

HRCT chest finding and clinical course of asymptomatic cases with COVID-19 pneumonia

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ABSTRACT

Aim: To detect the early HRCT chest findings and clinical course in patients diagnosed as COVID-19 positive but are asymptomatic.

Study design: A prospective study.

Setting: All the confirmed COVID-19 patients encountered at Sir Ganga Ram Hospital Lahore corona desk, from 1st April 2020 to 30th April 2020 were studied in this survey.

Methods: In our survey, we selected those asymptomatic patients who had positive contact history, diagnosed as COVID-19 positive by RT-PCR. Characteristic CT findings of each enrolled patient were collected and then interpreted.

Results: 53 asymptomatic exposed patients with COVID-19 lung disease were enrolled and underwent HRCT Chest. All patients who had a contact history of COVID-19 patients were tested positive by RT-PCR. These patients had a history of contact with COVID-19 patients. 58.49% of patients had normal HRCT Chest while 41.5% patients had abnormal CT findings. The predominant feature on HRCT Chest was GGO in (100%) with peripheral distribution (72.2%), diffuse (27.27%), unilateral distribution (45.4%), and bilateral distribution (54.5%). After a short-term follow-up, 20 patients (37.7%) developed symptoms mainly including fever, SOB, cough, and lethargy. Follow-up HRCT showed progression of disease in (9.09%) patients.

Conclusion: HRCT chest of patients having COVID-19 pneumonia that are asymptomatic has specific characteristics. As asymptomatic patients are silent carriers and some patients can worsen in a very short period. It is important to consider the importance of the detection and surveillance regarding asymptomatic patients having COVID-19. HRCT chest also has great value in screening and diagnosing patients with COVID-19 pneumonia, specifically in those who have a high suspicion, asymptomatic patients with negative PCR.

Keywords: COVID-19, HRCT Chest, GGO (Ground glass opacity).

INTRODUCTION

At the start of December 2019, a mass of people presented in hospitals of Wuhan (China) with a similar clinical picture of viral pneumonia which was given the name 2019-nCoV, that later declared as a pandemic and was officially designated coronavirus 2019 (COVID-19) by WHO on February 11, 2020; currently called SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). COVID-19 caused marked respiratory tract illness in many patients in China and continued to spread in the whole world with increased mortality.^{1,2,3,4} By now worldwide 12,180,557 cases had been reported and 552,382 deaths are declared due to COVID-19 pneumonia with the highest death toll in America of 134,867 till now.⁵ COVID-19 has been shown to damage the human respiratory lining by a complex mechanism involving the viral S protein and angiotensin-converting enzyme 2 receptor on these lining cells, therefore COVID-19 can infect humans.⁶ Based on recent studies and surveys the incubation period of COVID-19 is 1-14 days. The most common presenting complaints are fever, sore throat and body ache with some varied

symptoms of runny nose with congestion, anosmia, altered taste, and diarrhea.⁷ In patients with severe disease, symptoms of breathlessness predominate and they may progress to ARDS. A diagnostic viral nucleic acid assay using real-time reverse transcriptase-polymerase chain reaction RT-PCR was established to diagnose the COVID-19. However, the recent studies show some patients with high suspicion of COVID-19 have negative PCR test most common reason being inadequate cellular material for detection from the sample taken.⁸ HRCT Chest is an imaging study to diagnose and assess the extent of the disease. In our experience, HRCT shows different disease patterns in different patients starting from normal study to severe lung involvement. The various patterns seen in the majority of patients are ground-glass opacities (GGO), consolidation, crazy paving pattern, and vascular thickening.

The main aim and objective of the study was to decipher the HRCT chest imaging characters and clinical characters of patients without symptoms but having COVID-19 pneumonia presented to our institute with a strong history of contact with COVID-19 patients, and to have a more inclusive study of patients without any symptoms of COVID-19, to ease the diagnosis and then

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separation of these patients having COVID-19 pneumonia, specifically in those who have high suspicion (exposed), asymptomatic cases with a negative PCR test.

MATERIAL AND METHODS

This is a prospective descriptive study conducted at the Radiology Department of Sir Ganga Ram Hospital Lahore in collaboration with isolation wards of the same hospital. It has a designated COVID-19 filter clinic (corona desk) where suspected patients are screened initially with RT-PCR. All asymptomatic patients with a history of contact to COVID-19 case presented at corona desk from 1st April 2020 to 30th April 2020, were tested by RT-PCR and those with positive COVID 19 results were then included in the study. 53 COVID-19 patients with positive contact history were enrolled in the study and their HRCT Chest was conducted and included in the study for analysis. All the films of CT scans were obtained starting from the thoracic inlet to the lower level of the chest and diaphragm with patients lying in supine position. All HRCT images were individually reviewed by two skilled radiologists blinded to the clinical data. All differences were fixed by consensus. All these patients were admitted and a follow-up was done after 5 days for the onset of any symptoms and progression in CT findings.

Data Analysis and results: Quantitative variables e.g age are determined as a mean along with its range. Qualitative variables e.g gender were presented as frequency and percentages. The outcome variable, HRCT Chest findings were presented as frequency and percentages.

RESULTS

No of asymptomatic exposed cases with positive COVID test reported during the study time was 53. The mean age of these patients was 36. Among these 26.41% were males and 73.58% were females tabulated in Table-I. We found a female predisposition of the disease in the study. HRCT Chest of all 53 patients was classified as normal or having characteristic findings of COVID-19 pneumonia. 58.49% of patients had normal HRCT chest and 41.5% had a characteristic picture of ground glass haze and consolidation. Among these 45.5% of patients have unilateral involvement, 54.5% cases have bilateral lung involvement, 72.2 % have the peripheral distribution of disease and 27.7% have diffuse lung involvement of the disease. On follow-up, among these asymptomatic COVID-19 patients with HRCT chest findings, 63.6% developed symptoms of COVID-19 including cough, fever, and SOB, and the rest of 36.3% of asymptomatic patients remained asymptomatic. On follow-up, 19.3% of asymptomatic patients with normal HRCT developed symptoms and among patients with previously abnormal CT findings, 9.09% showed disease progression on follow-up HRCT chest.

40 yrs male Covid-19 positive case was initially asymptomatic at presentation and showed patchy subpleural air space opacification with ground glass haze and interlobular septal thickening left pleural effusion on HRCT, who later developed cough and SOB on day 5 of admission, however, no progressive change in HRCT chest findings noted.

Table I - Profile of the Patients

		Findings
Age	Mean	36
	Range	24-49
Gender	Male	14 (26.41%)
	Female	39 (73.58%)

Table II - HRCT findings and clinical course in COVID-19 patients

No of asymptomatic COVID-19 patients and normal HRCT chest on admission	31 (58.49%)
No of the patients who developed symptoms on follow-up	6 (19.3%)
No of the patients who remained asymptomatic on follow-up	25 (80.7%)
No of asymptomatic COVID-19 patients and HRCT findings of GGO/consolidation	22 (41.5%)
Location: Unilateral	10 (45.4%)
Bilateral	12 (54.5%)
Distribution: Peripheral	16 (72.2%)
Diffuse	6 (27.27%)
No of asymptomatic COVID-19 patients with positive CT chest findings, who developed symptoms on follow up	14 (63.6%)
No of asymptomatic COVID-19 patients with positive CT chest findings, who remained asymptomatic on follow up	8(36.36%)
No of asymptomatic COVID-19 patients with normal CT chest, who had positive CT findings on follow-up	-
No of asymptomatic COVID-19 patients with positive CT chest findings, who had an evolution in previous CT chest findings	2 (9.09%)

(Figures presented as numbers and percentages are in brackets).

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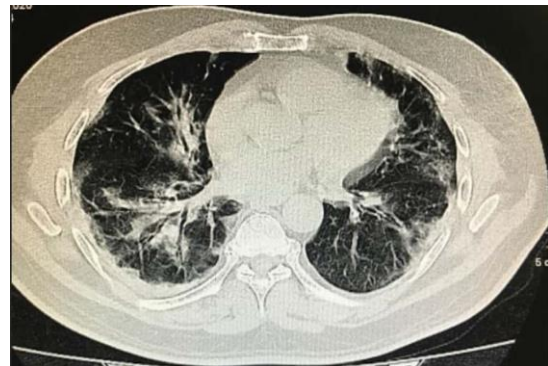




Fig-a Fig-b

30 year male asymptomatic Covid-19 case initially had bilateral subpleural patches of ground glass haze with interlobular septal thickening on HRCT, remained asymptomatic throughout a hospital stay.

30 year female asymptomatic Covid-19 patient initially showed patchy bilateral subpleural ground-glass haze with septal thickening on HRCT (a) who later developed severe SOB and extensive bilateral ground-glass haze with peripheral and basal predominance on follow up HRCT chest (b).

DISCUSSION

There are previously known six coronaviruses, which include SARS coronavirus (SARS CoV) and middle east respiratory syndrome (MERS CoV) that have been reported in China in 2003 and Middle East in 2012 respectively that can be transmitted to human and are highly pathogenic viruses. COVID-19 is the seventh coronavirus discovered and is highly contagious and pathogenic. It has recently erupted and how, is still a mystery. So far, there are more than 11 million cases been reported worldwide and 5.4 lacs deaths been declared due to COVID-19.⁹ With this pandemic, more and more researches and surveys are showing that many patients are asymptomatic yet they are carrying the COVID-19 and hence are silent carriers and can transmit the disease to others. Recent studies show that many patients with positive COVID-19 tests were asymptomatic at the time of sample collection and most likely added to the transmission of disease. Initially, Infection-control strategies were focusing exclusively on symptomatic cases, and this was not sufficient to prevent transmission.¹⁰ It is critical to fully appreciate the asymptomatic cases or cases with mild symptoms so that it can help in the control of the pandemic of SARS-CoV-2.

On average almost hundreds of suspected patients are now being tested for COVID 19 in a committed corona filtration hospital (corona desk) like Sir Ganga Ram Hospital, portable chest X-ray is the first available imaging modality available after RT-PCR testing of patients however, chest X-ray has a low sensitivity in distinguishing

other disease patterns and COVID-19 pneumonia. The chosen modality of imaging is HRCT chest regarding early detection of disease and its complication.

The diagnostic criteria of COVID-19 include the history of exposure to a COVID-19 patient, clinical symptoms, laboratory tests, imaging, and detection of viral nucleic acid by PCR according to the Chinese Guidelines for the Diagnosis and Treatment Plan of SARS-CoV-2 Infection by the National Health Commission (Trial Version 5),¹¹

In a study published in *Radiology* with the title of "Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 in China," researchers reported that the HRCT chest has a high sensitivity for diagnosing COVID-19 when compared to the RT-PCR from nasopharyngeal swabs. 1014 patients were analyzed in this retrospective study in Wuhan, China. Patients had to go through both the serial RT-PCR testing and HRCT Chest and the results showed 59% (n = 601) of the patients had positive RT-PCR results and 88% (n = 888) had positive chest CT scans and among patients with negative RT-PCR results, 75% (n = 308) had positive chest CT findings. This shows HRCT chest is more sensitive in diagnosing COVID-19 pneumonia than the RT-PCR. Also, there is a limited supply of detection kits in our setup due to its widespread use in the current pandemic, so the CT Chest is of great importance in diagnosing COVID-19 pneumonia during this outbreak.

In this study, all cases with a history of exposure and COVID-19 pneumonia confirmed by RT-PCR testing were asymptomatic, but some of them had abnormal HRCT chest findings. The NGOs in the HRCT imaging in asymptomatic patients with COVID-19 pneumonia were predominantly distributed in the peripheral location (72.2%) and mostly involving both bilateral lungs (54.5%).

In addition to pure GGOs, there are other characteristic findings, including patches of consolidation, septal thickening giving specific crazy paving patterns, and vascular thickening. CT findings of COVID-19 pneumonia have its pathophysiology.¹² As the diameter of coronavirus is about 60-140nm, and the alveolar pore's size is 10-

15µm, the virus enters the respiratory tract and first encounters the bronchioles and reaches the interstitium around the secondary lobular bronchioles causing bronchiolitis and peribronchitis. The first manifestation is the formation of nodules in the secondary lung lobule extending into the other lobules which give characteristic GGOs on HRCT chest imaging. This virus has spread along the reticular structure of the interlobular septa causing its thickening. Inflammation also causes the thickening of blood vessels in the lesion. When the degree of the inflammation rising, scattered lesions combine to give a form of continuous, crazy-paving pattern, even complete involvement like appearance in CT films.

As compared to the CT findings at admission, and asymptomatic, post-admission, 20 patients (63.6%) had some of the symptoms, i.e fever, sore throat, and shortness of breath, and the development of positive CT findings present in 9.09% of these patients who maintained a follow up for a shorter period.

The results specified that in a total of the asymptomatic patients suffering from COVID-19 lung disease, about 37.7% of cases presented without any symptoms.

All these clinically stable patients suffering from COVID-19 pneumonia were sent home once they got the necessary treatment.

The cases studied in this survey were all asymptomatic COVID-19 patients and had a positive contact history which was confirmed by positive results of RT-PCR and diagnostic findings in the HRCT chest. Ground glass lung changes in peripheral distribution present in bilateral lungs were the predominant feature of HRCT chest findings in asymptomatic COVID-19 patients. When these patients were followed for a short-term, few of these patients out of those who were asymptomatic showed clinical features, like fever, cough, and shortness of breath. And the progression of disease was shown by evolution in HRCT chest findings only in the patients having abnormal CT findings at the time of admission.

CONCLUSION

To conclude, HRCT Chest imaging of asymptomatic COVID-19 patients with close contact with COVID-19 patients, has definite characteristics in the early detection of disease. As we know that these patients who do not have symptoms silently carry the virus in them, these carriers could be the source of spread, and also some patients can swiftly deteriorate in a short period. Hence, paying attention to the surveillance of asymptomatic COVID-19 patients with positive contact history is essential. Also, HRCT Chest has a vital role in diagnosing and treatment of viral pneumonia in asymptomatic patients who are suspicious and have negative PCR results.

Conflict of Interest Statement: None.

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