



(CASE REPORT)



High resolution computed tomography signs lead an early diagnosis of COVID-19

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GSC Advanced Research and Reviews, 2021, 07(03), 067-071

Publication history: Received on 27 February 2021; revised on 15 June 2021; accepted on 17 June 2021

Article DOI: <https://doi.org/10.30574/gscarr.2021.7.3.0035>

Abstract

Introduction: The novel coronavirus disease 2019 (COVID-19) has huge impact on public health. RT-PCR of respiratory samples is generally accepted confirmatory test which can miss several cases due to various factors.

Case description: A 32-years-old male without any co-morbidity presented with complaints of cough and fever was negative for Reverse Transcription Polymerase Chain Reaction (RT-PCR) on two separate occasions on two different centres died and the last sample sent on 30th day of admission tested positive for RT-PCR. Radiologist reported the CT Chest signs as highly likely case of COVID-19 on the day of admission.

Clinical significance: Radiological signs on CT chest can contribute in the diagnostic workup of COVID-19.

Conclusion: Radiological signs reported in suspected COVID-19 should be noticed and given adequate weightage in conditions where the other laboratory tests are negative.

Keywords: COVID-19; HRCT Signs; Early Radiological Signs; Coronavirus Infections; Pneumonia

1. Introduction

The novel coronavirus disease 2019 (COVID-19) has impacted the global public health. Ranging from asymptomatic carriers to a variety of associated symptoms and limited diagnostic yield of various testing modalities fails to identify the disease in several cases. Based on various radiological signs, the etiological diagnosis of other pneumonia was attempted even in pre COVID-19 period by the radiologists. Correlation of several confirmed cases and the radiological signs make it possible to identify the probable diagnosis of COVID-19 with moderate to high accuracy [1]. Diagnosis becomes earlier and even in the conditions where the other clinically applicable investigations fail to identify the diagnosis due to their inherent limitations. We present a case where radiologist took the lead on pointing the underlying diagnosis, whereas the so called clinically applicable gold standard laboratory-based RT-PCR was repeatedly negative [2].

2. Case Description

A 32-years-old male without any co-morbidity presented with complaints of cough and fever for 20 days and shortness of breath for one week. Patient got admitted in a COVID Centre where he tested negative for COVID-19 RT-PCR. The patient was transferred to general hospital and was admitted in isolation cubicle in the ICU as an atypical pneumonia with COVID-19 RT-PCR 'negative' status. Chest X ray from the previous hospital was showing diffuse pneumonia on

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atypical pattern. On examination the patient was conscious- oriented (GCS- E4V5M6), tachycardiac (PR- 88/min), normotensive (BP- 120/80mmHg), hypoxic (SpO₂- 90% on BiPAP-14/6 on FiO₂ 100%), mildly febrile (Temp- 99.2°F), decreased bilateral air entry with diffuse crepts, heart sounds heard normally and abdomen soft with bowel sounds present. High Resolution Computed Tomography (HRCT) Chest was done which showed diffuse pneumonia with CT severity score of 22/25. The radiologist reported the presentation as highly suspected case of COVID-19.

After initial evaluation as per standardized protocols treatment was initiated with IV Fluids and other supportive care. A β -Lactam, a Macrolide and Remdesivir was also initiated empirically. Blood investigations were done which showed Hb- 12.5gm/dl, TLC- 58.46 $\times 10^9$ /L, SGOT (111 u/L), SGPT (213 u/L), Interleukin-6 (IL-6) 596.54 pg/ml, D-Dimer- 1294 ng/ml, C-reactive protein (CRP)- 148.89 mg/L, LDH- 250 U/L, Procalcitonin- 150ng/ml, Ferritin 18005 mcg/L and APTT 13.04 pg/ML. Arterial blood gas analysis was grossly normal except for low partial pressure of oxygen (PaO₂- 50.4 mmHg).

Peripheral blood picture showed normocytic normochromic red blood cells with absolute neutrophilia and toxic granulation within neutrophils, Leukocyte Alkaline Phosphatase (LAP) score was high (600). Covid-19 RT-PCR was again negative on 28th day of the onset of first symptoms.

On 30th day of onset of symptoms he developed respiratory distress and fall in oxygen saturation. On initiating him on mechanical ventilation his hypoxia was partially corrected. Further to this he started having refractory septic shock and needed escalating doses of inotropes. Echocardiography showed parameters within acceptable range with EF >55%. After intubation bronchial secretions was sent for repeat COVID-19 RT-PCR. He remained anuric for 8-10 hours not suitable to undergo hemodialysis. Septic shock worsened and he developed bradycardia followed by cardiac arrest and finally could not survive. Posthumously received COVID-19 RT-PCR report was positive.

3. Discussion

Etiological diagnosis of pneumonia helps in further line of care. Basic reproduction number (R₀ or R-naught) of SARS-CoV-2 is 2.5 predisposing to high transmissibility [3]. WHO has designated COVID-19 as a global pandemic on March 11, 2020, its first such declaration since designating H1N1 influenza a pandemic in 2009 [4].

The SARS-CoV-2 infection can range from asymptomatic carriers to a variety of symptoms ranging from one or more of the following such as fever or chills, cough, shortness of breath or difficulty in breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, anosmia, sore throat congestion or runny nose, nausea or vomiting, diarrhea, sputum production, malaise, respiratory distress, headache and altered mentality etc [5]. Pulmonary involvement leading to hypoxia is the most common cause of lethality with case fatality rate ranging from 0% in children (less than 9 years old) to 19.7 % in old persons (more than 80 years old) reported from different parts of the world [6].

The Gold Standard for the diagnosis of an infectious disease is identification of the alleged pathogen in patients involved organs or body fluids. As with other viral pathogens demonstrating the presence of coronavirus (SARS-CoV-2) requires electron microscopy usually available only in research centers or reference laboratories beyond the reach of every healthcare facility [7]. Clinically applicable diagnostic modality is nucleic acid amplification tests for detection of viral genetic material and immunoenzymatically assays or agglutination tests are available for detection of viral antigens. Antibody testing is an indirect way of diagnosing viral infections which depends on the host immune function. RT-PCR has its own limitations and also depends on the sample tested. Wang et al. reported rates of positive results from bronchoalveolar lavage fluid (14/15; 93%), sputum (75/104; 72%), nasal swabs (5/8; 63%), brush biopsy (6/13; 46%), pharyngeal swabs (126/398; 32%), feces (44/153; 29%), blood (3/307; 1%), and urine (0/72; 0%) [8]. In our centre turnaround time of RT PCR ranges from 12 to 24 hours. Sample collection is carried out by experienced paramedics under supervision of director laboratories. The patient was tested previously in a COVID centre which also makes the results much more reliable.

To some extent, imaging can meet the limitations faced by laboratory diagnosis chiefly due to its quick turnaround time, helping in detecting the missed diagnosis by other methods.

Computed Tomography (CT) of chest has been shown to contribute in the diagnostic workup of pulmonary infections including COVID-19. Prominent CT chest findings and their incidence are Ground-glass opacity (up to 98%), Consolidation (2-64%), Reticular pattern (up to 70.6%), Crazy-paving pattern (5-36%), Air bronchogram (Variable), Bronchus deformation (10-20%), Fibrosis (up to 17%), Pathological air containing spaces (variable), Subpleural line (Up to 20%), Vascular enlargement (up to 82.4%), Pulmonary nodules (3-13%), Halo sign and reversed halo sign (up

to 17.6%), Pleural changes (up to up to 32%), Mediastinal lymphadenopathy (up to 8%), and Pericardial effusion (Up to 5%) [9].

In our case a chest x ray (Figure 1) showed bilateral ground glass opacity with consolidation. HRCT chest axial view (Figure 2) showed consolidation, pneumomediastinum, pathological air containing spaces and mosaic crazy paving pattern. Coronal section (Figure 3) shows mosaic attenuation, air bronchogram and vascular enlargement. Chest CT objectifies bilateral, peripheral, and subpleural ground-glass opacities, with foci of band condensation. Other corroborative findings in the sagittal (Figure 4) section were also noticed as shown. The findings are shown in table 1.

Table 1 CT chest findings reported in COVID-19 compared to findings present in our case

CT chest (Pulmonary) findings reported in COVID- 19 patients	Findings present/ absent in our case
Ground glass opacity	Present
Consolidation	Present
Crazy paving pattern/ mosaic attenuation	Present
Air bronchogram	Present
Bronchus deformation	Present
Pathological air containing spaces	Present
Pulmonary nodules	Present
Vascular enlargement	Present
Subpleural lines	Absent
Halo/reverse halo sign	Absent
Fibrosis	Absent
CT chest (Extra pulmonary) findings reported in COVID- 19 patients	
Pneumomediastinum	Present
Pleural effusion	Absent
Pericardial effusion	Absent
Mediastinal lymphadenopathy	Absent

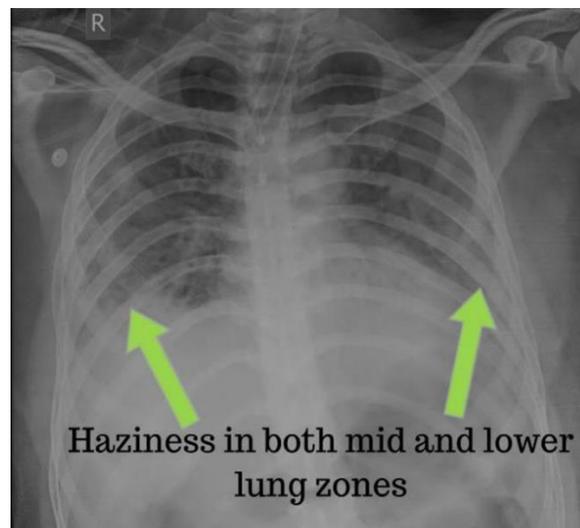


Figure 1 Frontal chest x-ray showing haziness in both mid and lower lung zones

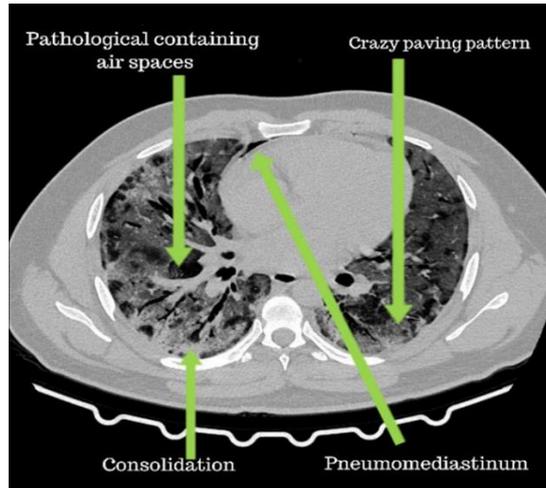


Figure 2 Axial CT view of chest showing pathological containing air spaces, crazy-paving pattern, consolidation and pneumomediastinum

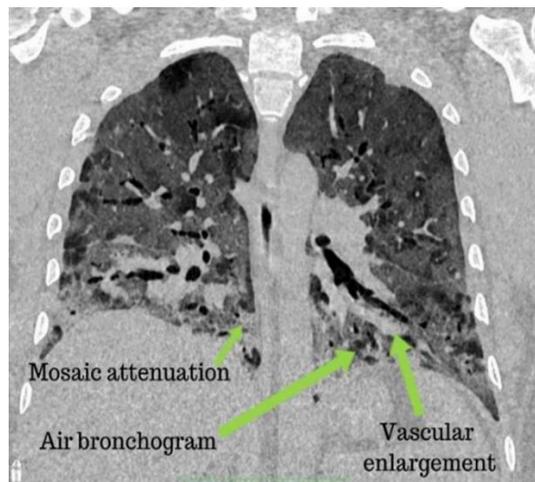


Figure 3 Coronal CT view of chest showing mosaic attenuation, air bronchogram and vascular enlargement

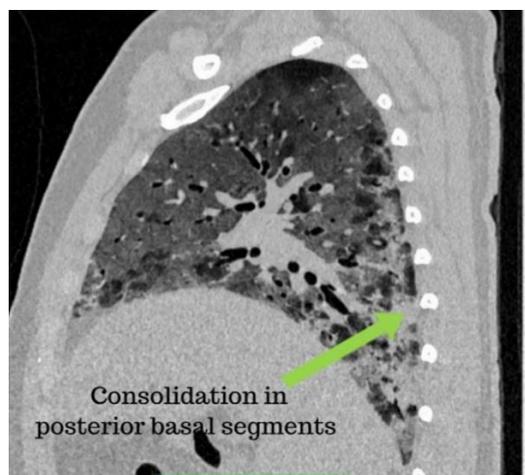


Figure 4 Sagittal CT view of chest showing consolidation in posterior basal segments

CT severity scoring is done in suspected COVID-19 cases to assess the severity of the disease. It is based on the extent of involvement of the lobes of the lung. Radiologist gives a score on the scale of 25; the higher the score more severe is the disease.

Repeated negative RT-PCR in our case could be either due to variable pattern of viral shedding or inherent limitations of the test. Follow up of RT-PCR confirmed cases for viral shedding has shown that the median time of viral RNA shedding was 19 days ranging from 3 days to 44 days. Performer related factors were unlikely in our setting since the paramedics involved in sample collection are experienced and routinely processed samples from other sources [10].

4. Conclusion

Early diagnosis has huge impact on patient transfers, management and prognosis of COVID-19. Laboratory diagnosis remains a challenge limited by performers and inherent factors in the tests. Quickly performed pulmonary CT, interpreted by an experienced radiologist can immensely expedite the diagnostic workup and must be included appropriately in the clinical management of COVID-19.

Compliance with ethical standards

Disclosure of conflict of interest

None

Statement of informed consent

Not applicable

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