

**To Cite:**

Hege A, Dadgal R, Qureshi MI. Effectiveness of early physiotherapy management in acute stage of traumatic spinal cord injury patient- A case report. *Medical Science*, 2022, 26, ms242e2163.  
doi: <https://doi.org/10.54905/disssi/v26i124/ms242e2163>

**Authors' Affiliation:**

<sup>1</sup>Intern, Department of Neuro-Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Wardha442004, Maharashtra, India; Email: akanksha.r.hege@gmail.com, ORCID Id- <https://orcid.org/0000-0003-0411-7591>

<sup>2</sup>Assistant Professor, Department of Neuro-Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Wardha442004, Maharashtra, India; Email: dr.raginidadgal@gmail.com, ORCID: <https://orcid.org/0000-001-9374-3484>

<sup>3</sup>Professor, Head of Neuro-Physiotherapy Department, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Wardha442004, Maharashtra, India

**Peer-Review History**

Received: 11 March 2022

Reviewed & Revised: 12/March/2022 to 12/June/2022

Accepted: 18 June 2022

Published: 24 June 2022

**Peer-review Method**

External peer-review was done through double-blind method.

URL: <https://www.discoveryjournals.org/medicalscience>



This work is licensed under a Creative Commons Attribution 4.0 International License.

## Effectiveness of early physiotherapy management in acute stage of traumatic spinal cord injury patient- A case report

Akanksha Hege<sup>1</sup>, Ragini Dadgal<sup>2</sup>, Moh'd Irshad Qureshi<sup>3</sup>

**ABSTRACT**

Spinal cord injury (SCI) is rare and has a profound impact on an individual's life. Traumatic SCI are cause due to Road Traffic Accident (RTA), gunshot, falls etc. It alters the motor, sensory and autonomic functions. The SCI can be categorized in tetraplegia and paraplegia. Presented case is a 26 year old male came in casualty with the complain of loss of power over bilateral lower limb, with history of trauma due to which he had T<sub>11</sub>- L<sub>3</sub> for L<sub>1</sub> vertebrae fracture and was operated for the fixation of the same. He was diagnosed as traumatic SCI based on symptoms, physical examination, outcome measures, MRI. Early physiotherapy management was initiated and after 15 days, the functional status of patient was improved. We conclude that the early physiotherapy management is effective in acute stage of traumatic SCI patient.

**Keywords:** Traumatic Spinal Cord Injury, Physiotherapy management, Acute stage SCI, Early PT management

**1. INTRODUCTION**

Spinal cord injury (SCI) is a relatively rare, high-cost accident that has a significant effect on an individual's life (Kim et al., 2013). It alters the function of many organ systems instantly and frequently results in sensory, motor, and autonomic deficits while cell death, tissue loss persist for several weeks after the initial trauma of SCI (Ramer et al., 2014). Many secondary impairments occurs due to the loss of motor, sensory and autonomic functioning in SCI (Harvey, 2016). The patient of SCI experiences paralysis of muscles depending on the lesion extend over spinal cord which affect patient's body structure and function, normal routine as well as social interaction, it not just only affects musculoskeletal system but also affects respiratory, cardiopulmonary, integumentary, gastrointestinal, genitourinary and sensory system (O'Sullivan et al., 2014). Usually vehicular trauma and gunshot injury are the most common cause of SCI (Waters and Sie, 2003; Harvey, 2016), other than this

falls, work-related injuries, fall of a heavy object over back are also the causes of traumatic SCI (Harvey, 2016).

The SCI can be tetraplegia and paraplegia (O’Sullivan et al., 2014; Harvey, 2016), but commonly it result in complete paraplegia (Waters and Sie, 2003). Before the physiotherapy management of acute stage of SCI, initial examination of patient is important in which we examine the stability, physical examination and neurological assessment (O’Sullivan et al., 2014). The severity of SCI is evaluated and documented by using International Standards for Neurological Classification of Spinal Cord Injury which is created by the American Spinal Injury Association(ASIA) in which assessment of sensory and motor functions are done, it also indicates whether the SCI is complete or incomplete (O’Sullivan et al., 2014; Kirshblum et al., 2020). Through the rehab phase, physiotherapy emphasizes motor related objectives task Stepping, dragging a wheelchair, shifting, and then using the upper extremity (Harvey, 2008).

The objective of rehab is to help the individual back to a functional and fulfilling life, physiotherapy intervention to improve muscle strength is strength training such as progressive resistance exercises to non- paralyzed muscles, which not just improve strength but also the standard of living of patients. Passive range of motions and stretching helps in treating and preventing contractures (Harvey, 2016). Motor learning which includes appropriate use of instructions, feedback and manual guidance improves the performance of tasks like walking, transferring, wheelchair mobility (Ellis, 2005). Activity-based therapy is a task-specific and context-specific rigorous practise that incorporates many hours of physical activity (Carr and Shepherd, 1989), it also focuses on improving function and brain repair under the extend of lesion (Harvey, 2016). Skin care education is also important part of physiotherapy management, as pressure ulcers are common in SCI patients (Brace and Schubart, 2010) and due to sensory impairment, skin care education includes positioning, use of protective gloves and/or shoes to prevent from injuries to skin and use of sunscreen and moisturizers to protect and prevent dryness of skin (Kisner et al., 2017). Physiotherapy management includes patient’s and family education, early immobilization of fracture site, passive range of motion exercises, bed mobility education, respiratory management, cardiovascular training, skin care, strengthening (O’Sullivan et al., 2014; Harvey, 2016).

## 2. CASE REPORT

### Patient Information

A 28 year old male is a labour by occupation, right side dominance, he was apparently all right 2 days back then he had trauma at lower back due to fall of heavy bags over his back when his trunk was flexed while working at his workstation and was stuck below these heavy bags for at least 10 minutes after which he was rescued and was taken to nearby hospital by his co-workers at around 6 pm on 20 October 2021 and on same day where investigations were done and on 20 October 2021, he was operated for spinal fixation at T<sub>11</sub>- L<sub>3</sub> for L<sub>1</sub> vertebrae fracture with retropulsion of L<sub>1</sub> vertebrae. The patient was presented with the complaint of loss of power over bilateral lower limbs. On 22 October 2021, patient was assigned for physiotherapy management. The patient’s medical, family, and psycho-social history was not significant.

## 3. CLINICAL FINDINGS

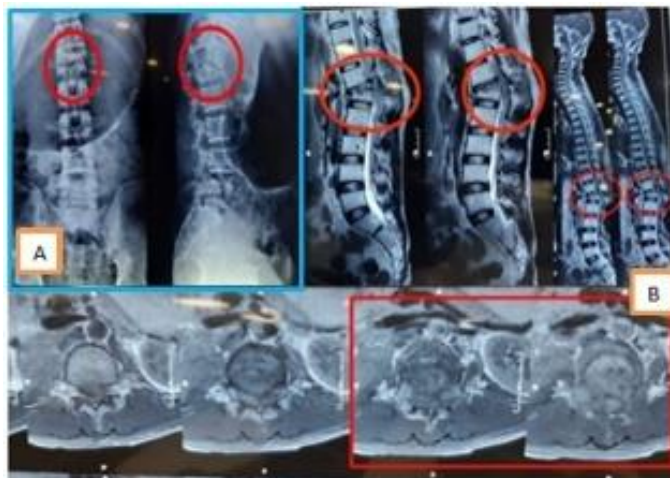
After taking informed consent, patient was examined in supine position with both anterior superior iliac spines at same level. Patients built was ectomorphic, was conscious and oriented. On physical examination, vital signs including temperature were normal, pulse rate 78 beats/min, respiratory rate 13 breaths/min, blood pressure 120/78 mmhg. On local examination, paraspinal muscle spasm present, spinal tenderness present over thoracic-lumbar region, tone evaluation revealed the flaccidity of bilateral lower limbs, deep tendon reflexes was absent at lower limb, abdominal reflex was present above the umbilicus, planter response was absent. Timeline is showed in table 1.

**Table 1** Timeline

Event	Date
Traumatic Spinal Cord Injury	20/10/2021
Date of admission	20/10/2021
Radiology, MRI	20/10/2021
Date of operation	20/10/2021
Date of physiotherapy management	22/10/2021

**Diagnostic Assessments**

X-ray and Magnetic Resonance Imaging (MRI) were done to confirm the diagnosis. X-ray shows compression fracture of L<sub>1</sub> vertebrae whereas MRI shows L<sub>1</sub> compression fracture with the SCI from T<sub>11</sub>-L<sub>3</sub>, (Figure 1).



**Figure 1** A: X-ray imaging, B: MRI imaging

**Therapeutic Interventions**

Physiotherapy intervention was initiated from Intensive Care Unit (ICU) where deep breathing exercises, passive end expiratory pressure to chest were given bilaterally, bed mobility training, positioning, passive Range Of Motion(ROM) exercises of bilateral lower limb (figure 2), active ROM exercises of bilateral upper limb were done.

This protocol was continued for 2 days till the patient was in ICU. After which the patient was shifted to general ward where strengthening of upper limbs was initiated including the above protocol was followed. Further detailed Physiotherapy (PT) management is mentioned in table 2.

**Table 2** Physiotherapy Management

Week 1	Stabilization of thoracic-lumbar spine using Thoracic Lumbar Sacral Orthosis (TLSO) Active range of motion exercise of bilateral upper limb (10 repetitions x 2 sets) Passive range of motion exercise of bilateral lower limb (10 repetitions x 2 sets) Tibialis Anterior(TA) stretch bilaterally (10 repetitions, 5 seconds hold x 1 set) Positioning Bed mobility- log rolling Deep breathing exercise Passive end expiratory pressure Static back exercise (10 repetitions with 5 seconds hold) Strengthening of upper limb using 1 kg weight (10 repetitions x 1 sets) Skin care education such as, use of protective shoes, avoid walking bare foot, use of moisturizers, weight shifts. Sensory re-education using soft cotton ball and feather
Week 2	Active range of motion exercise of bilateral upper limb (10 repetitions x 4 sets) Passive range of motion exercise of bilateral lower limb (10 repetitions x 4 sets) Joint approximation Deep breathing exercise Bed side sitting Reach- outs in sitting Rood’s approach- facilitatory techniques using quick ice, tapping, quick stretch Strengthening of upper limb using 1.5 kg weight (10 repetitions x 2 sets)

	Sensory re-education using soft cotton ball and feather
Week 3	Active range of motion exercise of bilateral upper limb (10 repetitions x 5 sets) Passive range of motion exercise of bilateral lower limb (10 repetitions x 5 sets) Joint approximation Deep breathing exercise Bed side sitting Reach- outs in sitting Rood’s approach- facilitatory techniques using quick ice, tapping, quick stretch Proprioceptive Facilitatory Technique- dynamic reversal for upper limb Tilt table training Strengthening of upper limb using 1.5 kg weight (10 repetitions x 4 sets) Sensory re-education using soft cotton ball, feather and sand Wheelchair mobility training Use of hip knee ankle foot orthosis while standing
Week 4	Passive range of motion exercise of bilateral lower limb (10 repetitions x 5 sets) Deep breathing exercise Supported standing Reach- outs in sitting Rood’s approach- facilitatory techniques using quick ice, tapping, quick stretch Strengthening of upper limb using 1.5 kg weight (10 reps x 4 sets) Sensory re-education using soft cotton ball, feather and sand Wheelchair mobility training and transfers Use of hip knee foot orthosis (HKFO) while standing Initiation of walking with HKFO using parallel bars PNF- Trunk dynamic reversals Standing daily for half hour



**Figure 2** Passive lower limb ROM exercises

Futuristic goals include wheel chair training, gait training, sensory re-education using various other stimulus such as sand paper, Functional Electrical Stimulation to lower limb, home exercise program.

**Follow- up and Outcomes**

Scoring on outcome measure scale was taken on the day of examination and follow up was taken by using outcome measure scales on 10<sup>th</sup> day of rehabilitation whereas, outcome measures are mentioned in table 3.

**Table 3** Outcome measures

Primary Outcome Measure:						
Outcome measure	Scoring on day of examination		On 15 <sup>th</sup> day of rehabilitation		On 30 <sup>th</sup> day of rehabilitation	
	Right	Left	Right	Left	Right	Left
International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI)						
Sensory level	T <sub>11</sub>	T <sub>11</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>
Motor level	T <sub>11</sub>	T <sub>11</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>
Neurological level of injury (NLI)	T <sub>11</sub>	T <sub>11</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>
Complete or Incomplete?	C (complete) A (complete)	C (complete) A (complete)	C A	C (complete) A (complete)	C A	C(complete) A(complete)
ASIA Impairment Scale (AIS)						
Zone of Partial Preservation: Sensory	T <sub>12</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>
Motor	L <sub>2</sub>	L <sub>2</sub>	L <sub>2</sub>	L <sub>2</sub>	L <sub>2</sub>	L <sub>2</sub>
Secondary Outcome Measure						
Outcome measure	Scoring on day of examination		On 15 <sup>th</sup> day of rehabilitation		On 30 <sup>th</sup> day of rehabilitation	
Barthel Index of Activities of Daily Living	02/20		08/20		12/20	

#### 4. DISCUSSION

Our case study includes the case of acute traumatic SCI, focused on the effect of early physiotherapy management in acute stage of SCI. SCI refers to the neurological damage which is caused due to trauma (Harvey, 2016). Literature by (Silva et al., 2013) states that the combination of multiple strategies for the management of spinal cord injury must be used for the functional recovery, in our case study we have also planned multiple strategies for management of SCI. In the study of Waters and Sie, (2003) it is clearly mentioned that the physical therapy help patients to achieve their maximal level of function by providing strengthening programmes, instruction in body handling abilities and when necessary, ambulation and wheelchair mobility in SCI patients, our study have also used these protocols for the intervention of SCI.

Study by Rauch et al., (2010), has showed that the functioning status of the patient has improved after physical therapy as compare to the functional status first and foremost of the treatment, in our case study we have also noted the progression of the patient’s functional abilities. Kirshblum et al., (2007) showed in there study that initiation of early rehabilitation of acute SCI from intensive care unit itself is extremely important, in our study we also have initiated the management at early stage of SCI and have marked the progression in patient’s health. Study by Scivoletto et al., (2005) shows that early beginning of SCI-specific therapy is a predictive factor for functional recovery that is both independent and relative, delays in initiating this intervention may have a substantial effect on the patients' final recovery; so, even if the patient's clinical status has not been completely stabilised but it is essential to monitor the medical status of patient before beginning the physiotherapy intervention to evaluate risk factors, a SCI-specific therapeutic programme should be initiated early in the clinical course, our study mainly focus on the early management of SCI patient’s.

Lisa A Harvey, (2016) states in her study that Rehabilitation after a SCI begins as soon as the patient is medically stable, physiotherapy is useful in both immediately after an injury and once patients are discharged from the hospital, in our study we have initiated early physiotherapy management when the patient was medically stable and it was continued after the discharge by taking follow- ups and prescribing home exercises with proper education of patient. Our case study of SCI is unique because rehabilitation was started immediately after surgery and significant improvement was seen.

#### 5. CONCLUSION

This study concludes that the early physiotherapy management is effective in acute stage of traumatic SCI patient. Early physiotherapy interventions that are goal-oriented and well- planned results in faster recovery.



**Author's Contribution**

All authors contributed equally

**Acknowledgement**

We thank the patient who participated and contributed for this case report.

**Informed Consent**

Written and Oral informed consent was obtained from the individual included in the case report. Additional informed consent was obtained from the individual for whom identifying is included in this case report.

**Funding**

This study has not received any external funding.

**Conflicts of interest**

The authors declare that there are no conflicts of interests.

**Data and materials availability**

All data associated with this study are present in the paper.

**REFERENCES AND NOTES**

1. Brace JA, Schubart JR. A Prospective Evaluation of a Pressure Ulcer Prevention and Management E-Learning Program for Adults with Spinal Cord Injury. *Ostomy Wound Manag* 2010;11.
2. Carr JH, Shepherd RB. A Motor Learning Model for Stroke Rehabilitation. *Physiotherap* 1989; 75:372–80. doi: 10.1016/S0031-9406(10)62588-6.
3. Ellis (MSc.) E. *Science-based Rehabilitation: Theories into Practice*. Elsevier Health Sciences; 2005.
4. Harvey L. *Management of Spinal Cord Injuries: A Guide for Physiotherapists*. Elsevier Health Sciences; 2008.
5. Harvey LA. Physiotherapy rehabilitation for people with spinal cord injuries. *J Physiother* 2016; 62:4–11. doi: 10.1016/j.jphys.2015.11.004.
6. Kim J, Kim JH, Bang MS. A Case Report of Spinal Cord Injury Patient from a High Velocity Gunshot Wound to the Lumbar Spine. *Ann Rehabil Med* 2013; 37:118–22. doi: 10.5535/arm.2013.37.1.118.
7. Kirshblum S, Snider B, Rupp R, Read MS, International Standards Committee of ASIA and ISCoS. Updates of the International Standards for Neurologic Classification of Spinal Cord Injury: 2015 and 2019. *Phys Med Rehabil Clin N Am* 2020; 31:319–30. doi: 10.1016/j.pmr.2020.03.005.
8. Kirshblum SC, Priebe MM, Ho CH, Scelza WM, Chiodo AE, Wurmser L-A. *Spinal cord injury medicine*. 3. Rehabilitation phase after acute spinal cord injury. *Arch Phys Med Rehabil* 2007; 88:S62-70. doi: 10.1016/j.apmr.2006.12.003.
9. Kisner C, Colby LA, Borstad J. *Therapeutic Exercise: Foundations and Techniques*. FA. Davis; 2017.
10. O'Sullivan S, Schmitz T, Fulk G. *Physical Rehabilitation*, 6th edition. Fac Bookshelf 2014.
11. Ramer LM, Ramer MS, Bradbury EJ. Restoring function after spinal cord injury: towards clinical translation of experimental strategies. *Lancet Neurol* 2014; 13:1241–56. doi: 10.1016/S1474-4422(14)70144-9.
12. Rauch A, Escorpizo R, Riddle D, Eriks-Hoogland I, Stucki Prof Dr med. G, Cieza A. Using a Case Report of a Patient With Spinal Cord Injury to Illustrate the Application of the International Classification of Functioning, Disability and Health During Multidisciplinary Patient Management. *Phys Ther* 2010; 90:1039–52. doi: 10.2522/ptj.20090327.
13. Scivoletto G, Morganti B, Molinari M. Early versus delayed inpatient spinal cord injury rehabilitation: An Italian study. *Arch Phys Med Rehabil* 2005; 86:512–6. doi: 10.1016/j.apmr.2004.05.021.
14. Silva N, Sousa N, Reis RL, Salgado A. From Basics to Clinical: A Comprehensive Review on Spinal Cord Injury. *Prog Neurobiol* 2013; 114. doi: 10.1016/j.pneurobio.2013.11.002.
15. Waters RL, Sie IH. Spinal Cord Injuries from Gunshot Wounds to the Spine. *Clin Orthop Relat Res* 2003; 408:120–5.