mg will also likely be recommended. For a mildly abnormal CAC score of 1 to 99 (or less than the 75th percentile for age, sex, and race), generally a statin is considered. For a CAC score of 0, statin therapy is not routinely recommended. For those with a score of 0, it is reasonable to repeat the coronary CT calcium scan after roughly 5 years to reassess risk (Kramer & Villines, 2022).

Of course, patients do receive a small radiation dose with this scan, so it should not be used indiscriminately. It is most appropriate in those patients for whom the discovery of an elevated CAC will change management.

If you and your healthcare provider have already decided that statin therapy is right for you, there is no clear role for measuring (or repeating) CAC. If you have questions about your risk of ASCVD or heart attack, please talk to your health care provider. A Coronary CT Calcium Scan may play a role in understanding this important component of your health!

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References

Kramer, C., Villines, T., (2022, August 23). Coronary artery calcium scoring (CAC): Overview and clinical utilization. UpToDate. https://www.uptodate.com/contents/coronary-artery-calcium-scoring-cac-overview-and-c linical-utilization