In vivo thrombosis imaging in patients recovering from COVID-19 and pulmonary embolism

In vivo Thrombosis Imaging in Patients Recovering from COVID-19 and Pulmonary Embolism

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Word count: 197/200

Running title: 18F-GP1 in COVID-19 and pulmonary embolism

Author contributions: RB, JA, MW, EB, MD and DN designed the study. RB, JA, MW, EB, CL, GM, TC, NK, AS, MM, AT, KD, DD, CL, MD and DEN contributed to data acquisition and analysis or interpretation. RB drafted the work. All authors revised the final version and approved it for publication. RB is responsible for data integrity.

Research impact: Protracted macrovascular and microvascular thrombosis of the systemic and pulmonary circulation is a feature of COVID-19 that persists despite systemic therapeutic anticoagulation. 18F-GP1 has potential applications across a

AJRCCM Articles in Press. Published August 10, 2021 as 10.1164/rccm.202011-4182IM

broad range of pathologies as well as monitoring thrombus burden in those recovering from COVID-19.

Funding: British Heart Foundation (RG/16/10/32375, RE/18/5/34216, PG/19/40/34422)

Disclosures: NK and AS are employees of Life Medical Imaging who provided reagents for radiotracer production.

Single descriptor: pulmonary embolism

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AJRCCM Articles in Press. Published August 10, 2021 as 10.1164/rccm.202011-4182IM

18F-GP1 is a novel radiotracer that binds to the platelet glycoprotein IIb/IIIa receptor and can image in vivo venous and arterial thrombi including deep vein thrombosis and pulmonary thromboemboli (1-3). We performed 18F-GP1 positron emission tomography-computed tomography (PET-CT) in 6 patients recovering from coronavirus disease (COVID)-19 with concomitant pulmonary embolism (median age 56 [interquartile range 53-60] years, 1 female, 5 requiring supplemental oxygen, no intensive care admissions) and undertook 18F-GP1 autoradiography of post-mortem lung tissue in 3 patients who had died from COVID-19 (4).

All patients demonstrated increased pulmonary 18F-GP1 uptake at a median of 69 (interquartile range 56-98) days after index presentation despite ongoing therapeutic oral anticoagulation. Focal intravascular uptake in persistent pulmonary embolism (A) was seen, as described previously (5). However, we also noted parenchymal uptake in regions of consolidation (B), as well as systemic uptake in an occluded saphenous vein coronary artery bypass graft and left ventricular thrombus which was subsequently confirmed on echocardiography (C). 18F-GP1 autoradiography also demonstrated focal and specific uptake co-localising to intravascular thrombus in patients with confirmed diffuse alveolar damage (D).

Protracted systemic and pulmonary thrombosis may be a feature of COVID-19 that can persist despite systemic therapeutic anticoagulation. 18F-GP1 is able to detect pulmonary and systemic arterial thrombosis and has potential applications across a broad range of pathologies.

AJRCCM Articles in Press. Published August 10, 2021 as 10.1164/rccm.202011-4182IM

SOURCES OF FUNDING

This work was supported by the British Heart Foundation (RG/16/10/32375, RE/18/5/34216, PG/19/40/34422).

DISCLOSURES

Radiotracer reagents were provided by Life Molecular Imaging.

PUBLICATION STATEMENT

This image has not been published elsewhere.

AJRCCM Articles in Press. Published August 10, 2021 as 10.1164/rccm.202011-4182IM

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AJRCCM Articles in Press. Published August 10, 2021 as 10.1164/rccm.202011-4182IM

FIGURE LEGEND

A. *Left*: Segmental pulmonary embolus with associated 18F-GP1 uptake. *Right:* Focal 18F-GP1 uptake without computed tomography pulmonary angiogram evidence of subsegmental thrombus.

B. Three examples of parenchymal 18F-GP1 uptake associated with consolidation (*left)*, healing peripheral infarction (*middle)* and nodular uptake in ground-glass changes with an associated dilated pulmonary artery but no evidence of pulmonary embolism at this site on computed tomography pulmonary angiogram (*right).*

C. Incidental systemic intravascular thrombosis and associated 18F-GP1 uptake at the site of an occluded saphenous vein coronary artery bypass graft (*left*), apical left ventricular thrombus (*middle*), left common femoral vein deep vein thrombosis (*right*).

D. Hematoxylin and eosin-stained sections of post-mortem pulmonary tissue with corresponding 18F-GP1 autoradiography in two patients who died of COVID-19. Diffuse alveolar damage and microvascular thrombosis was seen on histopathology. 18F-GP1 co-localises to intravascular thrombus (*left, centre-left)* but not to more organised thrombus of older duration (*centre-right, right)*. There is also 18F-GP1 signal in smoking-related anthracotic pigment.

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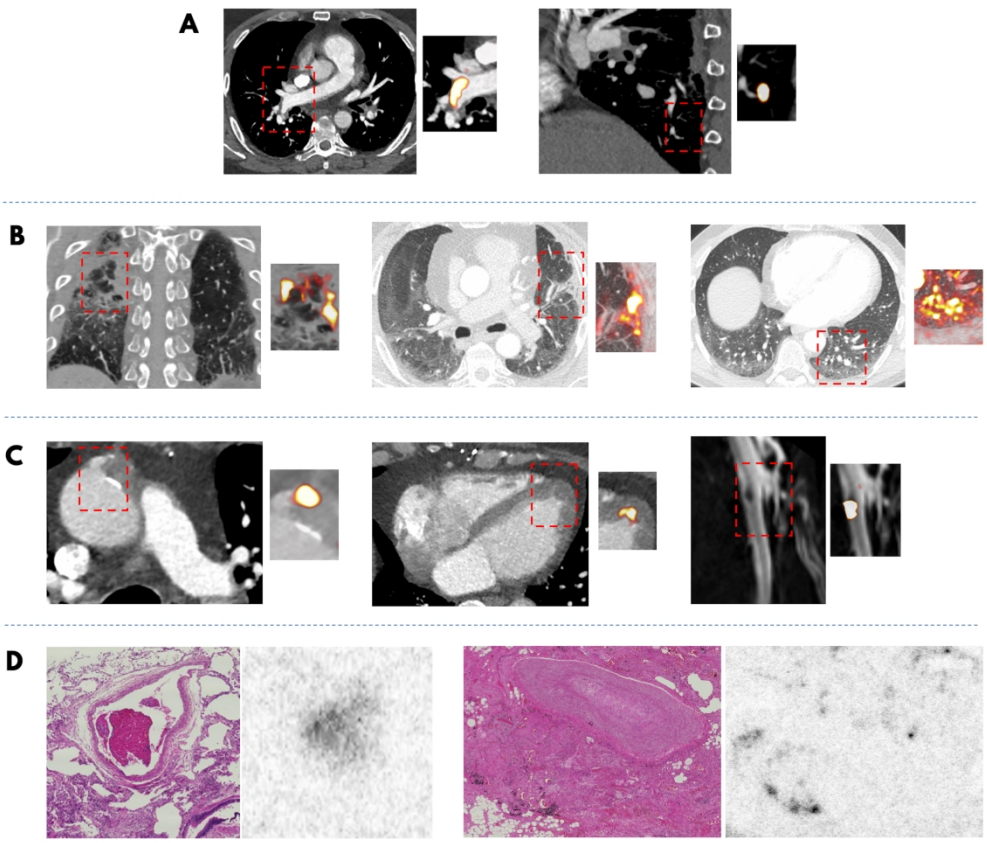

Figure 1
A. Left: Segmental pulmonary embolus with associated 18F-GP1 uptake. Right: Focal 18F-GP1 uptake without computed tomography pulmonary angiogram evidence of subsegmental thrombus.
B. Three examples of parenchymal 18F-GP1 uptake associated with consolidation (left), healing peripheral infarction (middle) and nodular uptake in ground-glass changes with an associated dilated pulmonary artery but no evidence of pulmonary embolism at this site on computed tomography pulmonary angiogram (right).
C. Incidental systemic intravascular thrombosis and associated 18F-GP1 uptake at the site of an occluded saphenous vein coronary artery bypass graft (left), apical left ventricular thrombus (middle), left common femoral vein deep vein thrombosis (right).
D. Hematoxylin and eosin-stained sections of post-mortem pulmonary tissue with corresponding 18F-GP1 autoradiography in two patients who died of COVID-19. Diffuse alveolar damage and microvascular thrombosis was seen on histopathology. 18F-GP1 co-localises to intravascular thrombus (left, centre-left) but not to more organised thrombus of older duration (centre-right, right). There is also 18F-GP1 signal in smoking-related anthracotic pigment.

338x338mm (300 x 300 DPI)

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