

Letter to the Editor

Electron Beam Computed Tomography

Dear Editor,

The ability of Electron Beam Computer Tomography (EBT) to detect presence of coronary calcification in asymptomatic patients has fueled much debate regarding the appropriate use of this new imaging modality.

It is apparent that the extent of calcification, in terms of both an absolute volume and an age related percentile score, is predictive of relative risk of coronary artery events. It has also been demonstrated that risk stratification by Coronary Calcium Scoring has incremental value over "traditional risk assessment". As Dr. Rumberger correctly points out: certain basic epidemiological characteristics of EBT have been defined (there is a low absolute risk of coronary artery disease (CAD) with a zero coronary calcium score, increased relative risk of events and increased likelihood of angiographically significant CAD occurs with high scores).

The source of the real debate is not these issues, but rather whether and how this test should be incorporated into routine clinical cardiology practice. Firstly, should the test be used as a non-invasive test in selected populations with intermediate risk of CAD or as a screening test for the early detection of atherosclerosis in unselected populations?

There are numerous factors regarding clinical application of coronary calcium scoring that remain undefined:

1. How should the results of EBT influence the level of aggressiveness of medical therapy in asymptomatic patients? For instance:

Opinions expressed are views of the authors and not necessarily the view of the editorial board or the Hong Kong College of Cardiology.

- a) Should a patient with a zero score continue with standard primary prevention risk factor modification? Are we doing these people an injustice by providing false reassurance with a "zero" score?
 - b) Does presence of any coronary calcium in an asymptomatic patient indicate the need to move to aggressive (secondary style) risk factor modification? Should these patients be prescribed aspirin?
 - c) What is the evidence that *asymptomatic* patients with coronary calcium scores >75% for age actually benefit from further investigations such as stress testing? Although higher scores may be associated with increased atherosclerotic burden, what percentage of these patients actually have inducible ischemia at stress testing? Preliminary reports would suggest this percentage is low unless the total calcium burden (Agatson score) is greater than 400.¹
2. What is the utility of serial coronary artery calcium testing, particularly after initiation of medical therapy? What do you say to a patient who has been compliant with statin therapy but has multiple new calcified lesions at follow up?
 3. Is there a role for EBT in patients with prior revascularization?
 4. Where should EBT be placed in the testing algorithm for symptomatic patients? Given that the risk of acute events relates to unstable plaque, and risk stratification in the presence of known coronary artery disease has been shown to relate to the extent of inducible ischemia and left ventricular function is knowledge of the coronary calcium burden additive or simply redundant information?
 5. Numerous characteristics of plaque that has been shown to relate to risk of plaque rupture cannot be assessed by electronic beam computer tomography

(i.e. plaque ulceration and surface contour, fibrous cap, lipid content etc.). Given that a relatively small amount of the total atherosclerotic plaque burden is calcified plaque, the relationship between coronary calcium scores and risk of acute events must be more variable than Dr. Rumberger suggests. Testing for plaque stability is the ideal approach and should be incorporated into plaque imaging.

6. Most importantly, there is no information available to date regarding the cost implications of coronary artery calcium assessment in testing strategies for symptomatic or asymptomatic patients in low or intermediate risk groups. Calcium scoring has the potential to generate considerable downstream costs from non-invasive and invasive evaluations, or from altered medical management strategies.

We agree with Dr. Rumberger that an extensive literature exists validating that physiologically the presence of coronary calcium has meaning. We also agree that "coronary artery disease" can be defined today either as the presence of a significant epicardial stenosis (a traditional angiographic definition) or as the presence of atherosclerosis as demonstrated by detection of coronary artery plaque with or without associated calcification. As pointed out by Dr. Rumberger, electronic beam computer tomography is far superior for identification of calcified plaque than for the detection of patients with angiographically significant stenosis.

Hence, as alluded to by Dr. Rumberger, despite early claims that EBT would serve as a test to replace conventional stress imaging, in light of its performance characteristics this is unlikely to be the case. Rather, EBT is one of a number of tests currently available to clinicians for identification of the presence of preclinical atherosclerosis (e.g. EBT, Intimal Medial Thickening,

Ankle Brachial Index). In addition, there are an increasing number of biochemical markers (such as high sensitivity C-reactive Protein) gaining acceptance for their ability to identify asymptomatic patients at risk of adverse cardiac events.

The questions facing cardiologists today are which combination of tests should be obtained in clinical practice to identify those asymptomatic patients at risk of events secondary to premature atherosclerosis. And in the event of symptoms, which combination of tests most accurately and efficiently leads to diagnosis, risk stratification and formulation of a management plan. EBT may well play an important role as a component of an algorithm in the future. However, this will only be the case after more extensive data is collected validating its performance characteristics both individually and as part of a testing algorithm.

Reference

1. He ZX, Hedrick TD, Pratt CM, et al. Severity of coronary artery calcification by electron beam computed tomography predicts silent myocardial ischemia. *Circulation* 2000;101: 244-51.

Yours sincerely,

Dr. Louise Thomson
MB, FRACP
Green Lane Cardiology Department
Green Lane Hospital
Auckland, New Zealand

Prof. Harvey White
DSc, FRACP
Green Lane Cardiology Department
Green Lane Hospital
Auckland, New Zealand