

CORONARY ARTERY DISEASE

Noninvasive imaging technique can identify high-risk coronary plaques

Atherosclerotic plaque rupture and subsequent acute myocardial infarction are well known to be a major cause of death worldwide. Prediction of plaque rupture, however, has proven challenging. A new noninvasive imaging technique that uses an inexpensive PET radioisotope, ^{18}F -NaF, might prove to be the answer. Indeed, the investigators of a study published in the *Lancet* believe that their technique “holds major promise as a means of identifying high-risk and ruptured plaque, and potentially informing the future management and treatment of patients with stable and unstable coronary artery disease”.

When 40 patients who had been hospitalized for myocardial

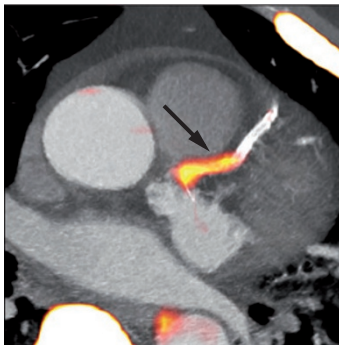


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infarction underwent ^{18}F -FDG PET-CT scanning, no significant differences in maximum ^{18}F -FDG uptake were observed between the culprit plaques and plaques located elsewhere in the coronary vasculature. By contrast, increased ^{18}F -NaF uptake was observed in the culprit plaque in 37 of the 40 patients. ^{18}F -NaF activity was found to be 34% higher in the culprit plaque than the maximum activity recorded anywhere else in the coronary vasculature.

Ex vivo ^{18}F -NaF PET-CT and histological analysis were performed on carotid specimens obtained from nine other patients who had undergone carotid endarterectomy for symptomatic carotid artery disease. Compared with tissue that did not take up ^{18}F -NaF, areas of increased ^{18}F -NaF uptake were found to have increased calcification, macrophage infiltration, and cell death. In their study report, Dr Nikhil Joshi and colleagues describe how they believe ^{18}F -NaF is taken up by high-risk plaques: “Hydroxyapatite is the central structural component of vascular calcification and is laid down during the earliest and most active stages of mineralization ... Fluoride ions are incorporated into the hydroxyapatite by ion

exchange with hydroxyl groups at the crystal surface.” “By identifying areas of nascent and ongoing calcification activity,” they explain, “ ^{18}F -NaF uptake allows us to detect regions of metabolically active plaque.”

Joshi *et al.* also assessed coronary ^{18}F -NaF uptake in 40 patients with stable angina pectoris. Increased ^{18}F -NaF uptake seemed to identify coronary plaques that, although mostly shown to be nonobstructive on coronary angiography, contained high-risk features (increased positive remodelling, microcalcification, and necrotic core) on intravascular imaging.

“Prospective studies are now needed in a broad range of patients to assess whether increased coronary ^{18}F -NaF activity will ultimately translate into future adverse events,” say the investigators. “If the results prove confirmatory, then this technique has the potential to fundamentally alter the way we treat coronary artery disease.”

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Original article Joshi, N. V. *et al.*

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