Clinical and CT Characteristics of Medical Personnel with the Coronavirus Disease-2019 (COVID-19) in Wuhan

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Abstract

Objectives: To investigate the clinical and chest CT characteristics of medical personnel infected with the Coronavirus Disease-2019 (COVID-19).

Methods: The clinical, laboratory test and computed tomography (CT) features of 30 medical personnel (MP group, 26-65 years, 16 males) with COVID-19 were retrospectively analyzed, and compared to 33 non-medical related patients (non-MP group, 26-74 years, 19 males). Follow-up CT characteristics were analyzed to assess the changes of the COVID-19 infection in the period of hospitalization.

Results: At admission, the main complaints of MP group, including fever (86.7%), fatigue (53.3%) and cough (43.3%), were similar to the non-MP group; the C-reactive protein, erythrocyte sedimentation rate and lactate dehydrogenase levels of the non-MP group (55.6 ± 45.9 mg/L, 34.7 ± 26.3 mm/H and 321 ± 117 U/L) were higher than that of the MP group (17.8 ± 19.9 mg/L, 18.6 ± 21.3 mm/H and 219 ± 54.2 U/L, respectively, all $p < 0.05$). Ground-glass opacities, consolidation, interstitial thickening were common CT features of both groups. The days from illness onset to the first CT exam, and the severity of opacities on initial CT were less in the MP group than that of the non-MP group ($p < 0.05$). However, the days from onset to observation of the most obvious pulmonary opacities, according to CT findings, were similar in the MP group (11.5 ± 5.9 days) and the non-MP group (12.2 ± 3.1 days, $p = 0.55$).

Conclusions: Like the general population, medical personnel are also susceptible to the COVID-19, although with more professional knowledge and protective equipment. Occupational exposure is a very important factor. Medical personnel have a higher vigilance about the infection in the early stage of the disease.

Key Points

Medical personnel are susceptible to the COVID-19 infection, due to occupational exposure.

Medical personnel have a higher vigilance about the infection in the early stage of the disease.

CT characteristics of the medical personnel with the COVID-19 have some similarities as the general patients group, however they change rapidly in both groups.

Abbreviations

COVID-19: Coronavirus Disease-2019

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

GGO: Ground-glass opacities

CRP: C-reactive protein (ESR)

ESR: Erythrocyte sedimentation rate

LDH: Lactate dehydrogenase

Introduction

In late December, 2019, Wuhan, China, has become the center of an outbreak of pneumonia caused by a novel coronavirus [1, 2], which was newly named the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The disease is spreading at a striking speed. Between when the first case was discovered at our institution in late Dec, 2019, until Feb. 20, the confirmed cases in China have exceeded 75,000 in such a short period. Medical and hospital staff, particularly those in Wuhan, have fought on the front lines against COVID-19, putting themselves at risk of infection. Information about this infected group is very limited.

These viruses are highly infectious and can spread very rapidly in human populations, according to the epidemiological investigation [3, 4]. The main route of transmission is via respiratory droplets, as well as physical contact. The digestive tract transmission was also suspected, as anal swab showed positive results for the SARS-CoV-2 virus nucleic acid in some patients. Medical personnel were trained on how to protect themselves since the beginning of the epidemic. In the process of treating and caring for patients, all medical personnel wore N95 masks, in addition to wearing goggles and protective clothing when necessary. However, despite these precautions, an increase in the number of cases of COVID-19 in medical and hospital staff had been noticed. In early January, a young doctor from the emergency department was diagnosed with the COVID-19 infection. He was among the first medical professionals at our institution who get infected, after swabbing a patient's throat for an inspection sample.

Medical personnel contribute a lot in this battle. After the outbreak of the disease, numerous patients poured into hospitals in Wuhan, especially the public hospitals. On Feb. 14, 2020, the data was disclosed from China's State Council that 1,716 medical and hospital staff had been confirmed infected with SARS-CoV-2 pneumonia. As of Feb. 18, 2020, 9 medical and hospital staff had sacrificed their lives. In a published paper of Zhongnan Hospital of Wuhan University, presumed hospital-related transmission of 2019-nCoV was suspected in 41% of patients, including medical and hospital staff [5].

Medical and hospital staff are more knowledgeable about how to protect themselves from infection spread and tend to pay more attention to their health status, both at home and at work. Once get infected, they are typically more compliant with clinical treatment. In this retrospective study, we aims to investigate the clinical and CT characteristics (including the initial and follow-up CT) of medical professionals and staff with COVID-19, and identify whether there are differences in the clinical symptoms and signs, laboratory tests and CT features compared to the non-medical related patients.

Materials And Methods

Patients

Our institutional review board approved this retrospective study. Informed consent was waived as this retrospective study involved no potential risk to patients. Data of 30 subjects with COVID–19, who were also medical personnel (MP group, 26–65 years, 16 males), and 33 non-medical related subjects from general patients group (non-MP group, 26–74 years, 19 males) were collected. All the subjects were admitted in Tongji hospital From Jan 10, 2020. The end of review date was Feb 15, 2020. Their diagnosis of COVID–19 were confirmed with a positive result to real-time fluorescence polymerase chain reaction (PCR) assay for SARS-CoV–2 nucleic acid, with nasopharyngeal or oropharyngeal swab specimens. Cases with lung surgery, tumors history, and other types of pneumonia caused by common bacterial and viral pathogens were excluded. All these patients underwent chest CT at admission and subsequent several reexaminations during the treatment (range 11 to 27 days).

Medical personnel, including professionals and staff, were clinical doctors (14 person), nurses (8 person), radiology technicians (2 person), sonography technicians (2 person), laboratory technicians (1 person), dialysis technicians (1 person) and other hospital staff (1 person) and postgraduates (1 person) who worked in clinic or service for clinical work directly. Retirees and administrative officials were not included. All the patients in MP group denied a exposure history of Huanan Seafood Wholesale Market, to which the majority of the earliest cases were linked [6].

We retrospectively collected the clinical and laboratory data, specifically including signs and symptoms, blood routine, erythrocyte sedimentation rate (ESR), D-dimer, biochemical examinations including C-reactive protein (CRP), lactate dehydrogenase (LDH), glutamic oxaloacetylase, procalcitonin. In addition, the Hamilton anxiety scale (HAMA) and Hamilton depression scale (HAMD) were used to evaluate the psychosocial status in a small portion of mild patients in each group.

Image acquisition

CT images were obtained using these scanners: LIGRTSpeed Plus (GE, Medical System, Milwaukee, USA), Aquilion ONE (Toshiba Medical System, Tokyo, Japan), and UCT 780 (United Imaging, Shanghai, China). The scan parameters were as follows: 120 kV; automatic tube current (180 mA–400 mA); slice thickness, 5 mm; spacing 5 mm; collimation thickness, 0.625 mm; helical pitch, 1.5; pixel 512×512. Images were then automatically reconstructed images into 1.25mm thickness images by the CT scanner (using an Adaptive Statistical Iterative Reconstruction (ASiR) technique).

Review of CT Images

All CT images were reviewed by two radiologists (D. S. and Y. X., with 2 and 11 years of clinical experience, respectively) using a special viewing console. Decisions were reached by consensus. For each patients, the initial and follow-up CT images were evaluated for: (1) Presence of ground-glass opacities (GGO), consolidation, interstitial thickening or reticulation, fibrous stripes and air bronchograms, pleural effusion, mediastinal lymph node changes (enlargement or increased number of lymph nodes), etc., as

these manifestations were reported common features in COVID–19 [7–9]; (2) Changes in size, distributions and degree of lobes involvement of the opacities. GGO was defined as increased lung attenuation with preservation of bronchial and vascular margins and consolidation was defined as opacification in which the underlying vasculature was obscured [8, 10].

To measure the alterations in changes in size and distribution of the lesions, a semi-quantitative analyze were applied. On each patient's CT images, each lobe of the lungs was assessed and the lesion size was classified as none (0 score), small (1 score, diameter < 1cm), medium (2 score, diameter 1 to 3 cm), large (3 score, diameter 3 cm to <50% of the lobe), or very large (4 score, 50%–100% of the lobe). The CT images for each patient in the two groups were evaluated by summing the scores of five lobes (range of possible scores, 0 - 20), naming Sum Score of the opacities.

The initial CT and all the follow-up CT exams (during the study time window: Jan 10 to Feb 15, 2020) were reviewed retrospectively. For every patient, the CT which exhibited the most obvious opacities were noted. The days from disease onset to this CT, as well as Sum Score of this CT were recorded. Furthermore, these two numerical values were also recorded of the CT which exhibited the beginning of the opacities decrement or absorption.

Statistical Analysis

All statistical analyses were conducted using SPSS 22.0 software (IBM, Armonk, NY). Continuous data are presented as mean $\pm$ standard deviation and categorical data are presented as percentage (%), when appropriate. Inter-group differences were compared by Student's *t* test or Pearson's χ^2 -test. A $p < 0.05$ was considered statistically significantly different. Correlation analyses were performed to study the relationship between Sum Score and disease duration. The correlation coefficient *R* and *p*-values were calculated with a statistical significance level set at $p < 0.05$.

Results

Clinical and Laboratory Test Findings

The average age of the 30 patients in MP group was 43.7 ± 10.6 years (range, 26–64 years), younger than the non-MP group (51.2 ± 14.0 years, range, 26–74 years, $p = 0.02$). All the patients of the MP group lived in Wuhan. The most common complaints were fever (26/30, 87%), fatigue (16/30, 53%) and cough (13/30, 43%). Other complaints included diarrhea (3/30, 10%), dyspnea (3/30, 10%), headache (3/30, 10%) and muscle soreness (3/30, 10%). Some patients of MP group had reduced white blood cell count (12/30, 40%) and reduced lymphocyte count (14/30, 47%), increased C-reactive protein (CRP, 18/30, 60%), increased erythrocyte sedimentation rate (ESR, 9/30, 30%), and increased lactate dehydrogenase (LDH, 12/30, 40%). However, the CRP, ESR and LDH levels were lower than those of the non-MP group ($p < 0.05$). More demographic data, laboratory tests and symptoms of the MP and non-MP groups are listed in Table 1.

Initial CT Features

Data of the initial and follow-up chest high-resolution CT findings of the MP group were listed in Table 2. In the first CT exams from disease onset, opacities were one-lobe involved (12/30, 40%), or multiple and bilaterally (17/30, 57%) distributed (one patient had no obvious opacities in her first CT), and commonly located in the subpleural (14/30, 47%), peribronchial (8/30, 27%), and diffuse area (7/30, 23%). In 23/30 cases (77%), the right and/or left lower lobes were involved. In some cases, consolidation (10/30, 33%), interstitial thickening or reticulation (10/30, 33%), air bronchograms signs (6/30, 20%) and pleural effusion (1/30, 3.3%) could also be seen (Fig. 1). These features were also observed in the non-MP group (detailed in Table 2).

In the MP group, the days from illness onset to first CT exam ranged from 1 to 11 days (3.3 ± 2.5 days), less than the non-MP group (1 to 10 days, 4.7 ± 2.8 days, $p = 0.042$). The Sum Score of opacities ranged from 0–16 (4.8 ± 4.0) scores, less than that of the non-MP group (1–20 scores, 9.5 ± 5.1 scores, $p = 0.0016$). Before admission in hospital and regular treatments, the Sum Score of the opacities was positively correlated with the days from illness onset to initial CT, in both the MP and non-MP groups (with age and gender as covariates, $R = 0.624$ and 0.602 , $p < 0.01$, respectively). After regular and individualized treatments, the correlations were not all significant (Fig. 2A, B).

Changes on Follow-up CT

All the patients in both MP and non-MP groups underwent 1–4 follow-up CT exams in our institution. Follow-up CT exams in both MP and non-MP patients usually demonstrated mild, moderate or severe progression of disease in approximate 11.8 ± 4.6 days, as measured by Sum Score of the total dataset, which represent an increased extent of pulmonary opacities. As disease progressed, severe cases could have more consolidation and air bronchograms in the relevant lobes (Fig. 3 and Fig. 4). The diffuse lesions, showed as “white lungs” were seen in the most severe patients. The days from disease onset to the date when the CT showed most obvious pulmonary opacities, were similar in the MP group (11.5 ± 5.9 days) and the non-MP group (12.2 ± 3.1 days, $p = 0.55$). However, at this “peak stage of opacities”, the average Sum Score of the MP group (10.2 ± 4.7 scores) was less than the non-MP group (14.2 ± 4.2 scores, $p = 0.0069$) (Table 2 and Fig. 2 C, D). It suggested that although the disease duration, from onset to peak opacities were observed, were similar in both groups, the extent of severity was relatively mild in the MP group.

Until 16th, Feb, 2020, we observed 22 patients (22/30, 73%) in the MP group get better in CT manifestations with decreasing extent and/or density of the opacities. Five patients were still showing a progressive progress in the latest CT. Two patients didn't undergo the third time CT, including one patient was transferred into ICU. Twenty-eight patients (28/33, 85%) in the non-MP group also exhibited less extent and/or density of the opacities in the follow-up CT exams. Three patients were still progressing, including a very seriously ill female patient, who died 18 days after the disease onset. One patients in the

MP group and two patients in the non-MP group had been transferred to another hospital. Among these patients who were getting better according CT manifestations, the days from disease onset to the date when CT began to show decreased extent and density of the opacities, was less in the MP group (16.0 ± 4.4 days) than that in the non-MP group (20.2 ± 3.8 days) (Table 2 and Fig. 2 C, D). Fibrous stripes could be a common sign during the remission stage (17/22 cases in MP group and 23/28 cases in the non-MP group).

Anxiety and Depression Assessments

The Hamilton anxiety scale (HAMA) and Hamilton depression scale (HAMD) [11] were applied in a small portion of mild patients (10/30 cases in the MP group and 11/33 cases in the non-MP group). The HAMA scores were 14.5 ± 2.8 and 15.3 ± 2.7 in the MP and non-MP groups; the HAMD scores were 13.4 ± 2.6 and 14.1 ± 2.7 , respectively ($p = 0.50$ and 0.55). In this limited study group, mild to moderate anxiety and depression were observed in both MP and non-MP patients.

Discussion

Medical personnel are also susceptible to the COVID-19. Their main complaints and laboratory tests were similar to common patients [4–6], such as fever, fatigue and cough, and increased CRP, ESR and LDH. Sometimes decreased white blood cells and lymphocytes count can be seen. The characteristics in CT images, for instance the ground-glass opacities and consolidation, and their distribution manner, which usually located in the posterior and peripheral part, are similar as the non-MP patients [7–9]

However, there are some obvious differences that can't be neglected. First, The days from illness onset to first CT exam were less in the MP group ($p = 0.042$). In an atmosphere surrounded by highly contagious and infectious viruses, professionals and staff who work in hospital are always more allergic and sensitive to their minor and concealed symptoms. They are more willing to carry a CT scan and laboratory blood tests, as early as possible. By the way, it is convenient for them to take these examinations. As a result of their earlier visit to doctors and specialists, the severity of opacities on initial CT were significantly less than the non-MP patients ($p = 0.0016$). Some laboratory parameters, for example the elevated CRP, ESR and LDH, were also not as that high as the non-MP patients (all $p < 0.05$).

Before clinical treatments, the Sum Score of opacification size was positively correlated with the days from illness onset to initial CT for both groups. Therefore, cautious attention to symptoms and application of CT examination are helpful for early detection of COVID-19 and standardized treatment and isolation. We noticed there was a nurse in the MP group, whose first CT showed no obvious abnormalities. However, several days later her follow-up CT exhibited significantly increased opacities.

Second, albeit the disease was detected early and the initial symptoms were mild, the duration from onset to the date when the most obvious opacities were seen on CT, were similar in the two groups ($p = 0.55$). This may be related to the immunopathological basis of the coronaviruses induced pneumonia. Majority

of studies attributed a dysregulated/exuberant innate response as a leading contributor to coronavirus-mediated pathology [12]. Many cytokines or chemokines are involved in the immune storm post coronavirus infection [13]. We speculate that though with active treatments, it takes a time for the specific immune response to establish and generate antibodies to suppress virus replication. As a result, it is of great importance to control the progression in the first two weeks from illness onset with utmost effort, for preventing extensive expansion of the viral pneumonia.

Third, in those patients who were getting better according to CT manifestations, the pulmonary opacities, consolidation and other abnormalities were decreasing with size and density more earlier in the MP group (16.0 ± 4.4 days) than the non-MP group (20.2 ± 3.8 days). There are several possible reasons. (1) At group level, the patients in MP group were younger than those in non-MP group. Younger patients always have better immunity, and fewer possibilities of cardiovascular and cerebrovascular diseases, diabetes and underlying respiratory problems, which may lead to other complications after COVID-19 infection. (2) Once get infected, medical personnel were more compliant with treatments. (3) Medical personnel underwent follow-up CT exams frequently, changes in opacities and consolidation could be reflected in time. (4) Medical personnel acquired and understood more professional knowledge about viral pneumonia; they were more determined to believe that they could be cured.

This study has some limitations. First, this is a modest-sized retrospective study in a single-center. Collection for a larger cohort would help to better define the clinical and imaging characteristics. Second, the subjects in the MP and non-MP groups were not strictly matched. As the medical-related patients were defined as doctors, nurses and technicians who worked in the clinical front, while in general patients with COVID-19, the elderly are the majority. Third, the status of viral pneumonia are changing all the time. However, CT can't be performed every day, due to the danger of exposure to radiation. Meanwhile in some cases the pneumonia was too severe to move the patients. So in our study, CT manifestations wouldn't be so efficiently and timely for reflecting the alterations in lungs.

In conclusion, although with more professional knowledge and equipment about protection from being infected, the medical professionals and staff are also susceptible groups of the COVID-19 infection. Occupational exposure is a very important factor. Strengthen the occupational protection for medical personnel, when they treating and caring patients, is of paramount importance.

References

1. World Health Organization (2020) WHO Statement Regarding Cluster of Pneumonia Cases in Wuhan, China. World Health Organization, Geneva. Available via <https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china>. Accessed 9 January 2020.
- 2 Velavan TP, Meyer CG (2020) The COVID-19 epidemic. Trop Med Int Health

- 3 Chan JF, Yuan S, Kok KH et al (2020) A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet* 395:514-523
- 4 Li Q, Guan X, Wu P et al (2020) Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med*
- 5 Wang D, Hu B, Hu C et al (2020) Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*
- 6 Huang C, Wang Y, Li X et al (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 395:497-506
- 7 Song F, Shi N, Shan F et al (2020) Emerging Coronavirus 2019-nCoV Pneumonia. *Radiology*:200274
- 8 Chung M, Bernheim A, Mei X et al (2020) CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV). *Radiology*:200230
- 9 Pan Y, Guan H, Zhou S et al (2020) Initial CT findings and temporal changes in patients with the novel coronavirus pneumonia (2019-nCoV): a study of 63 patients in Wuhan, China. *Eur Radiol*
- 10 Hansell DM, Bankier AA, MacMahon H, McLoud TC, Muller NL, Remy J (2008) Fleischner Society: glossary of terms for thoracic imaging. *Radiology* 246:697-722
- 11 Rodriguez-Seijas C, Thompson JS, Diehl JM, Zimmerman M (2020) A comparison of the dimensionality of the Hamilton Rating Scale for anxiety and the DSM-5 Anxious-Distress Specifier Interview. *Psychiatry Res* 284:112788
- 12 Channappanavar R, Zhao J, Perlman S (2014) T cell-mediated immune response to respiratory coronaviruses. *Immunol Res* 59:118-128
- 13 Huang KJ, Su IJ, Theron M et al (2005) An interferon-gamma-related cytokine storm in SARS patients. *J Med Virol* 75:185-194

Tables

Table 1: Patients Characteristics

	MP (N=30)	non-MP (N=33)	<i>p</i> value*
Clinical characteristics			
Age (years)	43.7 ±10.6	51.2 ±14.0	0.020
Male	16 (53.3)	19 (57.6)	0.735
Diabetes	1 (3.3)	7 (21.2)	0.033
Hypertension	3 (10.0)	8(24.2)	0.137
Cardiovascular disease	1 (3.3)	1 (3.0)	0.945
Signs and symptoms			
Fever	26 (86.7)	29 (87.9)	0.885
<37.3	4 (13.3)	4 (12.1)	
Highest temperatures, °C	38.3 ± 0.5	38.9 ± 0.7	<0.001
Cough	13(43.3)	21 (63.6)	0.106
Fatigue	16 (53.3)	10 (30.3)	0.064
Diarrhea	3 (10.0)	7 (21.2)	0.224
Dyspnea	3 (10.0)	4 (12.1)	0.789
Laboratory findings			
White blood cell count, ×10 ⁹ /L	4.6 ± 2.1	5.6 ± 2.3	0.084
<4	12 (40.0)	9 (27.3)	0.285
≥4	18 (60.0)	24 (72.7)	
Neutrophil count, ×10 ⁹ /L	3.0 ± 2.0	4.0 ± 2.3	0.078
Lymphocyte count, ×10 ⁹ /L	1.3 ± 1.1	1.1 ± 0.6	0.377
<1.1	14 (46.7)	19 (57.6)	0.387
≥1.1	16 (53.3)	14 (42.4)	
CRP, mg/L	17.8 ± 19.9	55.6 ± 45.9	<0.001
<10	12 (40.0)	5 (18.2)	0.026
≥10	18 (60.0)	28 (84.8)	
ESR, mm/H	18.6 ± 21.3	34.7 ± 26.3	0.012
<20	21 (70.0)	12 (36.4)	0.008
≥20	9 (30.0)	21 (63.6)	
Lactate dehydrogenase, U/L	218.9 ± 54.2	321.0 ± 117.8	<0.001
≤214	18 (60.0)	8 (24.2)	0.004
>214	12 (40.0)	25 (75.8)	
Procalcitonin, ng/mL	0.07 ± 0.06	0.20 ± 0.33	0.073
<0.05	11 (36.7)	9 (27.3)	0.424
≥0.05	19 (63.3)	24 (72.7)	
D-dimer, mg/L	0.38 ± 0.33	0.95 ± 0.82	0.001

Continues data are expressed as mean ± SD. Categorical data are presented as n (%).

**p*-values were obtained using a Pearson's χ^2 -test (two-sided) and a two-tailed Student's *t*-test between groups as appropriate.

Table 2: Comparison of initial and follow-up CT findings between the MP and non-MP groups.

CT characteristics	No. of patients or Values		
	MP (N=30)	non-MP (N=33)	<i>p</i> value*
Number of affected lobes			
Initial CT	2.38±1.57	3.94±1.52	< 0.01
CT with most obvious opacities	3.83±1.49	4.67±0.84	< 0.01
Opacities locations on initial CT			
Subpleural	14 (46.7)	10 (30.3)	0.182
Peribronchial	8 (26.7)	3 (9.1)	0.066
Diffuse	7 (23.3)	20 (60.6)	0.007
Disease duration			
Days from disease onset to initial CT	3.3 ± 2.5	4.7 ± 2.8	0.042
Days from disease onset to CT with most obvious opacities	11.5 ± 5.9	12.2 ± 3.1	0.545
Days from disease onset to CT with decreased opacities	16.0 ± 4.4 (N=22)	20.2 ± 3.8 (N=28)	0.0067
Sum Score of opacities and other features on initial CT			
Sum Score	4.83±4.04	9.55±5.12	0.0016
Consolidation	10 (33.3)	18 (54.5)	0.091
Interstitial thickening	10 (33.3)	12 (36.4)	0.801
Air bronchogram	6 (20.0)	10 (30.3)	0.312
Fibrous stripes	5 (16.7)	12 (36.4)	0.079
Pleural Effusion	1 (3.3)	4 (12.1)	0.197
Lymph nodes changes#	5 (16.7)	10 (30.3)	0.204
Sum Score of opacities and other features on CT with most obvious opacities			
Sum Score	10.17±4.68	14.21±4.23	0.0069
Consolidation	16 (53.3)	27 (81.8)	0.015
Interstitial thickening	14 (46.7)	26 (78.8)	0.008
Air bronchogram	10 (33.3)	21 (63.6)	0.016
Fibrous stripes	10 (33.3)	25 (75.8)	0.001
Pleural Effusion	4 (13.3)	13 (39.3)	0.020
Lymph nodes changes	5 (16.7)	11 (33.3)	0.129
Sum Score of opacifications of CT with decreased opacities			
Sum Score	7.13±4.23	11.21±3.79	<0.001

Continues data are expressed as mean ± SD. Categorical data are presented as n (%).

**p*-values were obtained using a Pearson's χ^2 -test (two-sided) and a two-tailed Student's *t*-test between groups as appropriate.

#Lymph nodes changes means mediastinal lymph nodes number > 5, or short-axis diameter > 1 cm.

Figures

Figure 1

Common CT imaging features: A: Multiple patchy ground-glass opacities (GGO), and GGO with interlobular septal thickening (like reticulation or “paving stone sign”) of a 44 years old male common patient (5 days from onset). B: Single GGO in peribronchial area of the right lower lobe of a 44 years old male patient (a physician, 2 days from onset). C: Diffuse opacities and consolidation, as well as air bronchograms in a 54 years old patient (a surgeon, 6 days from onset). D: Fibrous stripes are shown in bilateral lower lobes in a 51 years old female patient (a radiology technician, 20 days from onset).

Figure 2

A-B: Correlation between Sum Score and days from disease onset to initial CT; and days from disease onset to the most obvious pulmonary opacities were observed (CT_{peak}). (R denotes Pearson's correlation coefficient with age and gender as covariates). C-D: Differences in mean values of Sum Score and disease duration to initial CT, CT_{peak} and the CT began to show decreased extent/density of the opacities ($CT_{decrease}$), between the MP and non-MP groups. Note that at the timepoint of $CT_{decrease}$, 22 patients in MP group and 28 patients in non-MP group were included. The bar height indicates the mean, and the line on top of the bar represents the standard deviation. Asterisk indicates a significant difference (*p < 0.05, **p < 0.01).

Figure 3

The initial CT, CT with most obvious opacities, and CT with decreased opacities of a 38 years old nurse admitted in our institution. A: Patchy GGO distributed bilaterally on the initial CT (3 days from onset). B: In the follow-up CT, GGO progressed to multiple ground-glass infiltration in the lungs. C: Fibrous stripes could be a common sign during the remission stage.

Figure 4

The initial CT, CT with most obvious opacities, and CT with decreased opacities of a 28 years old common patient admitted in our institution. A: Patchy GGO in the left lower lobe on the initial CT (8 days from onset). B: In the follow-up CT, GGO progressed to multiple ground-glass infiltration in the lungs. C: Fibrous stripes could be a common sign during the remission stage. D: In the follow-up CT, GGO progressed to multiple ground-glass infiltration in the lungs.

from onset). B, C: In the follow-up CT, GGO progressed to multiple ground-glass infiltration and consolidation bilaterally. D: After absorption of some opacities, fibrous stripes and interstitial thickening could be seen. Images in the first and second lines represent different cross sections.