18F-sodium fluoride positron emission tomography-computed tomography in acute aortic syndrome

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Funding Acknowledgement: Type of funding source: Foundation. Main funding source(s): British Heart Foundation

Background: Acute aortic syndrome is characterised by diseases that disrupt the intima and weaken the aorta. This damaged aorta is prone to aneurysmal dilation and ultimately rupture – a catastrophic event. 18F-sodium fluoride positron emission tomography and computed tomography (PET-CT) is a promising multimodality imaging technique that informs on the pathological state of the aorta. In abdominal aortic aneurysms (a chronic aortic disease), 18F-sodium fluoride PET uptake is associated with aortic expansion and requirement for aortic repair.

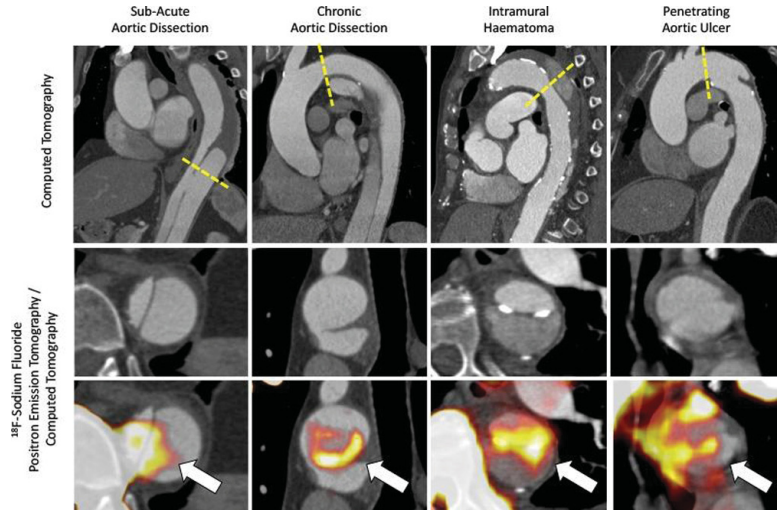
Purpose: The aim of this study was to describe aortic 18F-sodium fluoride uptake in patients with acute aortic syndrome for the first time.

Methods: Patients with intramural haematomas, aortic dissections or penetrating aortic ulcers, along with healthy control subjects, underwent contrast-enhanced 18F-sodium fluoride PET-CT. 18F-Sodium fluoride uptake was assessed using standardised uptake values and corrected for background blood pool activity to obtain tissue-to-background ratios (TBR).

Results: Forty-six patients and twenty healthy control subjects were matched for age, gender, body mass index, ischaemic heart disease and diabetes mellitus. Participants with acute aortic syndrome had widespread aortic 18F-sodium fluoride uptake. Radiotracer binding in patients with acute aortic syndrome was substantially greater than healthy subjects (TBR 2.00±0.45 vs 1.36±0.39, $p<0.001$). Subgroup analysis in patients with untreated type B acute aortic dissection revealed peak radiotracer binding at the site of intimal disruption compared to the proximal reference aorta (TBR [inter-quartile range] 1.61 [1.38–1.88] vs 1.18 [1.08–1.39] respectively; $p<0.001$).

Radiotracer uptake was highest in patients with penetrating aortic ulcers, followed by aortic dissection and intramural haematomas (TBR (±SD) 2.19±0.55 vs 1.99±0.43 vs 1.71±0.27 respectively; p=0.046). No difference in radiotracer uptake was observed between patients with sub-acute and chronic disease (TBR (±SD) 1.94±0.37 vs 2.04±0.51, p=0.497). 18F-sodium fluoride uptake was similar between Stanford Type A and Type B dissections (TBR (±SD) 1.98±0.49, 2.00±0.44, p=0.851). 18F-Sodium fluoride binding was independent of maximum aortic diameter (R2 = 0.036, p=0.21).

Conclusion: Our preliminary findings suggest that aortic 18F-sodium fluoride uptake is increased in patients with acute aortic syndrome, especially around the site of intimal disruption or penetrating aortic ulcers. This technique appears to identify disease activity that may have clinical applications for assessing prognosis and guiding therapeutic interventions.



18F-NaF PET/CT in Acute Aortic Syndrome