

Case Report

Severe Cases of COVID-19 Pneumonia: What Can We Do for Saving Lives ?

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Introduction

COVID-19 pneumonia is mostly not severe. However some cases progress into severe cases which are difficult to treat. It has been over a month since the declaration of pandemic by World Health Organization (WHO). However, there are no immediate signs of decrease, and increasing number of patients has been threatening society. We treated 11 cases of COVID-19 pneumonia in our hospital and obtained essential findings. Here we report our experiences of successful savings of lives.

Case report

[Case 1] 84 year-old, Male

[Chief complaint] fever

[Past History] aspiration pneumonia, paroxysmal atrial fibrillation

[Smoking] 20 cigarettes/day x 30 years

[Onset and course]

Patient visited our hospital at the end of March, 2020. Rapid test for Influenza antibody displayed negative. On Day 7 patient had sustaining fever and visited our hospital again. Chest CT scan revealed ground glass opacity (Fig.1). Blood test revealed decreased white blood cell counts and lymphocytes, and elevated CRP level (Table 1). Nasopharyngeal mucus sample showed positive for SARS-Cov-2 PCR (1.7×10^9 copies of RNA). Patient was admitted to our hospital on Day 7 when his oxygen saturation (SpO₂) was over 90% with inhaling oxygen 2L/min, but he developed severe respiratory failure on Day 8. Patient was transferred to another hospital for advanced treatment, but he refused to be on mechanical ventilation, and returned to our hospital on Day 9. Medication with azithromycin (AZM) 500mg/day, tazobactam/Piperacillin 18g/day, and ciclesonide inhaler was started, but patient presented severe hypoxemia with inhaling oxygen 15L/min (blood gas analysis: pH 7.50, pO₂ 51.0mmHg, pCO₂ 36.2mmHg, HCO₃ 27.7mmol/L).

[Course after admission]

Patient developed severe respiratory failure on Day 8, and SpO₂ was only 80 to 85% with inhaling oxygen 15L/min, but he reported only mild dyspnea. On Day 13 chest X-ray revealed worsening shadows (Fig.2), and blood test revealed increased white blood cell counts and neutrophils, elevated levels of CRP, LDH, and KL-6 (Table 1), which suggested concurrence of bacterial pneumonia, organized pneumonia, or acute respiratory distress syndrome (ARDS). Chest CT scan was not feasible in order to prevent hospital-acquired infection, thus it was difficult to make a diagnosis. As treatment for severe pneumonia, which was possibly organized pneumonia, methylprednisolone 500mg/day was administered for 3 days, followed by prednisolone 40mg/day for 2 weeks. The fever resolved immediately after initiating methylprednisolone. Levofloxacin 500mg/day was administered to

treat possible bacterial infection. For 5 days after admission, ECG monitor displayed atrial fibrillation with rapid ventricular response and patient was oliguric, suggesting that patient also developed heart failure. Furosemide 20mg/day was administered daily from Day 14, and respiratory failure resolved from Day 17. On Day 24 inhaling oxygen was decreased to 4L/min, and patient's general condition was improved to intake regular meal. Blood test revealed improvement of CRP 0.23mg/dL and LDH 327IU/L. Interstitial shadow remained on chest X-ray, and treatment of interstitial pneumonia was continued.

Tests	Units	Date					
		Day 1	Day 7	Day 13	Day 15	Day 17	Day 24
WBC	/ μ L	4,300	3,900	9,600	17,600	14,000	13,300
Hb	g/dL	15.8	16.2	16.1	16	17	16.2
PLT	$\times 10^4$ / μ L	12.2	10.6	16.5	18.9	17.6	16.6
Baso	%	0.5	0	0	0	0	0.2
Eosino	%	0.9	0	0	0	0	1.4
Neutro	%	66.7	61.7	86	85.5	89	83.5
Lympho	%	20.2	27.8	9	11	6	9.2
Mono	%	11.7	10.5	5	3.5	5	5.7
AST	IU/L	48	53	46	59	73	38
ALT	IU/L	42	53	33	59	127	80
LDH	IU/L	195	288	659	631	613	327
γ -GTP	IU/L	41	47	71	62	72	80
BUN	mg/dL	12.2	14.8	11	23.9	29.4	30.3
Cr	mg/dL	0.98	0.96	0.63	0.68	0.73	0.68
Na	mEq/L	139	137	133	140	141	136
K	mEq/L	4.1	3.6	3.8	3.6	3	3.2
CRP	mg/dL	0.62	1.27	10.48	4.97	1.28	0.23
BNP	pg/mL	18.7			84.7		
Procalcitonin	ng/mL	0.04					
KL-6	U/mL			554			

Table 1.

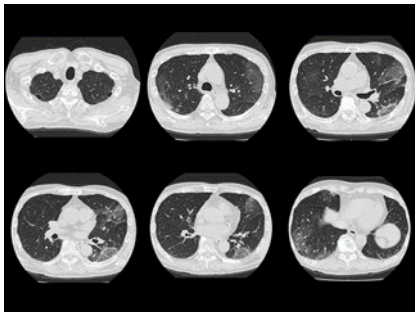


Fig. 1.

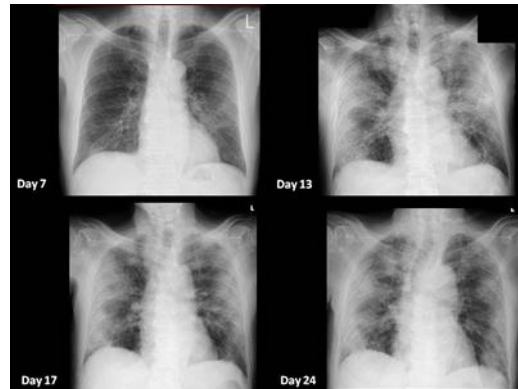


Fig. 2

[Case 2] 70 year-old, female

[Chief complaints] fever, productive cough, general fatigue

[Past history] bronchial asthma (without medication for 3 months)

[Smoking] none

[Onset and course]

Patient had general fatigue, productive cough, and slight fever at the end of March, 2020. On Day 2 she visited a local medical clinic. Oxygen saturation was 96%, and chest X-ray revealed normal findings. Carbocisteine, sitafloxacin, and acetaminophen were prescribed. However, high fever was sustained and productive cough worsened. On Day 9 patient visited the same local medical clinic because she developed dyspnea. Chest X-ray

revealed ground-glass opacity on bilateral lower lobes, and she was referred to our hospital. Patient had worsening dyspnea, and SpO₂ dropped to 90%, thus she was immediately admitted to our hospital.

[Physical findings] Body temperature 36.6°C, Oxygen saturation 91% (room air), rales on both lower lungs.

[Laboratory tests] Table 2

[Course after admission]

Blood test revealed decreased lymphocytes and elevated CRP level, but procalcitonin was low level, which suggested viral infection. Respiratory failure progressed drastically after admission, and a large amount of inhaling oxygen of more than 10L/min was required. Chest X-ray on Day 9 revealed ground-glass opacity in the right middle field and infiltration on the left field (Fig.3). Patient attempted to use steroid inhaler, however it was difficult because of her choking spells. On Day 11, sample of nasopharyngeal mucus displayed positive for SARS-Cov-2 PCR, however the blood test of Day 11 revealed increased white blood cell counts and neutrophils, suggesting secondary bacterial infection. Medication with levofloxacin 500mg/day was initiated. On Day 12, cardiomegaly and oliguria were observed after admission to hospital on Day 9, which suggested heart failure, and furosemide 20mg/day was started to be administered. Fever and respiratory failure resolved from Day 15. On Day 19 patient was able to intake normal meals and inhaling oxygen was decreased to 2L/min.

Tests	Units	Date			
		Day 9	Day 11	Day 15	Day 18
WBC	/μL	6,400	9,100	5,800	5,500
Hb	g/dL	14.3	13.1	12.9	11.6
PLT	x10 ⁹ /μL	35.3	41.4	51.9	38.3
Baso	%	0.2	0.2	0.5	0.5
Eosino	%	0.3	1.1	1.2	0
Neutro	%	78.6	78.1	68	83.5
Lympho	%	15.1	14.5	23.4	11.5
Mono	%	5.8	6.1	6.9	4.5
AST	IU/L	55	36	25	35
ALT	IU/L	47	35	30	45
LDH	IU/L	539	456	282	230
γ-GTP	IU/L	25	23	23	27
BUN	mg/dL	27.1	17.7	19.6	22.8
Cr	mg/dL	0.73	0.58	0.6	0.58
Na	mEq/L	140	138	137	137
K	mEq/L	4.1	4.3	4.5	4.3
CRP	mg/dL	7.2	7.02	4.07	0.67
BNP	pg/mL	5.8			
Procalcitonin	ng/mL	0.03			
KL-6	U/mL	435			

Table 2

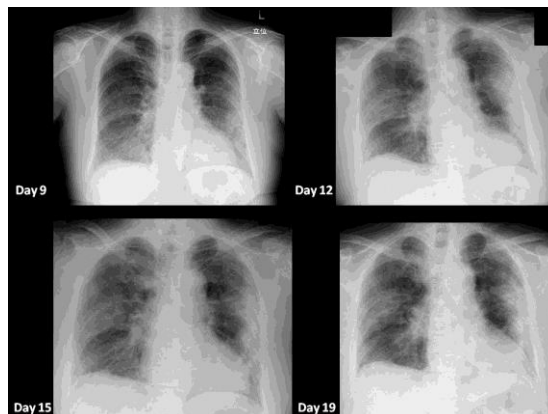


Fig. 3

Discussion:

Here we report the details of treatment experiences of severe COVID-19 pneumonia. Case 1 was a case of severe respiratory failure with large amount of viral RNA which was considered to have developed into ARDS or interstitial pneumonia. Case 2 was considered to have secondary bacterial infection. From April 1 to 17 we had 11 moderate cases of COVID-19 admitted to our hospital, and all cases worsened about 1 week after onset. Three patients developed severe respiratory failure as Case 1, and 8 patients developed secondary bacterial infection as Case 2.

Viral infection may cause severe illness requiring hospital admission, such as pneumonia, heart failure, hepatitis, enterogastritis, meningitis or encephalitis, rhabdomyolysis, and thyroiditis. We rarely experience viral myocarditis and pericarditis. Viral infection is often very mild, and patients do not present respiratory failure in the early stage of respiratory infection. In most common cold cases, symptomatic remedy is given without chest X-ray. Some

cases of viral pneumonia present X-ray findings of secondary bacterial pneumonia or interstitial pneumonia. Senior patients sometimes exhibit complication of aspiration pneumonia. Heart failure often occurs with viral infection especially in the elderly and patients with heart disease.

COVID-19 is a viral infection. Therefore, it is critically important to treat patients with caution for these complications. As described in the course of Case 1 and 2, patients' conditions may change and worsen every few days. Caution should be taken especially for concurring heart failure. Distraction of SARS-Cov-2 may divert needed medical attention away from true and fatal complications.

A report from China analyzing 1,099 patients of COVID-19 in 552 facilities presented 173 (16%) severe cases of pneumonia and 926 (84%) non-severe cases.¹⁾ Among the severe cases, the most common complication was ARDS (15.6%), followed by septic shock (6.4%). In the other report from China, the mean incubation period was 5.2 days, with 95th percentile of the distribution at 12.5 days.²⁾ Our cases also presented similar distributions, with patients worsening over several days to one week, and some patients developing into critical conditions.

There are pros and cons regarding steroid treatment for COVID-19. Wu et al. performed retrospective cohort study on COVID-19 pneumonia patients who developed ARDS, and reported that treatment with methylprednisolone decreased the risk of death.³⁾ However, Russel *et al.* pointed out that WHO did not recommend the use of corticosteroid in their declaration on January 28, and that corticosteroid may inhibit the immune response or delay the clearance of viral RNA.⁴⁾ WHO still did not recommend routine use of methylprednisolone in their declaration on March 13.⁵⁾ However, the aforementioned Case 1 patient refused the use of mechanical ventilation, and neither antibiotics nor Ciclesonide were effective, thereby presenting no other alternative but steroids, with said patient anticipating death. As patient did not have any contraindications to steroid, and because the clinical findings strongly supported the diagnosis of ARDS or interstitial pneumonia, a large amount of methylprednisolone was administered, which saved the patient's life. Antibiotics for concomitant bacterial infection and timely administration of diuretics for heart failure also contributed to saving patient's life. Watchful observation of patient's symptoms, timely treatment for complications, and coordinated teamwork of medical staff proved vital for the successful treatment of COVID-19.

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