Appearances can be deceiving

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A 55-year-old woman, hypertensive and hyperlipidemic, presented with atypical chest discomfort. Computed tomography coronary angiography (CTCA) showed mild narrowing in the left main artery (Panel A, black arrow, 25–49% diameter narrowing) and moderate narrowing in the proximal left anterior descending (LAD) artery (Panel A, white arrow, 50–69% diameter narrowing). The right and left circumflex arteries (RCA and LCx, Panels B and C, respectively) appeared smooth.

Contrast-enhanced, adenosine-stress dynamic computed tomography (CT) perfusion imaging was performed. Time-attenuation curves (TACs) were created in the aorta and myocardium. After fitting the TACs using a two-compartment model, an index of myocardial blood flow (MBF) was mapped on colour scale. By visual inspection, the basal septum looked suspicious of ischaemia (Panel D). According to the MBF index, ischaemia was unlikely (Panel E). This was based on a <78 mL/100 mL tissue/min threshold validated against invasive fractional flow reserve (FFR) (Eur Heart J Cardiovasc Imaging 2014;15:85). FFR in the LAD was 0.82 (Panel F). LCx and RCA were smooth (Panels G and H).

Although CTCA rules-out coronary artery disease efficiently, whether moderate coronary narrowing causes ischaemia is challenging to predict. This is however important for patient management.

Post-contrast CT attenuation (Hounsfield units) in the myocardium may be affected by beam hardening artefacts (spillover), poor-contrast-to-noise ratio, and patient-related factors such as microvascular dysfunction. Image display settings (window width/centre) too influence the visual identification of perfusion defects. For these reasons, there can be a mismatch between visual, relative assessment of CT attenuation and quantitative approaches to the evaluation of ischaemia.

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