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CASE REPORT

COVID-19 Patient Returned to Work after Long Hospitalization and Follow-up: A Case Report

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Background: Coronavirus disease 2019 (COVID-19) causes severe respiratory dysfunction and post-intensive care syndrome (PICS), which can significantly affect the return to work after discharge from the hospital. This report describes the first case of a patient with severe COVID-19 at our institution during the first wave of the COVID-19 pandemic (February to June 2020) who returned to work following rehabilitation management. **Case:** A 48-year-old female nurse was admitted with COVID-19 and underwent mechanical ventilation (MV). Respiratory and anti-gravity training was conducted as physical therapy; however, the patient developed PICS, muscle weakness, delirium, and psychological problems. After the withdrawal of MV, muscle strengthening activities, activities of daily living (ADL) training, family visits, and occupational and speech therapy were started. On day 60 post-admission, the patient was able to perform ADL independently and was discharged; however, she continued to experience shortness of breath during exertion. Post-discharge, follow-up assessments for symptoms, respiratory function, and exercise capacity were continued. On day 130, she returned to work as a nurse. **Discussion:** The PICS noted during hospitalization in this patient improved, but at discharge, the patient had difficulty completing the practical tasks involved in a nurse's workload. Follow-up assessments of symptoms, respiratory function, and exercise capacity after discharge helped to determine whether the patient could return to work.

Key Words: COVID-19; ICU-AW; post-intensive care syndrome (PICS); rehabilitation; return to work

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has spread globally and is associated with severe clinical problems, such as acute respiratory distress syndrome (ARDS) requiring intubation and mechanical ventilation (MV) in intensive care units (ICUs).[1,2] As a result of immobilization and prolonged MV, post-intensive care syndrome (PICS) can develop, leading to long-term physical, cognitive, and mental impairments in ICU patients.[3–6] Moreover, COVID-19 patients are at higher risk for PICS because rehabilitation and family visits are limited as a part of infection control measures.[7,8]

Recovery from ARDS and PICS can take an extended period after discharge from the ICU, sometimes with only partial long-term recovery.[9] Recent estimates indicate that at least 40% of COVID-19 patients have prolonged significant physical dysfunction, including fatigue and weakness, after discharge from the hospital.[10] These impairments can persist for months or years after severe disease. Such impairments can have a significant impact on important outcomes for

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patients, including activities of daily living (ADL), quality of life, and especially returning to work.[11,12]

However, few studies have reported on the returning to work outcomes after discharge in severe cases of COVID-19. Particularly in patients with PICS, physical, cognitive, and mental problems need to be assessed to determine whether a return to work is possible. This article describes the first case of a patient with severe COVID-19 with PICS at our institution during the first wave of the COVID-19 pandemic (February to June 2020) who returned to work as a nurse following rehabilitation management during hospitalization and after discharge.

CASE

Case Description

A 48-year-old female nurse had general malaise, low-grade fever, and sore throat without obvious cause. Three days later, she visited a local doctor and underwent a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction (PCR) test. The PCR test was negative 6 days after the onset of symptoms, but the patient then developed a high fever. Ten days after the onset of symptoms, chest computed tomography (CT) revealed pneumonia with multiple frosted lesions that were widely scattered with peripheral predominance in each lobe of the lung; this finding was consistent with viral pneumonia syndrome. The patient was suspected of being COVID-19 positive and was admitted (the first day of admission). On day 2 of admission, the patient's respiratory condition deteriorated and she was transferred to our hospital and admitted to the ICU. On day 3, the PCR test results for COVID-19 were positive. On day 4, endotracheal intubation and MV were performed, and antibiotics (piperacillin-tazobactam), sedatives (midazolam and dexmedetomidine), analgesics (fentanyl), and steroids (prednisolone) were administered. Lung-protective ventilation and nutritional therapy by tube feeding were methodically conducted. On day 17, the patient was first referred to the rehabilitation department. Until that point, positioning by the nurses, mainly in the posterior lateral lying position, was performed to prevent decubitus, but no other rehabilitation intervention, including postural drainage, was performed.

The patient had a history of renal cancer and comorbidities of rheumatoid arthritis, diabetes mellitus, and impaired kidney function. She had been taking prednisolone (5 mg/day) for over a decade. Written consent was obtained from the patient for publication of this case report.

Physical Findings (on Day 17 of Admission)

The patient's general findings were as follows: height, 168.0 cm; weight, 78.9 kg; body mass index, 28.0 kg/m^2; Richmond Agitation Sedation Scale (RASS) score, –4 (deep sedation, no response to voice, but any movement to physical stimulation); body temperature, 37.6°C; pulse rate, 87/min; respiration rate, 20/min; and blood pressure, 118/56 mmHg.

The respirator settings were as follows: pressure control and assist control mode; fraction of inspired oxygen, 35%; and positive end expiratory pressure, 8 cmH_2O.

The patient's physical findings were as follows: pupil diameter, 3/3 mm; normal bilateral light reflex; no rash; thick breath sounds from both sides of the lungs; chest abdominal (abdominal dominant) breathing; thorax elevation dominant on the left side; regular heart rhythm; inaudible pathological murmurs from the auscultatory valve areas; normal bowel sounds; no edema in the lower limbs; metacarpophalangeal joint deformity on both fingers and callus formation on both soles; and left valgus toe. Deep tendon reflexes: biceps ±/±, triceps ±/±, patellar tendon −/±, Achilles tendon −/±. Pathologic reflex: Babinski −/−, Chaddock −/−.

Chest X-ray and CT findings were as follows: frosted and infiltrated shadows with peripheral predominance in all lung fields (**Fig. 1A**). The blood gas analysis findings were as follows: pH, 7.375; PaO_2, 75.0 mmHg; and $PaCO_2$, 42.5 mmHg.

The blood test findings were as follows: white blood cell count, 8.09 × 10^9/L; neutrophilic cells, 73.5%; lymphocytes, 11.5%; platelet count, 1.80 × 10^{11}/L; hemoglobin concentration, 97 g/L; hypersensitivity C-reactive protein, 7.81 mg/L; blood sugar, 99 mg/dL; hemoglobin A1c (NGSP), 6.9%; blood urea nitrogen, 59 mg/dL; creatinine, 1.25 mg/dL; and the estimated glomerular filtration rate, 37 ml/min/1.73 m^2. The blood coagulation function findings were as follows: prothrombin time, 14.1 s; prothrombin activity, 69.7%; activated partial thromboplastin time, 40.1 s; fibrinogen, 646 mg/dL; and D-dimer, 2.1 μg/ml.

Outcome Measurements

The grip power and Medical Research Council (MRC) score was used to assess muscle strength; the 6-minute walk test (6MWT) was used to assess exercise capacity; the functional independence measure (FIM) was used to assess ADL; the forced expiratory volume in 1 s (FEV_1), forced vital capacity (FVC), and diffusing capacity for carbon monoxide (DLCO) were used to assess respiratory function; the Specific Activity Scale (SAS) as metabolic equivalents (METs) was used to assess physical activity intensity, and the Hospital Anxiety Depression Scale (HADS)[13] was used

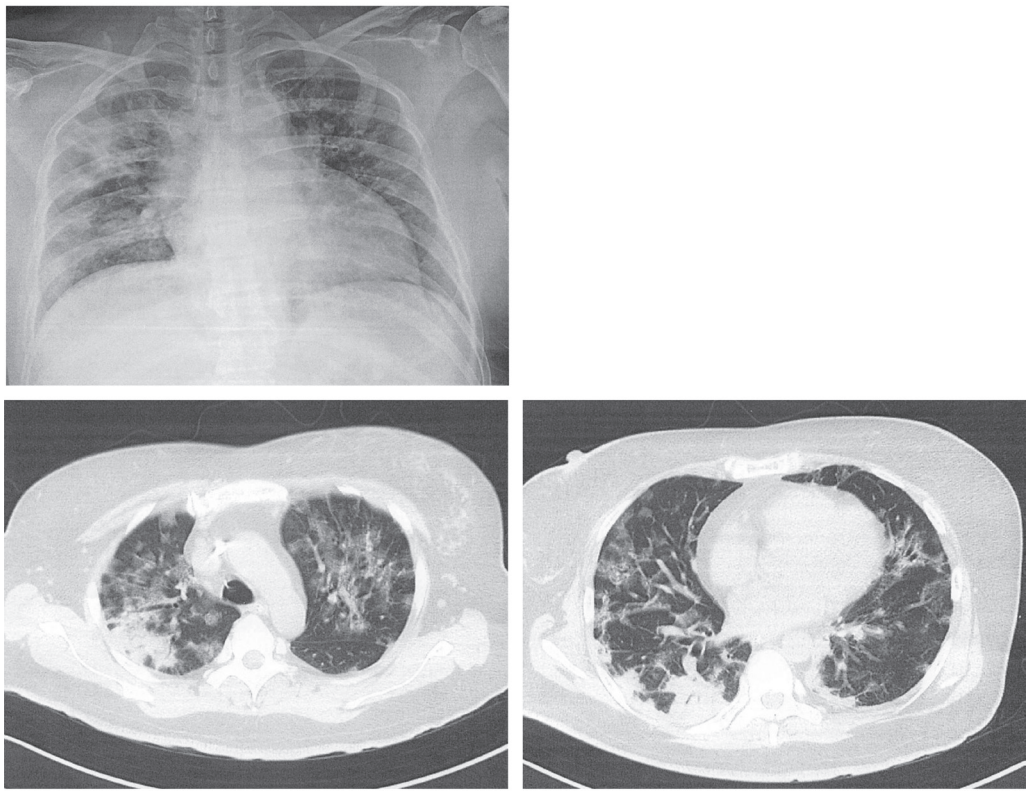

Fig. 1 A. Chest X-ray and computed tomography scans (transverse plane) of the patient at the time of admission (day 0).

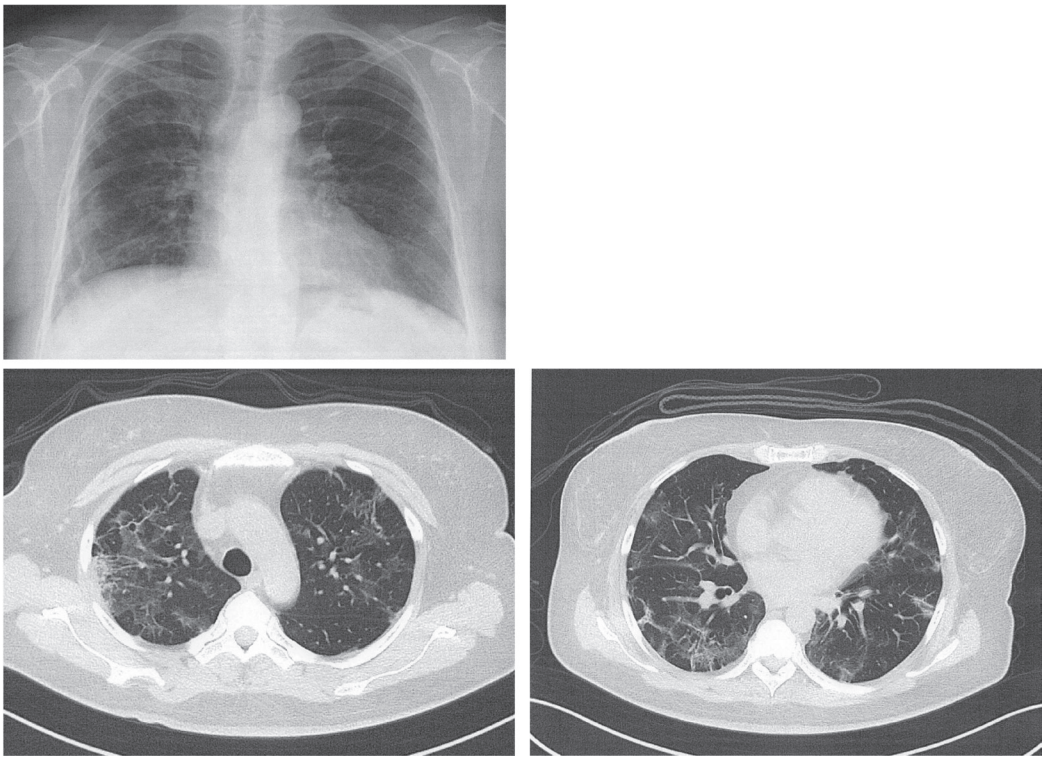

Fig. 1B. Chest X-ray and computed tomography scans (transverse plane) of the patient at the time of discharge (X-ray: day 56, CT: day 47).

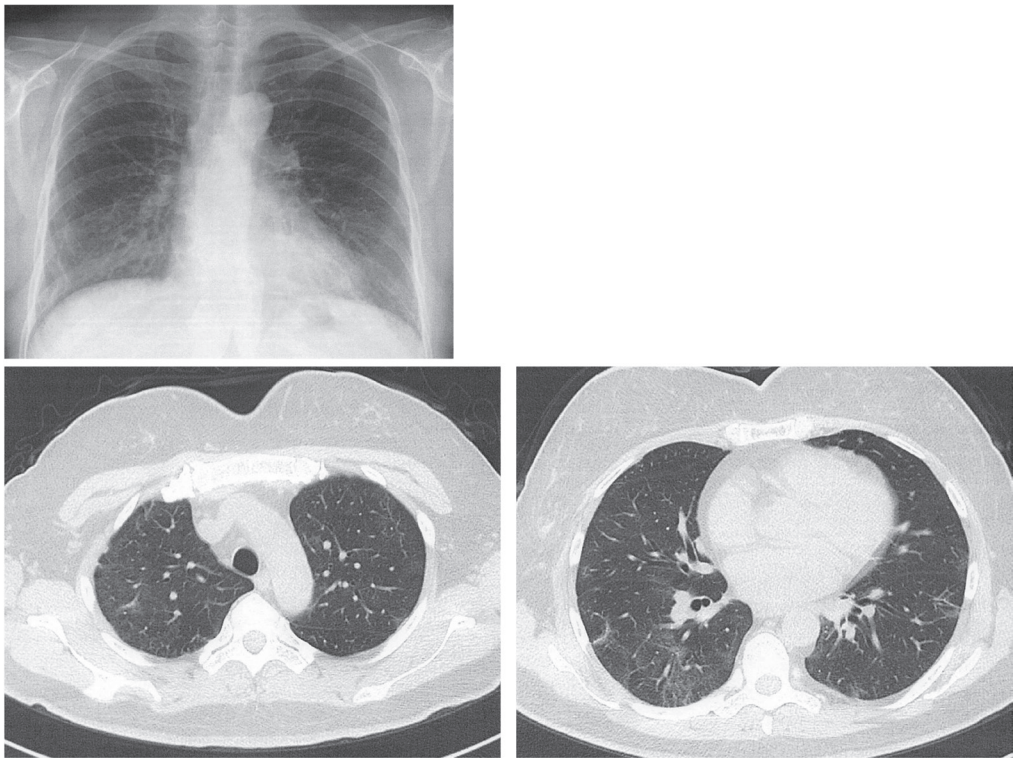

Fig. 1C. Chest X-ray and computed tomography scans (transverse plane) of the patient at returning to work (day 118).

to assess mental state. HADS is a self-assessment scale and is a reliable instrument for detecting mental state using a questionnaire scored between 0 and 21 for either anxiety or depression (0–7: normal; 8–10: borderline abnormal; 11–21: abnormal).

Clinical Course

Rehabilitation therapy was initiated with the minimum number of dedicated staff (a physiatrist, a physical therapist, and some nurses) to minimize the infection risk for staff members. All staff members wore personal protective equipment (PPE) to prevent SARS-CoV-2 infection via air droplets and aerosols. The patient's renal function was monitored daily to detect any worsening of renal dysfunction resulting from excessive exercise load.

The clinical course during hospitalization is shown in **Fig. 2.** On day 17, physical therapy of 20–40 min/day, 6 days/week, was first started with the aim of improving respiratory disorders by positioning, postural drainage, and early mobilization. Additionally, anti-gravity training with the patient in an anterior prone or tilt-up position was carried out, depending on the sedation state. On day 18, the RASS score had improved to −2 (light sedation, briefly awakens with eye contact to voice). Consequently, the respirator setting was changed to continuous positive airway pressure mode, and active-assisted exercise of the limbs was started. On day 20, the patient was weaned off MV, but oxygenation was started because she required effort to breathe. After the withdrawal of MV, voicelessness due to hoarseness, dysphagia, general muscle weakness, delirium, and hallucinations became apparent. In consultation with the attending physician and the infection control department, the patient's family was allowed to visit the patient through the glass window of the room with infection control and the use of PPE. After the first family visit, the delirium and hallucinations disappeared within a few days. Family visits were planned once or twice a week, and contact using remote devices was also conducted as needed.

Progress of the exercise load applied during physical therapy and the peripheral vital signs after exercise are shown in **Fig. 3** Immediately after the withdrawal of MV, muscle strengthening and ADL training were started as facilitated by nurses and physical therapists; however, on day 24, the patient's MRC score met the diagnostic criteria for ICU-acquired weakness (ICU-AW). On day 26, oxygenation was terminated because respiration had improved. On day 28, SAS assessment showed a physical activity intensity of 2.0 METs, and the HADS score was 4 for both anxiety and

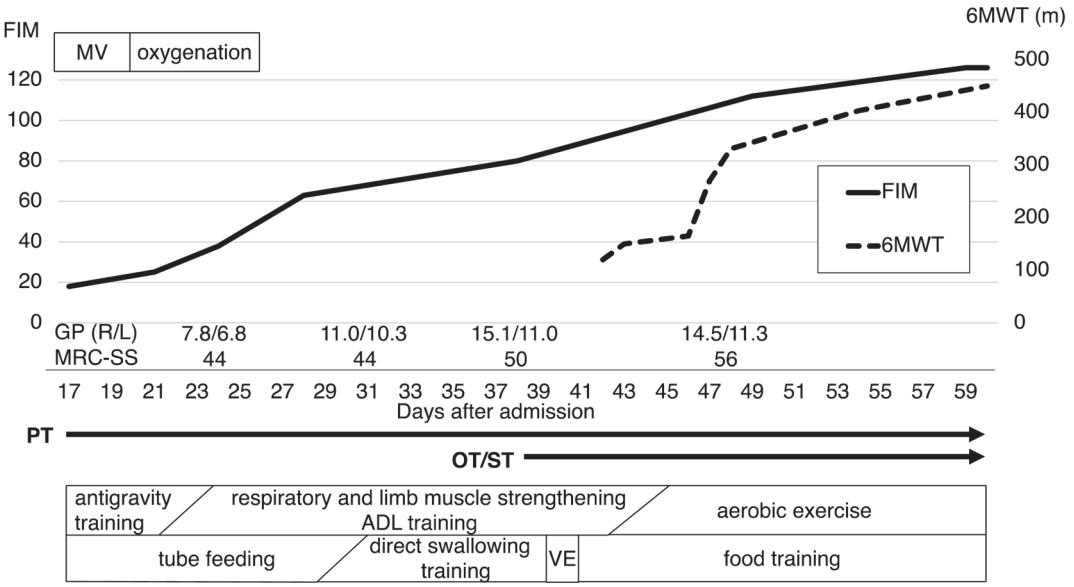

Fig. 2. Clinical course during hospitalization. ADL, activities of daily living; FIM, functional independence measure; GP, grip power; MRC-SS, Medical Research Council sum score; MV, mechanical ventilation; OT, occupational therapy; PT, physical therapy; ST, speech therapy; VE, videoendoscopic evaluation of swallowing; 6MWT, 6-minute walk test.

depression. On day 31, direct swallowing training with jelly was started under the guidance of a certified swallowing nurse and physiatrist. On day 38, additional occupational therapy was started that focused on the splinting of hand deformities, ADL training for joint protection, speech therapy focusing on swallowing assessment and training, and vocal exercises (each for 20 min/day, 6 days/week). On the same day, the patient underwent the 6MWT and achieved a distance of 85 m, despite shortness of breath; consequently, physical therapy was lengthened to 60 min/day with a focus on aerobic exercise.

On day 40, videoendoscopic evaluation of swallowing was performed. Poor mobility of the right vocal cord and decreased pharyngeal contraction were observed, which may have been the cause of hoarseness. However, no apparent aspiration or laryngeal invasion was observed with a small amount of water or food. On day 41, a dietary assessment was performed at lunch to confirm that there were no apparent problems in swallowing water or food; three meals a day were started on the next day. On day 54, evaluation using the SAS showed a value of 4.0–5.0 METs, and evaluation using the HADS indicated a score of 4 for anxiety and 2 for depression. On day 55, respiratory function tests were performed; the results were 86.3%, 90.7%, and 61.8% for FVC, FEV_1, and DLCO, respectively (**Table 1**). By day 56, Chest X-ray and CT findings showed an improvement of shadows in the lungs (**Fig. 1B**). On day 60, the patient achieved independent ADL with no cognitive or mental problems and was discharged. At discharge, the 6MWT distance was 450 m (**Fig. 2**), but the patient still had shortness of breath during exertion and was voiceless because of hoarseness.

After the patient was discharged from the hospital, physical and speech therapy were continued once or twice a month to monitor symptoms, give instructions for voluntary exercise, and provide feedback on the assessment of physical function. On day 118, Chest X-ray and CT findings showed only slight residual shadows in the lungs (**Fig. 1C**). On day 126, the 6MWT and DLCO further improved to 503 m (89.3% of the predicted value calculated using a regression method[14]) and 68.1%, respectively, but FVC and FEV_1 decreased to 78.5% and 83.4%, respectively (**Table 1**), with no symptoms during exertion. On day 130, considering the assessment of respiratory function and exercise capacity, the patient was allowed finally to return to work as a nurse (which generally requires up to 4.5 METs[15]) but was limited to light clerical work.

DISCUSSION

This case report describes a COVID-19 patient who had severe respiratory dysfunction requiring MV and developed PICS after the withdrawal of MV. This was the first case of COVID-19 in our institution, and it took time for all depart-

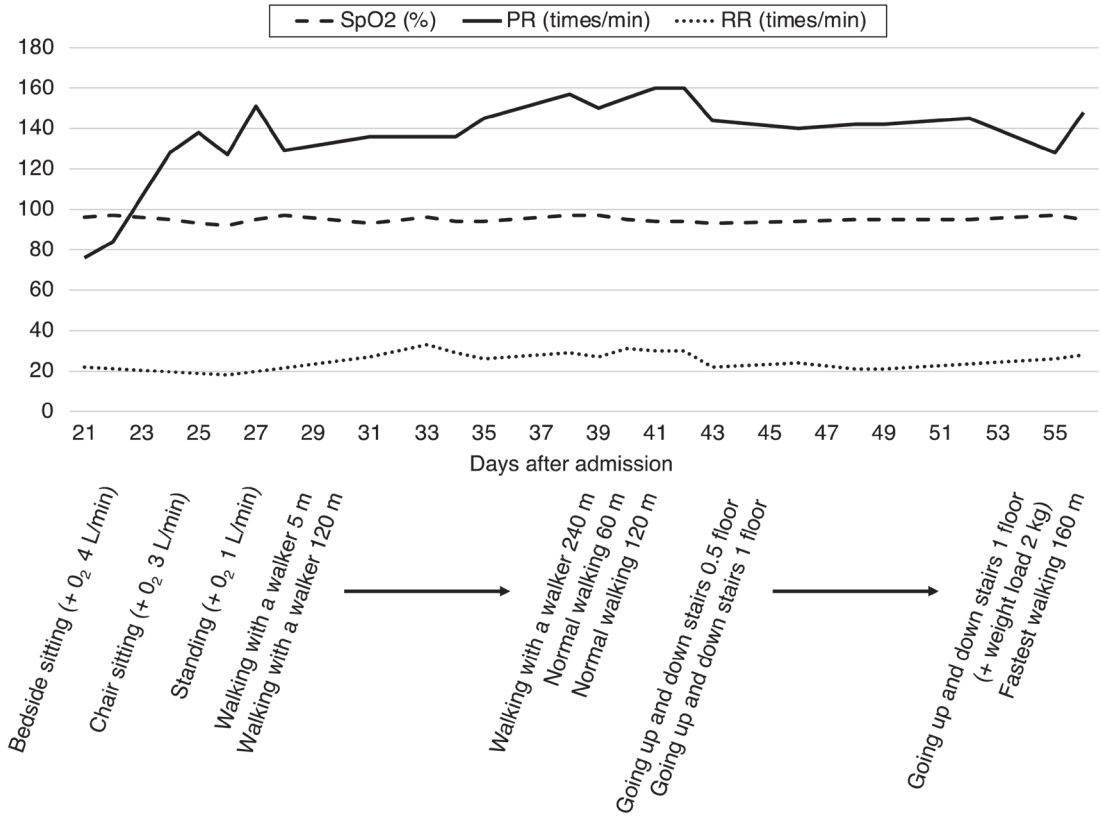

Fig. 3. Progress of exercise load during physical therapy and vital signs after exercise. PR, pulse rate; RR, respiratory rate; SpO_2, percutaneous oxygen saturation.

Table 1. Respiratory function and exercise capacity after discharge

	Days after admission (Days after discharge)		
	55 (–)	77 (17)	126 (66)
%FVC (%)	86.3	-	78.5
FEV_1% (%)	90.7	-	83.4
DLCO (ml/min/mmHg)	61.8	-	68.1
6MWT (m)	450	478	503

FEV_1, forced expiratory volume in 1 s; FVC: forced vital capacity; DLCO: diffusing capacity for carbon monoxide; 6MWT: 6-minute walk test.

ments to unify infection control measures and decide on a treatment plan. The patient was referred to the rehabilitation department on day 17 after admission. During hospitalization, rehabilitation management and family visits improved the patient's physical, cognitive, and mental problems resulting from PICS. The patient achieved independence in ADL and was discharged 2 months after admission. Although the patient's physical and cognitive function and mental state met the criteria for returning to work as a nurse, because of residual impairments at discharge, she had difficulty with the highly physical nature of the work required of a nurse. After discharge, a follow-up assessment of respiratory function and exercise capacity helped to determine whether the patient could return to work. The patient eventually returned to work as a nurse (from performing light clerical work).

The prognosis of patients admitted to the ICU with CO-

VID-19 is generally poor, with a mortality rate of about 50%. The time to death is usually within 1–2 weeks after ICU admission.[16] Even if COVID-19 patients survive to be discharged from the ICU, they may be at higher risk of developing PICS because of prolonged MV with concomitant exposure to higher amounts of sedatives, limited rehabilitation, and few family visits because of infection control measures.[8,10] The current patient underwent MV for 15 days, and after weaning from MV, she suffered severe delirium and muscle weakness that met the diagnostic criteria for ICU-AW and PICS. However, her cognitive function and mental state normalized in the early stages of recover after the withdrawal of MV, and physical function improved steadily. These good outcomes were supported by early rehabilitation that entailed anti-gravity training during MV, muscle strengthening and ADL training that started immediately after MV withdrawal, and rapid amelioration of delirium and hallucinations thanks to family visits. In contrast, a recent report has indicated that early rehabilitation that focused on physical function had a limited effect on the prevention of PICS; early rehabilitation resulted in significant improvements in short-term physical-related outcomes but had no significant effect on cognitive or mental-related outcomes.[17] Consequently, rehabilitation-related healthcare professionals should pay attention to physical function, cognitive function, and mental state in COVID-19 patients at a higher risk of PICS.

After discharge from the hospital, the major goal for COVID-19 patients is to restore the pre-morbid exercise capacity and to reintegrate into society, especially returning to work. A recent report on COVID-19 patients stated that rehabilitation treatment during hospitalization led to significant improvements in respiratory function and exercise capacity.[18] However, few studies have reported the outcomes of returning to work in patients with severe COVID-19 who recovered. Considering that approximately two-thirds of previously employed ICU survivors who did not have COVID-19 were jobless up to 3 months after discharge,[15,19] a similar situation is expected for COVID-19 patients. It has been reported that among COVID-19 patients admitted to the ICU, only 60% had been discharged 30 days after onset, and 63% of these discharged patients had persistent symptoms.[20] It has been also reported that COVID-19 patients after hospital discharge had fatigue symptoms with significant mobility limitations, which was also reflected by reduced 6MWT distances without oxygen desaturation.[21] Similar observations have been made during previous coronavirus outbreaks; in the 2003 severe acute respiratory syndrome (SARS) epidemic, some patients were only partly able to carry out their previous jobs because of these symptoms.[22] However, it is important to note that even asymptomatic COVID-19 patients may have objective abnormalities, such as ground-glass opacities on CT and disturbances in gas exchange.[23]

In the current patient, shortness of breath without oxygen desaturation during exertion persisted, and, at discharge, she experienced difficulty with the practical tasks required of a nurse. At 2 months after discharge, despite decreases in FVC and FEV_1, the patient's 6MWT distance and DLCO improved and she experienced no symptoms during exertion and had no significant findings on X-ray or CT. These findings helped inform the decision to allow the patient to return to full nursing duties from the clerical work she had been limited to. Generally, patients who successfully recover from acute COVID-19 should be followed up after discharge to assess the recovery of their physical function and to determine whether they can return to work.

There were some limitations to this case report. First, physical function could not be assessed on admission because of limited rehabilitation input as a result of infection control measures. Although the original physical function level was unknown, the patient's exercise capacity was estimated to have improved to about 90% of that before admission. Second, cardiopulmonary exercise testing for accurate evaluation of exercise capacity could not be conducted for the same reason; consequently, it was unclear whether respiratory or cardiopulmonary function improved exercise capacity during hospitalization. Respiratory function tests on day 55 showed a relatively low DLCO, suggesting that the improvement in exercise capacity had resulted from improvements in factors other than diffusing capacity. Third, the reasons for the decreases in FEV_1 and FVC and the improvements in DLCO and 6MWT distance after discharge were also unclear because the intensity of physical activities conducted after discharge were not investigated. After discharge, the patient was not able to perform endurance training with the same intensity as that done during hospitalization, which may have resulted in decreased FEV_1 and FVC. Fourth, the patient was not followed up in terms of her ability to complete the physical work required of a nurse. It will be necessary to continue to evaluate symptoms and exercise capacity during follow up and to assess whether the patient can sustain the full practical workload of a nurse. Despite these limitations, this case report indicates the importance of rehabilitation management of severe COVID-19 patients from the acute to post-acute stages to return to work.

In summary, given the impact of the severity of impair-

ments experienced by COVID-19 patients on returning to work, rehabilitation management is essential to improve physical, cognitive, and mental difficulties caused by PICS in the acute stage. Although discharge from the hospital for COVID-19 survivors is often the optimal outcome, current treatment trends may not provide optimal medical support, including rehabilitation management for impairments, disabilities, and social disadvantages affecting COVID-19 patients. Therefore, rehabilitation-related healthcare professionals need to consider rehabilitation management in the acute and post-acute stages of COVID-19.[24] Studies with longer follow-up periods and a larger number of subjects are needed to document long-term outcomes in COVID-19 patients.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest.

REFERENCES

1. World Health Organization: Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: Interim guidance V 1.2. https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected. Accessed 30 September 2020.
2. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. Int J Antimicrob Agents 2020;55:105924. DOI:10.1016/j.ijantimicag.2020.105924, PMID:32081636
3. Needham DM, Colantuoni E, Dinglas VD, Hough CL, Wozniak AW, Jackson JC, Morris PE, Mendez-Tellez PA, Ely EW, Hopkins RO: Rosuvastatin versus placebo for delirium in intensive care and subsequent cognitive impairment in patients with sepsis-associated acute respiratory distress syndrome: an ancillary study to a randomised controlled trial. Lancet Respir Med 2016;4:203–212. DOI:10.1016/S2213-2600(16)00005-9, PMID:26832963
4. Herridge MS, Cheung AM, Tansey CM, Matte-Martyn A, Diaz-Granados N, Al-Saidi F, Cooper AB, Guest CB, Mazer CD, Mehta S, Stewart TE, Barr A, Cook D, Slutsky AS, Canadian Critical Care Trials Group: One-year outcomes in survivors of the acute respiratory distress syndrome. N Engl J Med 2003;348:683–693. DOI:10.1056/NEJMoa022450, PMID:12594312
5. Huang M, Parker AM, Bienvenu OJ, Dinglas VD, Colantuoni E, Hopkins RO, Needham DM, National Institutes of Health, National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome Network: Psychiatric symptoms in acute respiratory distress syndrome survivors: a 1-year national multicenter study. Crit Care Med 2016;44:954–965. DOI:10.1097/CCM.0000000000001621, PMID:26807686
6. Fan E, Dowdy DW, Colantuoni E, Mendez-Tellez PA, Sevransky JE, Shanholtz C, Dennison Himmelfarb CR, Desai SV, Ciesla N, Herridge MS, Pronovost PJ, Needham DM: Physical complications in acute lung injury survivors: a two-year longitudinal prospective study. Crit Care Med 2014;42:849–859. DOI:10.1097/CCM.0000000000000040, PMID:24247473
7. Carda S, Invernizzi M, Bavikatte G, Bensmaïl D, Bianchi F, Deltombe T, Draulans N, Esquenazi A, Francisco GE, Gross R, Jacinto LJ, Moraleda Pérez S, O'Dell MW, Reebye R, Verduzco-Gutierrez M, Wissel J, Molteni F: The role of physical and rehabilitation medicine in the COVID-19 pandemic: the clinician's view. Ann Phys Rehabil Med 2020;63:554–556. DOI:10.1016/j.rehab.2020.04.001, PMID:32315802
8. Spruit MA, Holland AE, Singh SJ, Troosters T: Report of an ad-hoc international task force to develop an expert-based opinion on early and short-term rehabilitative interventions (after the acute hospital setting) in COVID-19 survivors (version April 3, 2020). https://ers.app.box.com/s/npzkvigtl4w3pb0vbsth4y0fxe7ae9z9 Accessed 25 December 2020.

9. Herridge MS: Recovery and long-term outcome in acute respiratory distress syndrome. Crit Care Clin 2011;27:685–704. DOI:10.1016/j.ccc.2011.04.003, PMID:21742223
10. Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, Chang J, Hong C, Zhou Y, Wang D, Miao X, Li Y, Hu B: Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. JAMA Neurol 2020;77:683–690. DOI:10.1001/jamaneurol.2020.1127, PMID:32275288
11. Herridge MS, Tansey CM, Matté A, Tomlinson G, Diaz-Granados N, Cooper A, Guest CB, Mazer CD, Mehta S, Stewart TE, Kudlow P, Cook D, Slutsky AS, Cheung AM, Canadian Critical Care Trials Group: Functional disability 5 years after acute respiratory distress syndrome. N Engl J Med 2011;364:1293–1304. DOI:10.1056/NEJMoa1011802, PMID:21470008
12. Kamdar BB, Suri R, Suchyta MR, Digrande KF, Sherwood KD, Colantuoni E, Dinglas VD, Needham DM, Hopkins RO: Return to work after critical illness: a systematic review and meta-analysis. Thorax 2020;75:17–27. DOI:10.1136/thoraxjnl-2019-213803, PMID:31704795
13. Zigmond AS, Snaith RP: The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361–370. DOI:10.1111/j.1600-0447.1983.tb09716.x, PMID:6880820
14. Enright PL, Sherrill DL: Reference equations for the six-minute walk in healthy adults. Am J Respir Crit Care Med 1998;158:1384–1387. DOI:10.1164/ajrccm.158.5.9710086, PMID:9817683
15. Ideno Y, Hayashi K, Lee JS, Miyazaki Y, Suzuki S: A proper reference metabolic equivalent value to assess physical activity intensity in Japanese female nurses. Womens Midlife Health 2019;5:4. DOI:10.1186/s40695-019-0048-3, PMID:31534774
16. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, Wu Y, Zhang L, Yu Z, Fang M, Yu T, Wang Y, Pan S, Zou X, Yuan S, Shang Y: Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med 2020;8:475–481. DOI:10.1016/S2213-2600(20)30079-5, PMID:32105632
17. Fuke R, Hifumi T, Kondo Y, Hatakeyama J, Takei T, Yamakawa K, Inoue S, Nishida O: Early rehabilitation to prevent postintensive care syndrome in patients with critical illness: a systematic review and meta-analysis. BMJ Open 2018;8:e019998. DOI:10.1136/bmjopen-2017-019998, PMID:29730622
18. Liu K, Zhang W, Yang Y, Zhang J, Li Y, Chen Y: Respiratory rehabilitation in elderly patients with COVID-19: a randomized controlled study. Complement Ther Clin Pract 2020;39:101166. DOI:10.1016/j.ctcp.2020.101166, PMID:32379637
19. Connolly B, Salisbury L, O'Neill B, Geneen LJ, Douiri A, Grocott MP, Hart N, Walsh TS, Blackwood B, ERACIP Group: Exercise rehabilitation following intensive care unit discharge for recovery from critical illness. Cochrane Database Syst Rev 2015;CD008632:CD008632. DOI:10.1002/14651858.CD008632.pub2, PMID:26098746
20. Pellaud C, Grandmaison G, Hoa Phong PH, Baumberger M, Carrel G, Ksouri H, Erard V, Chuard C, Hayoz D, Sridharan G: Characteristics, comorbidities, 30-day outcome and in-hospital mortality of patients hospitalised with COVID-19 in a Swiss area – a retrospective cohort study. Swiss Med Wkly 2020;150:w20314. DOI:10.4414/smw.2020.20314, PMID:32662869
21. Daher A, Balfanz P, Cornelissen C, Müller A, Bergs I, Marx N, Müller-Wieland D, Hartmann B, Dreher M, Müller T: Follow up of patients with severe coronavirus disease 2019 (COVID-19): pulmonary and extrapulmonary disease sequelae. Respir Med 2020;174:106197. DOI:10.1016/j.rmed.2020.106197, PMID:33120193
22. Moldofsky H, Patcai J: Chronic widespread musculoskeletal pain, fatigue, depression and disordered sleep in chronic post-SARS syndrome; a case-controlled study. BMC Neurol 2011;11:37. DOI:10.1186/1471-2377-11-37, PMID:21435231
23. Wang Y, Liu Y, Liu L, Wang X, Luo N, Li L: Clinical outcomes in 55 patients with severe acute respiratory syndrome coronavirus 2 who were asymptomatic at hospital admission in Shenzhen, China. J Infect Dis 2020;221:1770–1774. DOI:10.1093/infdis/jiaa119, PMID:32179910
24. Dowman L, Hill CJ, Holland AE: Pulmonary rehabilitation for interstitial lung disease. Cochrane Database Syst Rev 2014;10:CD006322. DOI:10.1002/14651858.CD006322.pub3, PMID:25284270