European Heart Journal (2007) **28**, 2967–2971
doi:10.1093/eurheartj/ehm487

Current opinion

Comparative performance of subclinical atherosclerosis tests in predicting coronary heart disease in asymptomatic individuals

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Received 18 April 2007; revised 13 September 2007; accepted 26 September 2007; online publish-ahead-of-print 29 October 2007

KEYWORDS
Primary prevention;
Intima–media thickness;
Plaque;
Atherosclerosis;
Arterial stiffness;
Coronary calcium;
Cardiovascular risk

The prognostic performance of subclinical atherosclerosis in predicting coronary heart disease (CHD) needs to be clarified because of the existence of many non-invasive tests available for its detection in the clinical setting: ultrasound measurement of carotid intima–media thickness (IMT) and plaque, cardiac computed tomography assessment of coronary artery calcium, Doppler stethoscope measurement of ankle–arm index pressure (AAI), and mechanographic or Doppler determination of aortic pulse wave velocity (PWV). Data analysis of the main prospective studies in asymptomatic populations allows the establishment of a dose–response relationship between subclinical atherosclerosis burden and cumulative incidence of future CHD event (absolute risk). Negative subclinical atherosclerosis testing conveys a low 10-year CHD risk inferior to 10% whatever the test considered, i.e. IMT less than the 1st tertile or 1st quintile, AAI ≥ 0.90, PWV less than the first tertile, no discernible carotid plaque, or zero coronary calcium score. Positive testing for IMT ($>$95th percentile or 5th quintile), AAI (<0.90), or PWV ($>$3rd tertile) conveys a moderately high 10-year CHD risk between 10 and 20%. Positive testing for carotid plaque (focal protrusion >1.5 mm or mineralization) or coronary calcium (total score $>$300 or 400 units) conveys a high 10-year CHD risk superior to 20%. Therefore, positive subclinical atherosclerosis measurement seems to have its place in the context of existing prediction models, namely for intermediate risk classification. It also remains to be established whether individuals with negative subclinical atherosclerosis may be considered at low CHD risk and receive conservative management.

Introduction

Better identification of asymptomatic individuals at high risk of future coronary heart disease (CHD) and who should therefore receive aggressive risk reduction therapy is an important challenge for primary prevention of cardiovascular disease.[1] Despite their aetiological importance in atherosclerosis, cardiovascular risk factors have a poor performance in predicting asymptomatic subjects who will or will not develop CHD.[2] A large overlap exists in the distributions of both the major risk factors, serum cholesterol and blood pressure, in men who died of CHD and in those who did not.[2] Moreover, more than half of subjects with CHD have no major risk factor, or only one.[3] Conversely, the well-established high prognostic performance of clinically overt arterial disease[4,5] has supported the idea of extrapolating the prognostic performance of clinical arterial disease to subclinical disease.[1] The observation that arterial disease does not begin with the first clinical event but develops long before without symptoms has motivated much biotechnological medical research for the detection of subclinical disease[6–8]. The more commonly used subclinical vascular markers in the clinical setting are carotid intima–media thickness (IMT) and plaque measured by ultrasound, coronary artery calcium detected by cardiac computed tomography (CT), ankle–arm index pressure (AAI) measured by distal pressure Doppler measurement, and aortic pulse wave velocity (PWV) measured from carotid and femoral pressure wave recordings with a Doppler or mechanographic device.[1] For individuals at intermediate risk, e.g. 10–20% 10-year Framingham risk of fatal and non-fatal CHD[4] or 3–5% European SCORE[9] risk of fatal cardiovascular disease, clinicians may consider testing for subclinical atherosclerosis and, in those with a positive test, aggressive risk reduction intervention may be appropriate.[8–11] Nevertheless, the implementation of subclinical atherosclerosis testing in the risk management of patients is dependent on a better knowledge of the comparative prognostic performance of various tests of atherosclerosis currently available.

In this report, the prognostic performance of subclinical atherosclerosis testing is discussed on the basis of crude CHD incidence (absolute risk) associated with positive and negative subclinical atherosclerosis testing.[12]

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