

Telerehabilitation of spinal cord injury in limited resources setting during COVID-19 pandemic: A case report

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ABSTRACT

Introduction: Spinal cord injury (SCI) rehabilitation is a resource-intensive and time-consuming process and this is problem in particular for patients from a rural, remote areas, or low socioeconomic backgrounds. This problem is further exacerbated by social restriction policies in place due to coronavirus disease 2019 (COVID-19). This case report aimed to describe how telerehabilitation could overcome these challenges

Case presentation: A 20-year-old female involved in a motor vehicle accident. Preoperative magnetic resonance imaging (MRI) indicated a complete burst fracture of the L1 vertebral body. The patient experiences paraplegia and loss of autonomic control. Long spine fusion was performed. After being discharged, the patient could only visit the hospital once one-month post-surgery due to personal financial reasons and COVID-19-related social distancing policy. Telerehabilitation was used for the remaining follow-ups and rehabilitation programs were monitored through instant messaging platform between the patient, the operating surgeon, and the rehabilitation specialist. Telerehabilitation using instant messaging was an affordable and practical platform of communication for patient self-reporting and monitoring of progress. With intensive telerehabilitation program, the patient's functional abilities recovered from Frankel B to D after 6 months of following the domiciliary telerehabilitation plan.

Conclusion: We report a case of satisfactory functional outcome of SCI rehabilitation following the use of instant messaging to assist the rehabilitation. This highlights that instant messaging may be utilized to guide the rehabilitation process with the consideration of other factors such as the patient's engagement and the healthcare provider's commitment. We recommend for further refinements in the adoption and use of telerehabilitation for orthopaedic and traumatology cases that need long-term rehabilitation.

Keywords: Burst fracture, rehabilitation, spinal cord injury, telemedicine, telerehabilitation.

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INTRODUCTION

Spinal cord injury (SCI) is one of the leading causes of permanent paralysis and subsequently results in loss of economical productive activities for the patient.¹ The management and rehabilitation of SCI is a long process that is time-consuming, expensive, exhaustive. The process requires exceptional patience and motivation from the caregiver, the patient and their families. Traditionally, physical rehabilitation of SCI requires the patient to attend sessions in person at specially designated facilities monitored by an interdisciplinary team consisting of physiatrist, physiotherapists, psychologist, and other related healthcare provider.² During the Covid-19 pandemic, there were social restrictive policies in place that disrupted the routine physical

rehabilitation process and several adjustments had to be made to ensure the patient able to receive optimum care.³ Here, we present the case of satisfactory outcome on the use of self-reported telemedicine in monitoring SCI rehabilitation process in limited resources setting.

CASE PRESENTATION

A 20-year-old female presented to Emergency Department of Dr Zainoel Abidin General Hospital, Banda Aceh, Indonesia after hemodynamic stabilization was performed. The patient was a street cart vendor who had a high-energy motor vehicle accident (MVA), located 300 km away from the hospital. After regaining the consciousness, the patient could not move but still retain some sensation on

both of the legs. There was loss of bladder and anal sphincter function. The patient came from a low-income family and was on government social welfare assistance.

The magnetic resonance imaging (MRI) was performed to the patient. The MRI indicated a complete discontinuation of spinal canal on coronal and sagittal and complete burst fracture of L1 vertebral body (**Figure 1**).

Emergency spinal decompression and long posterior fusion were performed by an experienced orthopedic spine surgeon in Dr Zainoel Abidin General Hospital, Banda Aceh, Indonesia (**Figure 2**). Three days post-surgery the patient was able to gradually sit up straight and move the legs but unable to stand.

The patient was only able to return to the hospital for follow-up one-month

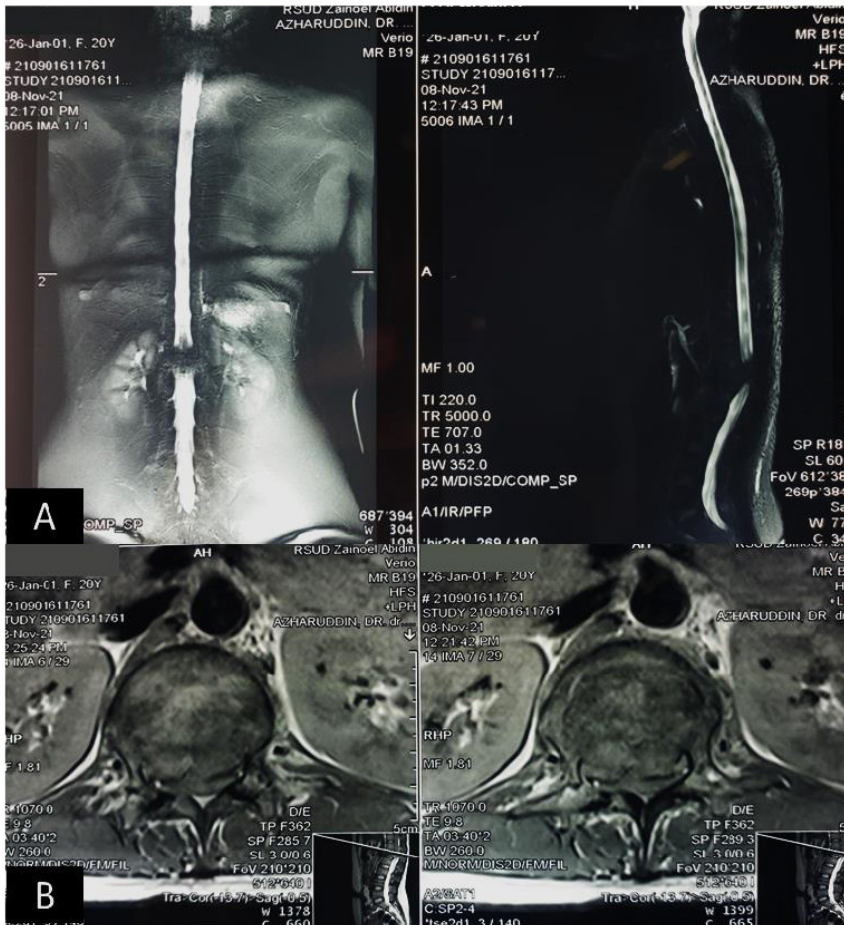


Figure 1. Preoperative magnetic resonance imaging (MRI) of the patient. (A) Complete discontinuation of spinal canal on coronal and sagittal T2 MRI. (B) Complete burst fracture of L1 vertebral body on axial T1 MRI.



Figure 2. Comparison of magnetic resonance imaging (MRI) of the patient before and postsurgery. (A) Preoperative sagittal MRI of the patient. (B) Post-surgery spinal long fusion application.

post-surgery due to personal financial reasons and coronavirus disease 2019 (COVID-19)-related social distancing policy in place. The remaining follow-ups and rehabilitation program were monitored through instant messaging platforms between the patient, the operating surgeon, and the rehabilitation specialist.

The patient's caregivers constructed a simple parallel bar in their home to assist in non-weight bearing and partial weight bearing exercises (Figure 3). The patient then reported monthly progress of the rehabilitation plan remotely to the attending physicians and the patient received feedbacks regarding the progress made.

After three months of regular rehabilitation program, the patient was able to ambulate short distances with walker, administer personal care independently, and use wheelchair for long-distance travel. Six months after surgery, the patient was able to walk with single walking cane, removed dependency of urinary catheter and recovered bowel functions. The patient's functional neurologic status had improved from Frankel B classification into Frankel D.

DISCUSSION

Successful functional recovery after SCI rehabilitation is uncommon for impoverished patients. This is associated with the lack of knowledge, motivation, access and resources to undergo the rehabilitation process. Adjustments to accommodate the patient's needs and capacity during drafting of the rehabilitation plan is critical for its success.³ Early rehabilitation in SCI is important to prevent further complications and disability. Rehabilitation plans need to be made and tailored to the patient's realistic functional goals and socioeconomic conditions.⁴ There are evidences available that patient with SCI with more severe and complex conditions have a more favorable outcome when rehabilitation began whilst the patient is still in admission, whilst patients with less severe conditions can be rehabilitated in outpatient, clinic, community, or domiciliary settings.⁵

Studies has identified five barriers that needed to be addressed in provision



Figure 3. Six months post-surgery. (A) Self-made parallel bars. (B) The patient attempted standing motion. (C) The patient during a rehabilitation session.

of rehabilitation services: low awareness and limited knowledge regarding SCI and rehabilitation issues, inadequate rehabilitation policies, inadequate infrastructure, inadequate in equipment and medication, and a shortage of well-prepared rehabilitation workforce.⁶ In our case, the patient faced those issues but used the available resources to the best of their abilities. One of the issues faced was that the national health insurance system only covers the costs of rehabilitation care, but not the supporting processes such as transportation and accommodation of the patient and their caregivers.⁷ This problem was further exacerbated by the geographic distribution of healthcare facilities to accommodate the needs of the population it serves.⁸ The patient and family overcame these limitations by constructing parallel bars to initiate domiciliary rehabilitation as there were no adequate facilities within proximity. This demonstrates the patient's and her caregivers' understanding of the importance of early rehabilitation of SCI.

Moshi et al. also reported that geographic challenges of obtaining adequate SCI rehabilitation services resulted in lower quality of life compared to those living within proximity of rehabilitation facilities.⁹ They highlighted that physical health and environments were the most important issues to be addressed.¹⁰ We believe that one of the key

important factors affecting satisfactory functional outcomes in this patient was the parent's ability to create a conducive environment for the patient to achieve the rehabilitation goals.

SCI rehabilitation process is best optimized through in-person monitoring from the multidisciplinary team. During COVID-19 pandemic, although multiple drugs have been tested, disruptions in multiple sectors occurred in Indonesia.¹¹⁻¹³ In-person physical interaction was limited and requires several adjustments such as staggering the schedule of activities or creating 'bubble' groups of rehabilitation originating from the same community.¹⁴ SCI patients are considered in the vulnerable group as their impaired neurological functions increased their susceptibility towards infections, hence limiting risk of exposure to infections is of the utmost importance.¹⁵ One of the ways to overcome this challenge is to conduct remote monitoring process through mobile devices in a process named telerehabilitation. Solomon et al. reported that despite the insufficient evidence to recommend telerehabilitation as an intervention to manage SCI, there are potential patient benefits such as reducing risk of depression through alleviation of patient's sense of social isolation and assistance in remembering the techniques in rehabilitation.¹⁶ In turn, this improves

the patient's satisfaction towards health professionals and gauge certain progress made by the patient.

Despite the convenience provided by telemedicine, security emerges as a critical issue due to the sensitivity of healthcare data and the potential for unauthorized access, data breaches, and privacy violations.¹⁷ Safeguarding patient information through encryption, secure platforms, and adherence to privacy regulations assumes paramount importance to instill confidence and trust in telemedicine, especially the use of widely available instant messaging platforms as the means of communication. Moreover, legal challenges encompass jurisdictional complexities, licensing requirements across different regions, liability concerns, and ensuring compliance with data protection regulations.¹⁸ Establishing clear legal frameworks and guidelines that address licensing, liability, and jurisdictional intricacies is essential for the widespread and sustainable adoption of telemedicine.

CONCLUSION

Patients with SCI requires intense monitoring throughout the rehabilitation process. Covid-19 associated social restriction policies and limited resources have accelerated the adoption of

telemedicine for remote monitoring of the rehabilitation activities. We report a successful outcome of SCI telerehabilitation.

CONFLICTS OF INTERESTS

The authors declare that they have no competing interests.

SOURCES OF FUNDING

There was no funding.

ETHICAL APPROVAL

Not required.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this upon request.

AUTHORS CONTRIBUTIONS

Both authors co-wrote the paper and discussed the results for the manuscript preparation. All authors have read and approved the final manuscript.

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