

Comparison of Clinical Features in Octogenarian and Non-octogenarian Adults with Severe COVID-19 Pneumonia

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Abstract

Background: Aged people is more susceptible and vulnerable to COVID-19 pneumonia. As the “super-elderly” group, octogenarian COVID-19 patients is not rare in current world-wide common healthy event.

Object: To describe clinical features in octogenarian with severe COVID-19. And try to find out the differences with other non-octogenarian adult patients.

Materials and Methods: We studied a small cohort of octogenarian COVID-19 patients at a hospital in Wuhan from 10 February to 15 March. We recorded interested clinical data including chest CT in the octogenarian patients. In order to know the differences of clinical characteristics between octogenarian and other adult patients, we included the number of non-octogenarian patients cohort as ratio of 1:3.

Result: For octogenarian patients, the age is 83.33 ± 3.08 and 4 are female (4/6,66.7%). For non-octogenarian patients, the age is 60.72 ± 8.28 years and 5 are female (5/18, 27.8%). and 59% were men. Compared non-octogenarian patients, octogenarian patients' hospital stay duration is significantly longer ($p=0.0052^*$). WBC is obvious elevated in octogenarian ($p=0.0494^*$). BUN ($p=0.0377^*$) and Cr ($p=0.0112^*$) is with obvious differences between two group patients. No obvious differences in CT findings between two groups.

Conclusion: The severe COVID-19 pneumonia octogenarian may have more chance to combined with bacterial infection. Octogenarian has worse baseline kidney function than non-octogenarian. In individual cases, the broader lesion and more lesion types may be found in octogenarian CT image.

Background

The COVID-19 pneumonia has breakout in Wuhan, China at the bottom of 2019. The novel coronavirus has been rapidly confirmed and has to be deem to cause severe respiratory syndrome[1]. Until date of March 14th, the estimated mortality of the COVID-19 pneumonia is about 3.9% (3194/81029 according to official real-time COVID-19 pneumonia data in China on March 14th). During this world-wide focused common health event, the aged people would not escape from the common susceptible disease. Through the current literatures, the patients' average age usually in range of 55-56 year old[2,3,4]. Due to the aged people especially like octogenarian is susceptible to infection[5], it might be refer that there will be tremendous number of aged people suffered from COVID-19 pneumonia. It should not neglect the octogenarian group in the current virus storm. And more attention need to pay to the clinical characteristics of the octogenarian. Also, the computed tomography has been applied and seemed to be very important method to diagnosis of the COVID-19 pneumonia[6,7,8]. Different age patients' CT image may indicate various clinical characteristics to physicians and help them to make and adjust proper management to patients[9]. Therefore, we conceived this retrospective study of clinical and CT findings characteristics of octogenarian and other adult patients. Our objective was to present preliminary findings of abnormalities in octogenarian with proven COVID-19 and also comparison to other non-octogenarian patients.

Materials And Methods

There are 6 octogenarian and other 18 non-octogenarian patients' data confirmed with severe COVID-19 pneumonia in B8 West isolated ward, Tongji Hospital (Wuhan, China) has been collected. The diagnosis of severe COVID-19 pneumonia was according to World Health Organization interim guidance[10] and Guidelines for diagnosis and treatment of COVID-19 infection by the National Health Commission (Trial Version 7) [11] (see **Supplement Table**). The diagnosis of COVID-19 was determined with at least two positive results of RT-PCR assay for SARS-CoV-2. Patients absent of or with negative SARS-CoV-2 test results were excluded from this study. The patients have been admitted in isolated ward on 10th Feb. During the treatment process, at least two times of CT scan have been done of every patient and the image of CT has been collected. Patients' CT images were identified by their characteristics as: 1) ground-glass opacities (GGOs); 2) consolidation with or without vascular enlargement; 3) interlobular septal thickening, and 4) air bronchogram sign. After evaluation of the octogenarian patients' data, CT image features (e.g. lobes involved, lesion types, absorption duration) and other clinical data (e.g. laboratory result, hospital stay duration) have been compared between octogenarian patients and non-octogenarian adult patients. Continuous measurements was expressed as mean \pm SD if they are normally distributed or median (IQR). If they are not, and their differences were compared by the Student's t-test or Mann-Whitney U-test or Kruskal-Wallis test or Wilcoxon signed rank test. Categorical variables were compared by χ^2 test or Fisher's exact test. We used Graph Pad Prism (version 8.0) for all analyses. Two-tailed P values <0.05 were considered statistically significant.

Result

Baseline characteristics of the study population

The study population included 24 hospitalized patients with severe type novel coronavirus pneumonia (COVID-19) and 6 patients are octogenarian, other 18 are non-octogenarian adult patients. All patients are survived when we finish the observation at March 15th. For octogenarian patients, the age is 83.33 ± 3.08 and 4 are female (4/6,66.7%). For non-octogenarian patients, the age is 60.72 ± 8.28 years and 5 are female(5/18, 27.8%), and 59% were men (**Table 1**). On admission, most patients had fever, cough, shortness of breath, myalgia, chest distress, diarrhea and fatigue. There is no difference of symptoms incidence between octogenarian and non-octogenarian patients. Compared non-octogenarian patients, octogenarian patients' hospital stay duration is significantly longer ($p=0.0052^*$). (**Table 1**)

Laboratory results of the two group patients

To find out the laboratory result difference between octogenarian and non-octogenarian patients, we compare the blood routine, blood chemistry, coagulation test and inflammation/ infection bio-markers separately. WBC counting has been found obviously elevated in octogenarian ($p=0.0494^*$). The renal function's indicator, BUN ($p=0.0377^*$) and Cr ($p=0.0112^*$) is obvious higher than non-octogenarian in octogenarian patients (**Table 2**).

CT findings and features of the two group patients

We compared the CT in two group patients in featured CT findings such as ground glass opacities, consolidation, vascular enlargement, interlobular septal thickening, air bronchogram sign. Also, the lesion area and absorption time is also with no difference. The above features seems have no differences between octogenarian and non-octogenarian statistically. However, we noticed that, in some individual case, the lesion involve area and lesion types is more and severe in octogenarian patients.(**Figure 1 and Figure 2**)

Discussion

Severe COVID-19 pneumonia octogenarian need longer hospital stay and prone to combined of bacterial infection.

Since the COVID-19 pneumonia has already spread all over the world, the aged people is one of the easily susceptible population [12]. And in the latest study reported that increasing odds of in-hospital death is associated with older age[13]. Octogenarian COVID-19 patients have more underlying comorbidities (e.g. hypertension, diabetes mellitus, chronic obstructive pulmonary disease and coronary heart disease). The clinical characteristics between octogenarian patients and other adult patients seems not that significant here in this study. Some study showed that in super-elderly patients (>85 year old), WBC may not be the better predictor to bloodstream bacterial infection[14]. However, in our study, the WBC between octogenarian and non-octogenarian seems have differences, might due to the aged people have more possibility to combined of bacterial infection except the COVID-19 infection[14]. It is not difficult to understand that the hospital stay of octogenarian is longer than non-octogenarian. We found that they prone to combined with bacterial infection, hypertension, diabetes and even more case of poor nutrition. All these factors may delay the recovery of octogenarian from COVID-19 infection. In this study, the oldest patient, who stay in hospital for 35 days, is 89 year-old. During the COVID-19 pneumonia treatment, we need help him a lot to his heart function, kidney function and nutrition situation as well.

Renal function is weaker in severe COVID-19 pneumonia octogenarian

In the laboratory result, the renal function has been found with significant differences between octogenarian and non-octogenarian patients. Although there are no definite basic nephropathy in octogenarian group, their Cr and BUN level is higher than younger people. The kidney function and the risk of chronic kidney disease is elevate associates to age[15]. This finding may remind that physicians should pay attention to the potential fragile nephrotic function. Because when treating the severe COVID-19 pneumonia, numerous drugs may worsen the kidney function of octogenarian[16,17]. For example, the frequently used anti-virus drug Arbidol, it should be decrease dose due to patients' abnormal kidney function. Further, since the COVID-19 pneumonia pathology shows the lungs of both patients exhibited edema, proteinaceous exudation[18], the intravenous fluid dose need consider for the octogenarian. Heavy fluid burden with decreased kidney function may deteriorate the pulmonary function.

CT findings is similar in octogenarian and non-octogenarian, however in some individual case, octogenarian's CT image seems more severe.

We do not found out differences between octogenarian and non-octogenarian adult patients. However, based on CT image case by case, there are some impression that the lesion area and lesion types may be larger and more than non-octogenarian (**Figure 1 and Figure2**). One study reported that in immunocompromised population, CT scans with novel influenza H1N1 commonly show a strong airway predominance of findings or peripheral areas of consolidation involving the lower lobes[19]. However, other study mentioned that the CT findings is not with differences between people in the immunocompetent or immunocompromise when the situation of virus infection[20]. Aged patients' COVID-19 pneumonia recovery manifestation in CT image may need longer follow-up to recognize. And its potential difference between two group patients also may need more CT image comparison and long-time observation.

Limitation Of The Study

The limitation of this study is the small size of cohort, even we paired 1:3 ratio of non-octogenarian patients. Some sampling error may happened and some useful information may not been find. Also, for the CT findings, we do not observe until the end of the lesion disappear completely. Follow-up of the chest CT of the COVID-19 pneumonia may help us to understand more difference between octogenarian and other adult patients.

Conclusion

In the background of global aging population trend and COVID-19 pneumonia breakout condition, aged people especially octogenarian is susceptible and vulnerable. For this small cohort study we may conclude: 1) The severe COVID-19 pneumonia octogenarian may have more chance to combined with bacterial infection. 2) Due to their baseline kidney function is weaker than non-octogenarian, deterioration of kidney function may happened by aggressive multiple-drug treatment of COVID-19 pneumonia. 3) In some individual case, the broader lesion and more lesions types may be found in octogenarian CT image.

Abbreviations

COVID-19: coronavirus disease 2019; CT: computed tomography; RT-PCR: real-time reverse transcriptase-polymerase chain reaction; SARS-Cov-2:severe acute respiratory syndrome coronavirus 2; GGO: ground glass opacities; SD: standard deviation; WBC: white blood cell; Cr: creatinine; BUN: blood urea nitrogen; H1N1: swine influenza virus Hsw1N1.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Secondary Xiangya Hospital (Changsha, China). Ethics Committee approval number is 2020012. The consent we obtained from participants was verbal. The verbal consent was obtained due to the contagious diseases, no hard copy can be kept after touched by patients. This verbal consent was approved by the ethics committee.

Consent to publish

The consent to publish we obtained from participants was verbal. The verbal consent was obtained due to the contagious diseases, no hard copy can be kept after touched by patients. This verbal consent was approved by the ethics committee.

Availability of data and materials

Extra data is available by emailing XL at 1292710310@qq.com.

Competing interests

There is no competing interest in this study.

Funding

Not funding was obtained for this study.

Authors' Contributions

XL make contribution in conceiving, data collection, analysis and writing. JJT, XLL and CS make equal contribution in validation, management and resource. BLY, LZ Y, HZ, GXH,LT, MX, LZ make equal contribution in data collection and support the analysis. JNZ and LX support the data analysis and management data.

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Tables

Table 1: Baseline characteristics of COVID-19 octogenarian and non-octogenarian adult patients on admission

Variable	Octogenarian (n=6)	Non-octogenarian (n=18)	P value
Age(years)	83.33±3.08	60.72±8.28	<0.0001****
Gender			0.9999
Men	2 (33.3%)	13 (72.2%)	
Cardiovascular diseases	2 (33.3%)	3 (16.7%)	0.9999
Pulmonary disease	0 (0%)	2 (11.1%)	0.9999
Hypertension	4 (66.7%)	5 (27.8%)	0.1501
Diabetes	1(16.7%)	4 (22.2%)	0.9999
Fever	3 (50.0%)	16 (88.9%)	0.0785
Cough	4 (66.7%)	6 (33.3%)	0.1921
Shortness of breath	1(16.7%)	8 (50.0%)	0.3509
Myalgia	0 (0%)	1(5.6%)	0.9999
Chest distress	3(50.0%)	5 (27.7%)	0.3618
Diarrhea	1(16.7%)	0 (0%)	0.2500
Fatigue	0 (0%)	1(5.6%)	0.9999
Onset to admission(day)	7.83±5.74	11.44±6.37	0.1995
Hospital stay (day)	33.00±2.76	15.61±6.99	0.0052**

COVID-19 patients: Novel coronavirus pneumonia patients; Data are median ± SD, and n (%).

Table 2: Laboratory results and comparison between octogenarian and non-octogenarian severe COVID-19 pneumonia patients.

Variable	Octogenarian (n=6)	Non-octogenarian (n=18)	P value
Blood routine			
WBC ($\times 10^9$ cells per L)	7.44 \pm 2.47	5.28 \pm 1.78	0.0494*
N ($\times 10^9$ cells per L)	5.38 \pm 2.77	3.66 \pm 1.56	0.1333
L ($\times 10^9$ cells per L)	1.30 \pm 0.62	1.16 \pm 0.49	0.5474
HGB (g/L)	118.5 \pm 8.14	122.1 \pm 8.70	0.4629
Coagulation function			
APTT (sec)	91.67 \pm 7.15	92.94 \pm 11.78	0.9597
PT (sec)	13.82 \pm 0.70	13.80 \pm 0.81	0.9541
INR	1.06 \pm 0.06	1.05 \pm 0.08	0.9999
FIB (g/L)	5.54 \pm 1.56	4.98 \pm 1.43	0.3839
Blood biochemistry			
TP (g/L)	69.23 \pm 4.40	67.02 \pm 5.07	0.4074
ALT (U/L)	41.33 \pm 21.93	28.94 \pm 22.62	0.1929
AST (U/L)	48.50 \pm 50.98	29.18 \pm 19.28	0.3272
BUN (mmol/L)	7.17 \pm 3.13	4.39 \pm 1.31	0.0377*
Cr (μ mol/L)	95.50 \pm 27.49	64.89 \pm 19.41	0.0112*
CK (U/L)	129.2 \pm 75.14	90.69 \pm 106.3	0.1587
LDH (U/L)	277.0 \pm 117.7	288.7 \pm 76.62	0.4458
Infection/inflammation-related biomarkers			
PCT (ng/mL)	0.71 \pm 0.19	0.08 \pm 0.08	0.2528
ESR (mm/h)	59.17 \pm 36.90	45.83 \pm 27.89	0.4051
hsCRP(mg/L)	51.50 \pm 41.97	29.31 \pm 37.04	0.3042
IL-6	18.84 \pm 11.76	11.09 \pm 15.48	0.0637

Data are show as median \pm SD. Abbreviations: WBC: White blood cell count; N: Neutrophil count; L: Lymphocyte count; HGB: Haemoglobin; APTT: Activated partial thromboplastin time; PT: Prothrombin time; INR: International normalized ratio; FIB: Fibrinogen; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; BUN: Blood urea nitrogen; Cr: Serum creatinine; CK: Creatine kinase; LDH: Lactate dehydrogenase; PCT: Procalcitonin; ESR: Erythrocyte sedimentation rate; hsCRP: high sensitive c reactive protein; IL-6: interleukin-6.

Table 3: CT features and comparison between octogenarian patients and non-octogenarian adult patients.

CT features	Octogenarian	Non-octogenarian	P value
Absorption duration (day)	20.00±9.25	15.61±5.43	0.2697
<i>CT characteristic findings</i>			
Number of involved lobes	3.83±1.47	2.61±0.98	0.1147
Lesion involve bilateral longs	5(83.3%)	15 (83.3%)	0.1818
GGO	5(100%)	18 (100%)	0.9999
Consolidation	4(66.7%)	10 (55.6%)	0.9999
Vascular enlargement	3 (50.0%)	5(27.8%)	0.3618
Interlobular septal thickening	3 (50.0%)	6 (33.3%)	0.6349
Air bronchogram sign	3 (50.0%)	5 (27.8%)	0.3618

Data are median ± SD, and n (%).

Abbreviations: CT: computed tomography; GGO: ground-glass opacities.

Figures

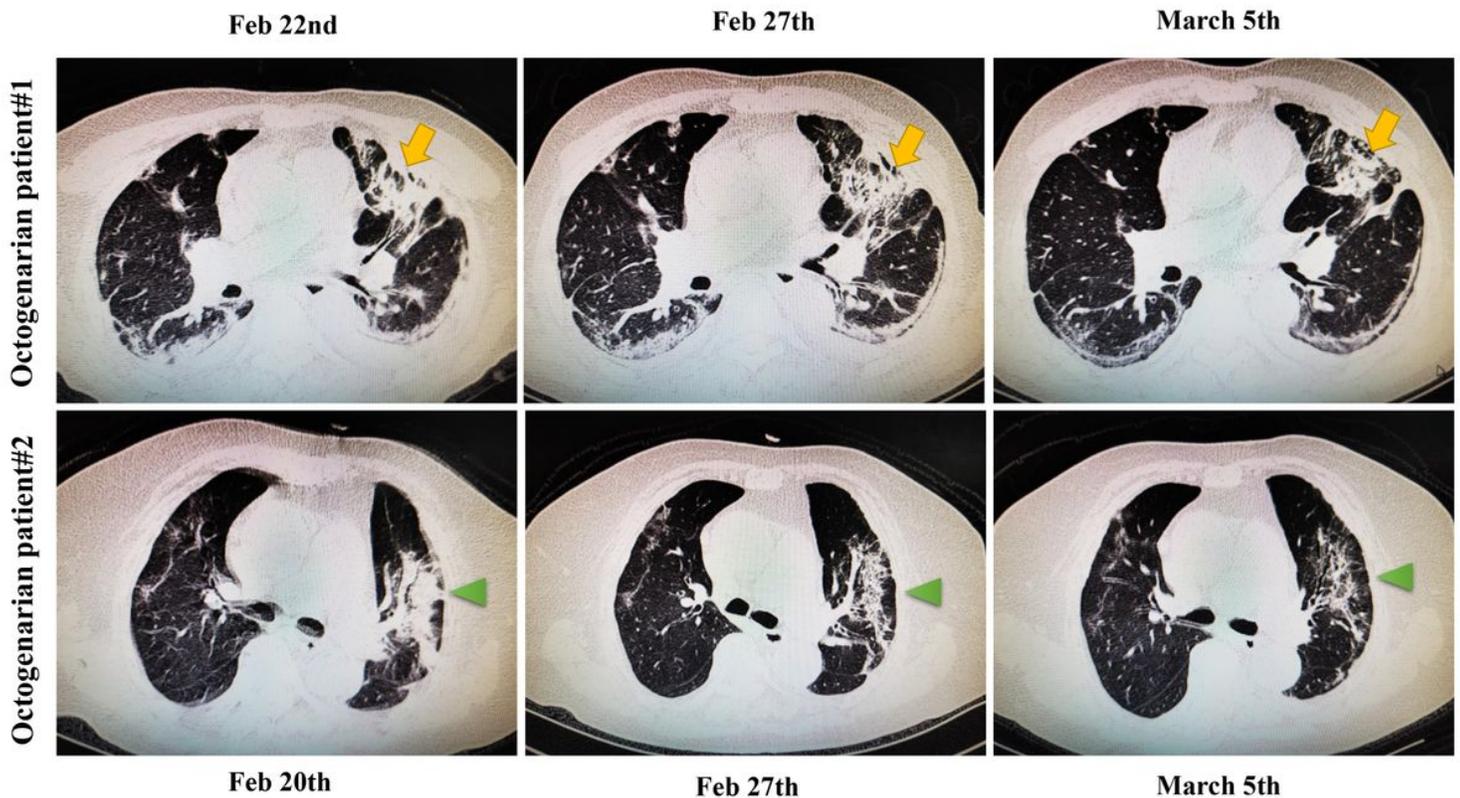


Figure 1

Upper lining figures is number 1 octogenarian patient's CT images. At the time course of three CT image at same somatic level, the large-scale lesion e.g. GGO, consolidation change is relieved. Yellow arrow shows the obvious absorption of lesion. Lower lining figures is number 2 octogenarian patient's CT

images. At the time course of three CT image at same somatic level, the lesion especially in left lung e.g. GGO, consolidation change is relieved. Green arrow shows the obvious absorption of lesion.

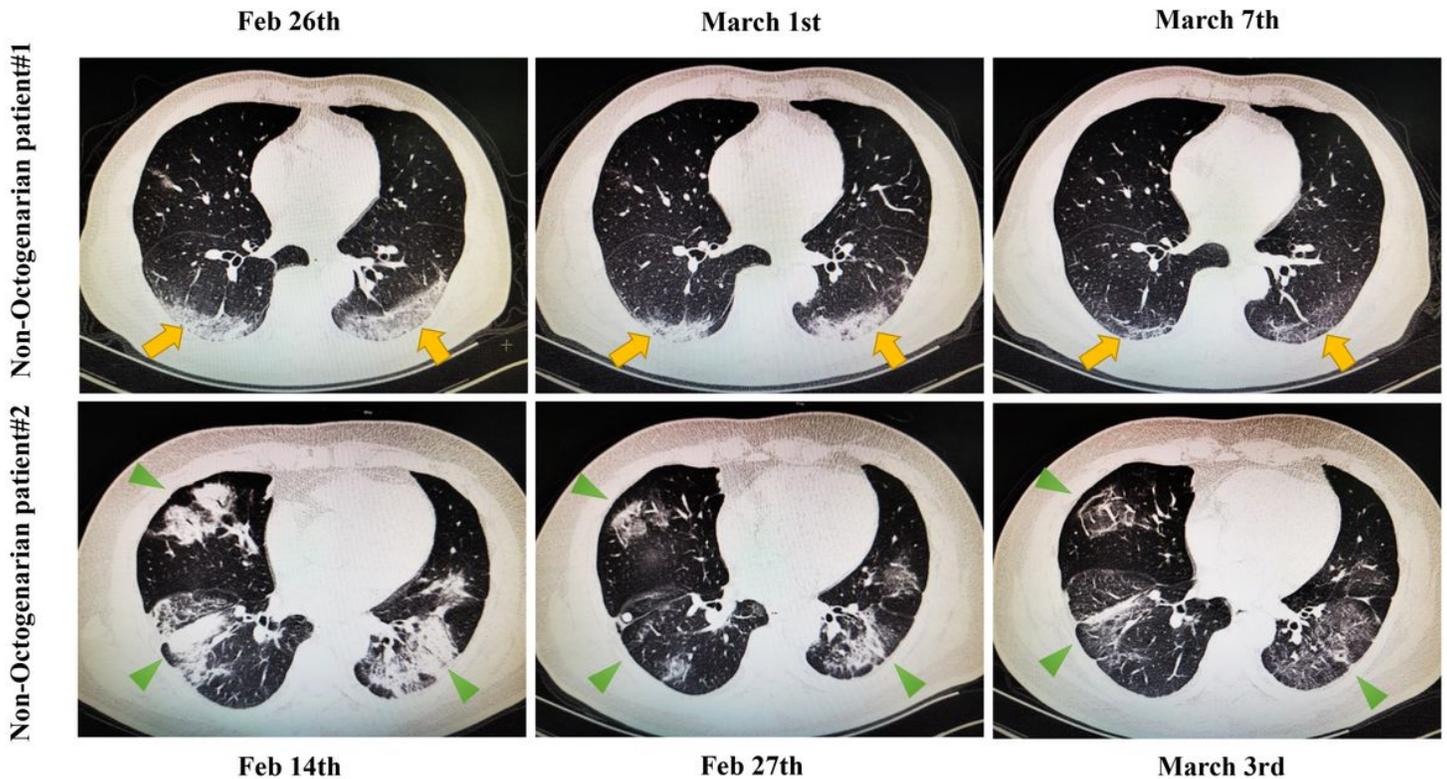


Figure 2

Upper lining figures is number 1 non-octogenarian patient's CT images. At the time course of three CT image at same somatic level, the bilateral localized lesion e.g. GGO change is relieved. Yellow arrow shows the obvious absorption of lesions. Lower lining figures is number 2 non-octogenarian patient's CT images. At the time course of three CT image at same somatic level, the lesions in bilateral lung e.g. GGO, consolidation change is relieved. Green arrow head shows the obvious absorption of lesions.

Supplementary Files

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