In this study patient population transient ECG changes on the resting electrocardiogram, occurrence of chest pain during exercise, and a positive exercise test at low cardiac workload were associated with a high probability of significant coronary disease at angiography. However, 18% of these patients had no evidence of flow limiting coronary disease.

The message that one can take from this report is that when chest pain is evaluated in men and women gender probably does not make any difference when symptoms are classic for myocardial ischaemia; the women are post-menopausal and there are ECG changes at rest and during exercise. Another point that should be made is that although the women reported in this study were 'high risk' for the presence of significant epicardial coronary artery disease, 18% did not demonstrate high grade epicardial coronary artery stenosis. The authors do not report TIMI flow or coronary flow resistance in these patients. Abnormalities of these parameters might account for some of the positive tests in patients with 'normal' coronary arteries. Thus even in this 'high risk' population the clinician must still use clinical judgment when evaluating the individual with chest pain.

This study confirms that if the clinical situation indicates a high pre-test probability of disease, the resting ECG and exercise test are as useful in women as they are in men. Most experienced clinicians known this but the data contained in this report confirm the clinical impression.

C. R. CONTI  
University of Florida,  
Florida, U.S.A.

References


European Heart Journal (1998) 19, 826-827

Cardiothoracic ratio and relative heart volume as predictors of coronary heart disease mortality

See page 859 for the article to which this Editorial refers

In this issue Hemingway et al. present 25-year prospective results from 1191 male civil servants aged 40 to 69. They found that the cardiothoracic ratio within the range considered 'normal' in clinical practice predicted coronary heart disease mortality (196 deaths) independent of age, systolic and diastolic blood pressure, heart rate, smoking, serum cholesterol, angina and ECG ischaemia. They found similar ratios for relative heart volume, but the latter did not predict coronary heart disease any better than the cardiothoracic ratio. Sigurdsson et al. studied a random population sample from Reykjavik, Iceland and found relative heart volume to be a significant risk factor for coronary heart disease death in multivariate analysis. However, they studied men both with and without coronary heart disease, and found, as expected, that those with coronary heart disease had considerably higher relative heart volume. It is not reported whether the increased coronary heart disease risk associated with high relative heart volume was also seen among men free of coronary heart disease at baseline. It is well known that the cardiothoracic ratio and relative heart volume increase with age and in studies with a relatively broad age span as 40 to 69 years in the British study it is crucial that age is properly controlled for.

In Göteborg, Sweden, we studied, prospectively, 855 men all aged 50 at baseline and randomly selected from the total population. The relative heart volume tended to be higher among the 50 men who suffered a non-fatal or fatal myocardial infarction during 10 years follow-up compared with those who did not suffer coronary heart disease. However, during 30 years follow-up (241 events) increased relative heart volume was only a significant risk factor for those who suffered fatal coronary heart disease, but not for non-fatal events in this study carefully controlled for the influence of age...
(unpublished observations). Thus, in accordance with the London study, a high cardiothoracic ratio or relative heart volume also seem to carry prognostic information regarding survival in coronary heart disease. Increased relative heart volume (within the 'normal' range) was also a risk factor in multivariate analysis for the development of congestive heart failure during 17 years follow-up\textsuperscript{41}.

The London authors found that larger heart sizes were positively related to body weight, body mass index, systolic and diastolic blood pressure, serum cholesterol and ECG ischaemia and negatively to height, heart rate, height adjusted FEV\textsubscript{1} and current smoking. The positive associations between body size, blood pressure as well as ECG ischaemia and heart volume are expected, but as mentioned the cardiothoracic ratio and relative heart volume still emerged as independent predictors of coronary heart disease mortality.

From a pathophysiological point of view, it is difficult to say whether the findings of an increased cardiothoracic ratio or relative heart volume reflect increased left ventricular mass or dilatation and/or dilatation of other cardiac chambers. Therefore the measurements are not as precise as might be requested by a clinician who would like to know the exact pathophysiology behind the relationships. It is known that relative heart volume depends on when it is measured in the cardiac cycle. The negative relationship between heart size and heart rate (longer diastole) is a finding explained by such circumstances. However, as mentioned in the paper, the cardiothoracic ratio and relative heart volume are associated with left ventricular mass assessed at post-mortem and at angiography as well as with left ventricular systolic dysfunction and left ventricular ejection fraction. Left ventricular mass is itself an independent predictor of subsequent increases in blood pressure\textsuperscript{5,6}. The independent prognostic importance of the cardiothoracic ratio and relative heart volume within the normal range and during very long-term follow-up is interesting, but not easy to explain pathophysiological. Hypothetically it may reflect in imbalance between external load on the heart, such as short-term peaks in blood pressure or psychological stress and/or early coronary atherosclerosis with diminished coronary reserve. Increased left ventricular mass and atherothrombotic disease of the coronary arteries share common antecedents such as obesity and insulin resistance as well as endothelial dysfunction.

It is interesting that the associations were found even within the lower two tertiles of systolic blood pressure. Such relatively small increases of heart volume as well as ECG signs of myocardial ischaemia may explain the increased risk for coronary heart disease seen at blood pressure levels that are considered 'normal' and would not lead to antihypertensive drug treatment.

Congestive heart failure is often related to coronary heart disease in Western populations. Our finding that relative heart volume is predictive of heart failure\textsuperscript{41} points towards a similar pathology. The authors refer to the findings of the SOLVD Prevention Trial, in which asymptomatic patients with decreased ejection fractions had normal cardiothoracic ratios. Thus, the cardiothoracic ratio may also be normal in congestive heart failure with minor symptoms, which indicates the value of more sophisticated analysis of cardiac function in these circumstances.

The London authors claim that use of the cardiothoracic ratio (or relative heart volume, which is used in some countries) is justified as part of coronary heart disease risk stratification. However, we do not know whether any interventions exist to lower heart size, and whether they will influence coronary heart disease incidence. Detailed studies using echocardiography as well as more sophisticated methods to study relationships between myocardial energy supply and load seem warranted.

L. WILHELMSEN

Sahlgrenska University Hospital,
Göteborg, Sweden

References