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Short communication

Clinical course and physiotherapy intervention in 9 patients with COVID-19

Audrey Jia Yi Lee^{a,*}, Chloe Lau Ha Chung^a, Barnaby Edward Young^{c,d,e},
Li Min Ling^{c,d}, Benjamin Choon Heng Ho^b, Ser Hon Pua^b,
Saboor Rahman Iqbal^a, Geak Poh Tan^b

^a Department of Physiotherapy, Tan Tock Seng Hospital, Singapore, Singapore

^b Department of Respiratory and Critical Care Medicine, Tan Tock Seng Hospital, Singapore, Singapore

^c Department of Infectious Disease, Tan Tock Seng Hospital, Singapore, Singapore

^d National Centre for Infectious Diseases, Singapore, Singapore

^e Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore, Singapore

Abstract

Since the outbreak of the 2019 novel coronavirus (COVID-19), the role of physiotherapy for patients with COVID-19 infection has been highlighted by various international guidelines. Despite that, clinical information regarding the rehabilitation of patients with COVID-19 infection remains limited. In this case series, we provide a novel insight into the physiotherapy management in patients infected with COVID-19 in Singapore. The main findings are: (1) Respiratory physiotherapy interventions were not indicated in the majority of the patients with COVID-19 in this case series; (2) During rehabilitation, exertional or position-related desaturation is a common feature observed in critically ill patients with COVID-19 infection locally. This clinical phenomenon of exertional or positional-related desaturation has significantly slowed down the progression of rehabilitation in our patients. As such, it can potentially result in a significant burden on healthcare resources to provide rehabilitation to these patients. Based on these findings, we have highlighted several recommendations for the provision of rehabilitation in patients who are critically ill with COVID-19.

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The 2019 novel coronavirus (COVID-19) pandemic has significantly affected the provision of clinical services worldwide. In this case series, we describe the rehabilitation course of patients with COVID-19 and share details of the physiotherapy interventions provided at our centre.

We retrospectively reviewed all inpatient physiotherapy referrals of patients with COVID-19 admitted to the National Centre of Infectious Diseases (NCID) between 23rd January 2020 and 20th March 2020. The NCID is a 330-bedded purpose-built facility, which includes 38 intensive care unit (ICU) beds. As of 20th March 2020, 352 of 432 cases of

COVID-19 in Singapore were admitted to NCID, of which 18 (5.11%) required ICU care.

Since the initial outbreak, nine patients (2.6% of all patients with COVID-19 in NCID; ICU: n = 8/18, 44.4%, general medical wards: n = 1/334, 0.3%) were referred to physiotherapy. The median age was 66 years (range 54 to 77) and six (66.7%) were male. All the patients were functionally independent prior to hospital admission. The clinical course and rehabilitation milestones achieved for these nine cases are illustrated in Fig. 1. Radiological imaging revealed predominantly ground-glass opacities and consolidative changes in the peripheral and basal subpleural areas instead of exudative consolidation [1]. In all the reviewed cases, respiratory secretion is not a major clinical feature, which is consistent with findings in previous reports from China [2,3]. This could be

* Corresponding author at: Department of Physiotherapy, Tan Tock Seng Hospital, 11 Jalan Tan Tock Seng, Singapore 308433, Singapore.

E-mail address: audrey_JY_lee@ttsh.com.sg (A.J.Y. Lee).

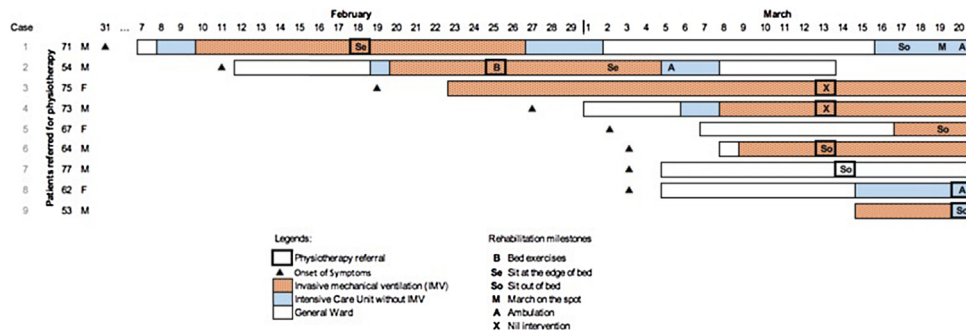


Fig. 1. Clinical course and rehabilitation milestones of the nine patients with COVID-19 who were referred to Physiotherapy. The rehabilitation milestone indicated presents the earliest time-point in which it was achieved. If multiple milestones were achieved on the same day, the highest level of rehabilitation milestone was recorded.

reflective of the patient profile as the majority of our patients did not have co-existing respiratory comorbidity, except for Case 7.

One case (Case 7) was referred for respiratory care on the general medical ward. The patient was spontaneously breathing and had pre-existing asthma/chronic obstructive pulmonary disease overlap syndrome. Upon review, the patient's cough was dry and unproductive, hence airway clearance techniques were not indicated. This is also consistent across all ICU referrals where infrequent suctioning was required, averaging four-hourly with minimal to a small amount of secretion (< 1/4 length of the suctioning catheter). Hence, respiratory physiotherapy interventions for airway clearance were not indicated at our centre. Considering the differences in patient profiles and physiotherapy practices across the world, the need for respiratory physiotherapy interventions should be evaluated and provided if indicated.

All the other patients were referred for rehabilitation. Exertional and positional-related oxygen desaturation was a common feature in five patients (Case 1, 2, 5, 6, 8). Particularly, one individual (Case 1) demonstrated severe and persistent postural hypoxaemia (oxygen saturation decreased to <90% when seated upright from a supine position and lasted beyond 4 weeks following ICU discharge). While Case 2 was discharged from the hospital, the patient still had exertional dyspnoea with poor exercise tolerance.

Although the exact pathophysiology remains unclear, it is hypothesized to be associated with severe ventilation/perfusion mismatch (likely predominantly increased intrapulmonary shunt) especially in severe COVID-19. Exertional-related desaturation has been previously described in some patients post-ARDS [4] and survivors of severe acute respiratory syndrome (SARS) [5].

Considering this phenomenon, various strategies were used. Therapy sessions were organised into small interval sessions with multiple rest breaks in between exercise sets. Interval training was prescribed in the initial stages of the rehabilitation before gradually progressing to continuous training, as the patients were unable to tolerate continuous aerobic exercises. A stepwise approach was also used to

progress mobilisation from sitting over the edge to standing and to sit out of bed. During mobilisation, the ventilator settings were titrated, and additional supplementary oxygen was provided if required. Vital signs were continuously monitored for all sessions to ensure the detection of changes in oxygenation. If significant desaturation were observed despite the above strategies, patients were returned to supine positioning to rest with supplementary oxygen. This phenomenon has greatly slowed down the progression of rehabilitation, especially during the initial phases (Fig. 1). Further, this could potentially result in a huge burden on healthcare resources to provide rehabilitation to these patients. As such, we should consider:

- 1 Early detection and recognition of this phenomenon to avoid raising unnecessary alarms and prevent adverse events by continuous monitoring;
- 2 A tailored rehabilitation approach in accordance with patient tolerance;
- 3 A prolonged duration of rehabilitation course may be expected especially for patients who were severely ill as a result of COVID-19 infection;
- 4 Prescription of home exercise program to target decreased exercise tolerance following hospital discharge. The possibility of a follow-up review via telerehabilitation should be explored;
- 5 Further studies to investigate the long-term impact of COVID-19 on respiratory and physical function.

There are several limitations to our findings. Firstly, this finding is based on a single centre in Singapore. Considering that NCID is the largest centre in Singapore and similar demographics (predominance of elderly male patients) observed in other countries [6], our finding is likely representative of the individuals with COVID-19 infection. However, the need for respiratory physiotherapy intervention may differ due to regional differences in patient profiles, prevalence of co-morbid diseases and physiotherapy practices.

Next, the percentage of patients who were referred to physiotherapy is small. While it is possible that some of the patients who may benefit from physiotherapy interven-

tions who were not referred to the service, this finding can also be attributed to several other factors. At the time of writing of this manuscript, all individuals with COVID-19 infection were admitted into hospitals in Singapore as part of the government's containment effort. Majority of these individuals were asymptomatic or have mild symptoms and therefore do not require physiotherapy interventions. Additionally, nurse-led early mobilisation, a standard of care in our institution, was rendered for patients who were admitted into the ICU. Lastly, since the start of the outbreak, exercise videos were provided to all patients in the general medical wards to ensure that they remain active during their stay in the isolation facility. Considering these, this finding may not be generalisable to other centres and should be interpreted with caution.

Nevertheless, the findings from this case report provide new insight into the clinical presentation of patients with COVID-19. Physiotherapists should consider these recommendations in the provision of rehabilitation to this group of patients.

Ethical Approval: Due to the nature of this public health emergency, a waiver of informed consent was provided by the Singapore Ministry of Health for this case series.

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