# Point: Diabetic Patients and Coronary Calcium

## Risk stratification, compliance, and plaque progression

The use of electron beam tomography (EBT) is becoming increasingly accepted for risk stratification in the asymptomatic patient (1). Coronary artery calcium (CAC), as measured by EBT, has been shown to be a marker of increased risk in every prognostic study published to date, in both symptomatic and asymptomatic cohorts (2). The relationship of CAC to angiographic disease holds the same tight correlation in persons with diabetes as in nondiabetic patients (3), suggesting that the risk stratification with EBT will be as robust in individuals with diabetes as in others. The only prognostic study of EBT and diabetes published to date demonstrates that diabetic subjects with CAC were four times more likely to suffer a cardiac event than nondiabetic subjects with low calcium scores ($P < 0.001$) (4).

The new National Cholesterol Education Panel (NCEP) guidelines (5) support the conclusions of the Prevention Conference V and the American College of Cardiology (ACC)/American Heart Association (AHA) report that high coronary calcium scores signify and confirm increased risk for future cardiac events. "Therefore, measurement of coronary calcium is an option for advanced risk assessment in appropriately selected persons. In persons with multiple risk factors, high coronary calcium scores (e.g., >75th percentile for age and sex) denotes advanced coronary atherosclerosis and provides a rationale for intensified LDL-lowering therapy" (5). Thus, a high CAC score should make a clinician more likely to institute secondary prevention measures sooner (e.g., aspirin, aiming for a lower blood pressure or an LDL cholesterol level <100 mg/dl as opposed to <130). However, these goals are already in place for type 2 diabetic patients over the age of 30.

### Is risk stratification necessary in individuals with diabetes?

The recent Prevention VI guidelines for the treatment of diabetic patients recently addressed the issue of screening (6). They stated, "A critical underlying assumption of screening is that test results will lead to a change in clinical management that can decrease morbidity and mortality. Because of the recognized high risk for cardiovascular events in patients with diabetes, the AHA currently recommends that they belong in the same high-risk category previously reserved for patients with known CHD (coronary heart disease)." This reiterates the NCEP guidelines (5) that state, "Persons with type 2 diabetes should be managed as a CHD risk equivalent. Treatment for LDL cholesterol should follow ATP III recommendations for persons with established CHD." Thus, screening for heart disease is not generally necessary in this cohort as the treatment algorithms will not change based upon the results. However, the NCEP suggests that certain individuals with diabetes will potentially benefit from further risk stratification.

### There are four possible times when EBT may be useful in the diabetic cohort.

*1)* **Type 1 diabetes.** The NCEP guidelines primarily address type 2 diabetes. While type 1 diabetic patients are at increased cardiovascular risk, no study has specifically examined whether type 1 diabetic subjects have a risk of CHD as high as age- and sex-matched nondiabetic subjects with preexisting CHD. Thus, the NCEP recommendations for therapy among persons with type 1 diabetes are less aggressive: "The intensity of LDL-lowering therapy in persons with type 1 diabetes should depend on clinical judgment." Here a positive EBT scan may very well sway the physician for more aggressive management of underlying atherosclerosis.

*2)* **Younger diabetic patients.** The use of aspirin and cholesterol-reducing medication, representing life-long therapy in this cohort, is not universally recommended for diabetic individuals <30 years of age. Choosing a starting age for aspirin, lipid lowering, and ACE-inhibitor therapy is currently difficult and somewhat arbitrary. The NCEP recommendation specifically states, "For younger persons with type 2 diabetes, who otherwise are at lower risk, clinical judgment is required as to the intensity of LDL-lowering therapy." Two studies have documented that the incidence of atherosclerosis is only 10% in these younger patients (7). The greatest potential impact of CAC screening in younger patients is the earlier use of aggressive medical therapy.

*3)* **Improving compliance.** Unfortunately, the diagnosis of type 2 diabetes comes with a need for multidrug therapy, requiring aspirin, ACE-inhibitors, and statins, in addition to multiple oral hypoglycemics. Wong et al. (8) demonstrated that individuals with CAC have been reported to be more likely to undertake preventive health measures, including beginning cholesterol- or blood pressure–lowering medications, starting aspirin, initiating an exercise program, following a low-fat diet, or quitting smoking. This improved compliance is especially important in a diabetic population, in which the average person may take seven or more different medications daily and are expected to adhere to a more strict diet and exercise regimen.

*4)* **Tracking efficacy of therapy.** EBT technology provides an opportunity to noninvasively monitor patients to assess the clinical efficacy of medical therapies. Accurate and noninvasive measures of atherosclerosis in the person at high-risk could allow better assessment of processes associated with disease progression, as well as of therapies to prevent the progression or even induce regression of atherosclerosis and clinical CAD (9). In a study of asymptomatic diabetic patients followed with EBT, statin use slowed the rate of CAC progression by 55%. Two studies demonstrate that a vast majority of events (>95%) occur in those patients

who exhibit rapid CAC progression (>20%/year) (10,11), suggesting that these patients are at increased risk and warrant more aggressive therapy. Thus, identifying a person with an increasing CAC score may very well trigger the treating physician to further lower the cholesterol or institute further lifestyle modifications.

Thus, while the vast majority of patients with diabetes would not need to undergo further noninvasive testing for CAC, there are certain cohorts that will benefit. The use of EBT to better risk stratify certain patients with diabetes, to improve compliance, and to allow for noninvasive tracking of atherosclerotic plaque could potentially reduce both mortality and costs and better direct therapy. Prognostic studies that include large numbers of diabetic subjects are now underway.

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