

Surprise diagnosis of COVID-19 following neuro-imaging evaluation for unrelated reasons during the pandemic in hot spots

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Abstract

During the height of recent outbreak of COVID-19 in New York City, almost all the hospital emergency rooms (ERs) were inundated with COVID-19 patients who presented with typical fever, cough and dyspnea, though a small number of patients also presented with either unrelated complaints (such as trauma) or other emergencies some of which are now known to be associated with COVID-19 (such as stroke). We report such a scenario in 17 patients who were admitted and investigated with CT spine imaging and CT angiography for non-pulmonary reasons (trauma=13, stroke=4). Their initial work up did not suspect COVID-19 as a diagnosis, but showed unsuspected/incidental lung findings, which led to further investigations and diagnosis of COVID-19.

Introduction:

During the height of the recent outbreak of COVID-19 in New York City, one of the worst affected regions in the United States, almost all hospital emergency rooms (ERs) were inundated with COVID-19 patients who presented with typical fever, cough and dyspnea, though a small number of patients also presented with either unrelated complaints (e.g. trauma) or other atypical emergencies some of which are now known to be associated with COVID-19 (e.g. stroke).¹ We discuss 17 such patients who presented to the ER with non-pulmonary complaints and did not raise suspicion of COVID-19 at the time of admission. Initial non-pulmonary imaging in the ER led to discovery of incidental lung findings that triggered further testing for SARS-CoV-2 virus and with eventual diagnosis of COVID-19.

Materials and Methods:

473 out of a total of 3160 COVID-19 positive patients, who were admitted to NYU Langone Health, New York between March 1, 2020 and April 13, 2020 were investigated with various neuro-imaging examinations (CT, MRI and angiography), some of which included partial coverage of bilateral lung fields. A confirmed case of Covid-19 was defined as a positive result on real-time reverse transcriptase-polymerase-chain-reaction (RT-PCR) assay of nasopharyngeal or oropharyngeal swab specimens. While reviewing these 473 patients, we identified a subgroup of 17 patients (44-93 years, Mean age 72 years; M:F::8:9) in which COVID-19 as a diagnosis was not suspected at the time of admission and underwent neuro-imaging.

This study was approved by the NYU Grossman School of Medicine Institutional Review Board, which granted both a waiver of informed consent, and a waiver of the Health Information Portability and Privacy Act.

Results:

The reason for the imaging study in these 17 patients was trauma (N=13) evaluated with spine CT (Cervical spine=11, thoracic spine=2; with coverage of the posterior lungs) and acute stroke (N=4) evaluated with CT angiography of the brain and neck (with coverage of the lung apices). 12 out of 13 patients with trauma had history of mechanical fall related with syncope or dizziness. These CT studies did not show any findings related to spine trauma or acute stroke, but revealed suspicious lung findings with multi-focal, peripheral, ground glass opacities in both lungs (Fig.). Lung findings were mentioned prospectively in the imaging reports as suspicious for pneumonia and viral etiology. All these patients underwent further laboratory investigations based on surprising lung findings and diagnosis of COVID-19 was confirmed with RT-PCR assay of nasopharyngeal or oropharyngeal swab specimens, according to WHO (World Health Organization) interim guidance.² 8 out of 17 patients on further questioning after COVID-19 diagnosis did confirm history of cough in the days preceding presentation to the ER. Despite the fact that initial admission was not related to pulmonary complaints, 14 patients were eventually managed for varying severity of respiratory symptoms and 6 patients had high oxygen requirements during their hospital stay. Three patients required non-breather mask with >15 liters/minute oxygen flow rate and 3 patients needed endotracheal intubation and ventilator support. These patients required hospital admission for a mean of 7.29 days (2-15 days) and 2 patients ultimately passed away due to COVID-19 related complications (1 and 6 day hospital stay).

Discussion:

One of the major reasons for very high community spread of SARS-CoV-2 (COVID-19) is the fact that viral loads are being detected in asymptomatic individuals or mildly symptomatic patients.^{3,4} 56% of asymptomatic residents of a skilled nursing home facility tested positive for COVID-19 in a recent study and likely contributed to disease transmission.⁴ High viral loads are almost always present soon after symptom onset unlike SARS in 2002-2003, when viral shedding only happened after a patient was extremely symptomatic.³ Our study builds on this evidence by demonstrating that during the height of the COVID-19 pandemic in hot spots, there are many unsuspected and asymptomatic patients who are admitted to the ER and urgent care centers for either non-COVID related reasons or atypical COVID symptoms. These patients may neither be initially screened for COVID-19 nor isolated with precautions needed to curb the spread of the virus since the admission appears unrelated to COVID-19. Therefore, they may come in contact with multiple healthcare workers in the ER, including first responders or even various imaging/laboratory technologists, who may not have taken all the required precautions while handling or treating them. Our case series will have major impact on medical practice policies and, e.g. imaging/laboratory technologists or even receptionists at these clinics, laboratories and imaging centers, who will be coming in first contact with many of these otherwise asymptomatic patients, must enforce better physical distancing, strict contact precautions, and improved screening practices. This will be especially important as hospitals/clinics start to open up their facilities for outpatient work in the immediate near future. All patients presenting at inpatient and outpatient imaging facilities at NYU Langone Health will now be screened for COVID-19 related symptoms and need to wear masks regardless of their COVID-19 status, apart from similarly

modified practice rules for radiology technologists and receptionists at the clinics and imaging centers.

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References:

1. Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, Chang J, Hong C, Zhou Y, Wang D, Miao X, Li Y, Hu B. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. *JAMA Neurol.* 2020 Apr 10. doi: 10.1001/jamaneurol.2020.1127. [Epub ahead of print]
2. World Health Organization. Clinical management of severe acute respiratory infection when Novel coronavirus (nCoV) infection is suspected: interim guidance. January 2020. Accessed February 5, 2020. [https://www.who.int/internal-publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/internal-publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected).
3. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, Yu J, Kang M, Song Y, Xia J, Guo Q, Song T, He J, Yen HL, Peiris M, Wu J. SARS-CO-2 Viral Load in Upper Respiratory Specimens of Infected Patients. *N Engl J Med.* 382.12 (2020): 1177-1179.
4. Arons MM, Hatfield KM, Reddy SC, et al. Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. *N Engl J Med.* DOI: 10.1056/NEJMoa2008457.

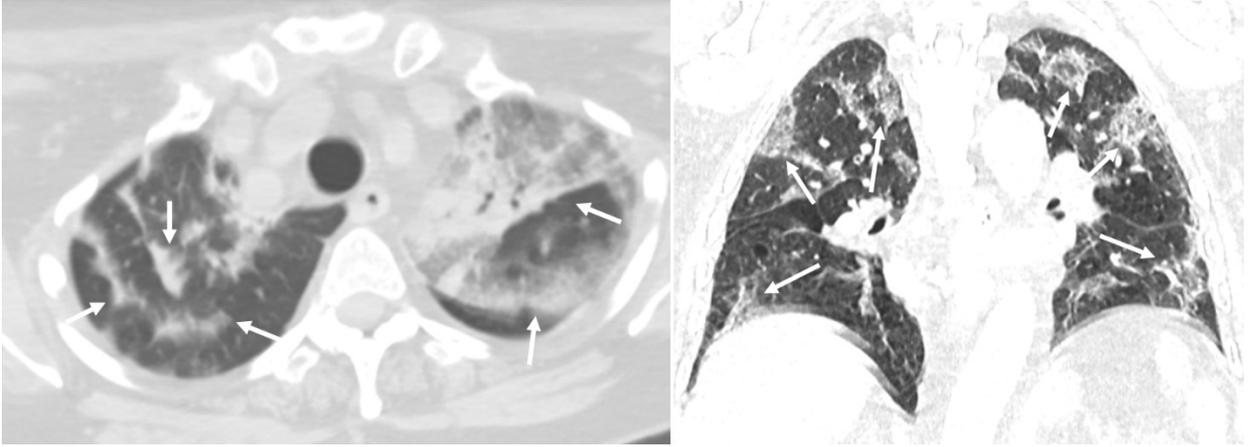


Figure Legend: Axial and coronal CT images of two different patients, obtained from CT angiogram of the neck (stroke evaluation) and CT thoracic spine (trauma evaluation) respectively, demonstrating typical multi-focal, peripheral, ground glass opacities in both lungs.