ORIGINAL ARTICLE

The Impact of Isolation on Elderly Patients with Mild to Moderate COVID-19

Mizuki Sugiyama, MD [a,b] Fumihito Kasai, MD, PhD [a,b] and Nobuyuki Kawate, MD, PhD [a]

Objectives: Patients with mild to moderate COVID-19 who require hospitalization are prone to physical inactivity. This study examined the impact of mild to moderate COVID-19 on the activities of daily living (ADLs) of patients who received rehabilitation therapy. **Methods:** Between February 1, 2020, and January 31, 2021, of 216 patients with mild to moderate COVID-19, 36 were selected for rehabilitation therapy. Of these, 28 received direct rehabilitation therapy, whereas 7 were discharged before rehabilitation therapy could start and 1 carried out indirect rehabilitation. The Barthel Index (BI) scores at the beginning and the end of therapy were compared in 18 patients (10 patients who did not undergo a final BI evaluation were excluded). **Results:** In total, 27 of the 28 patients receiving direct rehabilitation therapy were more than 65 years of age or had underlying diseases. The BI score decreased in 6 patients and was maintained or improved in 12 patients. However, the 6 patients with decreased BI scores after rehabilitation therapy had significantly higher BI values at the start of therapy (P=0.014). **Conclusions:** It was considered that the isolated environment of these COVID-19 patients likely resulted in a decrease in activity levels, leading to a decrease in ADLs. Older adults with mild to moderate COVID-19 need to reduce their isolation as much as possible to ensure adequate activity levels.

Key Words: mild to moderate COVID-19; elderly patients; isolation; direct rehabilitation

INTRODUCTION

The first case of COVID-19 occurred in Japan in January 2020, after which the infection spread rapidly. Through five periods of rapid increases in case numbers, by November 2021, a total of 1.7 million cases and 18,000 deaths had been reported in Japan.[1] The risk of severe COVID-19 is increased in elderly individuals and those with underlying diseases.[2–6] In Japan, elderly patients, patients with underlying diseases, and patients who are pregnant are considered for hospitalization; moreover, patients with moderate to severe COVID-19 are also considered for admission according to Japan's original severity classification.[7] Early bedside rehabilitation for patients with severe COVID-19 is mainly aimed at reducing the severity of ICU-acquired weakness and promoting rapid functional recovery; such rehabilitation reportedly prevents long-term functional decline.[8] However, for patients with mild to moderate COVID-19, although remote rehabilitation is reported to be effective,[9] there are few reports on the results of direct rehabilitation. In general, the elderly are regarded as needing direct rehabilitation because the decrease in activity due to acute illness can cause a decline in physical function; moreover, the isolation of COVID-19 patients because of their high infectivity can further limit physical activity.[10] The impact on activities of daily living (ADLs) of isolation during hospitalization in mild to moderate COVID-19 patients has not yet been reported; however, such impacts are often experienced by these patients. Therefore, in the present study, we focused on patients with mild to moderate COVID-19 who underwent direct rehabilitation and examined the impact of isolation on their ADLs.

METHODS

Clinical Care System for COVID-19 Patients

Total of 18–42 beds in two general wards for the hospitalization of patients with mild to moderate COVID-19. In our hospital, rehabilitation therapy was performed in an isolation room by two therapists wearing a full set of personal protective equipment, including N95 masks, caps, gloves, eye guards, and disposable fluid-resistant long-sleeved gowns. Rehabilitation therapy was determined based on the ADL assessment at the initiation of therapy. Each patient's load level was adjusted according to their respiratory status, and training with a focus on ADLs was conducted around the bed. If there was an exacerbation of respiratory status due to COVID-19 or an exacerbation of their underlying disease-related condition, a decision was made whether to continue rehabilitation therapy in discussion with the physician who had requested the rehabilitation therapy.

Patients

From February 1, 2020, to January 31, 2021, of the COVID-19 patients who were admitted to Showa University Hospital and Showa University East Hospital, 216 patients were diagnosed with mild to moderate disease and admitted to the general ward. Thirty-six of these patients received a request for rehabilitation therapy. Of these 36 patients 7 received the rehabilitation request but were discharged before rehabilitation evaluation and treatment and 1 received only rehabilitation guidance using a pamphlet and did not receive direct therapeutic intervention (**Fig.** 1); consequently, a total of 28 patients were included in the study. The following patient information was extracted from the electronic medical records: age, sex, medical history, length of hospital stay, COVID-19 severity, details of the request from the attending physician, number of rehabilitation therapy units performed, and the Barthel Index (BI) score at the beginning and end of therapy. This study was approved by the Ethics Committee of Showa University (approval number: 3350). The purpose of this study was fully explained to the subjects verbally and in writing, and the study was conducted after obtaining their informed consent.

Design

A case–control study was conducted by dividing patients into two groups: those who maintained or improved their BI from the beginning of rehabilitation therapy to the end (BI maintenance/improvement group) and those whose scores decreased (BI decrease group) (**Fig.** 1). The primary end-
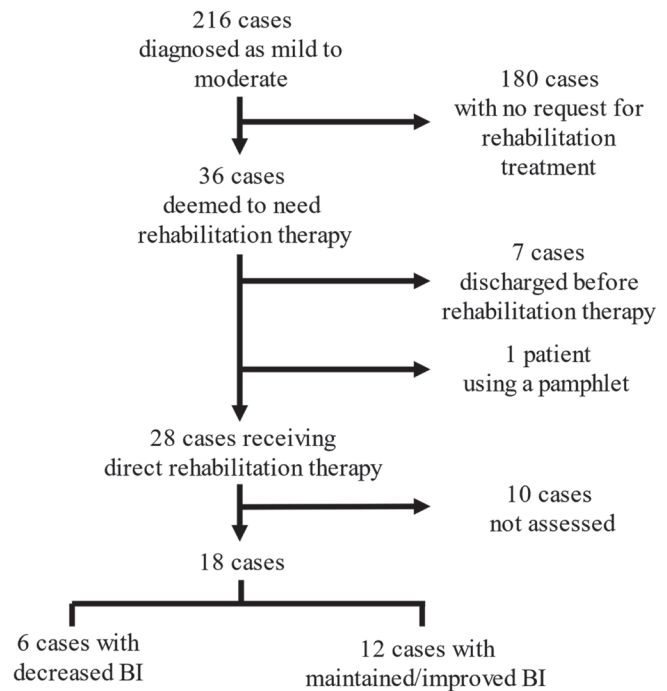

Fig. 1. Inclusion and exclusion criteria and classification of patients into two groups.

point of the study was the comparison of these two groups and identification of the causes of BI decline despite rehabilitation therapy. The secondary endpoint was the comparison of the BI item scores of the two groups and the evaluation of which ADL items were affected.

Statistical Analyses

Welch's test was performed on the differences in characteristics between the two groups. The scores for each BI item were on an ordinal scale; comparisons between the two groups were expressed as medians, and the Mann-Whitney U test was performed. The significance level was set at $\alpha=0.05$ (two-sided), and $P<0.05$ was considered statistically significant. Interval estimation was based on two-tailed confidence intervals using the 95% confidence interval. JMP 15 software was used to perform all analyses (SAS Institute Inc., Cary, NC, USA).

RESULTS

Of the 28 study subjects, 18 were men and 10 were women (median age, 79.5 years [range, 54–97 years]) and 96.4% were more than 65 years of age or had underlying diseases. Oxygen was provided to 9 patients. Twenty-seven of the 28 patients were admitted from home, and 1 was admitted from

Table 1. Characteristics of the maintained/improved BI and decreased BI groups

	Maintained/improved BI group	Decreased BI group	P value
Patients (n)	12	6	
Men/women	7 / 5	4 / 2	
Age (years), mean (SD)	78.8 (9.4)	82.7 (5.4)	0.281
Discharge home (n)	7	4	0.600
Oxygen therapy (n)	5	0	0.114
Time to discharge home (days), mean (SD)	29.67 (19.50)	20.67 (10.23)	0.218
Total sessions per patient (n), mean (SD)	28.33 (28.97)	17.17 (9.13)	0.242
Daily sessions per patient, mean (SD)	2.60 (0.79)	2.20 (1.02)	0.416
Number of days between admission and the initiation of therapy	9.75 (7.00)	6.67 (5.35)	0.257

a rehabilitation hospital. Nineteen patients were discharged to home, and the others were discharged to institutions or transferred to subacute care or rehabilitation hospitals. The median length of hospitalization was 21.5 days (range, 7–125 days), the median time from admission to the start of rehabilitation therapy was 6.0 days (range, 2–25 days), the median total number of rehabilitation units per patient was 15 (range, 2–125), and the median number of units per day was 2.5 (range, 1–4.3). None of the patients discontinued rehabilitation therapy. Rehabilitation therapy was conducted in an isolation room that had toilet facilities, but access to areas where stair climbing training could be conducted was not possible because of infection control. In most cases, the rehabilitation therapy included muscular strength training, balance training, and ADL training, which were possible in the isolation rooms. Of the 28 subjects, 27 had organ damage or malignancy, with some having both. The majority of the requests for rehabilitation therapy were for the prevention of disuse and maintenance of ADLs; in three cases, the patient's history was taken into consideration; in two cases, the patient wished to continue rehabilitation therapy after fracture or stroke; and in one case, no details were provided. After the exclusion of 10 patients who could not be assessed at the end of the intervention because of the sudden nature of their discharge, the BI values at the start and end of rehabilitation therapy were compared in 18 patients. The mean total BI score at the beginning of therapy was 60.89, and the mean total BI score at the end of therapy was 60.56. The BI scores obtained before and after intervention did not differ to a statistically significant extent (P=0.817). However, among the 18 cases, the BI score decreased in 6 (decreased BI group) and was maintained or improved in 12 (maintained/improved BI group). The decreased BI group had a BI score of 88.33 at the beginning of therapy and a BI score of 67.50 at the

end of therapy. In the maintained/improved BI group, the BI score at the beginning of therapy was 48.75 and the BI score at the end of therapy was 57.08. The BI score at the start of therapy was significantly higher in the decreased BI group (P=0.014). There were no significant differences in age, length of hospital stay, or the number of days between admission and the initiation of therapy between the two groups (**Table 1**). Although there was no significant difference in the presence or absence of oxygen administration, no patients in the decreased BI group received oxygen and there were more mild cases in this group (data not shown).

Analysis of the BI sub-item scores of the maintained/improved BI group and the decreased BI group indicated that at the start of rehabilitation therapy the scores of the decreased BI group were significantly higher for toilet use (P=0.046) and stairs (P<0.001) (**Table 2**).

DISCUSSION

We studied 28 inpatients with mild to moderate COVID-19 who received direct rehabilitation therapy. At the beginning of rehabilitation therapy, the decreased BI group had significantly higher total BI scores and a lower severity of illness than the maintained/improved BI group. Therefore, the reduction in ADLs was not due to the severity of COVID-19 but was related to other factors. The maintained/improved BI group had a lower BI score at the beginning of rehabilitation therapy, indicating a lower amount of activity than the decreased BI group. In contrast, many of the patients in the decreased BI group had higher BI scores at the beginning of rehabilitation therapy and were independent. The lower initial BI score may have led to the maintenance/improvement of BI because rehabilitation therapy may have reduced the amount of assistance needed with ADLs. The isolated

Table 2. BI sub-item scores of the maintained/improved BI and decreased BI groups

	Start of therapy			End of therapy		
	Maintained/improved BI group	Decreased BI group	P value	Maintained/improved BI group	Decreased BI group	P value
Feeding	10	10	0.476	10	10	0.716
Transfer	5	15	0.115	12.5	10	0.749
Grooming	2.5	5.0	0.316	2.5	2.5	1
Toilet use	5	10	0.046	7.5	5	0.773
Bathing	0	5	0.131	2.5	0	0.638
Mobility	7.5	15	0.093	12.5	10	0.686
Stairs	0	10	<0.001	0	5	0.325
Dressing	5	10	0.122	7.5	5	0.869
Bowels	7.5	10	0.204	7.5	10	0.348
Bladder	7.5	10	0.204	7.5	10	0.348

environment associated with COVID-19 reportedly affects the patients' amount of physical activity, and the effect of this reduced activity on the elderly is more important than the effect of COVID-19.[10] This fact suggests that patients with higher initial BI scores may experience reduced levels of physical activity in the isolation environment, resulting in a decrease in BI score. The comparison of the BI sub-item scores revealed that the initial toileting and stair climbing scores of the decreased BI group were significantly higher than those of the maintained/improved BI group. This suggests that patients with high independence in toilet use and stairs can be maintained in ADLs by providing an inpatient environment that maintains activity and encourages early discharge. To improve activity levels, it is necessary to make efforts to reduce isolation as much as possible; moreover, after an appropriate isolation period and when infection control measures are no longer required, adequate activity levels must be assured.

Among the 28 patients, 96.4% were >65 years of age or had underlying diseases, which are known to be risk factors for severe COVID-19.[2–5,11] Most of the rehabilitation requests were for rehabilitation therapy to prevent disuse and to maintain ADLs. As in general acute diseases, COVID-19 requires direct rehabilitation treatment that considers the balance of risk of severe disease and disuse.

One limitation of this study is that the effectiveness of direct rehabilitation therapy is unknown. Although this was a single-center study, it has been reported that – in patients with moderate to mild COVID-19 who underwent rehabilitation therapy during this period – BI scores could be maintained by tele-rehabilitation therapy.[9,12] However, in the present study, it was unclear whether direct rehabilitation

therapy led to prevention of disuse and the maintenance of ADLs. Even when direct rehabilitation therapy aimed at preventing disuse and maintaining ADLs was required, there were cases in which the BI score at discharge declined even after rehabilitation therapy. It is necessary to investigate the effects of direct rehabilitation therapy on patients with mild to moderate COVID-19 in further studies.

The present study demonstrated that even with rehabilitation therapy, some patients with mild to moderate CO-VID-19 still suffer from reduced ADLs due to their isolated environment. Although vaccination is progressing and the incidence of severe COVID-19 is gradually falling, there are still elderly patients with mild to moderate COVID-19 who require hospitalization. During rehabilitation therapy for these elderly patients with mild to moderate COVID-19, it is important to try to reduce isolation as much as possible and to ensure adequate activity after an appropriate isolation period and infection control measures.

CONCLUSION

An important aspect of rehabilitation therapy for elderly patients with mild to moderate COVID-19 is to attempt to reduce isolation as much as possible and to promote activity with appropriate isolation periods and infection control measures.

FUNDING STATEMENT

DECLARATION OF INTEREST

The authors state that they have no interests to declare.

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