ISSN 2307-8960 (online)

World Journal of *Clinical Cases*

World J Clin Cases 2021 April 26; 9(12): 2696-2950

Published by Baishideng Publishing Group Inc

World Journal of Clinical Cases

Contents

Thrice Monthly Volume 9 Number 12 April 26, 2021

MINIREVIEWS

ORIGINAL ARTICLE

Clinical and Translational Research

Retrospective Study

SYSTEMATIC REVIEWS

META-ANALYSIS

World Journal of Clinical Cases

Thrice Monthly Volume 9 Number 12 April 26, 2021

Contents

CASE REPORT

World Journal of Clinical Cases

Thrice Monthly Volume 9 Number 12 April 26, 2021

Contents

World Journal of Clinical Cases

Thrice Monthly Volume 9 Number 12 April 26, 2021

Contents

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Jing Liu, MD, PhD, Chief Doctor, Professor, Department of Neonatology and NICU, Beijing Chaoyang District Maternal and Child Healthcare Hospital, Beijing 100021, China. liujingbj@live.cn

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (*WJCC*, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The *WJCC* is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2020 Edition of Journal Citation Reports® cites the 2019 impact factor (IF) for *WJCC* as 1.013; IF without journal self cites: 0.991; Ranking: 120 among 165 journals in medicine, general and internal; and Quartile category: Q3. The *WJCC*'s CiteScore for 2019 is 0.3 and Scopus CiteScore rank 2019: General Medicine is 394/529.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ji-Hong Liu*; **Production Department Director:** *Xiang Li*; **Editorial Office Director:** *Jin-Lei Wang*.

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

EDITORS-IN-CHIEF
Dennis A Bloomfield, Sandro Vento, Bao-Gan Peng

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
April 26, 2021

INSTRUCTIONS TO AUTHORS
https://www.wjgnet.com/bpg/gerinfo/204

GUIDELINES FOR ETHICS DOCUMENTS
https://www.wjgnet.com/bpg/GerInfo/287

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
https://www.wjgnet.com/bpg/gerinfo/240

PUBLICATION ETHICS
https://www.wjgnet.com/bpg/GerInfo/288

PUBLICATION MISCONDUCT
https://www.wjgnet.com/bpg/gerinfo/208

ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/bpg/gerinfo/242

STEPS FOR SUBMITTING MANUSCRIPTS
https://www.wjgnet.com/bpg/GerInfo/239

ONLINE SUBMISSION
https://www.f6publishing.com

World Journal of Clinical Cases

Submit a Manuscript: https://www.f6publishing.com

World J Clin Cases 2021 April 26; 9(12): 2890-2898

DOI: 10.12998/wjcc.v9.i12.2890

ISSN 2307-8960 (online)

CASE REPORT

Timing of convalescent plasma therapy-tips from curing a 100-year-old COVID-19 patient using convalescent plasma treatment: A case report

Bo Liu, Kang-Kang Ren, Nian Wang, Xin-Ping Xu, Jue Wu

ORCID number: Bo Liu 0000-0003-3401-5422; Kang-Kang Ren 0000-0002-0088-1288; Nian Wang 0000-0002-5227-405X; Xin-Ping Xu 0000-0002-9568-4171; Jue Wu 0000-0001-6008-8428.

Author contributions: Liu B collected the data for the case presentation and contributed to manuscript drafting; Wu J and Wang N contributed to supervision of the data collection, analysis of the data, and write-up of this manuscript; Ren KK and Xu XP contributed to the data analysis; All authors contributed to the critical review and final approval of the manuscript.

Supported by Medical Collaborative Science and Technology Innovation Research Project of Science and Technology Commission of Beijing, No. Z181100001918013; and Nanchang Science and Technology Bureau, No. 20203306.

Informed consent statement: Informed written consent was obtained from the patient for publication of this report.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

Bo Liu, Department of Laboratory, Hospital No. 967 of PLA, Dalian 116000, Liaoning Province, China

Bo Liu, Department of Laboratory, Guanggu Branch of Hubei Maternal and Child Health Hospital, Wuhan 430073, Hubei Province, China

Kang-Kang Ren, Xin-Ping Xu, Gaoxin Hospital, The First Affiliated Hospital of Nanchang University, Nanchang 330006, Jiangxi Province, China

Nian Wang, GrandOmics Diagnostics Co., Ltd, Wuhan 430073, Hubei Province, China

Jue Wu, Translational Medicine Research Center, Medical Innovation Research Division of Chinese PLA General Hospital, Beijing 100853, China

Corresponding author: Jue Wu, PhD, Chief Physician, Translational Medicine Research Center, Medical Innovation Research Division of Chinese PLA General Hospital, No. 28 Fuxing Road, Haidian District, Beijing 100853, China. juetwmj79347@163.com

Abstract

BACKGROUND

Convalescent plasma therapy is used for the treatment of critically ill patients for newly discovered infectious diseases, such as coronavirus disease 2019 (COVID-19) pneumonia, under the premise of lacking specific treatment drugs and corresponding vaccines. But the best timing application of plasma therapy and whether it is effective by antiviral and antibiotic treatment remain unclear.

CASE SUMMARY

We describe a patient with COVID-19, a 100-year-old, high-risk, elderly male who had multiple underlying diseases such as stage 2 hypertension (very high-risk group) and infectious pneumonia accompanied by chronic obstructive pulmonary disease and emphysema. We mainly describe the diagnosis, clinical process, and treatment of the patient, including the processes of two plasma transfusion treatments.

CONCLUSION

This provides a reference for choosing the best timing of convalescent plasma treatment and highlights the effectiveness of the clinical strategy of plasma

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Manuscript source: Unsolicited manuscript

Specialty type: Medicine, research and experimental

Country/Territory of origin: China

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C, C
Grade D (Fair): 0
Grade E (Poor): 0

Received: December 5, 2020
Peer-review started: December 5, 2020
First decision: January 7, 2021
Revised: January 18, 2021
Accepted: March 3, 2021
Article in press: March 3, 2021
Published online: April 26, 2021

P-Reviewer: Ciotti M, Frater JL
S-Editor: Fan JR
L-Editor: Filipodia
P-Editor: Wang LL

treatment in the recovery period of patients with COVID-19 pneumonia.

Key Words: COVID-19; Convalescent plasma therapy; Treatment; Elderly; Timing; Case report

Core Tip: A 100-year-old coronavirus disease 2019 (COVID-19) patient with several underlying diseases including hypertension (stage 2 hypertension) accompanied by chronic obstructive pulmonary disease and emphysema was treated using convalescent plasma. Besides the effective maintenance of supportive treatment and no antiviral and antibiotic treatment, the convalescent plasma was infused into the patient in the early stage of the infection. This choice of time points (days 7 and 11 of hospitalization) provides a reference for choosing the best timing of convalescent plasma treatment and highlights the effectiveness of the clinical strategy of plasma treatment in the recovery period of patients with COVID-19 pneumonia.

Citation: Liu B, Ren KK, Wang N, Xu XP, Wu J. Timing of convalescent plasma therapy-tips from curing a 100-year-old COVID-19 patient using convalescent plasma treatment: A case report. *World J Clin Cases* 2021; 9(12): 2890-2898
URL: https://www.wjgnet.com/2307-8960/full/v9/i12/2890.htm
DOI: https://dx.doi.org/10.12998/wjcc.v9.i12.2890

INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) pneumonia in Wuhan in 2019 has garnered intense attention. Most patients with this type of pneumonia have a good prognosis. A small percentage of patients fall critically ill, and critical illness and death occur mostly in the elderly. Therefore, elderly people are the high-risk group of COVID-19 pneumonia patients. Understanding the medical treatment of elderly patients with severe COVID-19 pneumonia can greatly reduce the mortality from novel coronavirus infection. According to a press release issued by the National Health Commission of the People's Republic of China on February 4, 2020, an analysis of current death cases found that most deaths (two-thirds) are in men and in senior citizens (> 80% are over 60 years old). Over 75% of patients who die from it have more than one underlying disease, mainly including cardiovascular and cerebrovascular diseases, diabetes, and cancer. Once infected with pneumonia, elderly people with underlying diseases are considered high-risk in clinical practice, and their mortality rate is very high[1]. Although numerous trials have reported the timing of convalescent plasma therapy[2,3], to date, no trials have been conducted on extremely old persons or newly infected persons with multiple underlying diseases.

Here, we present a case of a 100-year-old (super elderly) patient with multiple underlying diseases (*i.e.* high-risk patient) who was cured of a novel coronavirus infection. We mainly describe the diagnosis, clinical process, and treatment of this case, including a description of two plasma transfusion treatments. The cure of this case provides a reference for formulating the treatment plans and the best timing of convalescent plasma treatment for elderly patients with various underlying diseases. This report was approved by Ethics Committee of Guanggu Branch of Hubei Maternal and Child Health Hospital.

CASE PRESENTATION

Chief complaints

The patient had a history of exposure and had repeated coughing and shortness of breath for 2 mo. He tested positive for the novel coronavirus using a nucleic acid test in Wuhan Community Health Center on February 22, 2020.

History of present illness

The patient had repeated coughing and shortness of breath for 2 mo.

History of past illness

The patient had a history of underlying diseases including hypertension for approximately 30 years, dementia, abdominal aortic aneurysm, cerebral infarction, and prostate hyperplasia.

Personal and family history

The patient had lived in Wuhan, China for a long time, and had contact with COVID-19-confirmed patients (not confirmed at that time).

Physical examination

Physical examination of the patient upon admission showed stable vital signs, with a body temperature of 36.6 °C, a pulse of 87 beats/min (regular), a respiratory rate of 18 breaths/min (regular), and blood pressure of 125/63 mmHg.

Laboratory examinations

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) test results in patient at different time points (on hospitalization days 5, 9, 10, 12 and 13) are shown in Table 1. The results of blood biochemistry (hepatic function, renal function, electrolytes, lipid, and glucose), blood cell analysis, and coagulation function are shown in Table 1.

Imaging examinations

On the second day after admission (February 25, 2020), a chest computed tomography (CT) scan revealed small amounts of abnormally dense shadows in both lungs, suggesting infectious pneumonia accompanied by chronic obstructive pulmonary disease and emphysema (Figure 1).

Further diagnostic work-up

We sequenced the metatranscriptome of the anal swab from the patient on the Illumina NextSeq 500 PE150 platform, producing over 18 Million Pair-End reads (Supplementary Table 1). The sample contained approximately 3.21% human reads. For taxonomic classification, filtered reads were searched against the NCBI Ref-Seq database. This classified 99.24% of the filtered reads to the bacteria domain and 0.05% to the viral domain (Supplementary Table 2 and Figure 2). No SARS-CoV-2 reads were detected. This result was consistent with the clinical outcome that the patient had recovered completely from SARS-CoV-2 infection. In addition, the anal swab sample exhibited a high abundance of reads of the putative bacterial pathogens, 27.44% classified to *Escherichia coli*, 25.65% *Salmonella enterica*, and 8.55% *Klebsiella pneumoniae* (Figure 2, Supplementary Figure 1 and Supplementary Table 3).

FINAL DIAGNOSIS

The patient was confirmed with COVID-19 by positive SARS-CoV-2 oropharyngeal swab test and suggested infectious pneumonia accompanied by chronic obstructive pulmonary disease and emphysema, and a history of underlying diseases.

TREATMENT

The treatment plan adopted was supportive treatment with oxygen inhalation and frequent, low-volume nasal-feeding nutritional support with a daily maintenance of 1000 mL of Fresubin Diabetes (Enteral Nutritional Emulsion [Tpf-D]). Because lung changes due to COVID-19 pneumonia were mild and the patient was very old, no antiviral treatment was given at first. Intravenous supplementation with hypertonic sodium chloride was given to correct his hyponatremia, and intravenous infusion of human albumin was given to correct the hypoproteinemia. The antihypertensive drugs that the patient routinely took (telmisartan tablets and nifedipine sustained release tablets) kept stabilizing blood pressure.

On day 5 of hospitalization, the patient tested positive for SARS-CoV-2 nucleic acid.

Table 1 Laboratory findings of patient infected with severe acute respiratory syndrome coronavirus 2 on admission to hospital

Hospital day	Reference range	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13
		Feb 25, 2020	Feb 26, 2020	Feb 27, 2020	Feb 28, 2020	Feb 29, 2020	Mar 1, 2020	Mar 2, 2020	Mar 3, 2020	Mar 4, 2020	Mar 5, 2020	Mar 6, 2020	Mar 7, 2020
Nucleic acid testing					P				P	P		N	N
Antibody						IgG+			IgG+	Detection IgM+	-	IgM+	
IL6 in pg/mL	0-10	-			24.63↑				66.21↑	21.47↑	-		
BNP in pg/mL	0-100		78.8		135.4↑							242.1↑	
Albumin in g/L	35-52	29.4		29.1			33.4	35	31.6			34.7	35.7
Blood clean	1-2.4	0.95↓		0.8↓			0.95	0.91	0.93			1.05	1.08
Globulin, A/GGlutamic pyruvic	0-55	49.3		34.2			17.4	20.7	16.4			13.7	17.3
Transaminase, ALT in U/L, GGT in U/L	12-64	96↑		75↑			57	52	42			35	34
TBA in μmol/L	0-9.67	4		2.5			19.3	14.5	29.7			42.8	11.2
CRE in μmol/L	64-104	73.1		62↓			50.8↓	55.1↓	53.2↓			42.6↓	48.4
UA in μmol/L	210-420	293		346			246	256	241			118↓	116
hs-cTn in pg/mL	0-34.2					19							
MYO in ng/mL	0-106					498.7↑							
CK-MB in ng/mL	0-3.1					11.1 ↑							
D-Dimer in mg/L	0-0.55								3.17				4.38
LYM, %	20-50						12.1↓		14.9↓			12.8↓	14.4
LYM, × 10^9/L	1.1-3.2						0.63↓		0.69↓			0.84↓	1.08
RBC, × 10^{12}/L	4.3-5.8						3.29↓		3.35↓			3.27↓	3.22
HGB in g/L	130-175						100↓		100↓			97↓	95
Red blood cell specific volume, HCT, %	40-50						29.3↓		29.7↓			29.3↓	28.7
hs-CRP in mg/L	0-10	108.43↑					49.18↑					27.03	24.97
tHb in g/L	117-174			70↓					94↓				115

Carbon monoxide	0.5-1.5	2.2↑	1.3	1.5
COHb, % un-ionized HHb, %	0--5	-0.4	0.6	0.2
Glucose in mmol/L	3.6-5.2	10.9↑	6.2↑	8.1
Base excess of blood in mmol/L	-2-3	-5.1↓	4.6↑	4.1
Beecf in mmol/L	-2-3	-5.6↓	5↑	4.7

-: Negative; +: Positive; ALT: Alanine aminotransferase; Beecf: Base excess of the extracellular fluid; CK-MB: Creatine kinase isoenzyme-MB; COHb: Hemoglobin; CRE: Creatinine; GGT: γ-Glutamyl transferase; HCT: Hematocrit; HGB: Hemoglobin; HHb: Hemoglobin; hs-CRP: Hypersensitive C-reactive protein; hs-cTn: High-sensitivity cardiac troponin; Ig: Immunoglobulin; IL6: Interleukin-6; LYM: Lymphocyte absolute value; MYO: Myoglobin; N: Negative; P: Positive; RBC: Red cell count; TBA: Total bile acid; tHb: Total hemoglobin; UA: Uric acid.

The patient showed repeated coughing and shortness of breath. An urgent blood test showed hemoglobin at 100 g/L and absolute lymphocyte value at 0.63 × 10^9/L, suggesting that the patient had anemia and low immunity. CT showed infectious pneumonia with chronic obstructive pulmonary disease and emphysema. The above clinical indications together with a confirmed diagnosis of COVID-19 pneumonia and the patient's age qualified the patient for infusion of convalescent plasma for COVID-19 patients. On day 7 of hospitalization (March 1, 2020), plasma transfusion therapy using convalescent plasma of an infected patient was started. Intravenous infusion started at 21:45, and 200 mL plasma was infused at 01:30. Throughout the infusion process, the patient had no special discomfort and no adverse reactions to blood transfusion such as fever, chills, rash, or allergies. The patient's vital signs were stable, and the blood oxygen saturation was stabilized at above 95% under low flow oxygen inhalation. The patient continued to receive nutritional support treatment.

On day 11 of hospitalization (March 5, 2020), we conducted the second round of convalescent plasma treatment for SARS-CoV-2 infection using 200 mL plasma, which was infused first slowly and then quickly and ended at 20:40. There was no transfusion reaction during plasma infusion. The day after the blood transfusion, the blood routine test was conducted to evaluate the effects of plasma therapy. The laboratory test results showed that the red blood cell count and hemoglobin had improved and remained stable. This confirmed that the blood transfusion was effective. At the same time, the patient's B-type natriuretic peptide was higher than before, so hydrochlorothiazide tablet was added for diuretic supportive treatment.

OUTCOME AND FOLLOW-UP

On day 11 (March 5, 2020) after admission, a throat swab was taken again, and the novel coronavirus nucleic acid test was negative. The SARS-CoV-2 antibody test

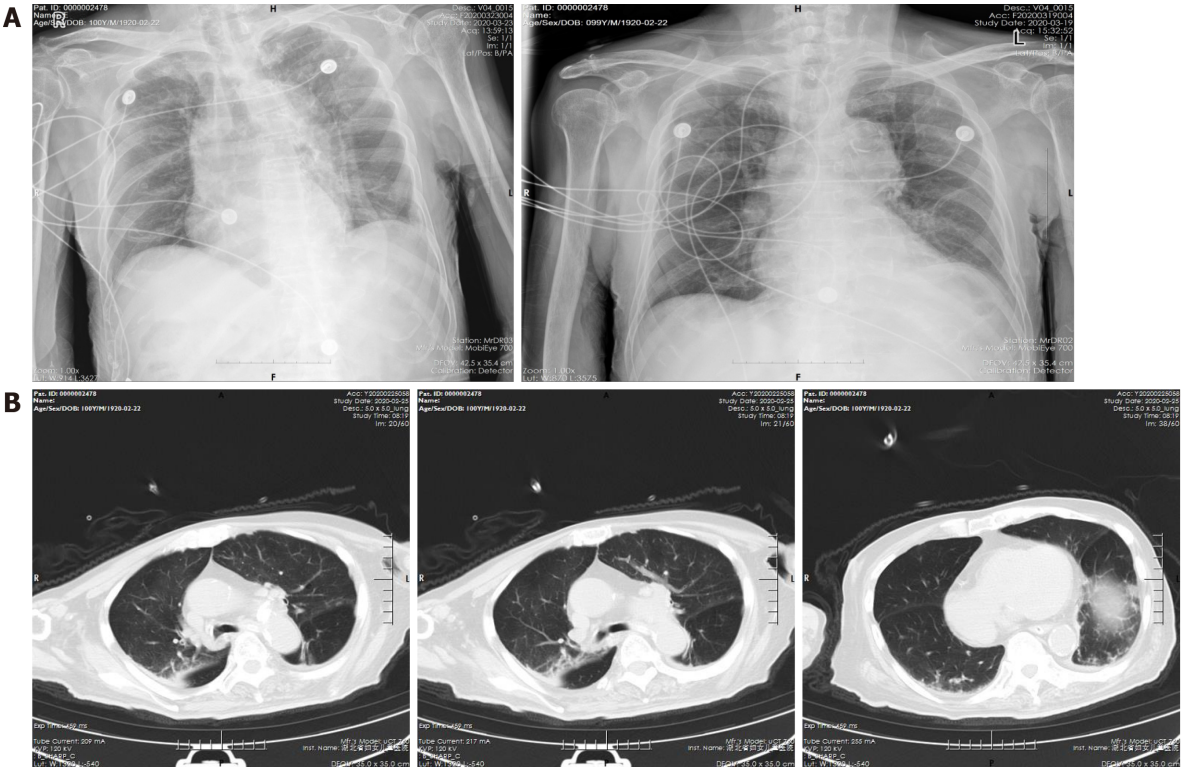

Figure 1 Anterior-posterior chest radiograph and computed tomography chest scan on February 25, 2020 (day 2 of hospitalization). A: Anterior-posterior chest radiograph; B: Computed tomography chest scan. Small amounts of abnormally dense shadows in both lungs, suggesting infectious pneumonia; chronic bronchitis with pulmonary emphysema; old left upper lung lesion; bilateral pleural hypertrophy and calcification; aortic atherosclerosis; and small cyst of the left liver.

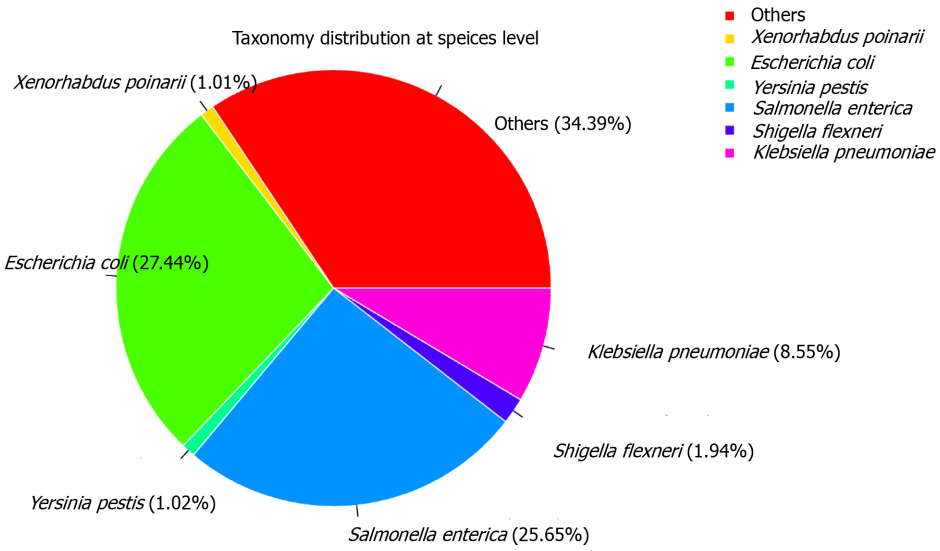

Figure 2 Visualization of the taxonomy classification interactively. Filtered sequences from the anal swab sample were classified by Kraken 2 software and visualized by using Krona tools (https://github.com/marbl/Krona). The distribution of each organism at each taxonomy level can be see interactively. At the domain level, 99.24% of the sequence were classified as bacteria and only 0.05% were classified as viruses.

showed positive for the novel coronavirus immunoglobulin (Ig) G and IgM. On day 12 after admission, the results of physical examination, blood routine, and biochemical tests indicated that the vital signs were stable, the novel coronavirus nucleic acid test was again negative, and the patient's condition had improved. On day 13 after admission, a nasopharyngeal swab sample was collected, and the patient was subjected to metagenomic sequencing using next-generation sequencing. The SARS-CoV-2 reads were not detected in the sequencing results, which was consistent with the nucleic acid test results.

DISCUSSION

Elderly people with underlying diseases, when they are infected with COVID-19 pneumonia, belong to the high-risk group in clinic practice, and their mortality rate is very high, especially patients over 60 years of age with hypertension, heart disease, diabetes, or cancer. In addition, the probability of becoming severely ill or critically ill is higher[4-7]. The treatment of severely ill and critically ill patients has put much pressure on Chinese medical teams at this time. When China's epidemic situation was at its peak, there were nearly 10000 severely ill and critically ill patients in Wuhan with critically ill patients accounting for approximately 5%. The material and manpower requirements were huge. Faced with this situation, we had to treat the patients scientifically and effectively, reduce the number of patients becoming critically ill, and ultimately reduce the mortality.

For the treatment of COVID-19 pneumonia, there are no particularly effective anti-disease drugs. In this case, treatment mainly includes strengthening nutritional therapy, applying oxygen therapy, such as oxygen masks, establishing early warnings for the functions of important organs, and administering intravenous immunoglobulin infusion or convalescent plasma infusion at early stages according to the disease condition. Convalescent plasma is a plasma product collected from patients who have been infected with the virus but have recovered after treatment, and its active ingredient is immunoglobulin. Convalescent plasma usually contains high-potency pathogen-specific antibodies. The collected plasma undergoes virus inactivation and is prepared after neutralizing antibody test and multiple pathogenic microorganism detection. It is used for the treatment of critically ill patients with infectious diseases. Compared with intravenous injection of human immunoglobulin, convalescent plasma contains more specific immunoglobulins for pathogenic microorganisms. Convalescent plasma from recovered patients contains more specific immunoglobulin than the ordinary human immunoglobulin for intravenous injection. For newly discovered infectious diseases, such as COVID-19 pneumonia, under the premise of lacking specific treatment drugs and corresponding vaccines, infusion of special plasma products collected from patients who have recovered from COVID-19 pneumonia can provide instant, massive, and passive immune support and eliminate pathogens. This greatly reduces the mortality of critically ill patients[8]. Convalescent plasma therapy has also been used in the past for the treatment of SARS, 2009 influenza A, avian influenza A, Ebola hemorrhagic fever, and other viral infections[9-11]. Therefore, convalescent plasma therapy has practical significance for the treatment of COVID-19 pneumonia in the absence of specific drugs and vaccines.

Recently, researchers at the Third People's Hospital of Shenzhen, China, treated five critically ill patients with convalescent plasma. All five of them had severe respiratory failure and were on a ventilator; two were accompanied by bacterial and/or fungal pneumonia; and one was under extracorporeal membrane lung oxygenation treatment. The four patients with no comorbid disease received plasma therapy on day 20 of hospitalization, and one patient with hypertension and mitral valve insufficiency received plasma therapy on day 10 of hospitalization. These patients showed improvement approximately 1 wk after infusion of plasma. At the same time, these patients were also receiving antiviral drugs, including lopinavir/ritonavir and interferon[12,13]. The study was not a randomized clinical study, and there was no control group that did not receive plasma therapy. The patients also received many other treatments, such as hormones and antibiotics. Therefore, it is difficult to determine the exact role of plasma therapy, the best timing for plasma therapy, and whether the earlier application of plasma therapy can lead to different clinical results. By contrast, the treatment plan for our patient at the early stage after the infection was detected was the effective maintenance of nutritional and supportive treatment and did not include antiviral and antibiotic treatment, while convalescent plasma was infused on day 7 after admission. Although the novel coronavirus nucleic acid test was still positive on the second day after infusion, the cycle threshold values were significantly higher than those on day 5 of hospitalization. There were no adverse reactions after blood transfusion, and the vital signs were relatively stable. On day 11 of hospitalization (the third day after the first blood transfusion), the patient received the second round of convalescent plasma therapy, and there was no transfusion reaction during the blood transfusion. The red blood cell count and hemoglobin both improved and remained stable. Afterward, the results of the novel coronavirus nucleic acid test were negative for two consecutive days.

According to the clinical classification[14], although the clinical symptoms of this patient were moderate, clinical indications such as his high age and multiple high-risk factors, suggested a risk of critical illness. The treatment plan we adopted did not

include antiviral treatment but used nutritional and supportive treatment to alleviate the patient's symptoms, and we promptly carried out the treatment plan of convalescent plasma transfusion. The patient's immunity was significantly improved, and the patient became negative for the virus within 6 d and did not become severely ill.

Our experience treating this patient suggests that for the elderly and patients with underlying conditions, administering immune-enhancing treatment such as convalescent plasma transfusion while maintaining supportive treatment at the early phase after the beginning of symptoms can effectively reduce the number of patients who progress into critically illness. The success in plasma transfusion in this case also provides a reference for the selection of the optimal time point for plasma treatment. The successful treatment of this case also gave us increased confidence in curing elderly patients.

CONCLUSION

Most patients with COVID-19 have a good prognosis, a small percentage of the patients are critically ill, and critical illness and death occur mostly in the elderly. The elderly is the high-risk group of COVID-19 pneumonia patients, so improving the medical treatment of elderly patients with severe COVID-19 pneumonia is of great significance. Our experience suggests that for patients with high-risk factors for COVID-19 pneumonia, such as old age and underlying diseases, improving the patients' immunity while maintaining supportive treatment in the early stages after they show symptoms can effectively reduce the number of patients who became critically ill. In addition, this patient was treated with convalescent plasma on days 7 and 11 of hospitalization and was successfully cured on day 12. This choice of time points provides a reference for choosing the best timing of convalescent plasma treatment and highlights the effectiveness of the clinical strategy of plasma treatment in the recovery period of patients with COVID-19 pneumonia. The results from this case report are encouraging, yet long-term data from more elderly COVID-19 patients with underlying diseases will be needed to draw definite conclusions and bring it into mainstream clinical practice.

REFERENCES

1 **CCTV**. National Health Commission: men account for two-thirds of all deaths from pneumonia, and 80 percent of them are over the age of 60. 2020 [cited December 10, 2020]. Available from: http://m.news.cctv.com/2020/02/04/ARTICyA7Lj6qtB8hg78M7ayK200204.shtml

2 **Chen N**, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zhang L. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020; **395**: 507-513 [PMID: 32007143 DOI: 10.1016/S0140-6736(20)30211-7]

3 **Agarwal A**, Mukherjee A, Kumar G, Chatterjee P, Bhatnagar T, Malhotra P; PLACID Trial Collaborators. Convalescent plasma in the management of moderate covid-19 in adults in India: open label phase II multicentre randomised controlled trial (PLACID Trial). *BMJ* 2020; **371**: m3939 [PMID: 33093056 DOI: 10.1136/bmj.m3939]

4 **Joob B**, Wiwanitkit V. Convalescent plasma and covid-19 treatment. *Minerva Med* 2020 [PMID: 32538591 DOI: 10.23736/S0026-4806.20.06670-7]

5 **Huang C**, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; **395**: 497-506 [PMID: 31986264 DOI: 10.1016/S0140-6736(20)30183-5]

6 **Wang D**, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y, Li Y, Wang X, Peng Z. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA* 2020; **323**: 1061-1069 [PMID: 32031570 DOI: 10.1001/jama.2020.1585]

7 **Guan WJ**, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DSC, Du B, Li LJ, Zeng G, Yuen KY, Chen RC, Tang CL, Wang T, Chen PY, Xiang J, Li SY, Wang JL, Liang ZJ, Peng YX, Wei L, Liu Y, Hu YH, Peng P, Wang JM, Liu JY, Chen Z, Li G, Zheng ZJ, Qiu SQ, Luo J, Ye CJ, Zhu SY, Zhong NS; China Medical Treatment Expert Group for Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020; **382**: 1708-1720 [PMID: 32109013 DOI: 10.1056/NEJMoa2002032]

8 **National Health Commission of the People's Republic of China**. Convalescent plasma clinical therapy for COVID-19 patients (trial version 2): National Health Commission of the People's

Republic of China, 2020. [cited December 10, 2020]. Available from: http://www.nhc.gov.cn/yzygj/s7658/202003/61d608a7e8bf49fca418a6074c2bf5a2.shtml

9 **Cheng Y**, Wong R, Soo YO, Wong WS, Lee CK, Ng MH, Chan P, Wong KC, Leung CB, Cheng G. Use of convalescent plasma therapy in SARS patients in Hong Kong. *Eur J Clin Microbiol Infect Dis* 2005; **24**: 44-46 [PMID: 15616839 DOI: 10.1007/s10096-004-1271-9]

10 **Kraft CS**, Hewlett AL, Koepsell S, Winkler AM, Kratochvil CJ, Larson L, Varkey JB, Mehta AK, Lyon GM 3rd, Friedman-Moraco RJ, Marconi VC, Hill CE, Sullivan JN, Johnson DW, Lisco SJ, Mulligan MJ, Uyeki TM, McElroy AK, Sealy T, Campbell S, Spiropoulou C, Ströher U, Crozier I, Sacra R, Connor MJ Jr, Sueblinvong V, Franch HA, Smith PW, Ribner BS; Nebraska Biocontainment Unit and the Emory Serious Communicable Diseases Unit. The Use of TKM-100802 and Convalescent Plasma in 2 Patients With Ebola Virus Disease in the United States. *Clin Infect Dis* 2015; **61**: 496-502 [PMID: 25904375 DOI: 10.1093/cid/civ334]

11 **Dean CL**, Hooper JW, Dye JM, Zak SE, Koepsell SA, Corash L, Benjamin RJ, Kwilas S, Bonds S, Winkler AM, Kraft CS. Characterization of Ebola convalescent plasma donor immune response and psoralen treated plasma in the United States. *Transfusion* 2020; **60**: 1024-1031 [PMID: 32129478 DOI: 10.1111/trf.15739]

12 **Shen C**, Wang Z, Zhao F, Yang Y, Li J, Yuan J, Wang F, Li D, Yang M, Xing L, Wei J, Xiao H, Qu J, Qing L, Chen L, Xu Z, Peng L, Li Y, Zheng H, Chen F, Huang K, Jiang Y, Liu D, Zhang Z, Liu Y, Liu L. Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma. *JAMA* 2020; **323**: 1582-1589 [PMID: 32219428 DOI: 10.1001/jama.2020.4783]

13 **Casadevall A**, Pirofski LA. The convalescent sera option for containing COVID-19. *J Clin Invest* 2020; **130**: 1545-1548 [PMID: 32167489 DOI: 10.1172/JCI138003]

14 **National Health Commission of the People's Republic of China**. Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7): National Health Commission of the People's Republic of China, 2020. [cited December10, 2020]. Available from: http://www.nhc.gov.cn/yzygj/s7653p/202003/46c9294a7dfe4cef80dc7f5912eb1989.shtml

Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: bpgoffice@wjgnet.com
Help Desk: https://www.f6publishing.com/helpdesk
https://www.wjgnet.com