Screening for Silent Coronary Heart Disease in Type 2 Diabetes

Clinical application of American Diabetes Association guidelines

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Patients with type 2 diabetes suffer twice the cardiovascular mortality of patients without the disease (1,2). In 1998, the American Diabetes Association (ADA) published guidelines for early detection of coronary heart disease (CHD) in asymptomatic patients with diabetes, with a specific focus on patients with multiple cardiovascular risk factors (3). Patients that fulfill any criteria are to be further risk stratified with stress testing. The criteria include 1) typical or atypical cardiac symptoms; 2) resting electrocardiograph suggestive of ischemia or infarction; 3) peripheral or carotid occlusive disease; 4) sedentary lifestyle, aged ≥35 years, and plans to begin a vigorous exercise program; and 5) more than two of the following risk factors in addition to diabetes: total cholesterol ≥240 mg/dl, LDL cholesterol ≥160 mg/dl, or HDL cholesterol <35 mg/dl; blood pressure >140/90 mmHg; smoking; family history of premature coronary artery disease; or micro-/macroalbuminuria.

However, there are limited data available evaluating the performance of these guidelines in a clinical setting. We determined the proportion of patients in our clinic with type 2 diabetes that satisfied the ADA screening criteria and prevalence of CHD in these patients using stress testing and cardiac catheterization.

RESEARCH DESIGN AND METHODS — In 1999, records of patients (n = 2,226) in the Joslin Center at the University of Maryland Medical Center were reviewed. Patients that met ADA criteria had a notification placed in the chart. Decision to proceed to stress testing was made by the treating diabetologist. Charts were periodically reviewed until December 2003. Of 116 patients with stress tests, 94 (81%) had stress myocardial perfusion single-photon emission tomography, four subjects had pharmacologic stress echocardiography, and one subject had exercise electrocardiography. Type of stress testing was unavailable for 17 patients (14.7%). Coronary artery diameter reduction of ≥50 and ≥70% were used as cutoff points to denote angiographic evidence of moderate and high-degree stenoses, respectively, as defined in previous studies (15).

Statistical analysis
Continuous and categorical variables were compared between groups using Student’s t tests and χ² tests. Logistic regression was used to determine independent clinical predictors of positive catheterization results. Statistical analysis was performed using SAS software (SAS Institute, Cary, NC).

RESULTS — A total of 1,053 patients had sufficient information to determine their risk factor profile. Few resting electrocardiograms were available and thus were not analyzed. No patients satisfied criterion 4. Six hundred and forty-nine (61.6%) patients met ADA criteria 3 or 5. Of patients who met these criteria, 116 (17.9%) had stress tests (Fig. 1). Patients who underwent stress testing were representative of all patients who qualified for stress testing in regards to age, race, duration of diabetes, and prevalence of risk factors. At the time of stress testing, 46 (39.7%) patients were receiving aspirin, 2 (1.7%) were receiving clopidogrel, 15 (12.9%) were receiving angiotensin receptor blockers, 66 (58.4%) were receiving ACE inhibitors, 30 (25.8%) were receiving β-blockers, 33 (28.4%) were receiving calcium channel blockers, and 62 (53.4%) were receiving statins.

Thirty-nine stress tests were abnormal (33.6%). Thirty-two patients with abnormal stress tests underwent catheterization. The remaining patients were lost to follow-up, had a fixed defect, had a normal repeat stress test, refused intervention, or died. Twenty-three of the catheterizations demonstrated CHD, and nine were normal. Ten patients had non-significant disease. Of nine patients with single- or two-vessel disease and >50 stenoses, two received percutaneous coronary intervention and seven received medical therapy. Four patients with multivessel disease and severe stenoses (>70%) underwent coronary artery bypass surgery (CABG). Of four patients receiving CABG, two had reduced left ventricular ejection fraction. At the time of CABG hospitalization, they reported long-standing exertional symptoms not recorded in the outpatient chart at the time of initial screening. Predictive value of a positive stress test for any degree of atherosclerosis was 61.5 and 33.3% for stenoses defined as ≥50%.

Patients with angiographically confirmed CHD had a higher prevalence of LDL >160 (39.1 vs. 16.3%, P = 0.02), family history of early CHD (21.7 vs. 7%, P < 0.05), and higher total number of risk factors than those who met ADA criteria but had normal stress or catheterization results. In multivariate analysis, family history (P = 0.02) and dyslipidemia (P = 0.04) were independently predictive of moderate to severe degree of CHD, but
CONCLUSIONS — We evaluated the utility of the ADA screening guidelines for asymptomatic CHD in patients with type 2 diabetes. Our population is more representative of an urban American academic center than previous studies. Prevalence of perfusion defects in those screened with ADA criteria was 33.6%, similar to that of other studies of asymptomatic patients with type 2 diabetes (5–9). Prevalence of angiographically confirmed coronary artery disease was 20.7% for any degree of disease and 11.2% for moderate to severe disease. Moderate single- and two-vessel disease predominated. Incidence of myocardial infarction and cardiac death in patients with moderate disease is unknown, and appropriate interventions are currently under investigation. Identifying these patients does not change their management since guidelines recommend aggressive risk factor modification for all patients with diabetes.

Patients who underwent CAGB were the only group whose risk of death was reduced as a result of screening (10,11). Careful questioning about exertional symptoms could have identified half of these patients in need of further cardiac evaluation based on symptoms alone. This discovery underscores the limitations of our study design, where information was obtained from chart review. This also highlights the realities of clinical practice, where anginal symptoms in patients with diabetes are difficult to elicit. Despite these limitations, the small numbers of patients that benefited from our screening suggest poor clinical utility of the current ADA guidelines.

The premise of the ADA guidelines was to target patients with diabetes and multiple cardiovascular risk factors. Our results do not show an independent relationship between the quantity of risk factors and incidence or degree of CHD. Other clinical predictors are needed to better define a population with increased incidence of severe CHD. Our study did not collect angiographic data on patients not meeting ADA criteria. Such information would be important in elucidating such predictors. Clearly, more research is needed to identify appropriate screening strategy for type 2 diabetic patients with asymptomatic CHD.

References
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