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Q/ How should we use the coronary artery calcium score to predict cardiovascular risk?

EVIDENCE-BASED ANSWER

A/ THE CORONARY ARTERY CALCIUM (CAC) SCORE—an independent predictor of cardiovascular events (strength of recommendation [SOR]: **C,** systematic review of disease-oriented outcomes)—can be used, in addition to traditional risk factor assessment, to further stratify the risk of coronary heart disease (CHD) in asymptomatic patients (SOR: **C,** multiple large observational studies with disease-oriented outcomes).

Although a high CAC score is associated with a greater risk of cardiovascular disease, no studies have evaluated cardiovascular outcomes of CAC-guided treatment, so its value remains theoretical.

Evidence summary

Most atherosclerotic lesions are calcified. The degree of calcification is proportional to the severity of atherosclerosis and can be quantified by the CAC score as measured by electron beam computed tomography (EBCT).[1]

As the CAC score rises, so does risk

A systematic review of 9 studies evaluated the relationship between CAC scores and coronary artery disease (CAD) in asymptomatic patients (TABLE). CAD was measured by such clinical outcomes as unstable angina, myocardial infarction, stroke, coronary death, all-cause mortality, or need for revascularization. The relative risk of CAD for a moderate CAC score compared with a low score was 3.5 (95% confidence interval [CI], 2.4-5.1) and for a high score compared with a low score was 9.9 (95% CI, 5.3-17.6). Some of the studies were of poor quality, including self-referred patients, for example.[2]

A subsequent study found similar associations. The observational study of 25,253 asymptomatic individuals referred for CAC testing to assess cardiovascular risk demonstrated that CAC was an independent predictor of all-cause mortality. After a mean of 6.8 years, the adjusted relative risk increased incrementally from 1.48 (95% CI, 0.71-3.07) for a CAC score of 1 to 10, to 9.36 (95% CI, 5.36-16.33) for a score ≥1,000, compared with a score of 0.[3]

CAC predicts risk, but does it improve treatment or outcomes?

Analysis of 3201 women followed for an average of 3.75 years in the Multi-Ethnic Study of Atherosclerosis cohort revealed that women at low Framingham risk, but with detectable CAC, had an increased risk of CHD (hazard ratio [HR]=6.5; 95% CI, 2.6-16.4) and cardiovascular disease events (HR=5.2; 95% CI, 2.5-10.8).[4]

The St. Francis Heart Study prospectively compared CAC with standard CHD risk factors for predicting atherosclerotic cardiovascular disease (ASCVD) events in 4903 asymptomatic people between 50 and 70 years of age. For CAC scores ≥100 compared with scores <100, relative risk was 9.6 (95% CI, 6.7-13.9) for all ASCVD events, 11.1 (95% CI, 7.3-16.7) for all CHD events, and 9.2 (95% CI, 4.9-17.3) for nonfatal myocardial infarction

and death. The CAC score predicted CHD events more accurately than standard risk factors and reclassified 24% of intermediate-risk women and 17% of intermediate-risk men into a higher-risk group.[5]

Despite studies that correlate higher CAC score with increased cardiovascular risk, we found no evidence that testing leads to improved treatment for preventing CHD or better cardiovascular outcomes.

Recommendations

The American College of Cardiology suggests that measuring CAC may be reasonable for asymptomatic patients with intermediate CHD risk (10%-20% 10-year risk of CHD events), for whom elevated CAC scores could lead to a higher-risk classification and subsequent modification of management.[6] The College doesn't recommend evaluating CAC in patients with low CHD risk, because it would constitute screening the general population, or asymptomatic patients with high CHD risk, who are already candidates for intensive risk modification.

The US Preventive Services Task Force conducted its own review and concluded that although the CAC score is an independent predictor of major CHD events, insufficient evidence exists to support its use to further stratify risk in intermediate-risk patients.[7] JFP

TABLE

What does that CAC score mean?[1]

Score	Severity of disease
<1	No identifiable disease
1-10	Mild
11-100	Moderate
101-400	Moderate to high
>400	Severe

CAC, coronary artery calcium.

The coronary artery calcium score is an independent predictor of cardiovascular events that can help stratify risk in asymptomatic patients.

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