FDG PET/CT in Diagnosing COVID-19 Infection in a Cancer Patient With Exposure History But Minimal Symptoms

Hubert H. Chuang, MD, PhD, Dustin J. Emery, BS,
Richelle Millican Campbell, BS, and Yang Lu, MD, PhD

Abstract: A 56-year-old woman with high-grade neuroendocrine small cell carcinoma had known contact history of COVID-19 about 16 days prior to the restaging PET/CT. The patient was instructed to self-quarantine for 14 days, and no COVID-19 test was performed. Upon arrival, the patient had low-grade fever of 37.1°C, but did not meet infection control criteria for COVID-19 testing, and it was approved to proceed with PET/CT. The FDG PET/CT images revealed new multifocal hypermetabolic bilateral pulmonary ground-glass opacities that are suggestive of COVID-19 pneumonia. Meanwhile, the patient's symptoms worsened, and a blood test later confirmed COVID-19 infection.

Key Words: COVID-19, FDG PET/CT, infection

(*Clin Nucl Med* 2020;00: 00–00)

Received for publication April 11, 2020; revision accepted April 25, 2020.
From the Department of Nuclear Medicine, Division of Diagnostic Imaging, The University of Texas MD Anderson Cancer Center, Houston, TX.
Conflicts of interest and sources of funding: none declared.
Correspondence to: Yang Lu, MD, PhD, Department of Nuclear Medicine, Division of Diagnostic Imaging, The University of Texas MD Anderson Cancer Center, 1400 Pressler St, Unit No. 1483, Houston, TX 77030.
E-mail: ylu10@mdanderson.org.
Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved.
ISSN: 0363-9762/20/0000-0000
DOI: 10.1097/RLU.00000000000003137

REFERENCES

1. Ai T, Yang Z, Hou H, et al. Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases. *Radiology*. 2020;200642.
2. Albano D, Bertagna F, Bertolia M, et al. Incidental findings suggestive of COVID-19 in asymptomatic patients undergoing nuclear medicine procedures in a high prevalence region [published online April 1, 2020]. *J Nucl Med*. 2020;jnumed.120.246256.
3. Xiong Y, Sun D, Liu Y, et al. Clinical and high-resolution CT features of the COVID-19 infection: comparison of the initial and follow-up changes [published online March 3, 2020]. *Invest Radiol*. 2020.
4. Xu X, Yu C, Qu J, et al. Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2. *Eur J Nucl Med Mol Imaging*. 2020;47:1275–1280.
5. Polverari G, Arena V, Ceci F, et al. (18)F-FDG uptake in asymptomatic SARS-CoV-2 (COVID-19) patient, referred to PET/CT for non-small cells lung cancer restaging [published online March 31, 2020]. *J Thorac Oncol*. 2020.
6. Qin C, Liu F, Yen TC, et al. ¹⁸F-FDG PET/CT findings of COVID-19: a series of four highly suspected cases. *Eur J Nucl Med Mol Imaging*. 2020;47:1281–1286.
7. Zou S, Zhu X. FDG PET/CT of COVID-19. *Radiology*. 2020;200770.
8. Tulchinsky M, Fotos JS, Slonimsky E. Incidental CT findings suspicious for COVID-19 associated pneumonia on nuclear medicine exams: recognition and management plan. *Clin Nucl Med*. 2020. [Epub ahead of print].
9. Pan F, Ye T, Sun P, et al. Time course of lung changes on chest CT during recovery from 2019 novel coronavirus (COVID-19) pneumonia. *Radiology*. 2020;200370.

FIGURE 1. A 56-year-old woman with metastatic high-grade neuroendocrine small cell carcinoma of a left paratracheal lymph node underwent radiotherapy. The 1.5-cm metastatic hypermetabolic left paratracheal lymph node on pretherapy FDG PET/CT showed intense FDG uptake (SUVmax 5.9, arrows; A: maximum intensity projection [MIP] PET; B–E: transaxial PET, CT soft tissue window, CT lung window, and fused PET/CT images). Of note, there were no ground-glass opacities (GGOs) in bilateral lungs.

FIGURE 2. Approximately 16 days prior to the restaging PET/CT, the patient had close contact with a COVID-19–positive patient. As she was asymptomatic and afebrile, the local authority advised her to self-quarantine for 14 days, and no COVID-19 test was performed. After 14 days’ self-quarantine, the patient presented for prescheduled restaging FDG PET/CT. Upon arrival, she had low-grade fever of 37.1°C, oxygen saturation of 93% at room air, and no shortness of breath or cough. Infectious disease service confirmed that the patient did not meet criteria for COVID-19 testing, and it was ok to proceed with PET/CT. Given her contact history of COVID-19, the patient was instructed to wear mask and kept in an isolated waiting room, while PET/CT was interpreted immediately. The FDG PET/CT images (A: MIP PET; B–E: transaxial PET, CT soft tissue window, CT lung window, and fused PET/CT; F–H: transaxial PET, CT lung window, and fused PET/CT images; and I–K: coronal PET, CT lung window, and fused PET/CT) showed that the metastatic left paratracheal lymph node has improved, now subcentimeter in size and with only background FDG uptake (long arrows in B, C), suggestive of favorable treatment response. However, there are new bilateral multifocal hypermetabolic GGOs (short arrows in A–K, SUVmax up to 4.8) compared with PET/CT 10 weeks ago (Fig. 1), suggestive of an infectious etiology. The GGOs presented as a “crazy paving” pattern, as reported in COVID-19 pneumonia.^{1–4} At rechecking of vital signs, the patient complained of sore throat and shortness of breath with exertion, oxygen saturation was 97% at room air, but temperature rises to 37.7°C. Subsequently, the patient was admitted for further management. The COVID-19 test result was confirmed as positive the next day. The patient received treatment with nasal oxygen, azithromycin, and hydroxychloroquine. There are only a handful cases that have been reported of FDG PET/CT in patients with COVID-19.^{5–7} However, nuclear medicine physicians should be aware of the suspicious COVID-19 image findings during the COVID-19 pandemic time and be vigilant of the incidental findings suggestive of an active infection/inflammation process,⁸ especially in patients with known contact history and with subtle symptoms or even asymptomatic.⁵ The hypermetabolic activity of GGOs is suggestive of active infection, as in this patient. We are pondering the extent and intensity of hypermetabolic GGOs on PET/CT might have correlation with COVID-19 clinical presentation and severity, but this will need more data to verify, and its anatomic correlation with the CT appearance during the disease course⁹ remains to be seen.