^{68}Ga-DOTATATE Uptake in COVID-19 Pneumonia: A Non-Neoplastic False Positive

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Abstract

In the detection and characterization of neuroendocrine tumors (NETs), the NETSPOT ^{68}Ga-DOTATATE positron emission tomography/computed tomography (PET/CT) utilizes a somatostatin analog to capture whole body imaging of somatostatin receptors. Here, we report a rare case of incidental coronavirus disease 2019 (COVID-19) detection using ^{68}Ga-DOTATATE PET/CT for a 48-year-old patient with COVID-19 who presented to our nuclear medicine department for oncologic and neuroendocrine indications. Current maximal intensity project image from ^{68}Ga-DOTATATE PET/CT demonstrated numerous hypermetabolic foci in the upper abdominal lymph nodes, consistent with somatostatin-avid pancreatic islet cell neoplasm. Radiotracer uptake corresponding to the anatomic infiltrates was also seen in the bilateral pneumonia. With the rise of worldwide COVID-19 cases, and the continued use of NETSPOT for somatostatin avid neoplasms, it is imperative that diagnostic measures of this disease are clearly understood. This case highlights the importance of including COVID-19 on the differential diagnosis when radiotracer uptake appears in ^{68}Ga-DOTATATE PET/CT.

Keywords
- Netspot
- coronavirus
- PET

Key Messages

COVID-19 should be included in the differential diagnosis when radiotracer uptake appears in NETSPOT ^{68}Ga-DOTATATE PET/CT. Current documented false-positive findings for ^{68}Ga-DOTATATE PET/CT include pancreatic uncinate process activity, prostatitis, splenosis, postradiation therapy change, paraganglioma, pheochromocytoma, neuroblastoma, meningioma, and osteoblastic activity.

Introduction

The coronavirus disease 2019 (COVID-19) outbreak has infected over 131 million people and caused 2.85 million deaths worldwide, as of early April 2021.[1] In many patients, COVID-19 presents with nonspecific symptoms such as fever, cough, and chest pain, while in some others, the infection remains asymptomatic.[2] Despite its suboptimal sensitivity, nucleic acid testing (reverse transcription polymerase chain reaction [RT-PCR]) has been regarded as the gold standard to confirm the diagnosis of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Imaging can be a useful adjunct. In symptomatic patients, chest X-rays are typically obtained. Computed tomography (CT) chest may be added as a key supplemental tool for the diagnosis of SARS-CoV-2 given its reported improved sensitivity relative to RT-PCR (98 vs. 71%).[3] Recently, several groups have reported the incidental [18F]-2-fluoro-2-deoxy-D-glucose (FDG)—positron emission tomography/computed tomography (PET/CT) imaging

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findings of COVID-19 (^{18}F-FDG PET) in the diagnosis of COVID-19.[4–6] The most prominent features reported on FDG-PET/CT in patients with COVID-19 include FDG uptake in pulmonary parenchymal lesions that are typically peripheral, bilateral, ground glass opacities.[5]

In the detection and characterization of neuroendocrine tumors (NETs), the NETSPOT ^{68}Ga-DOTATATE PET/CT utilizes a somatostatin analog to capture whole body imaging of somatostatin receptors. Somatostatin receptor imaging is successfully accomplished using 111In-DTPA-penteoctreotide (Octreoscan).[7] However, downsides to Octreoscan (including suboptimal spatial resolution, suboptimal image quality, and multiple day imaging protocols) have led to the development of several chelator-conjugated somatostatin analogs, including DOTATATE. These short amino acid–chelator conjugates have a higher affinity than Octreoscan for somatostatin receptors. Further, they can be labeled with ^{68}Ga, permitting imaging with PET and improved spatial resolution and image quality.[7] Here, to our knowledge, we report the first case of incidental COVID-19 detection using ^{68}Ga-DOTATATE PET/CT for a patient with COVID-19 who presented to our nuclear medicine department for oncologic and neuroendocrine indications.

Case Report

In July of 2020, a 48-year-old male with known pancreatic neuroendocrine carcinoma was evaluated for status of disease with NETSPOT ^{68}Ga PET/CT. The scan demonstrated multiple areas of metastatic disease in the liver and abdominal lymph nodes (not shown) and new bilateral ground glass opacities in the lungs (►**Fig. 1A** and **B**). The developing infiltrates were associated with low level but clearly abnormal radiotracer activity (►**Fig. 2**). Upon questioning the patient, it was discovered that he was recovering from COVID-19 infection that was diagnosed 3 weeks prior (►**Fig. 3**). The findings were not present on a prior scan

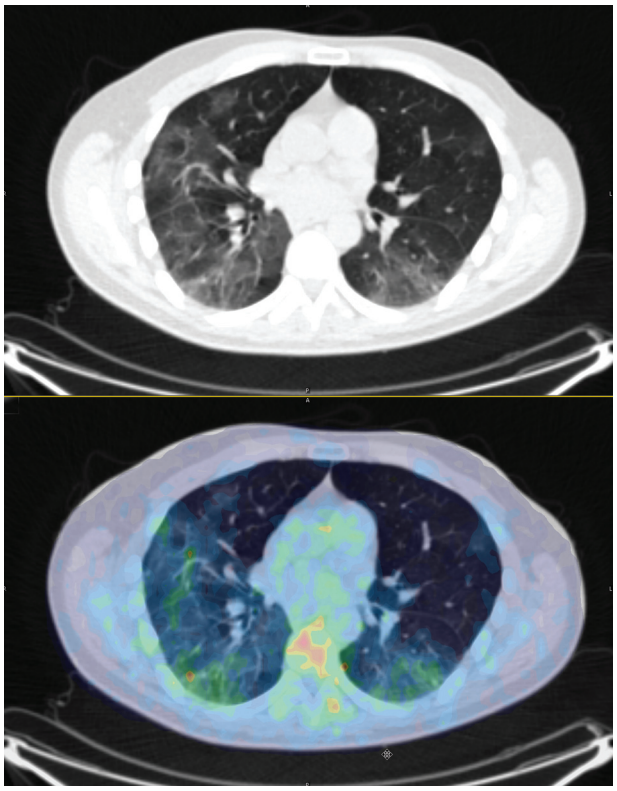

Fig. 1 (**A**) Axial computed tomography (CT) with lung windows demonstrates peripheral subpleural ground glass opacities predominantly in the lower lobes, typical of coronavirus disease 2019 pneumonia. These infiltrates correspond to the areas of uptake on scintigraphy. (**B**) Axial positron emission tomography-computed tomography (PET-CT) fusion with ^{68}Ga-DOTATATE PET/CT shows radiotracer uptake corresponding to the anatomic infiltrates. Maximum standardized uptake value 2.6.

Fig. 2 Maximal intensity projection image from the positron emission tomography-computed tomography demonstrates numerous hypermetabolic foci in the liver and upper abdominal lymph nodes, consistent with somatostatin-avid pancreatic islet cell neoplasm. Maximum standardized uptake value (SUV_{max}) liver masses 5.2. SUV_{max} abdominal lymph nodes 4.7.

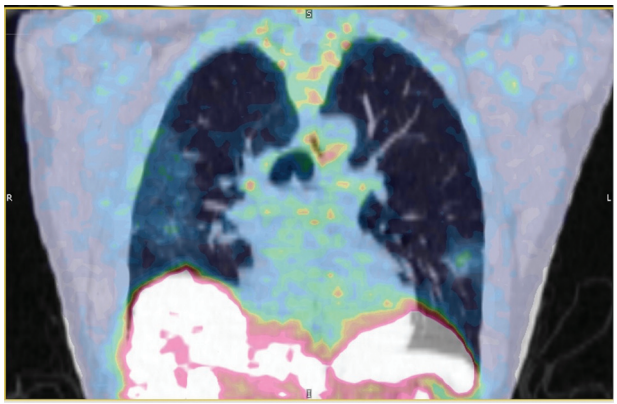

Fig. 3 Coronal positron emission tomography-computed tomography fusion shows radiotracer accumulation corresponding to the distribution of the bilateral ground glass pneumonia.

3 months earlier (not shown). Subsequent scan several months later for standard treatment follow-up demonstrated resolution of infiltrates and associated radiotracer uptake (not shown).

Discussion

The increase in reported incidental findings of COVID-19 on FDG-PET/CT imaging underscores the impact nuclear medicine may have outside of the oncologic setting. FDG-PET/CT plays a role in evaluating various inflammatory and infectious diseases, which may guide patient management and treatment.[8] Before the appearance of COVID-19, Das et al reported significant FDG uptake in a patient with Middle East respiratory syndrome coronavirus infection that ultimately progressed to pneumonia.[9]

In our case, an asymptomatic COVID-19 patient presented to our clinic for neuroendocrine cancer screening, and we observed pathologic uptake within the pneumonia using ^{68}Ga-DOTATATE PET/CT. It is important that the clinician be aware of potential false positives when imaging with this radiotracer.

Current documented false-positive findings for ^{68}Ga-DOTATATE PET/CT include pancreatic uncinate process activity, prostatitis, splenosis, postradiation therapy change, paraganglioma, pheochromocytoma, neuroblastoma, meningioma, and osteoblastic activity.[10] This case adds COVID-19 pneumonia to the list. With the growing number of worldwide COVID-19 cases, and the continued use of NETSPOT for somatostatin avid neoplasms, it is imperative that diagnostic measures of this disease are clearly understood. This case highlights the importance of including COVID-19 on the differential diagnosis when radiotracer uptake appears in ^{68}Ga-DOTATATE PET/CT.

Authors' Contributions

JPW was involved in conceptualization, designing, definition of intellectual content, literature search, manuscript preparation, review, and editing. TB contributed substantially in conceptualization, designing, definition of intellectual content, manuscript review and editing. TB has provided guarantee for this manuscript.

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Conflicts of Interest

None declared.

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