

## IN THE LITERATURE

## Can coronary calcification measured by CT predict future coronary events?

Arad Y, Goodman KJ, Roth M, Newstein D, Guerci AD. Coronary calcification, coronary disease risk factors, C-reactive protein, and atherosclerotic cardiovascular disease events: the St. Francis Heart Study. *J Am Coll Cardiol* 2005;46:158-65.

**Background:** The degree of coronary artery calcification correlates with the burden of atherosclerosis<sup>1</sup> and can be detected by noninvasive means such as electron-beam CT scanning (EBCT). Measurement of coronary calcification may be useful for predicting adverse cardiovascular events; however, studies have produced inconsistent results.<sup>2,3</sup> The main purpose of the St. Francis Heart Study was to compare the prognostic accuracy of coronary calcification measured by EBCT with standard risk factors in a setting of primary prevention.

**Methods:** A prospective, population-based study was conducted at a single hospital in New York State. Subjects without symptoms of coronary artery disease (CAD) between 50 and 70 years of age were recruited between 1996 and 1999. All enrolled subjects underwent EBCT and were assigned a calcium score on the basis of the degree of calcification visible in their coronary vessels; a subset also underwent C-reactive protein (CRP) measurement and risk factor assessment. Patients assigned to the active treatment arm (atorvastatin and antioxidant vitamins) were excluded from this natural history component of the study. Participants were followed prospectively for all coronary disease events, which were adjudicated

by a blinded, independent committee of experts.

**Results:** Of 5393 eligible subjects who underwent EBCT, 4903 did not receive active treatment and were included in the natural history component of the study; follow-up data were available at a mean of 4.3 years for 4613 patients, of whom 1293 also had risk factor assessment. Only 119 (2.6%) of the 4613 subjects had cardiovascular events over the follow-up period (40 had nonfatal myocardial infarction or coronary death, 7 had a nonhemorrhagic stroke, 59 had coronary revascularization, and 13 underwent peripheral vascular surgery). The relative risk for all CAD events was 9.6 (95% CI 6.7 to 13.9) among subjects with calcium scores greater than 100 compared with subjects whose scores were less than 100. The calcium score predicted cardiovascular events independent of CRP level and standard risk factors, and it had a higher area under the ROC (receiver-operating characteristic) curve than did the Framingham risk index (0.79 v. 0.68,  $p = 0.0006$ ). The CRP level was not significantly associated with cardiovascular events after adjustment for risk factors. The calcium score appeared to enhance risk stratification based on the Framingham index, particularly for subjects at intermediate risk.

**Commentary:** This large prospective study showed that coronary calcium scoring by means of EBCT predicted cardiovascular events independent of traditional risk factors. In addition, the calcium score augmented the Framingham risk index and could result in some patients at intermediate risk being reclassified as being at high risk. However, we were unable to estimate the proportion of patients who could be reclassified with EBCT because the study did not provide the data. The generalizability of the findings may be

limited because the study was conducted at a single centre, had a low participation rate and used an insensitive CRP assay. In addition, the majority of observed events were actually cardiovascular procedures rather than traditional cardiac events.

**Clinical implications:** Despite the study's results, routine coronary calcium screening by means of EBCT is not recommended, for a few important reasons. First, an optimal coronary calcium threshold has not been defined and may be difficult to identify because the amount of coronary calcification differs according to age, sex and race. Second, EBCT in a low-risk population likely does not represent a cost-effective strategy in this era of scarce health care resources. Finally, there is no evidence to date showing that routine coronary calcium screening could lead to improved clinical outcomes. In summary, many challenges and outstanding issues still need to be resolved before coronary calcium screening can be considered in routine clinical practice.

**Manu Prabhakar  
Dennis T. Ko**

Department of Medicine  
Sunnybrook and Women's College  
Health Sciences Centre  
Toronto, Ont.

### REFERENCES

1. Rumberger JA, Simons DB, Fitzpatrick LA, Sheedy PF, Schwartz RS. Coronary artery calcium area by electron-beam computed tomography and coronary atherosclerotic plaque area. A histopathologic correlative study. *Circulation* 1995;92:2157-62.
2. Greenland P, LaBree L, Azen SP, Doherty TM, Detrano RC. Coronary artery calcium score combined with Framingham score for risk prediction in asymptomatic individuals. *JAMA* 2004;291:210-5.
3. Detrano RC, Wong ND, Doherty TM, Shavelle RM, Tang W, Ginzton LE, et al. Coronary calcium does not accurately predict near-term future coronary events in high-risk adults. *Circulation* 1999;99:2633-8.