Vascular Imaging with ^{18}F-FDG PET/CT: Optimal ^{18}F-FDG Circulation Time?

TO THE EDITOR: We read with interest the paper by Menezes et al. (*1*) concerning the optimal circulation time for ^{18}F-FDG in relation to atherosclerosis imaging. We think the paper considerably advances the knowledge base within this emerging field. We would like to raise a few points in relation to the work.

First, the reason for choosing to image patients with abdominal aortic aneurysm (AAA) is not clear. In order for one to draw conclusions about the optimum time to start PET/CT acquisition in atherosclerosis, surely the study of atherosclerosis patients would have been a better choice? Although the processes underlying both diseases are similar, inflammation may not be the dominant pathology at all stages of AAA (*2*). Given the decision to study patients with AAA, without intravenous contrast, it is hard to be sure that regions of interest were indeed placed on the wall of the aorta rather than on areas of thrombus.

Second, it is not clear whether the outcome variable used was a single hottest standardized uptake value within the aneurysm or whether a complete slice-by-slice analysis of the aorta was performed. Along the same line, was the ^{18}F-FDG uptake in other regions of the aorta or in the carotid arteries measured? Those results, if available, would add considerable weight to the conclusions drawn because they would reflect atherosclerotic plaque inflammation rather than presumed atherosclerosis within AAA.

Finally, why did the authors choose the lumen of the aorta from which to derive background blood signal, rather than an adjacent vein such as the inferior vena cava or jugular as previously described (*3,4*)? The aortic lumen regions of interest may have been subject to partial-volume errors of activity spilling into the field. This possibility could explain some of the variability experienced in the later target-to-background measurements.

We congratulate the authors on their important study. We agree that standardization of imaging protocols (dose, acquisition mode, and imaging time points) across different vendors is crucial to the appropriate use of this technology for efficacy tests of novel antiatherosclerosis drugs and for possible prediction of future events.

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REPLY: We appreciate the important comments from Drs. Rudd, Elkhawad, and Fayad regarding our recent investigation of the optimum circulation time for ^{18}F-FDG in relation to atherosclerosis imaging (*1*), and we would like to address these.

The patients were part of a larger study investigating the role of inflammation in the rate of expansion of abdominal aortic aneurysm. Abdominal aortic aneurysms typically arise in the setting of severe atherosclerosis (*2*), and several studies have suggested that aneurysmal disease may progress from occlusive disease (*3*). Inflammation does play an important role in the pathogenesis of atherosclerotic aneurysms, with increased ^{18}F-FDG uptake in symptomatic aneurysms being shown to correlate with macrophage and T-cell infiltrates into the aortic wall (*4*). This correlation would seem to suggest that the results are applicable to vascular inflammation imaging in other arterial territories.

We accept that the use of unenhanced CT made identification of the aortic lumen more difficult for region-of-interest placement, but we suggest that the wall is easy to identify because it is peripherally bound by intraabdominal fat, which has a different CT density. One advantage of using the aorta, instead of the carotid or iliac arteries, is that it is larger and thus has more easily identified boundaries.

The outcome variable was the maximum standardized uptake value at the area of most intense aortic wall ^{18}F-FDG uptake averaged over each dynamic acquisition at each time point. This value was identified by examining each PET/CT slice acquired. However, only a single bed position covering the abdominal aorta was acquired. Therefore, no other vascular territories were examined.

We chose the lumen of the aorta as the background region of interest because the diameter of the lumen of an aortic aneurysm is considerably larger than that of the adjacent inferior vena cava. Therefore, we aimed to minimize spillover from one region into another by selecting a centrally placed region of interest at the center of the enlarged lumen. The effect of any remaining spillover would be to reduce the target-to-background ratio and therefore minimize any changes with time. We agree that partial-volume errors are an important consideration in the semiquantitative analysis of ^{18}F-FDG uptake when the structures of interest (e.g., blood vessels) are smaller than the spatial resolution of the