

## Original Research Article

## High Resolution CT Scan Of Lungs In Covid-19: Our Experience In 200 Patients

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**Abstract**

**Background:**The standard of reference for confirming COVID-19 relies on microbiological tests such as real-time polymerase chain reaction (RT-PCR) or sequencing. Computed tomography (CT) can be used as an important complement to RTPCR for diagnosing COVID-19 pneumonia in the current epidemic context. Hence; the present study was undertaken for assessing lung parenchymal findings in high resolution CT scan of lungs in COVID 19 patients. **Materials & methods:**200 cases were included in the present study that were symptomatic and in which diagnosis of COVID-19 infection was confirmed by RT-PCR. Complete demographic details of all the patients were obtained. All patients underwent HRCT scanning of the thorax in the supine position during end-inspiration. A Performa was made and CT findings were recorded separately. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. **Results:** Mean age of the patients was 58.7 years. Majority of the subjects belonged to the age group of more than 50 years. 58.5% of the patients were males while the 41.5% were females. Left lung involvement occurred in 20.5% of the patients while right lung involvement occurred in 43 percent of the patients. Bilateral lung involvement occurred in 36.5 percent of the patients. Ground glass opacities were seen in 91.5 percent of the patients. **Conclusion:** Ground glass opacities are the typical CT presentation in COVID patients.

**Keywords:** Lungs, Computed tomography, COVID-19.

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**Introduction**

New pneumonia cases emerged in Wuhan City, China in late December 2019 and were reported to the World Health Organization (WHO). The new cases presented with respiratory features that resembled viral pneumonia a few months before the declaration of the pandemic by WHO[1-3]. The standard of reference for confirming COVID-19 relies on microbiological tests such as real-time polymerase chain reaction (RT-PCR) or sequencing. However, these tests might not be available in an emergency setting and their results are not immediately available. HRCT can be used as an important complement to RTPCR for diagnosing COVID-19 pneumonia in the current epidemic context. Indeed, when the viral load is insufficient, RT-PCR can be falsely negative while chest CT shows suggestive abnormalities. HRCT of the chest is one of the major imaging modalities according to World Health Organization and CDC guidelines. The typical findings from chest CT images of patients are bilateral multiple lobular and sub segmental areas of consolidation and ground-glass opacity. Thus, CT can play a pivotal role in the

early detection and management of COVID-19 pneumonia, at least for patients who have been symptomatic for more than three days[4-6]. Hence; the present study was undertaken for assessing HRCT findings of lungs in COVID 19 patients.

**Materials & methods**

The present study was conducted with the aim of assessing high resolution CT scan findings in lungs of 200 COVID 19 patients. Written consent was obtained from all the patients after explaining in detail the entire research protocol. Only those cases were included in the present study that were symptomatic and in which diagnosis of COVID-19 infection was confirmed by RT-PCR. Complete demographic details of all the patients were obtained. All patients underwent CT scanning of the thorax in the supine position during end-inspiration using HRCT protocol. A Performa was made and CT findings were recorded separately. Diabetic and patients with presence of any Co-morbid condition were excluded from the present study. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

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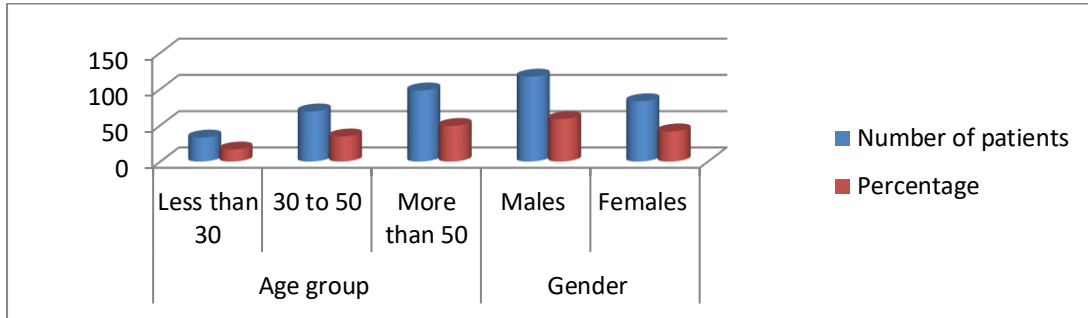
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**Results**

In the present study, a total of 200 subjects with confirmed diagnosis of COVID-19 as reported by RT-PCR were enrolled. Mean age of the patients was found to be 58.7 years as shown in Figure 1. Majority of the subjects belonged to the age group of more than 50 years. 58.5 percent of the patients were males while the remaining were females. Left lung involvement occurred in 20.5 percent of the patients while right lung involvement occurred in 43 percent of the patients. Bilateral lung involvement occurred in 36.5 percent of the patients as shown in Table 1. In the present study, ground glass opacities were seen in 91.5 percent of the patients. Consolidation was found in 29 percent of the patients. Bronchiectasis was seen in 6.5 percent of the patients. Nodules were seen in 5.5 percent of the

patients. Cavitation and pleural effusion was seen in 1.5 and 3 percent of the patients respectively as shown in Table 2. Figure 2 shows COVID findings on CT demonstrating mild ground glass opacity in anterior subpleural region of left upper lobe. In another case as shown in Figure 3 bilateral extensive COVID pneumonia with fibrosis and bronchial dilatation is observed. Extensive bilateral lower lobe consolidation with bronchial dilatation and ground glass opacities is shown in Figure 4. Figure 5 shows ground glass opacity with stranding in posterior subpleural region of right lower lobe. Figure 5 shows bilateral ground glass opacities associated with septal thickening resulting in crazy paving pattern. Coronal image showing ground glass opacity with septal thickening resulting in crazy paving pattern is shown in Figure 7. Figure 8 shows bilateral lower lobe peribronchovascular consolidation and patchy ground glass opacity.



**Fig 1: Age and gender-wise distribution**

**Table 1: Distribution of lung findings on CT**

Lung involvement	Number of patients	Percentage of patients
Left lung	41	20.5
Right lung	86	43
Bilateral	73	36.5

**Table 2: CT findings**

CT characteristics	Number of patients	Percentage of patients
Ground glass opacity	183	91.5
Consolidation	58	29
Broncho-vascular thickening	31	15.5
Crazy paving	23	11.5
Bronchiectasis	13	6.5
Nodules	11	5.5
Pleural effusion	6	3
Cavitation	3	1.5



**Fig 2: Mild ground glass opacity in anterior subpleural region of left upper lobe**



**Fig 3: Bilateral extensive COVID pneumonia with fibrosis and bronchial dilatation**

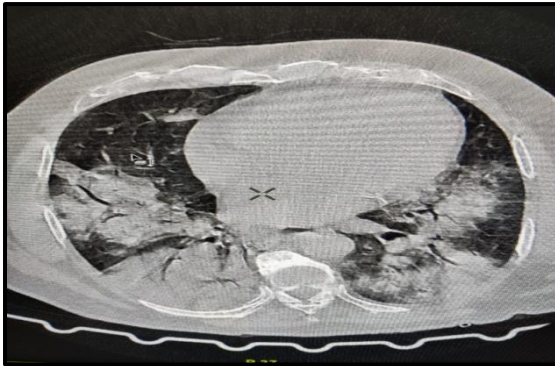


Fig 4: Extensive bilateral lower lobe consolidation with bronchial dilatation and ground glass opacities



Fig 5: Ground glass opacity with stranding in posterior subpleural region of right lower lobe

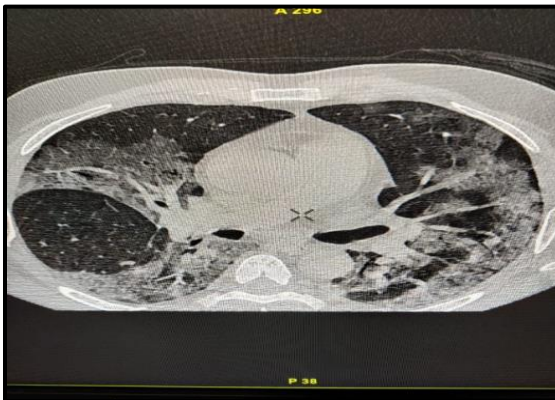


Fig 6: Bilateral ground glass opacities associated with septal thickening resulting in crazy paving pattern

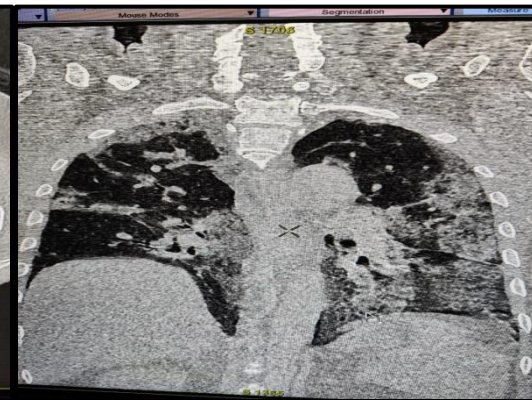


Fig 7: Coronal image showing ground glass opacity with septal thickening resulting in crazy paving pattern



Fig 8: Bilateral lower lobe peribronchovascular consolidation and patchy ground glass opacity

**Discussion**

As evident from data of past literature, similar to viral pneumonia due to other etiologies, ground-glass opacities (GGOs) are the main CT findings of the patients with COVID-19. Reticular and/or interlobular septal thickening and consolidation are common associated findings. Crazy-paving pattern was also detected in some cases. Pure consolidation without GGO is less common. These lesions usually involve bilateral lungs. Peripheral distribution of disease was noted in 33% and 85% of patients, respectively. However, normal scan at the early stage of COVID-19 can be found in a few patients when the disease is diagnosed[6-9].Li Y et al compared the CT features of COVID-19 with the CT features of other viruses to familiarize radiologists with possible CT patterns.

Their study included the first 51 patients with a diagnosis of COVID-19 infection confirmed by nucleic acid testing and two patients with adenovirus. COVID-19 was misdiagnosed as a common infection at the initial CT study in two inpatients with underlying disease and COVID-19. Viral pneumonia was correctly diagnosed at the initial CT study in the remaining 49 patients with COVID-19 and two patients with adenovirus. These patients were isolated and obtained treatment. Ground-glass opacities (GGOs) and consolidation with or without vascular enlargement, interlobular septal thickening, and air bronchogram sign are common CT features of COVID-19. They found that chest CT had a low rate of missed diagnosis of COVID-19 (3.9%, 2/51) and may be useful as a standard method for the rapid diagnosis of COVID-19 to optimize the management of

patients[10]. In the present study, Figure 1 shows COVID findings on CT demonstrating mild ground glass opacity in anterior subpleural region of left upper lobe. In another case as shown in Figure 2 bilateral extensive COVID pneumonia with fibrosis and bronchial dilatation is observed. Extensive bilateral lower lobe consolidation with bronchial dilatation and ground glass opacities is shown in Figure 3. In terms of the radiological findings on a chest X ray or CT scan, the infiltrative process can be even seen unilaterally unlike the case in description. As the timeline progresses and with the progression of the disease, the radiological findings tend to become more confluent and bilateral. These can range from ground glass opacities (GGOs) to dense consolidations. At this point there is limited evidence to state that denser or more confluent radiological lung involvement is linked to worse clinical outcomes, but it is clear that the longer duration of illness is definitely linked to diffuse bilateral infiltrates with bibasilar distribution[11-13]. In the present study, Figure 4 shows ground glass opacity with stranding in posterior subpleural region of right lower lobe. Figure 5 shows bilateral ground glass opacities associated with septal thickening resulting in crazy paving pattern. Coronal image showing ground glass opacity with septal thickening resulting in crazy paving pattern is shown in Figure 6. Figure 7 shows bilateral lower lobe peribronchovascular consolidation and patchy ground glass opacity. Hu Q et al analysed the high-resolution computed tomography (HRCT) early imaging features and the changing trend of coronavirus disease 2019 (COVID-19) pneumonia. Forty-six patients with COVID-19 pneumonia who had an isolated lesion on the first positive CT were enrolled. The follow-up CT images were compared with the previous CT scans, and the development of the lesions was evaluated. The lesions tended to be peripheral and subpleural. All the lesions exhibited ground-glass opacity with or without consolidation. A higher proportion of supply pulmonary artery dilation (89.13 % [41/46]) and air bronchogram (69.57 % [32/46]) were found. The typical early CT features of COVID-19 pneumonia are ground-glass opacity, and located peripheral or subpleural location, and with supply pulmonary artery dilation[14].

#### Conclusion

From the above results, the authors conclude that ground glass opacities are the typical CT presentation in COVID patients. Long-term follow-up is required to determine whether the reticulation represents irreversible fibrosis.

**Conflict of Interest: Nil**

**Source of support: Nil**

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