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Diagnosing COVID-19 from Chest X-ray in Resource Limited Environment-Case Report

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Abstract

The World Health Organization (WHO) officially declared the novel Coronavirus Disease 2019 (COVID-19) a pandemic in March 2020. Most COVID-19 infected patients present with pneumonia with typical Chest X-ray. Radiological investigations aid in the diagnosis of COVID and may help to diagnose or triage COVID 19 patients. This case report focuses on the role of chest X-ray in the diagnosis of the disease.

Keywords: COVID-19; Chest; X-ray; Triage; Pneumonia

Introduction

COVID-19 (coronavirus disease 2019) is a highly infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first cases were reported in Wuhan; China, in December 2019 before the rapid global spread [1-3]. The outbreak was subsequently declared as a pandemic on 11th March 2020 [4]. Ghana has confirmed (needs update 834 COVID cases with 9 deaths (as at April 18, 2020) according to the Ghana health service.

The chest radiographs of patients infected by the novel coronavirus demonstrate characteristic pneumonia-like patterns that can help in the diagnosis, according to a case report by the Chinese Center for Disease Control and Prevention published in the New England Journal of Medicine.

The chest imaging findings are non-specific and most commonly show atypical or organising pneumonia, often with a bilateral, peripheral and bi-basal predominant distribution [5].

Medical Imaging Departments

Infection control measures

The staffs in a medical imaging department is some of the first people to come in contact with COVID-19 patients and

therefore clear infection control guidelines are extremely important for an imaging facility. Droplet-type precautions including medical mask, gown, gloves, and eye protection N95 masks and aprons should be donned routinely [6] because of COVID-19.

Patients who may require transportation to the imaging departments should be made to wear a mask to-and-from the unit. All machines, including any ancillary equipment used during examinations, should be cleaned after examinations [7] using the departments protocol. Imaging studies should be done with two radiographers in attendance using the 'one clean, one in contact with the patient' system to reduce any cross-contamination [8]. It is reported that the corona virus can exist on surfaces for up to 3 days, reinforcing the need for protection of equipment with barriers like disposable covers and thorough cleaning of equipment between patients [9].

Imaging Departments policies on personal protective equipment (PPE) for patients with COVID-19 is strongly advised in these current times.

Chest X-ray imaging for COVID

The radiological findings of COVID-19 on chest X-ray are those of atypical pneumonia [7] or organising pneumonia [5,10]. Though chest CT scans are reported to be less sensitive than Chest X-rays, chest radiography still remains the first-line imaging modality of choice used for patients with suspected COVID-19 infection [3] because it is cheap, readily available and can easily be cleaned. For ease of decontamination, the use of portable radiography units are preferred [11].

Chest radiographs are often normal in early or mild disease. According to a study by Wong et al. Of the patients with COVID-19 requiring hospitalisation, 69% had an abnormal chest radiograph at the initial time of admission, and 80% had radiographic abnormalities sometime during hospitalisation [11]. The findings are reported to be most extensive about 10-12 days after symptom onset [11].

The most frequent radiographic findings are airspace opacities, whether described as consolidation or, less commonly, ground-glass opacity (GGO) [8,11]. The distribution is most often bilateral, peripheral, and lower zone

predominant [8,11]. Unlike parenchymal abnormalities, pleural effusion is rare (3%) [11].

According to the Center for Disease Control (CDC), even if a chest CT or X-ray suggests COVID-19, viral testing is the only specific method for diagnosis.

Radiography's sensitivity was reported at only 25% for detection of lung opacities related to COVID-19, among 20 patients seen in South Korea with specificity of 90% reported [12].

"With the COVID-19 pandemic threatening to overwhelm healthcare systems globally, chest X-ray radiographs should be considered a useful tool for identifying COVID-19" [13].

As the novel coronavirus pandemic grinds on, clinicians on the front lines may increasingly turn to radiography [13].

The most frequent findings are airspace opacities, whether described as consolidation or, less commonly, ground-glass opacity (GGO) [8,11]. The distribution is most often bilateral, peripheral, and lower zone predominant [8,11]. In contrast to parenchymal abnormalities, pleural effusion is rare (3%) [11]. According to the CDC, even if a chest CT or X-ray suggests COVID-19, viral testing is the only specific method for diagnosis.

Case Report

A 41-year-old male presented with Fever, non-productive cough and general malaise of 5 days duration.



Figure 1: PA view chest radiograph showing bilateral peripheral opacities and left lower zone ground glass opacities.

He denies sore throat or running nose, anosmia, hyposmia and had no recent travel history to China or Europe. He was otherwise a healthy man with no significant comorbidities.

On examination, he was febrile with a temperature of 38.5°C. He was ill looking with a respiratory

- Rate of 24 bpm. SPO of 95-98% on air. He was not in obvious respiratory distress.
- Air entry was adequate bilaterally with resonant percussion sounds.
- No crackles detected at the lung bases.
- FBC, CRP, and a chest X-ray were ordered.

The AP and Lateral chest showed diffuse bilateral Sub-pleural peripheral opacities (white arrow) and Ground glass opacification on the left lower lung zone (**Figures 1 and 2**). No pleural effusion.

This finding was highly suggestive of COVID 19.

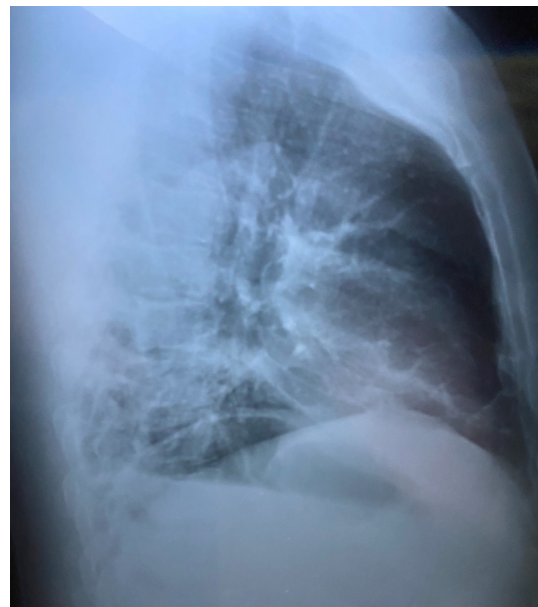


Figure 2: Lateral view chest X-ray.

A nasopharyngeal swab was sent as part of COVID-19 screening, and it was positive for SARS-CoV-2 on polymerase chain reaction (PCR) assay.

Discussion

In this case of a 41-year-old man from Accra, Ghana with no travel history to China or Europe and four-day cough and fever, chest X-rays showed features suggestive of COVID-19 infection and helped to isolate the patient while waiting for the PCR results.

The rapid and fast spread of COVID 19 is exerting massive pressure on the healthcare systems globally. It is important for radiologist to be abreast with Chest X-ray findings suggestive of COVID and to raise the suspicion if imaging features are present, especially in resource poor/developing countries.

Chest x-ray may be useful triage tool to help isolate and test or diagnose for COVID 19. Using PCR alone for screening may not offer the brakes on the spread of the disease as results tend to come after 24-48hrs at present in Ghana and therefore lead to more contact during the wait period for the test. Other authors have suggested use the use of chest Radiography as a first line diagnostic tool [13].

Conclusion

Even though CT scan of the chest offers more reliable features for COVID diagnosis it is not readily available in resource limited environment like Ghana. Even when it is available it is not as affordable as an x-ray and may decimate diagnosis. The average cost of a CT scan chest is 90 USD compared to 17 USD for chest X-ray in Ghana. Chest X-ray can be used as effective, fast and affordable way to immediately triage COVID-19 patients when suspected and should be encouraged as a diagnostic tool for isolation until PCR testing is done for confirmation.

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