

PREDICTING THE FUTURE WITH ECHOCARDIOGRAPHY: LOOKING OUTSIDE THE HEART?

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Predicting the future is a fundamental requirement of cardiovascular prevention practice. Identification of individuals who we predict to be at risk of future events allows us to target interventions and potentially change the future. Cardiovascular risk scores based on modifiable factors such as cholesterol level, blood pressure, smoking history and presence of diabetes remain our simplest but most robust prediction tools¹. However, alongside these traditional tools there have been consistent efforts to identify better markers, particularly through the use of imaging. Visualisation of blood vessels is potentially a powerful means to quantify directly vascular disease burden or stability. Ultrasound, CT and MR have all developed independent means to stratify risk for examples as coronary artery calcium scoring² or carotid wall and plaque imaging³. However, many structural imaging techniques have failed to substantially modify or add to the information provided by traditional risk scores and it may be necessary to use imaging in more sophisticated ways.

Combining imaging with stress testing provides information on the functional relevance of structural disease⁴ and direct assessment of functional changes in vessels through stiffening⁵ or inflammation has proved of interest⁶. Looking at different parts of the body that may be modifying vascular disease development has also become of interest. Fat is easy to image and is closely linked with levels of cardiovascular risk factors, metabolic problems and inflammation^{7, 8}. Regional distribution of fat may also be of relevance as localised fat around vessels and the heart might be expected to be able to have a more direct impact on cardiovascular disease development. Fat can also be imaged by all the main modalities, with cross sectional imaging providing insight into deeper fat deposits such as visceral, around the aorta or even within the myocardium^{9, 10}. While ultrasound can characterise more peripheral regions, including around the heart¹¹. Echocardiographic assessment of cardiac fat has been

validated against other techniques¹² and allows differentiation of epicardial and paracardiac fat¹³.

Cardiac fat assessed with CT is known to relate closely to cardiac risk factors and predicts cardiovascular events in some populations^{9, 14, 15}. Now Christensen et al¹¹ have used echocardiography in a cohort of patients with type 2 diabetes to characterise cardiac fat and understand whether this measure can also predict cardiovascular events. Furthermore, they compared the measure against other imaging techniques such as coronary artery calcium scoring and carotid intima media thickness. Interestingly, they found that there was a threshold thickness of cardiac fat, beyond which, event rate over the next 6 years doubled. This increase in risk was independent of other cardiovascular risk factors including body mass index. Furthermore, of the imaging techniques used, total cardiac adipose tissue provided the best prediction of future risk. The study was relatively small and only included patients with diabetes meaning the results may not be generally applicable to patients. Also, surprisingly, there were no association with circulating markers of inflammation, so the *a priori* hypothesis about why risk may be increased could not be confirmed.

Nevertheless, the findings are intriguing. Echocardiography remains the most widely used imaging technique in patients with cardiac disease and in the vast majority of scans the amount of fat between the probe and the myocardium in parasternal views is ignored. As we learn more about normal ranges for epicardial or pericardial fat, and potential thresholds associated with risk, opportunities may emerge for additional cardiovascular risk stratification in all patients undergoing echocardiography for investigation of cardiac disease. Furthermore, the importance of changes in cardiac fat and interventions targeted to reduce amount of cardiac fat become of potential relevance for future clinical prevention trials.

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