Quantified CT Evaluation in coronavirus disease (COVID-19): A study of 30 Patients in Chongqing, China

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Research article

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Abstract

Background Chest computed tomography (CT) provides insight into the progression and prognosis of COVID-19 pneumonia.

Purpose To quantify the chest CT scans of patients with CODIV-19 pneumonia using the pulmonary inflammation index (PII)and associate it with the severity of pneumonia.

Methods A total of thirty inpatients admitted between January 30 and February 29, 2020 with confirmed COVID-19 infection were enrolled in this retrospective review. Patients were classified as “severe”(those who met the severe pneumonia criteria) or “mild”. Chest CT scans and clinical statistics data were obtained at four milestones (the date of admission, 3 days after treatment, 1 week after treatment and the time the last CT scan was obtained before discharge orthe completionof our research).

Results Thirty patients (18 males and 12 females, age 20–74 years) with confirmed COVID-19pneumonia were evaluated. Increased neutrophilswere noted in 11 (36.7%) patients and decreased in 3 (10%) patients. Elevation of C-reactive protein (CRP) in 22 (73.3%) patients and erythrocyte sedimentation rate in 27 (90%) patient were observed, but elevation of procalcitonin was not obvious. Seven (53.8%) patients had elevation of lactate dehydrogenase (LDH).The presentation of CT opacities was mainly in the form of distribution in both the severe andmild groups. The mean PII score in the severe group was 58% and 13.7% in the mild group. The score in the severe group was more than 50%and less than 20%in the mild group at every milestone. The score in the severe group was always higher than the mild group, therefore, the severity of the disease may be positively correlated with PII score.

Conclusion The pulmonary inflammation index (PII) score of chest CT scans correlated with coronavirus disease (COVID-19) progression and could be used to indicate severity in patients.

Background

An outbreak of coronavirus disease (COVID–19) was first reported from Wuhan, China, on 31 December 2019 just before the Chinese traditional Spring Festival. The virus is capable of human-to-human transmission [1]; therefore, population mobility was increased with many people returning home during the Spring Festival, allowing the virus to spread rapidly all over the country and even worldwide. On February 26, 2020, World Health Organization(WHO) data showed that there were 80980 confirmed cases worldwide, 78190 cases in China and 2762 death cases worldwide. [2]The second meeting of the Emergency Committee convened by the WHO Director-General led to the final decision to declare a Public Health Emergency of International Concern (PHEIC) related to this novel coronavirus in the People’s Republic of China. [3] Therefore, this is a global event that is important for all humans.

Researchers confirmed that that the causative virus had not been detected in China before.It has been officially named as SARS-CoV–2 (Severe Acute Respiratory Syndrome Coronavirus–2) by the International Committee on Taxonomy of Viruses (ICTV).[4]. A study showed that49% of patients had a

history of exposure to the Huanan seafood market[5] suggesting that Coronaviruses (CoVs) are capable of infecting both human and animals. In addition, research showed that 2019-nCoV is 96% identical at the whole-genome level to a bat coronavirus.[6]Hence, this is an important reminder for human beings to live in harmony with animals.

At present, there is still no definite therapeutic regimen. Most treatments focus on complications and symptomatic treatment. According to the “Diagnosis and treatment protocols of pneumonia caused by a novel coronavirus (trial version 5)" (“protocol”is abbreviated later), most patients have a good prognosis and few develop critical illness. However, the prognosis of the elderly and patients with chronic underlying diseases is poor. Overall, symptoms in children are relatively mild and in general, the earlier the infection is discovered, the better the prognosis will be if isolation is initiated and treatment is administered in good time. Clinically, several studies have shown that chest computed tomography (CT) scans can be more indicative of health status before laboratory confirmed results are available.[7, 8]Thus, our study retrospectively analyzed serial chest CT scans obtained from patients withSARS-CoV–2 for changes and differences between patients who developed severe disease and those with mild disease to compare the prognostic value of imaging and other clinical parameters.

Materials And Methods

Patient Cohort

Between January 30 and February 29,2020, a total of 30 patients in Chongqing Public Health Medical Center were diagnosed with coronavirus disease (COVID–19). The diagnosis ofpneumonia was confirmed by real-time reverse transcription polymerase chain reaction (RT-PCR).[9] Of these 30 cases, there were 18males (60%) and 12females (40%), with an average age of 46years ranging from 20–74. According to current routine treatment options, patients could be administered interferon α–1b,ribavirin and LopinaVilitoNawei(LPV) tablets. All confirmed cases were randomly treated with pairwise combination of the three drugs above or together. CT examinations were regularly performed according to the changes of illness in hospitalization. Informed consent for this retrospective study was waived. As far as we know, we can confirm that the data of patients in the article have not been reported in any other research by myself or anyone else until now.

Milestone Selection

Four milestones during patients’ hospitalization were used for the purpose of CT scoring and comparison; the date of admission, 3 days after treatment, 1 week after treatment and the time at which the last CT scan was obtained before discharge or the completion of our research. According to the protocol, patients with severe pneumonia criteria were defined as meeting any of the following conditions: 1. respiratory distress, respiratory frequency (RR) ≥ 30 beats / min; 2. finger pulse oxygen saturation (SpO2) <93% in the resting state; 3.oxygenation index: arterial partial pressure of oxygen (PaO2) / oxygen concentration (FiO2) ≤300mmHg (1mmHg = 0.133kPa). As not all patients who met the criteria were admitted to the

Intensive Care Unit (ICU), we categorized the patients as “severe” (who met the severe pneumonia criteria) or “mild” in thisstudy.

Imaging Technique and Evaluation

Chest CT imaging data were obtained according to standard protocols in Chongqing Public Health Medical Center using CT scanners (Toshiba Aquilion16 Row Spiral CT Machine, Japanese). The quantitative evaluation method for COVID–19 was developed by an expert group of radiologists at the Chongqing Medical Association. Owing to the highly infectious nature of the disease, cross-infection was an important consideration; therefore, we did not keep the CT scans taken before hospitalization.

Results of previous studies have shown that the main imaging abnormality observed in patients with COVID–19 is bilateral ground-glass opacities on chest CT scan[5, 8–10], which was used as the basis for scoring in this study. Specifically, according to the distribution and size of the opacities, chest CT images were scored according to the pulmonary inflammation index (PII) which is simple and easy to evaluate. The scoring rules are based on the distribution, size and consolidation of opacities. First, a score for the distribution of the lung segment (1 point for one segment, 20 points for the left and right lungs overall) is calculated. Secondly, a score for the size of the opacities was calculated (1 point if the volume of the opacities exceeds 50% of the lung segment, so the maximum score of the first two steps does not exceed 40 points).Thirdly, a score for the consolidation of opacities was calculated as an additional score to help define disease progression. If consolidation was present in the segment opacities, 1 point was added. The overall score was obtained by summing the scores of the three steps divided by 40to give a total score for the first two criteria, and multiplied by 100.The PII score is quantitative; the higher the value, the heavier the inflammatory load. Each score was independently evaluated by two experienced physicians trained in using this method, and the mean score was recorded.

Clinical Parameters

We reviewed medical records, nursing records, laboratory findings, and chest CT scans for patients included in the study who had laboratory-confirmed COVID–19. The clinical and laboratory parameters used for analysis were collected from the Chongqing Public Health Medical Center. These included routine blood tests, liver and kidney function tests, creatine kinase, blood gas analysis, procalcitonin and erythrocyte sedimentation rate. In addition, oxygenation index was included as an indicator of the patients’ blood oxygen saturation level. These parameters were chosen because they have been reported to correlate well with the clinical condition of patients with COVID–19and to be important prognostic indicators.[5, 9, 10]Corresponding CT and clinical observations were compiled for the four milestones mentioned above. For each PII score for a patient, the corresponding clinical parameters were obtained on the same day.

Statistical Analysis

The patients were sorted into two clinical outcome groups, the severe group(patients who met the severe pneumonia criteria)and the mild group. Counting data were presented as the percentage of the total unless otherwise specified and the quantitative data were presented as mean±standard deviation (minimum-maximum). The three aspects relating to each of the four milestones were quantitively assessed using GraphPad Prism 8.0. Statistical analyses were performed using IBM SPSS Statistics Software (version 22; IBM, New York, USA). A p-value of <0.05 was considered statistically significant.

Results

Demographic Data

The cohort consisted of 30patientsincluding 18 male patients (60%) and 12 female patients (40%). The average age was 46 years(range: 20–74). Patients had a mean Body Mass Index (BMI) of 23 kilograms per square meter (range: 16.4–29.5). At the onset of illness, fever was the most common symptom (83.3% of patients), followed by cough (56.7%) and diarrhea (3.3%). Few of the infected patients had underlying diseases, such as hypertension (three patients [10%]), diabetes (two patients [6.7%])and cardiovascular disease (one patient [3.3%]). No patients with chronic obstructive pulmonary disease or malignancies were included. The median duration from contact history to symptom onset was 7 days. The median time from symptom onset to diagnosis was 3 days. The median hospitalization time was 20 days (Table 1).

There were 13patients who met the severe pneumonia criteria, including 7male patients (53.8%) and 6 female patients (46.2%). The mean BMI in severe patients was higher (24 kg/m^2) than mild patients (22.3 kg/m^2). In addition, older patients had more severe disease (mean age 53years) compared with a mean age of 40years in mild patients. In addition, hospitalization time was significantly longer in the severe group (24 days) compared with the mild group (17 days) (Table 1).

Laboratory Parameters

There were some abnormalities in the laboratory investigations. The routine bloods of patients showed that leucocytes were not elevated as is the case with bacterial pneumonias, and leucocyte numbers decreased in two (6.7%) patients(Table 2). Increased neutrophils were noted in 11 (36.7%) patients and decreased in 3 (10%) patients. The percentage of decreased lymphocytes, haemoglobin and packed cell volume in all patients were 50%, 50% and 16.7%, respectively(Table 2). Platelets decreased in 3 (10%) patients and increased inonepatient (3.3%). Some abnormalities, in alanine aminotransferase (ALT),aspartate aminotransferase (AST),total bilirubin (TB) andserum creatinine (sCr) were observed (table 2). Most patients had abnormal infection related biomarkers including elevation of C-reactive protein (CRP) in 22 (73.3%) patients and increased erythrocyte sedimentation rate in 27 (90%) patients; elevation of procalcitonin was not obvious in any patient (Table 2). Furthermore, haemoglobin, packed cell volume and albumin were significantly decreased in severe patients ($p<0.05$).Meanwhile, the creatine

kinase isoenzyme (CK-MB) was higher (12.5 μg/L) in severe patients compared with 7.8 μg/L in mild patients. Seven (53.8%) patients had elevation of lactate dehydrogenase (LDH) (Table 2).

Pulmonary Inflammation Index Scores at Milestones

First of all, according to a series of patients' CT scans, the optimal way to evaluate the PII score and the evolution of CT scans is as follows:

At initial Presentation: the apical and posterior segment (S1+2) and the anterior segment (S3) of the left lung were occupied by opacities taking up more than 50% of the total area and both had consolidation (Figure 1a).The superior segment (S6) of the lower lobe of the left lung and the superior and inferior lingula segment (S4+5) were also occupied by opacities taking up more than 50% of the total area which showed consolidation(Figure 1b). The anterior basal segment (S7+8) of the left lower lobe (size<50%) and the inferior lingula segment (S5) of the left upper lobe (Figure 1c).Overall, the score for distribution was eight, for size was six, and for consolidation was six totaling20, which when divided by 40 equals 50percent. Thus, the PII at initial presentation was 50%.

Seven days after treatment: the corresponding CT scans were the same as before except for some new opacities in the medial segment (S5) of the right middle lobe, posterior basal segment (S10) of the right lower lobe, lateral basal segment (S9)of the right lower lobe and posterior basal segment (S10) of the left lower lobe. (Figure1 d-f) For some of them, the area occupied was more than 50%; therefore, the total score of the three aspects was 28 and the PII was 70%.

Before the deadline: the opacities in both lungs were significantly absorbed; the opacities in the posterior basal segment (S10)of the left lower lobe were completely absorbed and consolidation inthe lateral basal segment of the middle of the right middle lobe was also absorbed (Figure1 g-i). Therefore, the total score of the three aspects was 23 and the PII was 57.5%.

The PII score in patients with severe disease continued to deteriorate until the second milestone(mean PII 66.9%).Mild patients had the highest score on admission (mean PII 18.8%) which decreased gradually after hospitalization (Table 3). At every milestone, the mean PII score in the severe group was more than 50and less than 20 in the mild group(Table 3). The mean PII score in the severe group was 58% and 13.7%in the mild group (Table 4). There was no significant change in mean PII at any of the four milestones for distribution or size, but there was a little decline for distribution in the mild group from 6.3(initial presentation) to 3.4(before discharge). In both mild and severe cases, consolidation alleviated over time (Table 3).The presentation of CT opacities was mainly in the form of distribution (14.54 vs 4.7 in the severe and mild groups, respectively). Ultimately, patients in the severe group always had PII scores for all three components compared with the mild group (Table 4).Among the four milestones, the proportion of distribution was always the biggest (Figure 2).

Discussion

Many studies have reported the clinical, laboratory and imaging features of COVID–19 in different provinces, and the results are more or less the same due to the various numbers of cases and regional characteristics. In our study, the incubation period(the median duration from contact history to symptoms onset) was7 days, which is similar to other reports which state 5–6-day or 6.4 days. [11, 12]Fever is the most common symptom at onset. We conclude that the BMI and age are important risk factors for COVID–19pneumonia. In our study, the decrease of haemoglobin, packed cell volume, albumin andthe increase of erythrocyte sedimentation rate in the severe group may be related to accelerated metabolism caused by COVID–19pneumonia. Some studies have shown that the CT manifestations of COVID–19pneumonia are ground glass opacities (GGO), crazy-paving pattern (GGO with superimposed inter- and intra-lobular septal thickening) and consolidation[13, 14], while the focus of our study was to analyze CT scans and evaluate the severity of COVID–19pneumonia.

We use the PII to score the CT scans of patients infected with SARS-CoV–2. In our study, we observed that the mean PII score in the severe group was always more than 50 and less than 20 in the mild group(table 3); therefore, we suggest that the PII score can be used as a differentiator between mild and severe cases. Previously, Lee KS. et al also evaluated a CT model to predict prognosis.[15] Therefore, we suggest that a PII score > 50 may be prognostic for the development of severeCOVID–19pneumonia.If the score is less than 20, the prognosis may be good. While a score between 20 and 50 requires close monitoring for the development of severe pneumonia.

There are several limitations to this study. First, the choice of four milestones in this was based on the time of CT examination in most patients at Chongqing Public Health Medical Center, and changes in the CT score may occur more rapidly in practice. It would be better to include more CT scans more frequently and more patients from other hospitals. Secondly, since many opacities are reported to have bilateral lung involvement [13, 16], there may be important differences; however, according to PII criteria, there is no distinction between the left and right lobes of lung, and further analysis of the scores in the two lobes independently may lead to further discoveries. Thirdly, the number of patients was limited and more standardised data for a larger cohort would help to further optimize the criteria for the PII score.

In conclusion, the PII score index for chest CT scans correlated well with coronavirus disease (COVID–19) progression. Regardless of whether patients had mild or severe disease, the distribution of opacities was always the largest factor in the overall score rather than size or consolidation. We suggest that PII can be used to define prognosis in patients with COVID–19; specifically, if the PII score is more than 50%, the pneumonia may become severe. If the score is less than 20%, the prognosis may be good. Otherwise, CT scans should be monitored more closely.

Abbreviations

COVID–19 coronavirus disease

PII pulmonary inflammation index

WHO World Health Organization

PHEIC Public Health Emergency of International Concern

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

ICTV the International Committee on Taxonomy of Viruses

Declarations

Ethics approval and consent to participate

Not applicable. We collected data on population level to our study. The data collect from thirty diagnostic COVID-19 cases, including their general characteristics, laboratory parameters and CT scan data. Our aim was to obtain information about the objective index, rather than individuals. It requires no administrative permissions to access the raw data, and the data used in this study was anonymised before its use. Besides, the data do not included experiments on humans and/or human tissue samples. Therefore, ethics approval is not applicable in our paper.

Consent for publication

Not applicable. Our aim was to obtain information from the population, rather than individuals.

Availability of data and materials

The datasets used and analysed during the current study are collected from Chongqing Public Health Medical Center and the raw data should be available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The following are the author's contributions. *WZ* conceived and designed the current study and, with *YXB*, guided the work. *WZ and YX drafted the manuscript, YXB revised it.JL, SKY and JY* participated in the data collection and analysis of the article. All authors have read and approved the final text.

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Tables

TABLE 1 Demographics and baseline characteristics of patients infected with SARS-CoV-2

	All patients(n=30)	Severe group(n=13)	mild group(n=17)	P value
Characteristics				
Gender				0.55
male	18 (60%)	7 (53.8%)	11 (64.7%)	
female	12 (40%)	6 (46.2%)	6 (35.3%)	
Mean age (y)	46 (20–74)	53 (28–74)	40 (20–65)	0.01
BMI (kg/m^2)	23 (16.4–29.5)	24 (18.9–29.5)	22.3 (16.4–25.7)	0.06
Any comorbidity				
Diabetes	2 (6.7%)	1 (7.7%)	1 (5.9%)	0.84
Hypertension	3 (10%)	3 (23.1%)	0	0.04
Cardiovascular disease	1 (3.3%)	1 (7.7%)	0	0.25
Signs and symptoms				
Fever	25 (83.3%)	11 (84.6%)	14 (82.4%)	0.87
Cough	17 (56.7%)	7 (53.8%)	10 (58.8%)	0.79
Diarrhoea	1 (3.3%)	1 (7.7%)	0	0.25
Days from contact history to symptoms onset	7 (2–20)	6 (3-10)	7 (2-20)	0.88
Days from symptoms onset to diagnosis	3 (0–7)	4 (1-6)	2 (0-7)	0.048
Days of hospitalization	20 (10–30)	24 (13–30)	17 (10–26)	0.002

Note: Counting data are presented as count (percentage of the total), while the quantitative data are presented as mean ± standard deviation (minimum-maximum).

TABLE 2 Laboratory results of patients infected with SARS-CoV-2

	All patients(n=30)	Severe group(n=13)	Mild group(n=17)	P value
Blood routine				
Leucocytes(× 10⁹ per L; NR 3·5–9·5)	5.0 (3.1–8.0)	5.1 (3.7–7.5)	4.9 (3.1–8.0)	0.639
Decreased	2 (6.7%)	0	2 (11.8%)	0.20
Neutrophils percentage (%; NR 50–70)	64 (39-83)	72(62–83)	59 (39–80)	0.001
Increased	11（36.7%）	8（61.5%）	3（17.6%）	
Decreased	3（10%）	0	3（17.6%）	
Lymphocytes(× 10⁹ per L; NR 1·1–3·2)	1.2 (0.5–2.4)	1.0 (0.65–1.6)	1.4 (0.5–2.4)	0.026
Decreased	15（50%）	10（76.9%）	5（29.4%）	
Platelets(× 10⁹ per L; NR 125·0–350·0)	206 (100–376)	219 (140–376)	197 (100–288)	0.349
Increased	1（3.3%）	1（7.7%）	0	
Decreased	3（10%）	0	3（17.6%）	
Haemoglobin (g/L; NR 130·0–175·0)	130 (99–160)	123 (99–140)	136 (120–160)	0.006
Decreased	15（50%）	9（69.2%）	6（35.3%）	
packed cell volume(%;NR 35–50)	39 (32–47)	37 (32-42)	40 (35–47)	0.025
Decreased	5（16.7%）	4（30.8%）	1（5.9%）	
Blood biochemistry				
Albumin(g/L; NR 40·0–55·0)	39.6 (33.5–46.8)	37.6 (33.5–41.8)	41.2 (37.4–46.8)	**
Decreased	16(53.3%)	11 (84.6%)	5 (29.4)	
Alanine aminotransferase (U/L; NR 9·0–50·0)	29.5 (8.7–91.5)	40.6 (15.8–91.5)	21 (8.8–37.3)	0.002
Increased	3 (10%)	3 (23.1%)	0	
Aspartate aminotransferase (U/L; NR 15·0–40·0)	26.8 (12.8-72.5)	34.5 (17.3–72.5)	20.9 (12.8–30.3)	0.001
Increased	3 (10%)	3 (23.1%)	0	
Total bilirubin(μmol/L; NR 0·0–21·0)	16.6 (9.3–37.3)	14.8 (9.3–21.2)	18 (10.1–37.3)	0.172
Increased	4 (13.3%)	1 (7.7%)	3 (17.6%)	
Serum creatinine (μmol/L; NR 57·0–111·0)	71.1 (45.4–118)	70.2 (49.2–113.3)	71.7 (45.4–118)	0.819
Increased	2 (6.7%)	1 (7.7%)	1 (5.9%)	
Lactate dehydrogenase (U/L; NR 120·0–250·0)	241 (123–575)	321 (233–575)	180 (123–231)	**
Increased	7 (23.3%)	7 (53.8%)	0	
Creatine kinase isoenzymes (CK-MB) (μg/L; NR 0–25)	9.8 (4.2–37.2)	12.5 (4.2–37.2)	7.8 (4.2–14.5)	0.046
CD4/CD8ratio(NR 1.4–2.0)	1.45 (0.78–3.22)	1.33 (0.78–2.1)	1.6 (0.87–3.22)	0.369
Infection-related biomarkers				
C-reactive protein(mg/L; NR 0·0–5·0)	24.6 (1.9–122)	41.7 (6.4–122)	11.6 (1.9–55.8)	0.002
Increased	22（73.3%）	13（100%）	9（52.9%）	
Erythrocyte sedimentation rate (mm/h; NR 0·0–15·0)	44.9 (6.5–98.5)	66.7 (33.7–98.5)	28.3 (6.5–71.7)	***
Increased	27（90%）	13（100%）	14（82.4%）	

Note: Counting data were presented as count (percentage of the total), while the quantitative data were presented as mean ± standard deviation (minimum-maximum). Increased means over the upper limit of the normal range and decreased means below the lower limit of the normal range.

NR: normal range.

***p value < 0.001

TABLE 3 Mean PII Scores across the Four Milestones in Patients in the severe groupversus the mild group

Parameter	InitialPresentation	3 days after treatment	1 week after treatment	Before deadline or discharged
No. ofradiographs*	26	25	20	23
Severe group	13	13	12	12
Mild group	13	12	8	11
Mean PII score%	34.5	42□1	40.6	32.3
Severe group	50.1	66.9	61.3	53.8
Mild group	18.8	15.2	9.7	8.9
P value	***	***	***	***
Mean distributionscore	10	10.7	10.5	9.2
Severe group	13.4	15.2	15.1	14.6
Mild group	6.3	5.4	3.5	3.4
P value	***	***	***	***
Mean size score	3.8	5	5.5	3.4
Severe group	6.2	8.6	8.5	6.5
Mild group	1.3	0.9	0.4	0.09
P value	0.004	***	0.001	***
Mean consolidationscore	0.68	1.7	0.56	0.14
Severe group	0.77	2.9	0.91	0.2
Mild group	0.58	0.36	0	0.09
P value	0.67	0.05	0.053	0.5

Note: Quantitative data were presented as mean (SD).

*Not every patient underwent CT scan at each of the four milestones; hence, the number of CT radiographs were not the same.

PII: pulmonary inflammation index.

*** p value < 0.001

TABLE 4 PII Scores in Patients in the severe groupversus the mild group

	All patients(n=30)	Severe group(n=13)	Mild group(n=17)	P value
Mean PII score%	37.2	58	13.7	***
Mean distributionscore	10	14.54	4.74	***
Mean size score	4.4	7.44	0.73	***
Mean consolidationscore	0.79	1.24	0.29	0.19

Note: Quantitative data were presented as mean (SD).

***p value < 0.001

Figures

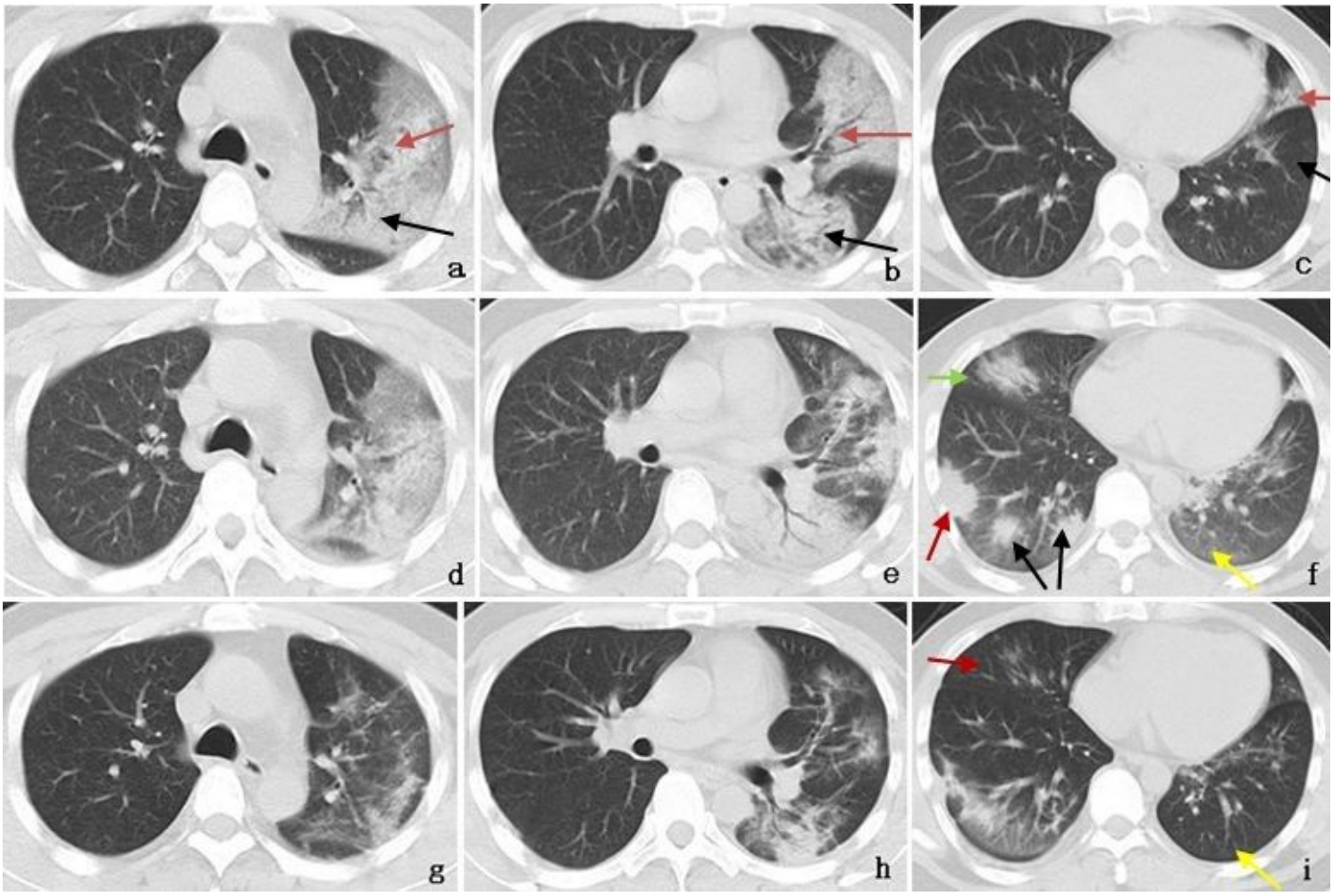

Figure 1

Typical CT findingsand specific score rules in a patient with COVID-19. At initial presentation: (a) the apical and posterior segment (S1+2) of the left upper lung (black arrow); the anterior segment (S3) of the left upper lung (red arrow). (b) the superior segment (S6) of the left lower lobe (black arrow); the superior and inferior lingula segment (S4+5) of the left lobe (red arrow). (c) the anterior basal segment (S7+8) of the left lower lobe (black arrow); the inferior lingula segment (S5) of the left upper lobe (red arrow). Day

7(d-f): the corresponding CT scans were the same as before except new opacities in f: medial segment (S5) of the right middle lobe (green arrow), posterior basal segment (S10) of the right lower lobe (black arrow), lateral basal segment (S9) of the right lower lobe (red arrow) and posterior basal segment (S10) of the left lower lobe (yellow arrow). Before deadline (g-i): The opacities in both lungs were significantly absorbed, especially in i: the posterior basal segment (S10) of the left lower lobe (yellow arrow)in which the opacities were completely absorbed, the lateral basal segment of the middle of the right middle lobe (red arrow) in which the consolidation was absorbed.

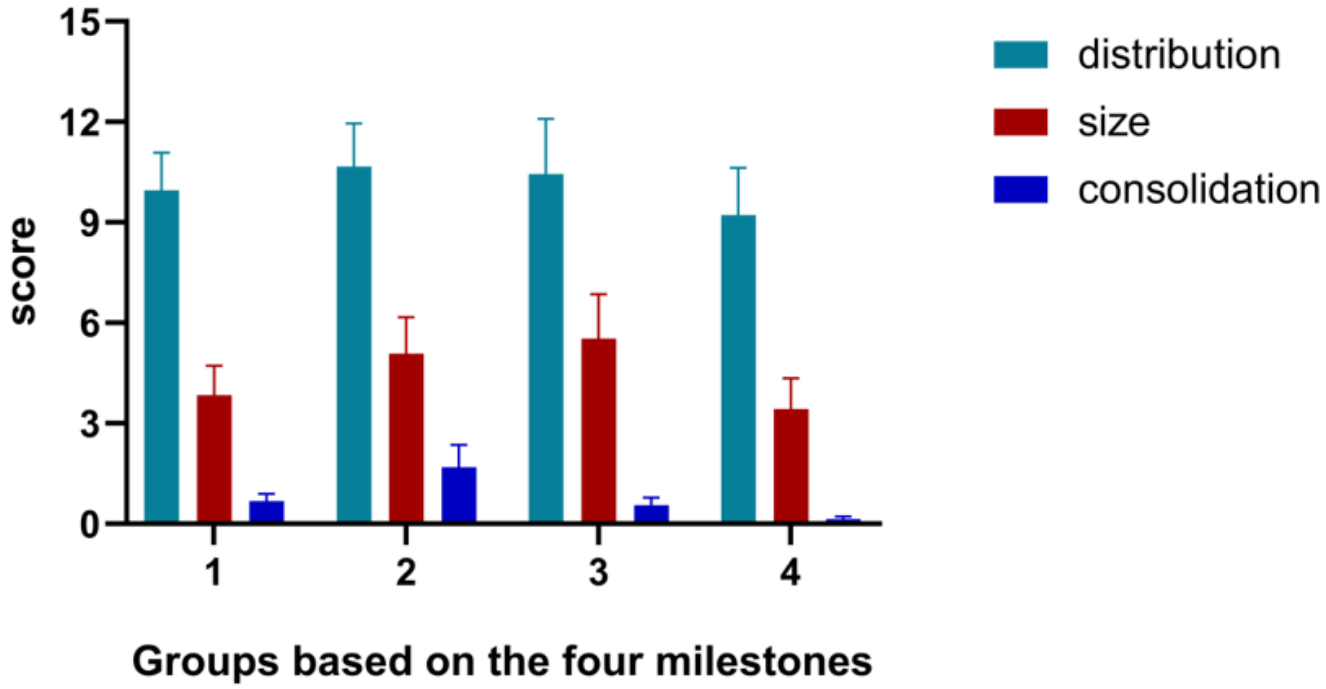

Figure 2

The proportions of PII scores with distribution, size and consolidation at each of the four milestones.(PII: pulmonary inflammation index;Four milestones refer to: 1.the date of admission;2. 3 days after treatment;3. 1 week after treatment;4. the time at which the last CT scan was obtained before discharge orthe completion of our research.)

Supplementary Files

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- supplyment.docx