^{18}F-FDG PET/CT findings in post COVID Multisystem inflammatory syndrome in adults (MIS-A)

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Short Report

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Abstract

We describe 18 fluorodeoxyglucose positron emission tomography/computed tomography (^{18}FDG-PET-CT) findings in a patient that inadvertently betrayed features of MIS-A. The findings were suggestive of an exaggerated Systemic inflammatory response syndrome (SIRS)- a prequel to MIS-A. MIS-A has been recently described in 2020 as a post-infectious or para-infectious sequela of COVID-19. Within 12 weeks of symptomatic or asymptomatic COVID-19 illness (diagnosed by serum SARS CoV2 antibodies), patients present with an illness requiring hospitalization that can rapidly progress to myocardial dysfunction and cardiogenic shock. (1)

As with any illness, there is a period of 'quiet before the storm'. Identification of patients early in the course of the illness and prompt treatment can improve clinical outcomes in MIS-A.

Introduction

Although rapid vaccination development and deployment have helped COVID vaccination rates (3.42 billion) rapidly outpace COVID infections (182 million) [by June 13, 2021], COVID-19 continues to strain healthcare resources.(1) Since April 2020, new complications of COVID-19 such as Multisystem inflammatory syndrome in adults have emerged. MIS-A is primarily an extra-pulmonary multi-organ dysfunction (MODS) that occurs as a para or post-infectious complication of COVID-19.(2) As most patients are very sick at the time of hospitalization, clinical features, laboratory evidence of inflammation, and current or previous SARS-CoV2 are used for diagnosis. ^{18}F-FDG PET/CT findings have not been described in MIS-A.

Methods

Two patients underwent ^{18}F-FDG PET/CT for evaluation of pyrexia of unknown origin. Eight mCi of 18F Flouro Deoxy Glucose (FDG) was injected IV in euglycemic status. One hour later, imaging was performed on a Siemens Biograph Horizon Time of Flight 16 Slice PET CT scanner. Standardized Uptake Value (SUV) was calculated for body weight and expressed as g/ml. PET-CT showed abnormal findings that led to evaluation for MIS-A.

Results

Two patients (aged 28–33 years) (M: F -1:1) presented within 3 weeks of COVID-19 illness with high-grade fever for one week. They had no prior co-morbidities. On examination, both were febrile (38–39^0 C), tachycardic (110–130 bpm), and had cervical lymphadenopathy. On day 8 after extensive evaluation for fever was negative, both patients underwent an ^{18}F-FDG PET/CT for PUO. This showed splenic avidity, cervical lymphadenopathy, and symmetrical abdominal oblique muscle uptake. The second patient additionally had cardiomegaly and symmetrical abdominal recti muscle uptake. Systemic inflammatory markers were elevated in both [CRP-272- 301, (< 5 mg/L), S. Ferritin- 1800–2354 (20–250 ng/ml), D-

dimer-2830-3850 (< 500ng/ml) and there was transaminitis (ALT 150–230 (< 31 U/L) and AST 180–195 (< 34 U/L). Serum CPK levels were normal in both patients. MIS-A was considered 2 days later in case 1, when an Echocardiogram showed a reduced ejection fraction (EF) of 40%, elevated hs Troponin I-143 (< 13 ng/ml), and BNP-789 (< 100 pg/ml)). He was started on IVIg 2gm/kg and IVmethylprednisolone 1gm/day over the next 5 days.(2) He was asymptomatic by day 17.

The woman was suspected to have MIS-A after PET-CT and started on IV methylprednisolone. 24 hours later, she went into cardiogenic shock and MODS. Despite administering IVIG, Plasma exchange, and Rituximab, she succumbed after 3 weeks.

Discussion

Resting muscles do not show ^{18}F-FDG muscle uptake on PET/CT (as they utilize fatty acid oxidation for energy purposes). However, muscle uptake can increase if the patient is tachypneic, has exercised strenuously just before imaging, or moves vigorously during image acquisition. Increased uptake in the paraspinal muscles, posterior cervical, trapezius, or other muscles that have been exerted can be observed.(3) Dyspneic or COPD patients show increased FDG uptake in the diaphragm, chest wall, and abdominal muscles. Muscle uptake also increases in inflammatory myopathies or Grave's disease [symmetrical uptake in the psoas and rectus abdominis muscles].(4)

Splenic and lymph node avidity on ^{18}F-FDG PET/CT are compatible with a Systemic Inflammatory Response Syndrome (SIRS).(5) As MIS-A is a SIRS with MODS, more extensive changes can be expected on PET/CT. Our patients were eupneic and calm during the PET-CT. Thus, a combination of splenic, lymph node and symmetrical abdominal muscle ^{18}F-FDG uptake was more suggestive of a systemic inflammatory syndrome with myositis than an infection.

MIS-A is diagnosed at an average of ~ 5 days after the onset of illness, by which time, the patient is often critically ill.(6) ^{18}F-FDG PET/CT could potentially be used as a functional imaging marker of early MIS-A, before the onset of MODS.

References

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Declarations

Patient consent was obtained for these studies.

Competing interests; None

Ethics committee waiver was obtained from Aster Medcity EC as the report is only for 3 cases.

Figures

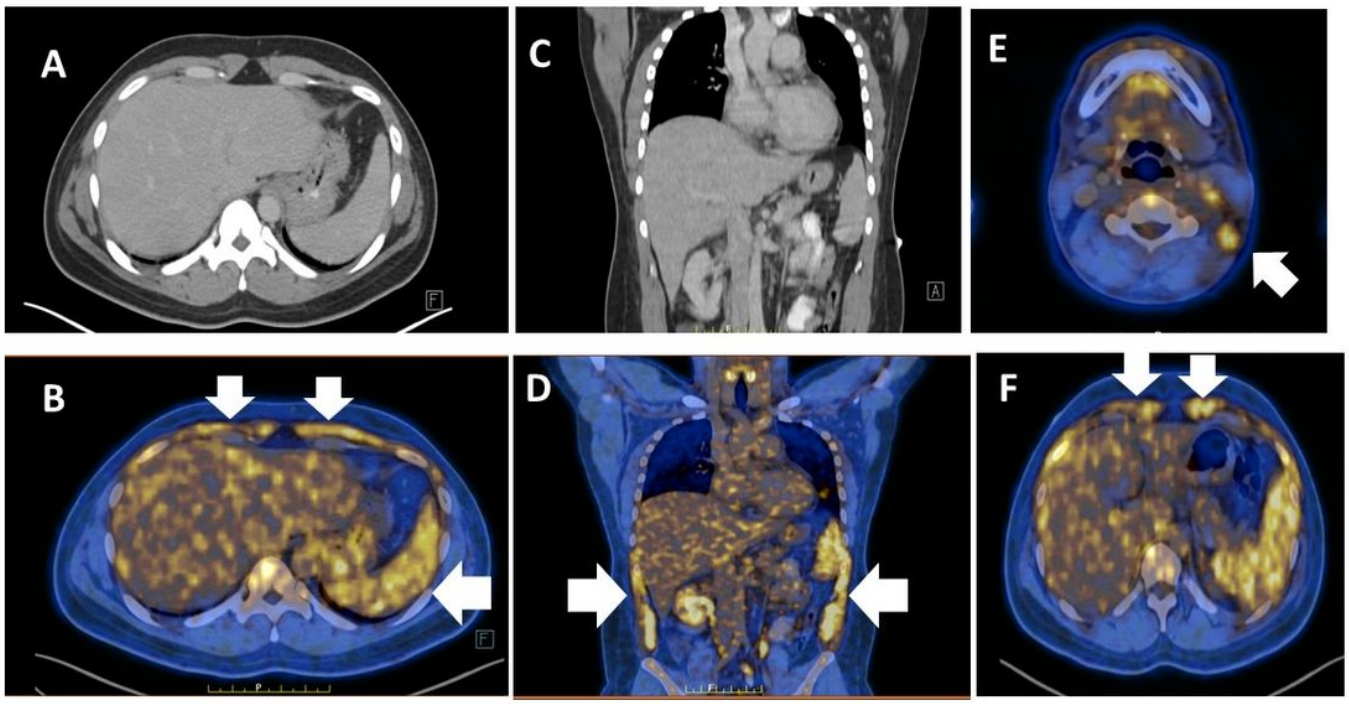

Figure 1

Panel A and B; Transaxial images showing diffuse increased FDG splenic uptake (white arrow) (SUV Max 4.2) compared to the liver without any corresponding CT lesions. Panel C and D. Coronal CT and PET CT images showing increased FDG uptake in the oblique muscles (white arrows) of the abdomen bilaterally (SUV Max 5.5). Panel E; Transaxial image showing an FDG avid left cervical node. Panel F: Transaxial image showing FDB avidity in the rectus abdominis muscles bilaterally (white arrows)

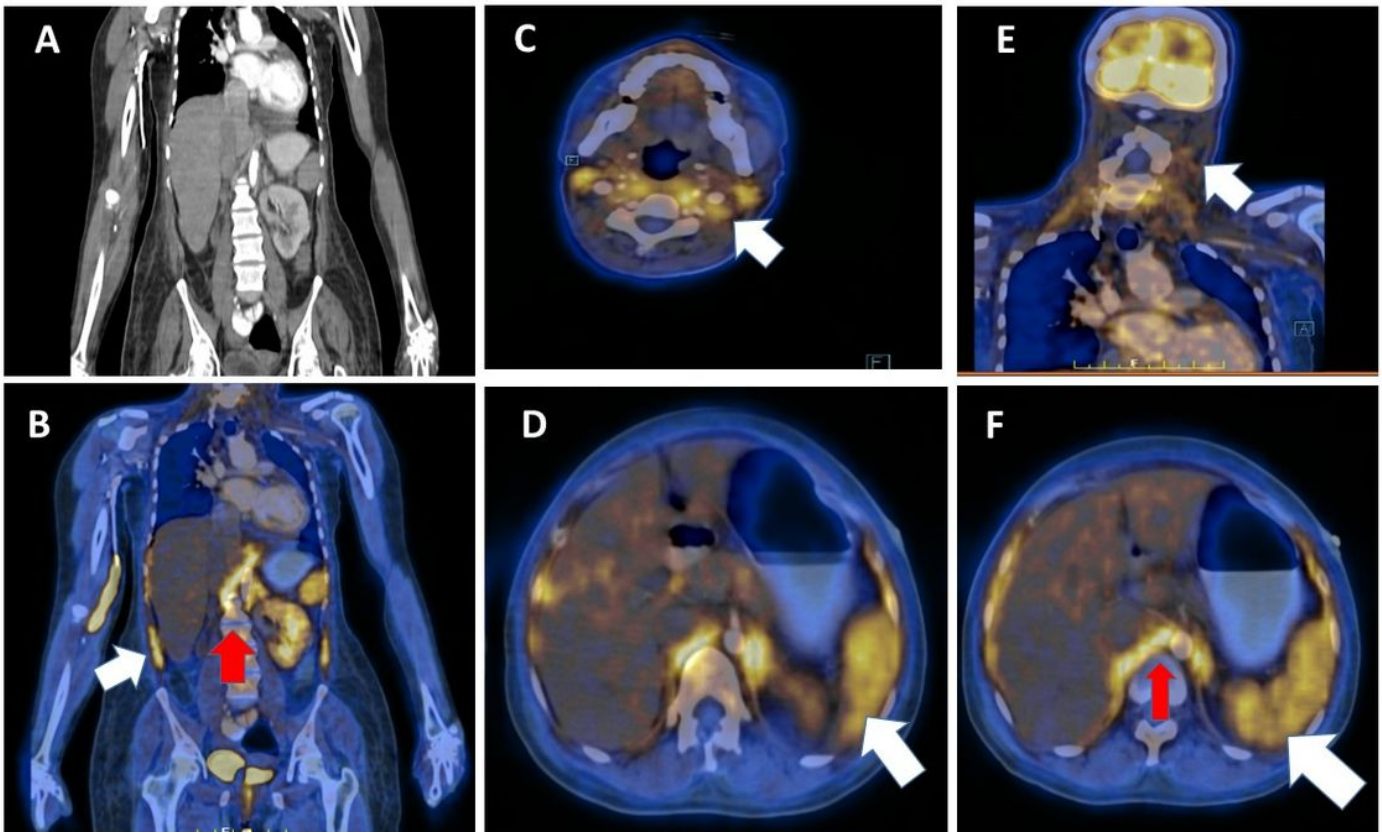

Figure 2

Panel A Coronal CT image. Panels B-F-18F-FDG PET-CT images. Panel B- showing oblique muscle avidity (white arrow) and diaphragmatic crura avidity (red arrow). Panels C & E- Cervical lymphnode avidity (white arrow). Panels D & F showing splenic avidity (white arrow) and diaphragmatic crura avidity (red arrow).