DOI: 10.35845/kmuj.2019.18442

FUNCTIONAL RECOVERY IN PATIENTS WITH POST-TRAUMATIC SPINAL CORD INJURIES: AN OUTCOME OF GROSS MOBILITY AT PARAPLEGIC CENTER PESHAWAR, PAKISTAN

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Date Submitted: June 12, 2018
Date Revised: March 21, 2019
Date Accepted: March 21, 2019

ABSTRACT

OBJECTIVE: To determine the outcomes of gross mobility after physical therapy interventions undertaken at the Paraplegic Center Peshawar, Khyber Pakhtunkhwa, Pakistan for functional recovery of patients with spinal cord injuries (SCI).

METHODS: This sequential intervention trial was conducted from June 2016 to July 2017, at Paraplegic Center Peshawar, Khyber Pakhtunkhwa, Pakistan. Using consecutive sampling technique, a total of 76 persons with paraplegia were included. Persons with tetraplegia were excluded. Motor relearning program (MRP) was applied three hours per day in a standardized intervention, 3 days per week. The post intervention evaluation was done by using spinal cord independence measure (SCIM) scale. Data was analyzed in SPSS version 20.0, where the mean score of post intervention (for each six visits) was compared to see the improvement. ANOVA was used and a p value of <0.05 was considered significant.

RESULTS: Out of 76 patients with spinal cord injuries, 19 (25%) were females and 57 (75%) were males. There was a gradual increase in the improvement of gross mobility of persons with SCI as a result of physical therapy interventions based on MRP. Mean scores for mobility in bed and action to prevent pressure sores, bed-wheelchair transfers: wheelchair-toilet-tub, indoors and outdoors mobility, mobility for moderate distances (10-100 meters), outdoors mobility (>100 meters), wheelchair-car transfer & ground-wheelchair transfers showed significant improvement ($p<0.01$) during six visits. However, no significant improvement was observed in stair management ($p=0.13$).

CONCLUSION: Physical therapy based on a MRP is an effective tool for improvement of gross mobility in persons with SCI.

KEY WORDS: Physical therapy (Non-MeSH); Physiotherapy (MeSH); Rehabilitation (MeSH); Physical Therapy Modalities (MeSH); Spinal Cord Injuries (MeSH); Mobility (Non-MeSH); Mobility Limitation (MeSH); Motor relearning program (Non-MeSH); Spinal cord independence measure scale (Non-MeSH).

THIS ARTICLE MAY BE CITED AS: Zeb A, Arsh A, Bahadur S, Shah I, Ilyas SM. Functional recovery in patients with post-traumatic spinal cord injuries: an outcome of gross mobility at Paraplegic Center Peshawar, Pakistan. Khyber Med Univ J 2019;11(1):17-20. DOI: 10.35845/kmuj.2019.18442.

INTRODUCTION

Spinal cord injury (SCI) is one of the major causes of lifelong disability in both developing and developed countries.[1] The most obvious consequences of SCI are paralysis. However, it has widespread effects on many body functions including bowel and bladder, respiratory, cardiovascular and sexual dysfunctions. It has social, financial and psychological implications while it tends to increases individual's susceptibility to other secondary complications like pressure sores, late-life renal failures, musculoskeletal deformities, neuropathic pains, osteoporosis and heterotrophic ossifications etc.[2,3]

In Pakistan, the population based data on SCI is not available; however few single-center based retrospective studies reported demographic information of SCI patients in Pakistan.[4-7] The primary goal of rehabilitation of SCI patients is to maximize functional independence and minimize dependency.[8] Interdisciplinary team comprising of physiatrists, physical therapists, nurses, occupational therapists, psychologists and social workers work in collaboration to maximize functional independence.[9]

Mobility tasks such as bed mobility training (mat activities e.g. rolling, prone on elbow, prone on hands, supine on elbows, sitting in bed, vertical lift), transfers training (e.g. transfers to and from bed, floor, commode chair and car etc.) balance training, co-ordination training and gait training are applied in order to achieve functional goals.[10] These activities, not only enable SCI patients to live a dignified life but also help in preventing secondary complications associated with SCI.[11]

Although previous research studies reported significant improvements in SCI patients who underwent standard rehabilitation program and mobility training, yet evidence regarding efficacy of motor tasks training is

TABLE I: COMPARISON OF GROSS MOBILITY AMONG PATIENTS WITH SPINAL INJURIES WITH RESPECT TO CONSECUTIVE FOLLOW UP FOR REHABILITATION SERVICES

Outcome Variables of Rehabilitative Interventions	Mean Score at 1st Visit t ($\bar{x}$ ± S.D)	Mean Score at 2nd Visit t ($\bar{x}$ ± S.D)	Mean Score at 3rd Visit t ($\bar{x}$ ± S.D)	Mean Score at 4th Visit t ($\bar{x}$ ± S.D)	Mean Score at 5th Visit t ($\bar{x}$ ± S.D)	Mean Score at 6th Visit t ($\bar{x}$ ± S.D)	P-Value
Mobility in Bed and Action to Prevent Pressure Sores	0.80±1.8	2.3±2.5	2.4±2.6	6.6±2.6	2.5±2.4	4.6±1.8	0.0001
Transfers (bed-wheelchair)	0.24±0.6	0.64±0.8	1.0±1.3	0.76±1.1	4.2±1.0	4.1±2.0	0.0001
Transfers (wheelchair-toilet-tub)	0.2±0.6	0.7±0.8	0.7±0.8	1.5±0.8	2.3±0.5	3.2±0.5	0.0001
Mobility Indoors and Outdoors	0.3±0.9	1.5±2.0	1.5±1.8	2.1±1.3	2.4±1.2	3.1±1.0	0.0001
Mobility for Moderate Distances (10-100 meters)	0.4±1.1	1.4±1.9	1.4±1.6	1.0±1.5	0.5±1.1	0.3±0.9	0.0001
Mobility Outdoors (more than 100 meters)	0.3±0.8	1.3±1.8	1.2±1.5	1.7±1.4	2.1±1.2	3.1±0.5	0.0001
Stair Management	0.04±0.2	0.2±0.5	0.2±0.8	0.08±0.3	0.09±0.4	0.03±0.2	0.13
Transfers (ground-wheelchair)	0.2±0.4	0.6±1.0	0.5±0.7	0.6±0.9	1.2±0.5	1.7±0.4	0.001
Transfers (wheelchair-car)	0.05±0.2	0.2±0.3	0.3±0.7	0.6±0.7	0.8±0.2	1.07±0.2	0.002

controversial.[12-14] Therefore this study was designed to determine the outcomes of gross motility after series of physical therapy interventions based on motor relearning program (MRP) among SCI patients.

METHODS

This was an experimental study based on sequential intervention of MRP for three hours per day in a standardized intervention of 3 days per week. The study was conducted in Paraplegic Centre, Peshawar, Pakistan from June 2016 to July 2017.

Patients with paraplegia regardless of their gender, area of living and causes of injuries were included while tetraplegic and SCI patient with complications and/or other co-morbidities were excluded to minimize confounding. Using consecutive sampling technique, a total of 76 registered patients participated in the study. Informed consent was taken from all patients. Ethical approval was obtained from Institutional Ethical Review Committee of Paraplegic Center, Peshawar.

The subjects underwent bed mobility training (mat activities e.g. rolling, prone on elbow, prone on hands, supine on elbows, sitting in bed, vertical lift), transfers training (e.g. transfers to and from bed, floor, commode chair and car etc.) and gait training for one month. The outcomes of interventions were evaluated using spinal cord independence measure (SCIM) scale. Trained physical therapists were involved in pre and post intervention assessment. Data was analyzed in SPSS version 20.0, where the mean score of post intervention (for each 6 visits) was compared to see the improvement. ANOVA test was used and a p value <0.05 was considered significant.

RESULTS

A total of 76 persons with SCI participated in the present study in which 19 (25.0%) were female and 57 (75.0%) were male. Educational status of the participants shows that most of them (n=28; 36.8%) were uneducated followed by 27 (35.5%) with 6-7 years of education, 13 (17.1%) had below primary education while 8 (10.5%) had secondary school level education.

Majority of patients (n=57; 75%) were married while remaining 19 (25%) were unmarried. Patients were presented from both rural (n=40; 52.6%) and urban (n=36; 47.4%) areas. Forty-eight (63.1%) patients had chronic SCI (more than 42 days of SCI) while 28(36.9%) were acute (less than 42 days of SCI) cases. Forty-nine (49; 35.5%) of them underwent spine fixation procedure.

There was a gradual increase in the improvement of gross mobility of persons with SCI as a result of physical therapy interventions based on MRP. The mean score of gross mobility at consecutive visits (follow-up) is given in Table I. The p value for consecutive mean difference in majority of variables was highly significant ($p<0.001$).There was non-significant improvement regarding stair management ($p=0.130$).

DISCUSSION

SCI affects mental, physical, social and psychological aspects of life. The outcomes of interventions for rehabilitation of patients with SCI are mostly measured in terms of gross mobility.[15] In the present study the gross mobility among patients with SCI was assessed in consecutive follow up visits. The outcome of gross mobility was measured in terms of; mobility in bed,

transfers from bed to wheel chair and wheel chair to toilet or tub, wheel chair to car and ground. It also includes indoor and outdoor mobility and stair management. There was a gradual increase in the improvement of gross mobility of persons with SCI as a result of physical therapy interventions based on MRP.

The goal of physical rehabilitation is to maximize functional independence and mobility. Previous studies reported that comprehensive rehabilitation improves gross mobility in SCI patients.[16] Current study also reported that physical rehabilitation interventions could improve bed mobility, transfers and indoor and outdoor mobility. Though SCI is incurable but rehabilitation strategies aim to minimize complications and maximize independence according to patient functional capabilities.[17,18]

Conventionally, the physical rehabilitation interventions have been considered to improve functional outcomes in SCI patients only through enhancement, compensation and replacement of the remaining function of nerve and muscle.[10] However, recently accumulating evidences indicated that physical rehabilitation interventions can improve the function in different levels from end-effectors organ such as skeletal muscle to cerebral cortex through reshaping skeletal muscle structure and muscle fiber type, regulating physiological and metabolic function of motor neurons in the spinal cord and remodeling function of the cerebral cortex.[19]

Physical rehabilitation interventions including bed mobility training and transfer training etc enable SCI patients to live a dignified life. Despite the fact that a growing number of studies from developed countries reported effectiveness of physical trainings in the rehabilitation of SCI patients, however literature from developing countries is scarce.[20,21] The results of present study indicate significant improvement, which could be augmented as a result of integrative rehabilitation services provided at Paraplegic Center, Peshawar. Despite the fact that current study was a preliminary study to determine effectiveness of physical therapy training for spinal cord injury patients however current study has some limitations. First, sample size of current study was small due to which results of current study cannot be generalized. Secondly, due to lack of control group, confounding variables were difficult to minimize. Moreover, current study was conducted in a single rehabilitation center and multicenter, large clinical trials are recommended in future.

CONCLUSION

Physical therapy based on a MRP is an effective tool for improvement of gross mobility in persons with SCIs. It is recommended that principles of motor relearning should be implemented in all SCI rehabilitation centers.

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AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

AZ: Acquisition, analysis & interpretation of data, drafting the manuscript, final approval of the version to be published

AA: Concept & study design, acquisition of data, critical review, final approval of the version to be published

SB, IS & SMI: Acquisition of data, critical review, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE

NIL

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