Thrombus formation on bioprosthetic aortic valves

R. Bing[1], J. Andrews[1], M. Williams[1], T. Clark[1], S. Semple[1], E. Van Beek[1], C. Lucatelli[1], S. Sellers[2], J. Leipsic[2], A. Tavares[1], A. Stephens[3], N. Koglin[3], M. Dweck[1], D. Newby[1]

[1]University of Edinburgh, Edinburgh, United Kingdom; [2]University of British Columbia, Vancouver, Canada; [3]Life Molecular Imaging, Berlin, Germany

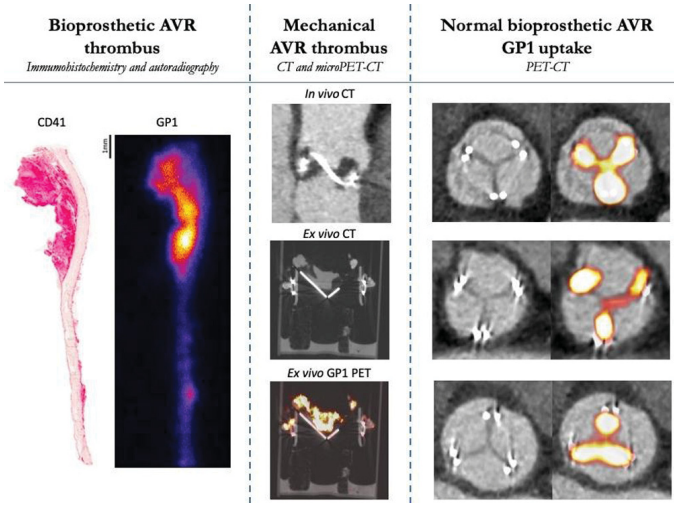
Funding Acknowledgement: Type of funding source: Foundation. Main funding source(s): British Heart Foundation

Background: 18F-GP1 is a novel radiotracer with a high affinity for the platelet glycoprotein IIb/IIIa receptor. Subclinical bioprosthetic valve thrombus has been postulated as a trigger for accelerated valve degeneration.
Purpose: To determine the feasibility of 18F-GP1 positron-emission tomography-computed tomography (PET-CT) for the detection of subclinical bioprosthetic aortic valve thrombus.
Methods: (i) Explanted degenerated aortic valve prostheses underwent histology and imaging. (ii) In a prospective observational study, patients with bioprosthetic aortic valve replacement (AVR) underwent echocardiography and 18F-GP1 PET-CT. Valves were assessed for hypoattenuating leaflet thickening (HALT), hypo-attenuation affection leaflet motion (HAM) and GP1 uptake.
Results: (i) GP1 correlated with thrombus on explanted valves (Figure). (ii) The first 6 patients (Table) were asymptomatic and had normally functioning surgical bioprostheses on echocardiography. At a median of 166 (range 122–189) days post-AVR, no patients had HALT or HAM on CT. There was avid focal GP1 uptake on the leaflets of all 6 patients which appeared most prominent along the leaflet edges (Figure). Only one patient had focal uptake in the valve frame, remote from the leaflets. In a separate cohort undergoing 18F-GP1 PET-CT for other conditions, there was no uptake on normal, native aortic valves (n=8).
Conclusion: For the first time, we demonstrate that 18F-GP1 PET-CT is a highly sensitive method of assessing platelet activation on bioprosthetic aortic valves. Despite the absence of CT evidence, early thrombus appeared to be a universal finding on recently implanted valve prostheses. The biological and clinical implications of subclinical bioprosthetic aortic valve thrombus have yet to be established.

Baseline characteristics

n	6
Age	71 (66–75)
Female	3 (50)
Aortic valve Vmax (m/s)	2.45 (2.65–2.20)
Aortic vale peak gradient (mmHg)	24 (19.5–28.5)
Aortic valve mean gradient (mmHg)	24 (19.5–28.5)
SUVmax	14.1 (5.9–10.8)
SUVmean	4.1 (2.6–3.1)
TBRmax	7.0 (3.3–5.2)
TBRmean	2.1 (1.4–1.7)

n (%) or median (interquartile range). SUV, standardised uptake value; TBR, tissue to background ratio.



GP1 uptake in AVR